

Chapter 3J. Environmental Setting, Impacts, and Mitigation Measures - Recreation Resources

This chapter describes the recreation resources in Mono Basin and Owens River basin that could be affected by the target lake level alternatives. In Mono Basin, these resources are located around Mono Lake, along diverted and undiverted tributary streams, around Grant Lake reservoir and the June Lake Loop, and near other lakes in the basin. In the Owens River basin, potentially affected resources are located along the Upper Owens River, around Lake Crowley reservoir, in the Owens River gorge, and around Pleasant Valley reservoir near Bishop.

Recreation resources are described as they existed prior to diversions from Mono Basin, as important changes occurred since 1941, and as they existed in recent years. Potential impacts of the project alternatives and available mitigation measures are presented in later portions of this chapter. The information in this chapter is organized by major basin (Mono Basin and Owens River basin). The visual resources of Mono Basin and Owens River basin, which greatly influence recreational activities, are described in Chapter 3I, "Visual Resources".

PREDIVERSION CONDITIONS

Sources of Information

Information on recreation resources and use in Mono Basin and Owens River basin before 1941 was obtained from published contemporary and historical accounts and interviews with individuals with first-hand knowledge of the subject. Contemporary sources include Homer Mining Index (1884) and Bergman (1938). Historical accounts include Mears (1963), Bean (1977), and Moore (1987). Personal accounts of prediversion recreation conditions in the study area were obtained from Wallis McPherson, Katherine Clover, and others.

Mono Basin

Historically, the major recreation resources in Mono Basin were Mono Lake, lakes along the June Lake Loop, and the tributary streams that supply water to Mono Lake (Figure 3J-1).

Mono Lake

Much of the early recreational activity at Mono Lake depended on use of its waters for their purported health benefits. A private health spa was in operation by 1884 where visitors soaked in lake water and rested in adjoining bedrooms (Homer Mining Index 1884). During the 1920s, a large health spa, including a sanitarium featuring hot-spring baths and a large hotel, was planned for construction on Paoha Island, but the venture eventually foundered because of inadequate financial resources. (McPherson pers. comm.)

The lake's sandy beaches were highly attractive to tourists; however, its unique water chemistry created unusual conditions for typical lake activities such as swimming and fishing. Although no fish species were known to reside permanently in Mono Lake, trout were observed historically in the brackish environment of the Rush Creek delta (McPherson pers. comm.).

Tourists began visiting Mono Lake in substantial numbers during the 1920s. A 1927 brochure promoted the "Inyo-Mono Playground" and its seven hotels and campgrounds. Early lakeshore facilities included the Mono Inn, Tioga Lodge, Farrington's Ranch, El Mono Hotel, Lee Vining Camp, and Lakeview Camp. Winter tourism increased when a rope tow for skiing was installed on Conway Summit in 1939 (McPherson pers. comm.).

Mono Lake attracted most of its visitors from southern California and, to a lesser extent, the San Francisco Bay Area. Early promoters of the area's recreational resources specifically targeted Los Angeles. Visitors pursued activities such as motor boating, waterskiing, swimming, picnicking, hunting, and camping. Sunbathing and beach games also were common on the lake's sandy beaches (McPherson pers. comm.).

Hunting for deer and waterfowl was popular historically at Mono Lake. The area was known for its abundant populations of waterfowl and other birds. Before 1940, many hunting blinds were located along the road connecting the mouths of Lee Vining and Rush Creeks (McPherson pers. comm.).

In 1938, the Mono Inn's owners initiated motorboat tours of Paoha and Negit Islands. One popular sport was aquaplaning, a precursor to waterskiing in which people standing on a large platform were towed. (McPherson pers. comm.)

Mark Twain Days, a Lee Vining festival that was initiated in 1929 to commemorate Mark Twain's 1862 visit to the basin, attracted many visitors to Mono Lake. The event occurred annually through 1941 when it was discontinued because of World War II. Mark Twain Days featured boat races, various tests of skill, and a bathing-beauty contest. By 1940, boat races held in conjunction with Mark Twain Days were sanctioned by the National Outboard Racing Commission and the American Power Boat Association, and over 50 boats participated.

June Lake Loop

The June Lake Loop road provides access to a string of lakes and reservoirs (June, Gull, Silver, and Grant) that are linked by Rush and Reversed Creeks (Figure 3J-1). The chain of lakes was created by glaciers that also left features such as Reversed Creek, which appears to flow uphill toward the Sierra Nevada, and Perched Rock, a 750-ton glacial boulder (Bean 1977).

Improvements to the June Lake Loop road and construction of water diversion and transport structures by LADWP brought many people to the June Lake area in the 1930s. Construction of Mono Craters Tunnel began in the early 1930s. The community of West Portal was founded to accommodate tunnel workers, many of whom preferred to live in the June Lake community. During construction of the tunnel, weekly rodeos and boat races were held at June Lake.

Grant Lake was originally formed by the same glacier that sculpted the other lakes of June Lake Loop. The lake was enlarged in 1915 when a dam was constructed at its outlet, and again enlarged in 1926 when the dam was raised. In 1935, construction began on a new Grant Lake reservoir dam. This project brought many workers to the northern end of June Lake Loop, further increasing the number of recreational events in the area. (Bean 1977.)

During the 1930s, June Lake Loop was a popular destination for tourists from southern California. A development at Silver Lake was known as "Little Pasadena", because most of its cabins were owned by Pasadena families. (Bean 1977.)

By 1940, the June Lake Loop had developed into a major outdoor recreation area. Warm-weather activities included camping, hiking, fishing, horseback riding, swimming, and picnicking. Deer and duck hunting, ice-skating, and skiing were popular during colder weather. Cabins and campgrounds were available at all of the loop's lakes, and horses could be rented at June Lake. Fishing was popular, and each lake had tackle shops and boat rentals. Fern Creek Fish Hatchery, established near Silver Lake in 1927, produced a yearly average of a million fingerlings for distribution to June Lake Loop lakes, Rush Creek, and other Mono Basin waters. (Bean 1977.)

Tributary Streams of Mono Lake

In the prediversion period, seven perennial streams flowed into Mono Lake. The most important of these streams were Rush and Lee Vining Creeks. The others are Parker, Walker, DeChambeau, Mill, and Wilson Creeks.

Rush Creek. Fishing was popular on Rush Creek. More than 300 species of birds, including 90 waterfowl and shorebird species, have been identified at Mono Lake. Although Mono Basin's waters did not support any native fish populations, trout fisheries were established in the creek by plantings in the late 19th century. Rush Creek provided good trout habitat and its banks supported lush riparian vegetation (Clover and Arnold pers. comms.). Streamflows were adequate to provide year-round fish cover, and

periodic floodflows maintained good supplies of spawning gravels. In 1924, California Bureau of Fish and Game began stocking Rush Creek, supplementing the wild trout populations with trout weighing up to 6 pounds (McPherson pers. comm.). See Chapter 3D, "Fishery Resources" for a more complete assessment of the prediversion fishery.

Rush Creek also sustained substantial camping and picnicking use (McPherson pers. comm.). Many artists used the area as subject matter for paintings (Clover pers. comm.). Waterfowl hunting was a major use of the Rush Creek delta. Most recreationists along Rush Creek were not local residents (Arnold pers. comm.).

Lee Vining Creek. As today, the Lee Vining Creek canyon was the principal route to Mono Basin for travelers from San Francisco. Many tourists combined visits to Mono Basin with trips to Yosemite National Park. Use of the creek increased substantially after Tioga Pass Road was paved in the 1920s. Popular campgrounds were located near the confluence of Lee Vining Creek and Gibbs Canyon and near the current intersection of U.S. 395 and SR 120. The California Bureau of Fish and Game first stocked Lee Vining Creek with trout in 1924 (Arnold pers. comm.). Lee Vining Creek and the other streams of the basin did not support as many large trout as Rush Creek and were not as renowned for their fishing as Rush Creek (McPherson pers. comm.)

Owens Basin

The main recreation resource in the Owens Basin is the Owens River, which originates at Big Springs and flows through Long Valley (Upper Owens River), Owens River gorge, and Owens Valley to its historic sink at Owens Lake (Figure 3J-2). Historically, the Upper Owens River was typically less than 30 feet wide and bordered primarily by grassy, overhanging banks interspersed with willow stands upstream of John Arcularius Ranch (Bergman 1938). Upper Owens River streamflows near the present location of the East Portal averaged approximately 55 cfs, and peak flows never exceeded 180 cfs. These conditions provided excellent trout habitat. (Edmondson pers. comm.)

The Upper Owens River was renowned for the quality of its fishing. One author described it as "the most underrated brown-trout water in the West", and another claimed it was the best stream in the nation for production of large trout (Mears 1963). The owners of two ranches encompassing 7 miles of the Upper Owens River took advantage of its fishery by establishing guest fishing ranches. The first of these guest ranches to be established was Arcularius Ranch in 1919 (Moore 1987). Owens River Ranch, just upstream from Arcularius Ranch, was operated as a guest ranch by the early 1920s. By the 1930s, both ranches were attracting many loyal customers.

In the mid-1920s, LADWP began construction of an impoundment on the Upper Owens River several miles downstream of the guest fishing ranches. After construction was suspended for several years,

Lake Crowley reservoir dam was completed in 1940, and water began filling the reservoir concurrent with the first water exports from Mono Basin.

The Owens River gorge, located downstream from Lake Crowley reservoir, is distinguished from other sections of the river by its high, steep rock walls. Before diversions for power production began in the early 1950s, the river flowed through the gorge to the Los Angeles Aqueduct (LA Aqueduct) intake below Tinemaha Reservoir. The gorge was well known for its production of large brown trout. Ten-pound fish were common, and the record catch was 22 pounds. (Mears 1963.)

ENVIRONMENTAL SETTING

This section describes recreation resources in the two-county Mono/Inyo area (the region) that could be adversely affected by the target lake level alternatives. Important resource changes that occurred since 1940 and recreation use in recent years are described.

Sources of Information

Principal information sources used in preparing this section include public agency reports; unpublished use records compiled by public agencies; summaries of user surveys commissioned by LADWP; summaries of creel censuses conducted by DFG; published scientific reports; and interviews with public land managers, resort operators, and public recreation facility concessionaires. Additional information on the characteristics of users of the affected areas and on their patterns of use was obtained through onsite user surveys conducted in 1991 and 1992 at Mono Lake, Rush Creek, Lee Vining Creek, Grant Lake reservoir, and Lake Crowley reservoir.

Regional Context

The region includes a large portion of the eastern Sierra Nevada, one of the premier recreation regions in the western United States. It features spectacular mountains, abundant lakes and streams, pristine forests and meadows, and fascinating historical sites. The region is heavily visited year-round, mainly for sightseeing, camping, fishing, hiking, and boating in summer and for skiing and other snow-related activities in winter. For example, Mammoth Mountain Ski Area near Mammoth Lakes is used more than any other ski area in the nation (U.S. Fish and Wildlife Service 1989).

Most of the region's recreation resources are managed by public agencies and are accessible to the public. The area's principal land management agencies are the U.S. Forest Service (USFS), U.S. Bureau of Land Management (BLM), California Department of Parks and Recreation (DPR), and

LADWP. Most of the Upper Owens River flows through private land, but much of this land also is accessible to the public if they reserve cabins at guest ranches.

Most visitors to the region are residents of metropolitan southern California. The proportion of visitors from southern California ranges from 69% in summer to 76% in winter, and out-of-state residents account for 15-19% of the visitors. Almost all visitors travel by motor vehicle. (California Department of Transportation 1979.)

The importance of the region for recreation can perhaps best be described using recreation information compiled for the Inyo National Forest. The Inyo National Forest includes 1.6 million acres in Mono and Inyo Counties, nearly all of which are in Mono Basin and Owens River basin (U.S. Forest Service 1989). (About 83% of the national forest is in either Inyo or Mono County.) In 1982, recreation use in the Inyo National Forest totaled 4.8 million recreation visitor days (RVD). (One RVD equals 12 hours of recreation use by any combination of persons.) Of this total, approximately 58% of RVDs were spent in the national forest's developed recreation areas (including alpine ski areas) and 42% were spent in dispersed areas. Recreation use of the Inyo National Forest has increased rapidly since 1982, reaching a total of 8.0 million RVD in 1989 (Upham pers. comm.).

Mono Basin

Recreation areas in Mono Basin that could be directly affected by the target lake level alternatives include Mono Lake, Grant Lake reservoir, and some of the tributaries of Mono Lake. Estimates of annual visitor days at these recreation areas are shown in Table 3J-1.

Recreation at other basin lakes and streams could be indirectly affected by potential changes in regional recreation use patterns. Other lakes and streams could have increases or decreases in use in response to changes in the quality of recreation opportunities at the directly affected areas.

Mono Lake

Resources. Mono Lake and its lakeshore are part of the 116,000-acre Mono Basin National Forest Scenic Area, which is administered by the USFS (Figure 3J-1). The Scenic Area includes lands owned by the federal and state governments, the City of Los Angeles, and various private entities. Portions consist of relicted lands on the lakeward side of nonfederal lands and constitute the 17,000-acre Mono Lake Tufa State Reserve, which is managed by DPR (Figure 3J-1). The entire lakeshore is open to public use.

Mono Lake's distinctive tufa towers and mounds form underwater as calcium-rich spring water mixes with carbonate-rich lake water. The lake's greatest concentrations of tufa are located near its

southern and western shorelines (see Chapter 3I, "Visual Resources") and are a primary attraction for visitors to Mono Basin.

Sand tufa are tubular structures formed of beach sand and carbonates that are also uniquely characteristic of Mono Lake. The lake's greatest concentrations of sand tufa occur near Navy Beach, along its southern shoreline. The lake's sand tufa are less well known than its calcium-carbonate tufa towers and are an important recreational feature for only a small portion of the lake's visitors.

Birds are another of the lake's popular attractions. The lake and its nearshore environments support relatively large populations of nesting shorebirds, including California gulls and plovers, and also provide important resting and feeding areas for large numbers of migrating grebes and phalaropes. Waterfowl use, substantial in prediversion times, is relatively small at present, although several thousands of ducks still visit the lake (see Chapter 3F, "Wildlife").

Recreation resources at Mono Lake have been affected by declines in the lake level due to stream diversions. Seasonal waterfowl use has markedly diminished from its historic level. Opportunities for swimming, wading, and powerboating have declined as the lake's salinity has increased and as the lake has become less accessible. The increased frequency of severe dust storms on the lake's northern and eastern shores as more unvegetated lakeshore has become exposed (see Chapter 3H, "Air Quality") also has affected the recreational experience, particularly for the relatively few people who visit these areas.

Declining lake levels have affected recreation facilities originally constructed to improve lake access. For example, at Old Marina the boat ramp became unusable because of low lake levels. Boardwalks and interpretive signs at several recreation sites have functioned less effectively as the lake level has fallen. Much of the recently exposed shore is muddy and difficult to traverse on foot. As a result, the western shore, which consisted of sandy beaches and supported heavy recreation use in the prediversion period, is now less suitable for sun bathing and other beach uses.

Mono Lake produces abundant alkali flies and brine shrimp, which are the principal diet of the lake's bird populations. Fly and shrimp production may vary depending on lake elevation and salinity. Such changes in invertebrate production could affect bird abundance. Although some visitors to Mono Lake are intrigued by its abundant invertebrate populations, surveys conducted for the visual resources analysis for this EIR indicate that visitors do not consider alkali fly and brine shrimp to be important features of the visual environment.

Fluctuating lake levels also have affected the lake's tufa formations, one of its primary tourist attractions. As the lake has declined, tufa towers have become increasingly visible, land based, and accessible to the public. Mono Lake Tufa State Reserve was established in 1981 in part to control damage to tufa resulting from increased visitor pressure. During a temporary rise in the lake level during the wet years of the early 1980s, many tufa towers at South Tufa were undercut and toppled by waves (Stine 1992).

Use. Most recreation use at Mono Lake occurs along the lakeshore. The most popular recreation areas have been South Tufa, County Park, and Old Marina (Figure 3J-1). Their popularity is attributable to their relative accessibility and unique natural features. South Tufa and County Park feature the best views of tufa towers. South Tufa is the most popular site for boating because of its comparative ease of access from the lake. Picnicking is highly popular at County Park because of its picnic facilities, restrooms, and shade. Much of Old Marina's popularity results from its location immediately adjacent to heavily traveled U.S. 395; however, since the May 1992 opening of the Forest Service Visitors Center, located along U.S. 395 just north of Lee Vining, use of Old Marina has declined substantially. The Forest Service Visitors Center and the Mono Lake Committee's Visitor Center in Lee Vining provide visitors with information on Mono Lake.

The typical visitor to Mono Lake is a day user engaging primarily in relatively passive activities such as sight-seeing. A survey of 297 visitors conducted in summer 1992 for this EIR found that 23% spent more than 1 day at the lake and that the average length of a daily visit was 2.5 hours. When asked how satisfied they were with their most recent visit to Mono Lake, 73% of those surveyed indicated they were very satisfied, 23% indicated they were generally satisfied, and 4% indicated they were not satisfied. Thirty-nine percent of all those surveyed also had visited Mono Lake within the past 3 years.

The main reason for visiting Mono Lake indicated by 52% of the lake's visitors was "to see what the lake looks like"; another 25% indicated sight-seeing was their main reason for visiting. Bird watching or nature study was the next most frequently mentioned activity, accounting for 8% of visitors.

Mono Lake was the principal destination for 26% of the visitors, 52% of the visitors indicated that Mono Lake was one of several important destinations, and 23% indicated it was an incidental stop. Approximately 35% of the visitors interviewed at Mono Lake also visited Mammoth Lakes on their trip, 26% visited Yosemite National Park, and 25% visited June Lake Loop.

Use of Mono Lake peaks during summer; 67% of all visits take place during June-September (Carle pers. comm.). Most summer visitors are vacationing California families engaged primarily in casual sight-seeing; off-season visitors are more likely to be individuals participating in nature study (Carle and Upham pers. comms.).

Mono Lake is a popular destination for foreign visitors. Approximately 17% of the Scenic Area's visitors are overseas travelers, particularly from Germany, the United Kingdom, and Japan (Inyo National Forest 1989). The percentage of all visits made by foreign travelers increases during the off-season when use by California families declines.

Of the United States residents interviewed in the 1992 survey, 24% resided in the San Francisco Bay area, 20% in metropolitan southern California, 24% elsewhere in California, and 24% in other states. Only 1% of the respondents resided in Mono Basin.

Between 1986 and 1989, visitation to the lake increased while the lake level declined (Table 3J-3). The increase in use may be related to increasing public awareness and curiosity regarding Mono Lake. Estimates of Mono Lake use since 1990 compiled by DPR indicate that use may have decreased in recent years, although recent use estimates are less reliable than pre-1990 estimates. (Carle pers. comm.)

Grant Lake Reservoir

Grant Lake reservoir, along the June Lake Loop (Figure 3J-1) provides fishing from boat and shore, sailing, and powerboating activities such as waterskiing and jet skiing. Powerboating is limited at other Mono Basin lakes because of their relatively small size. Grant Lake Marina features a 70-unit campground; boat launch, moorage, and rentals; store; and cafe (Ihnen pers. comm.). Another public boat launch is located at the inlet of Parker Flume near the southeast end of the lake (Balint pers. comm.).

The spillway elevation at Grant Lake reservoir dam is 7,130 feet above sea level. The lake consists of an upper and a lower lobe (Figure 3J-1). At lake elevations above 7,125 feet, most of the lakeshore is inundated and the area available for beaching boats is limited (Ihnen pers. comm.). Vehicle access to the upper lobe and the east side of the lake also are limited at very high lake levels (Balint pers. comm.).

As lake levels decline, the upper lobe is affected first. When the lake level drops below 7,110 feet, the upper lobe becomes inaccessible to boats, and the boat launches are unusable (Balint pers. comm.). When the launches are out of use, the lake is accessible only to smaller boats. Fishing quality also declines at levels below 7,110 feet because the lake's natural fishery suffers from low reproductive success (see Chapter 3D, "Fishery Resources").

Based on a survey of 98 users of Grant Lake reservoir conducted in 1991 for this EIR, the average length of stay at the lake is 5.3 days and the average daily period spent on the lake or lakeshore is 4.3 hours. Among visitors interviewed, 66% indicated that Grant Lake reservoir was their primary destination.

The most popular activity at Grant Lake reservoir is shore fishing, which was identified as the main reason for visiting the lake by 87% of the visitors. Only 6% of the visitors identified a boating-related activity (i.e., boating, waterskiing, or trolling) as the most important reason for visiting the lake.

About 66% of Grant Lake visitors also visited other lakes in the June Lake Loop during their most recent trip to Grant Lake reservoir. About 28% of Grant Lake reservoir visitors visited Mammoth Lakes and about 16% visited the lakes near Tioga Pass.

Day and overnight use at Grant Lake reservoir and lake levels are shown for recent years in Table 3J-4. Since 1986, total annual use at Grant Lake reservoir has averaged approximately 48,000 visitor days. Approximately 20% of Grant Lake reservoir's use typically occurs in April and May; 60% occurred

in June, July, and August; and 20% occurred in September and October (Ihnen pers. comm.). Both use and lake levels were relatively low in 1990 and 1991.

As suggested by the data in Table 3J-3, Grant Lake reservoir recreation use varies with lake level fluctuations. For example, fishing and waterskiing decline when the lake level drops and the upper lake becomes dry. Although lake levels often fluctuate substantially from year to year and even from month to month, use levels typically recover slowly following sustained low lake levels. Adverse publicity regarding recreation conditions at Grant Lake in 1 year are believed to affect visitation levels for several years (Ihnen pers. comm.).

Diverted Tributary Streams

The lower reaches of Rush, Lee Vining, Walker, and Parker Creeks were largely dewatered by diversions to the LA Aqueduct beginning in 1941. Except for occasional flooding episodes, these creeks were dry after 1971, when the second pipeline of the LA Aqueduct became operational. Recreational use of these stream reaches, which had mainly consisted of trout fishing, subsequently declined to negligible levels. Continuous streamflows were resumed in these reaches by large runoff events during the early 1980s and, subsequently, by orders from the El Dorado County Superior Court in 1986 for Rush and Lee Vining Creeks and in 1991 for Walker and Parker Creeks.

Based on results of a 1991 survey of 247 tributary stream users conducted for this EIR, visitors spent an average of 9.9 days on the upper reaches of the streams in 1990 and 1.1 days on the lower reaches. In 1991, visitors' use of the tributary streams was estimated to be an average of 11.8 days on the upper reaches and 1.3 days on the lower reaches. The average period of daily use was 6.0 hours.

Visitors to the tributary streams also were asked about other destinations on their most recent trip to the area. Convict Lake was identified by 54% of the visitors, Mammoth Lakes or Twin Lakes by 33%, Lundy Lake by 32%, the Bishop area by 26%, Convict Creek by 16%, and Lake Crowley reservoir by 15%. Of the 197 visitors surveyed, 54% resided in metropolitan southern California, 6% resided in the San Francisco Bay Area, 2% were residents of Mono Basin, 36% resided elsewhere in California, and 2% resided out of state.

Rush Creek. Lands adjacent to upper Rush Creek (i.e., the reach above Grant Lake reservoir) are managed by USFS. Most of the lands along lower Rush Creek, which extends for 10 miles from the Grant Lake reservoir diversion dam to Mono Lake, are managed by LADWP. The entire creek is accessible to the public. Access to Rush Creek is provided by SR 158 (the June Lake Loop) above its intersection with U.S. 395 and by unimproved roads and trails below U.S. 395. A 17-unit USFS campground is located on Reversed Creek below Gull Lake. No facilities are provided along lower Rush Creek.

Most fishing on Rush Creek occurs on its upper reaches. Because DFG regularly stocks upper Rush Creek with catchable-sized trout, anglers generally enjoy high fishing success rates despite intense fishing pressure.

Recent El Dorado Superior Court decisions have sustained the rewatering of lower Rush Creek and the restoration of the historical conditions that supported its pre-1941 fishery. The suitability of lower Rush Creek for fishing is not yet widely recognized outside Mono Basin, however, and thus little recreation occurs there. Use of the lower reach has not yet approached levels that existed before the streams were dewatered (Vestal 1954). Between 1985 and 1990, annual fishing use on lower Rush Creek ranged from 73 to 250 fishing days (Sorensen 1990). As the restoration and recovery of Rush Creek and its fishery continue, recreation use is expected to increase substantially. (A fishing day is 12 hours of use; on Rush and Lee Vining Creeks, the average length of a visitor-day is 0.5 fishing day.)

Other popular activities along Rush Creek include camping, hiking, wildlife observation, and photography. As with fishing, very little of this use occurs along its recently rewatered reach (Sorensen 1989). These activities are also expected to increase as restoration and recovery of the stream progress.

In the 1991 survey of users of Rush Creek, 76% of those surveyed indicated the main reason they visited Rush Creek was to fish with bait or lures. Fly fishing and camping were the main reasons identified by 15% and 3% of the respondents, respectively.

After being shown photographs of Rush Creek at 20 cfs, 60 cfs, and 100 cfs, visitors to Rush and Lee Vining Creeks were asked which (if any) of the streamflow conditions was most appealing to them for their primary recreation activity. Of the visitors interviewed, 5% indicated that they preferred 20 cfs, 36% preferred 60 cfs, 43% preferred 100 cfs, and 15% had no preference.

Lee Vining Creek. Lee Vining Creek is accessible from SR 120 upstream from U.S. 395 and by dirt roads and trails below U.S. 395. Big Bend Campground, consisting of 16 camp sites, is located in Lee Vining Canyon 7 miles west of U.S. 395.

Fishing, camping, hiking, and picnicking are the primary recreation uses at Lee Vining Creek. In the 1991 survey of users of Lee Vining Creek, 58% of those surveyed indicated the main reason they visited Lee Vining Creek was to fish with bait or lures. Camping and bird watching were the main reasons identified by 30% and 7% of the respondents, respectively.

Like Rush Creek, upper Lee Vining Creek is frequently stocked with catchable-size trout and is heavily fished. Lower Lee Vining Creek consists of the 4-mile-long reach below the diversion dam. The El Dorado County Superior Court has ordered the restoration of the historical conditions that supported the pre-1941 fishery for Lee Vining Creek, as it did for Rush Creek. Continuous streamflow was resumed in lower Lee Vining Creek in 1986, but the riparian habitat has not yet recovered and its recovering fishery

has not yet attracted many anglers. Annual use of lower Lee Vining Creek increased from 15 fishing days in 1987 to 74 fishing days in 1990 (Sorensen 1989, 1990).

Walker and Parker Creeks. Access to Walker and Parker Creeks is provided by unimproved roads and footpaths. No public recreation facilities are provided along these creeks. A private fishing club, however, is located on Walker Creek above the diversion points near the outlet of Walker Lake.

The upper reaches of Walker and Parker Creeks receive light use, primarily for fishing. The portions of Walker and Parker Creeks between their diversion dams and their confluences with Rush Creek were rewatered in 1991. Some stream restoration work has been completed, but these recently rewatered streams have attracted only a few anglers to date (Ford pers. comm.).

Other Potentially Affected Resources

Lakes of the June Lake Loop. Access to June, Gull, and Silver Lakes is provided by SR 158. Although the area supports year-round recreation, most activity at the lakes occurs during summer.

Facilities at June Lake include a marina, 130-unit and 27-unit campgrounds, boat launch, picnic area, and swimming beach. Gull Lake features 16-unit and 10-unit campgrounds. Facilities at Silver Lake include a 63-unit campground, a boat launch, and a back-country pack station. Use of the five campgrounds at June, Silver, and Gull Lakes in 1991 totaled approximately 42,000 visitor-nights for an average campsite occupancy rate of 54%. (Senn pers. comm.)

Other Mono Basin Lakes. Lundy Lake is located on Mill Creek near the upper end of Lundy Canyon and features a boat launch and a 15-unit private campground. Ellery, Tioga, and Saddlebag Lakes, located near the headwaters of Lee Vining Creek at Tioga Pass, are accessible by SR 120. Each lake has a resort and camping and boating facilities. Saddlebag Lake has a 22-unit campground, and Tioga Lake and Ellery Lake have 13-unit campgrounds.

Walker Lake is located on Walker Creek about 0.5 mile downstream from the eastern boundary of the Ansel Adams Wilderness. Access to the lake is provided by a gated dirt road and trails. Although Walker Lake features no public facilities, a private resort is located just downstream from the lake's outlet to Walker Creek.

Mono Basin also features many high-elevation lakes accessible only by foot or by horse. Many of these lakes are located in the Ansel Adams and Hoover wilderness areas. Management prescriptions for these wilderness areas emphasize opportunities for solitude and primitive recreation. No developed recreation facilities are provided at these lakes.

The most popular activities at Mono Basin's freshwater lakes include fishing, boating, and camping. Campsite occupancy at the three campgrounds near Tioga Pass averaged 89% in 1991, or approximately 11,900 visitor days (Senn pers. comm.). Facilities at lakes accessible by motor vehicles are typically open May-October. High-country lakes that can be reached only by hiking are usually accessible somewhat later.

Other Tributaries to Mono Lake. Other streams tributary to Mono Lake include Mill, Wilson, and Dechambeau Creeks, the latter discharging into the lake at Mono Lake County Park. Mill Creek is accessible by a USFS road that ends at Lundy Lake. A 50-unit campground administered by Mono County is located on Mill Creek approximately 1.5 miles below Lundy Lake.

A major destination resort, Conway Ranch, has been proposed for establishment on private land along the lower portion of Wilson Creek. Mono County approved a master plan for this project in 1990, but further approvals are required for construction to proceed (see Chapter 3G, "Land Use").

Owens River Basin

Principal recreation areas in Owens River Basin that could be affected by the target lake level alternatives are the Upper Owens River and Lake Crowley reservoir. Estimates of annual visitor days at these recreation areas are shown in Table 3J-1. Other recreation areas in the basin at which use could be indirectly affected by changes in the regional pattern of use include the Owens River gorge and Pleasant Valley reservoir.

Upper Owens River

Resources. Recreation facilities along the upper Owens River include public and private campgrounds and private ranches that allow limited access to the river for fishing. USFS operates a 24-unit campground at Big Springs, a 30-unit campground at Glass Creek, and an 80-unit campground at Deadman Creek (U.S. Forest Service 1987). These campgrounds, accessible from U.S. 395 from mid-May through October, are all upstream of the East Portal of LADWP's Mono Craters tunnel. A 100-unit privately operated campground is located at Benton Crossing several miles upstream from Lake Crowley reservoir along a reach of the Owens River affected by Mono Basin exports.

The Upper Owens River offers high-quality recreation that combines good fishing opportunities, campgrounds, and attractive scenery. Fishing is seasonally available for resident trout and for trout that migrate from Lake Crowley reservoir to the Upper Owens River to spawn. Two guest ranches are operated along the Upper Owens River: Alpers' Owens River Ranch, which comprises 2 stream miles above the East Portal beginning 1 mile downstream from Big Springs, and John Arcularius Ranch, which encompasses the 5 stream miles immediately downstream from Owens River Ranch and on which the East

Portal is situated. Although fishing is the primary activity at the guest ranches, at least half of the guests visit primarily to enjoy the serenity and scenic amenities. These ranches can jointly accommodate up to 120 guests. The fishing quality is maintained by restricting fishing access and streamside grazing and through catch-and-release restrictions. (Alpers and Arcularius pers. comms.)

Fishing quality on the Upper Owens River depends on the size of trout spawning runs between Lake Crowley reservoir and the river's headwaters. Low streamflows (from low runoff, low exports from Mono Basin, and large local irrigation diversions) can result in the formation of sandbars and other physical impediments to fish migration and increased water temperatures that constitute thermal barriers to migration (Scheubert pers. comm.). Flows in the Upper Owens River could be further reduced by extractions of groundwater from the aquifer supplying Big Springs proposed for municipal use by the Town of Mammoth Lake.

Use. Fishing, camping, and sightseeing are the primary recreation activities along the Upper Owens River. John Arcularius Ranch and Owens River Ranch are open during the trout fishing season, which runs from the last week in April through October. Fishing activity is greatest during the season's opening weekend. On an average day, approximately 25 anglers use the 7 miles of the Upper Owens River within these ranches, for an annual total use of about 4,600 visitor days (Alpers and Arcularius pers. comms.)

Fishing access is restricted to landowners and their guests on the 7 miles of the Upper Owens River downstream from John Arcularius Ranch owned by Inaja Land Company and Howard Arcularius. These ranches support approximately 1,000 visitor days of fishing use each year.

More fishing activity occurs along the public-access portions of the Upper Owens River, where access is unrestricted and anglers may keep up to five fish per day. A 1987 survey of fishing use on the 6.5-mile public reach between Howard Arcularius Ranch and Benton Crossing estimated total use during the 6-month season at 43,300 fishing hours. Assuming the average daily visit lasts 6 hours, this amount of fishing would equal approximately 7,200 visitor days, or 1,110 visitor days per stream mile. Bait fishing accounted for 60% of the total, fly fishing for 21%, and lure fishing for 19%. Fishing activity varies in response to periodic changes in fishing regulations and in response to fish stocking activities. (Deinstadt pers. comm.)

Remaining public portions of the Upper Owens River are the 1-mile reach between Big Springs and Owens River Ranch and the 4-mile reach between Benton Crossing and Lake Crowley reservoir. Assuming use of these reaches equals the average use rate on the 6.5-mile reach upstream from Benton Crossing, annual fishing use on the all public portions of the Upper Owens River would total approximately 13,000 visitor days.

Estimates of fishing use of the Upper Owens River in 1987 are shown by reach in Table 3J-4.

Lake Crowley Reservoir

Resources. Recreation facilities and use at Lake Crowley reservoir were managed by the City of Los Angeles until 1991. Los Angeles owns all land surrounding the lake. South Landing Marina, located at the south end of the lake, is the only developed recreation facility. The marina is open to the public from the last weekend in April through Labor Day, although its hours of use are reduced after August 1. In 1992, management of the marina and other recreation facilities was contracted to Sierra Recreation Associates, a private concern.

Recreation opportunities on the reservoir include fishing from boats, float-tubes, and shore; water skiing; sailing; and other watercraft use. Its trout fishery is highly renowned. The recreation facilities at South Landing Marina include a boat launching ramp, marina, boat storage and rentals, and parking area (Griffith pers. comm.). Camping is allowed at South Landing Marina only on the first weekend of the season. Dispersed camping is allowed along the lakeshore outside the marina throughout the year. Frequently used areas outside the marina include North Landing and Leighton Springs.

Recreation opportunities and quality vary over the season according to fluctuations in reservoir level and water temperature and quality. High water temperatures and low water levels frequently result in large algae blooms. These blooms reduce the attractiveness of the reservoir for boating, waterskiing, and fishing. In addition, the surface area and depth of the reservoir decline with water level, thus reducing the area available for waterskiing. A waterski course in a constructed cove at the south end of the reservoir is largely unusable when lake levels drop below 6,772 feet (Paranick pers. comm.).

Fishing success also is affected by lake levels. Natural production of trout and Sacramento perch decline at shallower lake levels (see Chapter 3D, "Fishery Resources"). For example, late-season fishing for perch and trophy brown trout in McGee Bay is generally possible if the reservoir is maintained at levels exceeding 6,765 feet. Lower levels cannot support extensive weed beds in the littoral zone; these weed beds are the main source of cover for fish and the substrate for the insects that provide much of their diet. (Edmondson pers. comm.)

Use. Fishing is the leading recreation activity at Lake Crowley reservoir, accounting for 91% of its total use. Approximately two-thirds of the fishing occurs from boats and one-third from shore or float-tubes. Boating, including boat fishing, waterskiing, and other boating, accounts for 67% of the lake's total recreation. (O'Donnell pers. comm.)

Early season use typically accounts for a disproportionately large share of Lake Crowley reservoir's total annual use. Between 1988 and 1991, 16% of recreation use at Lake Crowley reservoir occurred during the opening week of trout fishing season and 58% occurred during the first five weeks of the season (Table 3J-5).

Relative use levels at South Landing Marina and at undeveloped areas outside the marina vary over the season. During the first week of the season, use levels at the marina and the undeveloped areas are

roughly equal. Relative use of the marina then increases, accounting for approximately 90% of the total during August. Recreation continues in the undeveloped areas after the marina closes on Labor Day. Except for the opening weekend, camping use along the lakeshore is relatively low because of the lack of facilities. (Griffith pers. comm.)

In a survey of 294 Lake Crowley reservoir users conducted in 1991 and 1992 for this EIR, respondents indicated they spent an average of 3.0 days at Lake Crowley reservoir during their trip and 6.2 hours on the reservoir each day. They spent an average of 12.7 days visiting Lake Crowley reservoir during 1991. Shore fishing or float-tubing for trout was the main reason 52% of those surveyed visited the reservoir; a boating-related activity (i.e., boating, waterskiing, or trolling) was the main reason identified by 42% of the visitors.

Among the visitors interviewed, 28% had visited Mammoth Lakes and 28% had visited June Lake Loop on their trip. Lake Crowley reservoir was identified as the principal destination for 73% of the visitors interviewed. As far as place of residence, 56% of the reservoir's users resided in metropolitan southern California, 26% were local residents (i.e., lived between Mammoth Lakes and Bishop), and less than 1% resided in the San Francisco Bay Area. Only 1% of the respondents resided outside California.

Recreation use at Lake Crowley reservoir has declined dramatically since the early 1980s, in part because of low lake levels. Fishing use was estimated at 40,839 fishing days in 1989, down 78% from 182,661 days in 1980 (Sorensen 1989). As at Grant Lake, users' negative impressions of Lake Crowley reservoir resulting from low lake levels in one year appear to affect use in subsequent years.

Total use and lake level are shown by month for four recent years in Table 3J-5. Use was relatively low in 1989 and especially low in 1990, when the lake level was relatively low throughout the recreation season.

Other Potentially Affected Recreation Areas

The key recreation areas potentially affected by displacing visitors from the Upper Owens River and Lake Crowley reservoir are the Owens River gorge and Pleasant Valley reservoir.

Owens River Gorge. The Owens River gorge connects Long Valley and Owens Valley. The gorge, which is upstream from Pleasant Valley reservoir, has been largely dewatered for almost 40 years by diversion of the Owens River into the LA Aqueduct. Seepage beneath Long Valley Dam at the outflow of Lake Crowley reservoir has maintained a sport fishery in a short reach of the river immediately downstream. In 1991, a penstock failure resulted in the temporary rewatering of the gorge. Ongoing negotiations between LADWP, DFG, and others could result in the permanent rewatering of the gorge and restoration of its formerly famous trout fishery.

The reach of the Owens River gorge just downstream from Long Valley Dam supports a moderate level of fishing. Unlike most of the Upper Owens River, the pools in this reach support fishing for warmwater species such as bass, in addition to trout. Because of the absence of streamflow and the area's steep and rugged terrain, recreation use of the remainder of the gorge has been negligible.

Pleasant Valley Reservoir. Pleasant Valley reservoir is a 4-mile-long reservoir located at the south end of the Owens River gorge. Recreation opportunities at Pleasant Valley reservoir are limited by its narrow width, water-level fluctuations resulting from LADWP water operations, and use-restrictions to maintain high water quality. In particular, boating and water-contact activities are not allowed on the reservoir. Motor vehicle access to the reservoir is prevented by a locked gate; pedestrian and bicycle access is provided by a paved service road along the reservoir's west bank. The primary recreation activity at the reservoir is shore fishing for rainbow and brown trout. The reservoir is noted for producing trophy brown trout and has a year-round fishing season.

Pleasant Valley campground is located immediately downstream from the reservoir. It has 200 campsites and is operated by Inyo County. Campers enjoy access to both the reservoir and the Owens River downstream from the reservoir.

A survey of 52 visitors to Pleasant Valley reservoir conducted in 1991 for this EIR indicated that 65% of the reservoir's visitors are residents of metropolitan southern California, 17% are local residents, and 2% are residents of the San Francisco Bay Area. Pleasant Valley reservoir was the principal destination for the trips of 50% of the visitors. Other places visited on their most recent trip included the Bishop area (73%), Owens River (21%), Convict Lake (15%), and Mammoth Lakes (15%). Approximately 63% of the respondents had visited Lake Crowley reservoir at least once, 33% had visited it in 1990, and 27% had visited it in 1989.

IMPACT ASSESSMENT METHODOLOGY

Introduction

For the Mono Basin EIR, recreation impacts consist of potential changes in the quality of recreation opportunities relative to point-of-reference conditions. They include changes in recreation conditions projected to occur at recreation areas either directly or indirectly affected by the target lake level alternatives.

The directly affected recreation areas are:

- # Mono Lake;
- # the lower reaches of four tributaries to Mono Lake (i.e., Rush, Lee Vining, Walker, and Parker Creeks);

- # Grant Lake reservoir;
- # Lake Crowley reservoir; and
- # the Upper Owens River.

Target lake level alternatives could indirectly affect recreation at other areas if enough users displaced from directly affected areas because of decreasing opportunities visit alternative areas, thereby increasing congestion at the alternative areas such that the quality of recreation there declines. Such indirect impacts were analyzed by identifying recreation areas in the eastern and southern Sierra Nevada regions representing suitable substitutes for the directly affected areas, and assessing congestion levels at these substitute areas.

Point-of-reference hydrologic conditions for all directly affected areas were projected based on the point-of-reference scenario described in Chapter 2. Streamflows and lake levels were simulated for two projection periods. The first, a 20-year period, was used to analyze the near-term effects of water diversions (i.e., effects occurring as the lake moves from its 1989 level, the point of reference, toward the target levels that define the alternatives). The second, a 50-year period beginning after Mono Lake reaches the target level for a specified alternative, was used to analyze long-term (i.e., post-transition) recreation effects. Hydrologic conditions for both projection periods were assumed to replicate the historical (i.e., 1940-1989) distribution of dry, normal, and wet runoff years.

At all directly affected areas except Mono Lake, the recreation analysis focused on near-term impacts because recreation impacts expected to occur over the next 20 years are considered to be more relevant to comparison of the EIR alternatives than impacts that would not occur for more than 50 years under some alternatives. For Mono Lake, the recreation analysis focused on long-term impacts because the EIR alternatives were formulated based on long-term Mono Lake target levels. Mono Lake recreation opportunities for the alternatives were compared at their respective target lake levels for lake fluctuations.

In addition to near-term and long-term effects, the recreation impacts of a prolonged drought were analyzed based on hydrologic information describing streamflows and lake levels associated with the driest 1% of the projection period.

Impact Prediction Methodology

Direct Impacts

The objective of the analysis of direct recreation impacts is to assess changes in the quality of recreation opportunities at each directly affected area. Recreation impacts were assessed through identification of environmental features of each directly affected area that are necessary to maintain the quality of the area's recreation opportunities. Features considered in this EIR include the aesthetic quality

or biological conditions of the recreation environment, the accessibility or ease of use of recreation areas or facilities, and the abundance of catchable fish. These important features were identified through review of published technical reports and discussions with resource specialists.

User surveys were conducted at Mono Lake, Grant Lake reservoir, Lake Crowley reservoir, Rush and Lee Vining Creeks, and other areas to identify the most important recreation activities at each area and to predict the impact of various hydrologic scenarios on respondents' use of these areas. (Key results of the user surveys are summarized in Appendix W.) The analysis of recreation effects then focused on identifying hydrologic thresholds (i.e., lake levels or streamflows) which, if exceeded, could substantially affect opportunities for user participation in the important recreation activities or the quality of such participation.

In most cases, the quality of recreation opportunities changes gradually with hydrologic conditions. For example, reduced tributary flows during midsummer result in higher water temperatures that increase stress on the trout population. Temperature stress, in turn, impedes feeding activity among the fish and can also cause fish injury or mortality. The eventual result of low flows is generally poorer fishing opportunities.

In developing thresholds for recreation opportunities, hydrologic conditions were identified at which recreation quality for a particular activity changed in response to a change in water availability (e.g., a streamflow of 19 cfs on lower Rush Creek during July or August). The recreation opportunity thresholds used in this analysis represent the consensus of scientific knowledge on flows and lake levels where substantial changes in environmental features affecting recreation opportunities are most likely to occur. Los Angeles Aqueduct Monthly Program (LAAMP) operations model projections were analyzed to determine whether flows and lake levels associated with each alternative would exceed any thresholds and, if so, the frequency of exceedance.

Key environmental conditions affecting important recreation opportunities are discussed next with their corresponding thresholds for each directly affected recreation area.

Mono Lake. Analysis of recreation effects at Mono Lake focused on opportunities for sightseeing, birdwatching, and nature study. Results of the Mono Lake user survey indicate that the principal reason that 76% of the lake's visitors stop at Mono Lake is to "see what the lake looks like" or to engage in sightseeing. An additional 8% of the respondents listed birdwatching or nature study as their principal reason for visiting Mono Lake. No other activity accounted for more than 5% of the responses concerning the principal reason for visiting Mono Lake.

The principal features of the Mono Lake environment that are important to sightseeing and lake-viewing opportunities and that could be affected by lake level changes are:

- # the distance from parking lots to the lakeshore at popular visitor areas,
- # the frequency of severe dust storms, and
- # the abundance of land-based and exposed tufa towers.

Environmental features sensitive to lake level changes that could affect birdwatching and nature-study opportunities include:

- # the abundance of gulls, grebes, phalaropes, and waterfowl, and
- # the presence of phalaropes at areas frequented by visitors.

Snowy plovers are a species of special concern that may also be affected by lake level changes. Because these birds constitute such a small portion of Mono Lake's avian fauna, however, and because they are located along the remote northeastern lakeshore, birdwatching of this species is of relatively minor importance as a recreation activity.

The physical processes through which these environmental features are affected by lake level changes are complex and are described in detail elsewhere in this EIR. The effects of changes in these features on recreation opportunities are summarized in Table 3J-6, which identifies threshold lake elevations that, if exceeded, would substantially affect opportunities for sightseeing and lake-viewing or for birdwatching and nature study.

As shown in Table 3J-6, the elevation of 6,373.5 feet was selected as the threshold lake level for distance from parking areas to the lakeshore. Among Mono Lake's most popular viewing areas, lake level changes have their greatest effect on distance to shoreline at Mono Lake County Park on the lake's northwest shore. When the lake level declines from 6,377 feet to 6,373.5 feet, distance to the shoreline increases by approximately 67% to 2,000 feet. Subsequent declines in lake level result in proportionately smaller increases in distance. Distances to the lakeshore from South Tufa and Old Marina, two other popular lakeshore areas, are shorter and less sensitive to lake elevation changes.

Dust storms occur mainly on the lake's northeastern and eastern shores and on Paoha Island where relatively few people visit. Severe dust storms, however, can reduce visibility over a large portion of the lake and lakeshore. No large reductions in the frequency of severe dust storms are expected to occur until the lake level approaches 6,390 feet (see Chapter 3H, "Air Quality"). At elevations exceeding 6,390 feet, such storms would become infrequent and geographically restricted events.

Lake level increases above 6,390 feet elevation adversely affect the visibility and accessibility of Mono Lake's tufa groves, considered to be its most distinctive recreation resource. With lake elevation at 6,390 feet, most of the small towers at South Grove would be toppled by wave erosion or, if still standing, would be covered with water. At 6,407 feet, nearly all towers at South Grove would be toppled or inundated. (See discussion of tufa formations in Chapter 3I, "Visual Resources".) (Stine 1992.)

Each of the major bird species at Mono Lake is affected differently by changes in lake level. As shown in Table 3J-6, the numbers of grebes and phalaropes at Mono Lake would probably decline substantially if the lake declined below its prehistoric low level of 6,368 feet. Gull numbers at Mono Lake would probably be considerably lower at levels below 6,373.5 feet because prime island nesting sites would be susceptible to persistent predation by land-based carnivores. Opportunities for observing phalaropes would decline substantially at levels below 6,378 feet; at levels above 6,378 feet, many

phalaropes would move from the eastern shore to the northwestern shore, which is more accessible to visitors. Unless artificial ponds were constructed near the lakeshore, numbers of migratory waterfowl using Mono Lake would not increase substantially until the lake level exceeds 6,400 feet.

Lower Reaches of Affected Mono Lake Tributaries. Tributaries to Mono Lake potentially affected by target lake level alternatives are Rush, Lee Vining, Walker, and Parker Creeks. Only the lower reaches (i.e., the portions downstream from LADWP diversions) of these streams would be directly affected.

Analysis of recreation impacts on the tributary streams focused on the effects of streamflow variations on angling opportunities, including the availability and accessibility of fishable waters and the abundance of catchable trout. Effects on fishing opportunities were emphasized because, of the 247 respondents to the tributary survey, 86% had fished at the tributaries on their current trip and 72% identified fishing as their main reason for visiting the tributaries. Camping was identified as the most important reason for visiting the tributaries by 20% of the respondents; the quality of camping opportunities is insensitive to streamflow changes.

The analysis of recreation impacts focused on lower Rush Creek, which is the largest and most popular of the four tributary streams. As shown in Table 3J-7, three streamflows were identified as thresholds for angling quality on lower Rush Creek. Flows less than 19 cfs in July and August usually result in water temperatures that are intolerably high for adult trout. Similarly, at flows of less than 40 cfs in October and November, spawning habitat characterized by stream depths exceeding 2 feet is highly limited. (Beak Consultants 1991.)

Grant Lake Reservoir. Analysis of recreation impacts at Grant Lake reservoir focused on opportunities for angling, boating, and waterskiing. In the survey of Grant Lake reservoir users, fishing was identified as the main reason for visiting by 89% of the 95 users interviewed. Only 13% of the anglers interviewed fished from boats; the remainder fished from shore. Only 2% identified boating or waterskiing as their main reason for visiting the lake. Boating and waterskiing were unusually unpopular at Grant Lake reservoir in 1991 when the survey was conducted because low lake levels made the boat ramp at Grant Lake reservoir inoperable.

One lake level threshold for fishing opportunities at Grant Lake reservoir and two thresholds for boating and waterskiing were identified (Table 3J-8). Natural trout production at Grant Lake reservoir is substantially reduced at lake levels below 7,101 feet between April and October because of limited total surface area and limited shallow water area. (See Chapter 3D, "Fishery Resources".) At levels below 7,105 feet, the upper lobe of the lake is too small and shallow to accommodate boating or waterskiing. (These conditions are discussed in detail in Chapter 3D.) A lake level of at least 7,111 feet is needed for the boat ramp to be operable, even though the ramp was extended substantially in 1992 to make it usable at lower levels (Miller pers. comm.).

Upper Owens River. Fishing constitutes almost all recreation activity along the Upper Owens River. Analysis of recreation impacts on this reach will focus on changes in fishing opportunities as a function of the abundance of catchable fish.

Only the reach of the Upper Owens River between East Portal and Lake Crowley reservoir would be directly affected by target lake level alternatives. In 1987, approximately 78% of the fishing use of the Upper Owens River occurred downstream from East Portal. Fishing opportunities on the reach above East Portal could be indirectly affected by export alternatives, however, through changes in the number of trout that live in Lake Crowley reservoir most of the year but migrate above East Portal to spawn. Spawning trout provide trophy fishing opportunities and are highly prized by Owens River anglers.

Three threshold streamflows were identified for fishing opportunities on the Upper Owens River (Table 3J-9). At flows less than 75 cfs, summer water temperatures below the Hot Creek confluence would frequently exceed 68°F, which would cause substantial stress on trout populations. Second, flows of approximately 200 cfs are considered optimal for trout production for much of the Upper Owens River; flows below 150 cfs between May and October would support less than 75% of the potential adult trout habitat available when streamflow is 200 cfs. Third, flows exceeding 200 cfs would substantially accelerate streambank erosion and related adverse geomorphic effects, especially in the reach just below East Portal. (EBASCO Environmental et al. 1993.)

Lake Crowley Reservoir. Analysis of recreation effects at Lake Crowley reservoir focused on opportunities for angling, boating, and waterskiing. In the survey of 271 Lake Crowley reservoir users, 79% indicated that fishing was their main reason for visiting Lake Crowley reservoir. Ten percent of those interviewed indicated that boating was their main reason for visiting and 8% specified waterskiing as their main reason. Boat-fishing is very popular at Lake Crowley reservoir.

Different lake level thresholds were identified for boating, fishing, and waterskiing opportunities at Lake Crowley reservoir (Table 3J-10). Below 6,760 feet elevation, some boat docks and ramps are inoperable (Griffith pers. comm.). Below 6,766 feet, production of large trout is limited by declines in the littoral ecosystem at McGee Bay (Edmundson pers. comm.). Below 6,773 feet, a waterskiing course constructed for competition use is inaccessible (Paranick pers. comm.).

Indirect Impacts

The principal indirect recreation impact considered in this EIR is potential increased congestion at eastern and southern Sierra Nevada recreation areas caused by displacement of users of directly affected recreation areas. Increased congestion could result in reduced opportunities at these areas. Offsite congestion impacts were analyzed by estimating reductions in use of directly affected areas resulting from quality declines, identifying substitute recreation areas that people displaced from directly affected areas might visit, and assessing potential congestion effects resulting from such displacement.

Cumulative Impacts

Cumulative impacts include adverse effects of past, present, and foreseeable future projects that are closely related to the proposed project. One past project and one future project were identified that are closely related to the EIR alternatives that have had, or would have, adverse effects on recreation. The relevant past project is LADWP's historical diversions of Mono Lake tributaries, which began in 1940. The relevant future project is the proposed extraction of groundwater potentially tributary to the Upper Owens River for municipal use by the town of Mammoth Lakes. The proposed pumping by the town of Mammoth Lakes could affect flows in the Upper Owens River.

Cumulative impacts of historical diversions of Mono Lake tributaries were analyzed by assessing changes in recreation opportunities and qualities at recreation areas adversely affected by the diversions (i.e., Mono Lake, the diverted tributaries, and the Upper Owens River). Cumulative recreation effects were not analyzed for Lake Crowley reservoir or Grant Lake reservoir because these were constructed or enlarged in conjunction with the LADWP's Mono Basin diversion project; consequently, the effects of historical diversions on recreation at these reservoirs were beneficial.

Criteria for Determining Impact Significance

Direct Impacts

The significance of direct recreation impacts was determined using two approaches. The first approach involved assessing the frequency with which the important recreation opportunity thresholds described above would be exceeded under an EIR alternative relative to the point-of-reference scenario. All opportunity thresholds used in this analysis are defined such that exceedance implies an adverse recreation effect. For some thresholds, exceedance occurs when water availability (as measured by median lake level or streamflow) is *below* a specified level; other thresholds are exceeded when water availability is *above* a specified level.

An adverse change in recreation opportunities under a specified alternative was considered significant if an opportunity threshold was conclusively exceeded more frequently than under the point-of-reference scenario. Based on the limitations of the model used in this recreation analysis, changes in threshold exceedance frequencies of at least 10% were considered conclusive; changes in exceedance frequencies of less than 10% were considered to represent inconclusive departures from point-of-reference conditions. Significance was not determined for beneficial changes.

The second approach involved analyzing potential effects on recreation use at the directly affected areas and comparing resulting use with that associated with the point-of-reference conditions. Use effects were predicted from data collected in on-site user surveys concerning whether and how much visitor use of a recreation area would change in relation to local hydrologic conditions (i.e., lake levels for Mono Lake, Grant Lake reservoir, and Lake Crowley reservoir, and streamflow for Rush Creek). Estimated changes

in per capita use of a recreation area were used as criteria to assess the impacts. Changes in per capita use of a recreation area were considered significant impacts when the change associated with hydrologic conditions of an alternative was 10% or more. Per-capita use changes were not estimated for the Upper Owens River, however, because no survey-based information was obtained on users' responses to streamflow changes. For the Upper Owens River, the significance of recreation impacts was evaluated based on changes in available habitat and fishing opportunities. Additional details on the estimation of per capita use are provided in Appendix W.

These two approaches provide a balanced and comprehensive consideration of recreation effects. Discrete, measurable changes in the quality of the recreation environment are indicated by the threshold exceedance approach and impacts resulting from incremental changes in hydrologic conditions are analyzed by use changes.

Indirect Impacts

Displacement of visitors from directly affected areas was considered to be a significant indirect impact if it would likely result in substantial use increases at areas where congestion has been recognized as a problem in recent years or where use is currently at or near its carrying capacity.

Cumulative Impacts

A cumulative recreation impact was considered significant if, in conjunction with a proposed lake level alternative, it would result in a substantial long-term reduction in the quality of one or more recreation opportunities or activities relative to the prediversion condition.

SUMMARY COMPARISON OF IMPACTS AND BENEFITS OF THE ALTERNATIVES

As described in the "Impact Assessment Methodology" section, relative recreation effects of the alternatives are assessed in this section through several key variables related to recreation opportunities, quality, and use:

- # aesthetic quality, biological conditions, and lakeshore access at Mono Lake;
- # fishery habitat and stream access on the lower reaches of the Mono Lake tributaries;

- # fish production and lake access at Grant Lake reservoir;
- # fishery habitat on the Upper Owens River;
- # fishery habitat and lake access at Lake Crowley reservoir;
- # changes in visitor use rates at directly affected areas; and
- # potential congestion impacts at other eastern and southern Sierra Nevada recreation areas caused by displacement of users of directly affected areas (indirect impacts).

Table 3J-11 provides a summary comparison of each alternative using the recreation opportunity and quality attributes (first five items above). Table 3J-12 provides a summary comparison of each alternative using the visitor use variable (sixth item above). For the analysis of direct and indirect impacts, values of the attributes and variables for each alternative are compared to values for the point-of-reference condition. For the analysis of cumulative impacts, projected conditions are compared with prediversion conditions.

POINT-OF-REFERENCE SCENARIO

This section describes recreation opportunities and qualities and per visitor use levels projected for the point-of-reference scenario. It describes predicted long-term (i.e., post-transition) conditions at Mono Lake and near-term conditions at all other directly affected areas. These conditions are used in subsequent sections to assess recreation impacts under the EIR alternatives and determine their significance. Estimated exceedance frequencies for each recreation opportunity threshold under the point-of-reference scenario are shown in Table 3J-11. Per visitor use levels under the point-of-reference scenario are shown in Table 3J-12.

Mono Lake

The point-of-reference elevation for Mono Lake is 6,376.3 feet, its level on August 22, 1989 (Table 3J-13). Four of the recreation opportunity thresholds previously described for Mono Lake (Table 3J-7) are at lake levels that exceed the point-of-reference level. These threshold elevations are 6,378 feet for observing phalaropes, 6,390 feet for severe dust storms and toppling of small tufas, 6,400 feet for waterfowl abundance, and 6,407 feet for toppling and inundation of all tufa.

As part of a survey conducted for this EIR, visitors to Mono Lake were asked how their use of the lake would be affected by various lake levels. As discussed in Appendix W, a 1-foot increase in the

level of Mono Lake from the lake's 1991 level (6,375 feet) would result in an estimated increase in per visitor use of 0.035 days per year. Average annual per visitor use at the point of reference is estimated to be 3.3 days (Table 3J-12).

Lower Reaches of Affected Tributaries

The point-of-reference scenario for the affected reaches of Mono Lake tributaries is defined by the lower Rush Creek streamflows that would have resulted from repetition of historical runoff conditions and diversion practices under the minimum release flow requirements established in August 1989. Such flows were projected for a 20-year period that replicates the distribution of dry, normal, and wet runoff years that occurred during 1940-1989. (This definition of the point of reference for analyzing near-term effects also applies to Grant Lake reservoir, the Upper Owens River, and Lake Crowley reservoir.)

Two of the flow-related thresholds identified for Rush Creek (Table 3J-8) would be exceeded at times under the point-of-reference scenario. Streamflow would be less than 40 cfs during October and November for 80% of the projection period (Table 3J-11); this condition would impair trout spawning. In addition, flows would exceed 150 cfs for 10% of the projection period, impairing wading opportunities and access to fishable waters.

Streamflow on lower Rush Creek averaged 50 cfs in 1991 when per visitor use averaged 1.5 days. As discussed in Appendix W, each 1-cfs increase in the average streamflow of lower Rush Creek (up to 100 cfs) is estimated to result in an average use increase of approximately 0.02 day per visitor per year. Under the point-of-reference scenario, flows on lower Rush Creek would average 52 cfs over all types of runoff years (Table 3J-13), an increase of just 2 cfs over the average flow in 1991; consequently, annual use would also average an estimated 1.5 days per visitor under the point-of-reference scenario (Table 3J-12).

Grant Lake Reservoir

Point-of-reference conditions for Grant Lake reservoir represent the lake levels that would result from historical runoff conditions and diversion practices and minimum release flows for the lower tributaries. Similar to the protection levels developed for the lower tributaries, minimum lake levels (7,101 feet elevation) were developed to protect the reservoir's environmental and recreation resources. Because of these protections, recreation quality thresholds for trout production (7,101 feet) would not be exceeded under point-of-reference conditions (Table 3J-11). Recreation quality thresholds for boating and water-skiing on the upper lake (7,105 feet) would be exceeded with a frequency of 50%. The threshold for use of the marina boat ramp (7,111 feet) would be exceeded 50% of the time.

Per visitor use of Grant Lake reservoir averaged 9.6 days in 1991 when the lake's average level was 7,094 feet. As described in Appendix W, the rate of change in per visitor use for each 1-foot change in the average level of Grant Lake reservoir was estimated to be 0.1 day. Under the point-of-reference scenario, the average level at Grant Lake reservoir over the near term is 7,112 feet (Table 3J-13), which is an increase of 18 feet relative to 1991 when per-visitor use averaged 9.6 days. At this median lake level, annual use is estimated to average 11.4 days per visitor (Table 3J-12).

Upper Owens River

Point-of-reference conditions for the Upper Owens River represent historical diversion practices and minimum release flows for the lower tributaries. Under these conditions, the water temperature threshold (less than 75 cfs) would not be exceeded, the adult trout habitat threshold (less than 150 cfs) would be exceeded 60% of the time, and the excessive streambank erosion threshold (more than 200 cfs) would be exceeded 40% of the time.

Lake Crowley Reservoir

As with Grant Lake reservoir, point-of-reference conditions at Lake Crowley reservoir represent historical runoff and diversion practices and minimum release requirements for the lower tributaries. As with Grant Lake reservoir, minimum lake levels (6,768 feet elevation) were developed to protect Lake Crowley reservoir's environmental and recreation resources. Because of these protections, recreation quality thresholds for operability of boat ramps (6,760 feet) and productivity of the littoral ecosystem in McGee Bay (6,766 feet) would never be exceeded. The threshold for accessibility of a waterskiing course would be exceeded with a frequency of 20% (Table 3J-11).

Per visitor use at Lake Crowley reservoir averaged 11.0 days in 1991 when its average level was 6,767 feet. As described in Appendix W, the rate of change in per visitor use for a 1-foot change in the average level of Lake Crowley reservoir was estimated to be 0.4 day. The median level of Lake Crowley reservoir would be 6,773 feet under the point-of-reference scenario (Table 3J-13); at this level, annual use would average 13.5 days per visitor (Table 3J-12).

IMPACTS AND MITIGATION MEASURES FOR THE NO-RESTRICTION ALTERNATIVE

Changes in Resource Condition

As discussed above under "Impact Prediction Methodology", assessment of recreation impacts for this EIR focused on changes in recreation opportunities and quality as indicated by exceedances of opportunity thresholds. In this section, changes in recreation opportunities under the No-Restriction Alternative are considered relative to the point-of-reference scenario. Comparisons of recreation opportunities focus on long-term conditions for Mono Lake and for near-term conditions for the other directly affected areas. Important differences in recreation opportunities between long-term, near-term, and drought-period conditions are also noted.

Mono Lake

Under the No-Restriction Alternative, the average level of Mono Lake over the long term would be 6,354 feet. At this level, thresholds for grebe, phalarope, and gull abundance at Mono Lake would be exceeded 100% of the time, compared to 0% of the time under point-of-reference conditions (Table 3J-11). This condition would adversely affect opportunities for birdwatching and nature study at Mono Lake.

The threshold for lakeshore accessibility would also be exceeded 100% of the time under the No-Restriction Alternative, compared to 0% of the time under point-of-reference conditions. This condition would adversely affect sightseeing and lake-viewing opportunities. Visitor use of Mono Lake also is projected to decline substantially under the No-Restriction Alternative (Table 3J-12).

Exceedance frequencies for other lake level conditions that affect recreation opportunities at Mono Lake (i.e., dust storms, tufa, and waterfowl) would not change relative to point-of-reference conditions (Table 3J-11).

Per-capita use cannot be estimated for the No-Restriction Alternative because Mono Lake's average level over the long term (6,354 feet) is outside the range for which information is available. The change in use is likely to substantially exceed the 10% change estimated to result from a lake level decline to 6,372 feet, however, and thus represents a significant adverse effect on recreation.

Over the near term, the lake's average level would be 6,370 feet (Table 3J-13). Consequently, birdwatching opportunities would not be adversely affected. Recreation opportunities at Mono Lake would not be appreciably different during prolonged droughts compared to opportunities over the long term (Table 3J-13).

Affected Reaches of Lower Tributaries

Under the No-Restriction Alternative, low flows in July and August occur 80% of the time compared to 0% of the time under point-of-reference conditions (Table 3J-11). These conditions, which would result in stream temperatures that are limiting to trout production, would adversely affect fishing opportunities. Recreation use of the lower tributaries is also projected to decline substantially (20%) under the No-Restriction Alternative (Table 3J-12).

Recreation opportunities on the lower tributaries would not be appreciably different over the long term compared to the near term.

During drought periods, fishing conditions in the lower tributaries would be worsened because high stream temperatures and low-flow periods for spawning would occur more often than under the near-term conditions.

Grant Lake Reservoir

Under the No-Restriction Alternative, lake level thresholds for making upper Grant Lake reservoir unusable for boating and waterskiing and for making the boat ramp unusable would be exceeded less often than under the point-of-reference scenario (Table 3J-11). Recreation use of Grant Lake reservoir is also projected to increase by 9% under the No-Restriction Alternative (Table 3J-12).

Over the long term and under drought conditions, these thresholds for making Grant Lake reservoir inaccessible for boating and fishing activities would be exceeded more often than under near-term conditions.

Upper Owens River

Under the No-Restriction Alternative, Upper Owens River streamflows would result in no significant adverse impacts (Table 3J-12).

During drought periods, the adult trout habitat threshold would be exceeded more often than under near-term conditions.

Lake Crowley Reservoir

Under the No-Restriction Alternative, waterskiing opportunities at Lake Crowley reservoir would not differ appreciably from those under the point-of-reference scenario (Table 3J-11). Recreation use of Lake Crowley reservoir is projected to increase slightly (3%) under the No-Restriction Alternative. Consequently, this alternative would not appreciably affect recreation at Lake Crowley reservoir.

Over the long term and during severe droughts, waterskiing opportunities at the lake would be more limited than under near-term conditions.

Indirect Impacts

Mono Lake

Under the No-Restriction Alternative, Mono Lake is expected to have an average elevation of 6,354 feet over the long term. The change in use under this alternative relative to the point of reference cannot be reliably estimated because lake levels would be well below levels for which survey information was obtained. Recreation opportunities would be so limited at 6,362 feet, however, that use could decline substantially. Based on recent use levels (Table 3J-1), implementation of this alternative could result in displacement of more than 70,000 Mono Lake visitors per year.

As discussed above, recreation opportunities at Mono Lake are relatively unique; no good substitute recreation areas exist in the Sierra Nevada or western Great Basin regions. According to results of the Mono Lake visitor survey, other popular places visited on trips to Mono Lake are Mammoth Lakes, Yosemite National Park, June Lake Loop, and Bodie State Park. None of these areas provide opportunities for sightseeing or birdwatching comparable to those at Mono Lake. These other destinations are considered complimentary to visits to Mono Lake, rather than substitute destinations. Consequently, if use declines at Mono Lake, significant increases in use and congestion at these other recreation areas would not be expected.

Lower Reaches of Affected Tributaries

Under the No-Restriction Alternative, fishing opportunities on the lower tributaries would decline substantially relative to the point-of-reference scenario. In recent years, annual use of lower Rush and Lee Vining Creeks has been less than 530 visitor days (Table 3J-1). Considering that hundreds of miles of fishable streams are available in the eastern Sierra Nevada, the potential increase in congestion on any stream would be negligible even if most users of the lower tributaries were displaced to several locations.

Grant Lake and Lake Crowley Reservoirs

Under this alternative, use at Grant Lake and Lake Crowley reservoirs would increase relative to point-of-reference conditions (Table 3J-12). No displacement of users to substitute lakes or reservoirs would occur.

**Summary of Benefits and Significant Impacts
and Identification of Mitigation Measures
(No-Restriction Alternative)**

- # Enhances fishing opportunities on the Upper Owens River.

- # Significantly reduces birdwatching and nature study opportunities at Mono Lake contributing to an estimated 12% decline in visitor days.

Mitigation Measures. Grebe and phalarope abundance and viewing opportunities would decline as a result of changes in prey abundance attributable to changes in water quality and hard substrate extent. These effects cannot be mitigated without increasing the lake level. Gull abundance and viewing opportunities would be affected by predation because of land bridges to nesting sites. This impact cannot be feasibly mitigated.

- # Significantly reduces sightseeing and lake-viewing opportunities at Mono Lake, contributing to an estimated 12% decline in visitor days.

Mitigation Measures. Adverse impacts on sightseeing and lake-viewing opportunities resulting from long distances between parking lots and the lakeshore could be reduced by extending roads and constructing new parking lots closer to the lakeshore.

- # Significantly reduces fishing opportunities on the lower reaches of the affected tributaries, resulting in an estimated 20% decline in recreation use.

Mitigation Measures. Under the No-Restriction Alternative, no water would flow down the lower tributaries during dry and normal runoff years. Under these circumstances, significant adverse impacts on fishing conditions cannot be effectively mitigated.

- # Increases opportunities for boating and waterskiing at Grant Lake reservoir.

**IMPACTS AND MITIGATION MEASURES FOR
THE 6,372-FT ALTERNATIVE**

Changes in Resource Condition

Mono Lake

Under the 6,372-Ft Alternative, Mono Lake's average long-term level would be 6,375 feet, 1 foot lower than the point-of-reference level. At this level, the thresholds for lakeshore inaccessibility and for

low gull populations would be exceeded 64% of the time compared to 0% of the time under point-of-reference conditions. This condition would adversely affect opportunities for sightseeing and birdwatching.

Lake level thresholds for low phalarope observability would be exceeded slightly more often than under point-of-reference conditions. Visitor use of Mono Lake is projected to be unchanged.

During prolonged droughts, adverse lake level conditions for grebes, phalaropes, and gulls would occur constantly.

Lower Reaches of Affected Tributaries

Under the 6,372-Ft Alternative, low flows in October and November would occur 100% of the time compared to 80% of the time under the point-of-reference conditions. These conditions, which result in poor trout spawning habitat, would substantially affect fishing opportunities. Recreation use of the lower tributaries is projected to decline by an estimated 7%.

During drought periods, poor trout spawning habitat would occur more frequently than over the near term.

Grant Lake Reservoir

Under the 6,372-Ft Alternative, exceedance of lake level thresholds for reservoir inaccessibility would be comparable to that under point-of-reference conditions. Consequently, there would be no substantial impact on recreation opportunities. Recreation use at Grant Lake reservoir would decrease by an estimated 5%.

Over the long term and during drought conditions, the reservoir access thresholds would be exceeded more often than under near term conditions.

Upper Owens River

Under the 6,372-Ft Alternative, flows would cause excessive streambank erosion more frequently than under point-of-reference conditions, while available adult trout habitat would be restricted less often than under point-of-reference conditions (Table 3J-11). Because the adult trout habitat threshold is a more comprehensive indicator of the effect on fishing opportunities than the excessive streambank erosion threshold, and because the beneficial effect on adult habitat would occur relatively more frequently than the adverse effect on bank stability, the 6,372-Ft Alternative is considered to have a net beneficial effect on fishing on the Upper Owens River.

Over the long term and during drought conditions, thresholds associated with high stream temperatures and low habitat availability would be exceeded more often than over the near term.

Lake Crowley Reservoir

Under the 6,372-Ft Alternative, waterskiing opportunities would be substantially affected because the course would be unusable 35% of the time compared to 20% of the time under the point-of-reference scenario (Table 3J-11). Recreation use at Lake Crowley reservoir would decline by an estimated 3% compared to point-of-reference conditions.

During prolonged droughts, the waterskiing course would never be usable.

Indirect Impacts

Mono Lake

Under the 6,372-Ft Alternative, use at Mono Lake is not projected to change relative to the point of reference; consequently, impacts on other recreation areas from displacement of users would not occur.

Affected Reaches of the Lower Tributaries

The 6,372-Ft Alternative would result in an estimated 7% reduction in use of the lower tributaries relative to the point-of-reference scenario (Table 3J-12). Potential impacts on other streams resulting from displacement of use would be negligible.

Grant Lake Reservoir

The 6,372-Ft Alternative would result in an estimated use reduction of 5% (or approximately 2,300 visitor days per year) at Grant Lake reservoir relative to the point-of-reference scenario (Tables 3J-1 and 3J-12). Displaced users are most likely to use one or more of the other lakes on the June Lake Loop. Campsite occupancy at June Lake, Reverse Creek, Gull Lake, and Silver Lake campgrounds averaged 77% over the 1991 recreation season (Senn pers. comm.). If all 2,300 visitor days of displaced use at Grant Lake reservoir were accommodated at these four campgrounds, their average occupancy rate would increase to approximately 80%. The resulting increase in congestion at these areas would be less than significant.

Lake Crowley Reservoir

The 6,372-Ft Alternative would result in an estimated use reduction of 3% (or approximately 3,800 visitor days per year) at Lake Crowley reservoir relative to the point-of-reference scenario (Tables 3J-1 and 3J-12). The best substitutes for Lake Crowley reservoir are Bridgeport Lake, Lake Topaz, Big Bear Lake, Isabella Lake, Shaver Lake, and Huntington Lake. Southern California residents who visit Lake Crowley reservoir would tend to use Big Bear, Isabella, Huntington, or Shaver Lakes; all of these lakes are closer to Los Angeles than is Lake Crowley reservoir. According to survey results, 61% of Lake Crowley reservoir's users reside in metropolitan southern California. Almost all remaining visitors to Lake Crowley reservoir reside elsewhere in California.

If all use displaced from Lake Crowley reservoir were distributed evenly among the six substitute lakes identified above, average total daily use would increase by less than 4 visitor days per area. This increase in use would have a negligible effect on congestion at these areas.

Summary of Benefits and Significant Impacts and Identification of Mitigation Measures (6,372-Ft Alternative)

- # Enhances fishing opportunities on the Upper Owens River.
- # Significantly reduces opportunities for sightseeing and lake viewing at Mono Lake.

Mitigation Measures. See measure described above for the No-Restriction Alternative.

- # Significantly reduces opportunities for observing gulls at Mono Lake.

Mitigation Measures. See measure described above under "No-Restriction Alternative" for enhancing gull-viewing opportunities.

- # Significantly reduces fishing opportunities on the lower reaches of the affected tributaries.

Mitigation Measures. Inadequate flows during spawning periods could be avoided by increasing the uniformity of flows over the year. In particular, reducing June flows could make more water available in October and November.

- # Significantly reduces waterskiing opportunities at Lake Crowley reservoir, contributing to a 3% decline in visitor days.

Mitigation Measures. This effect could be mitigated by constructing a substitute waterskiing course at a different Lake Crowley reservoir location that is relatively insensitive to lake level fluctuations.

IMPACTS AND MITIGATION MEASURES FOR THE 6,377-FT ALTERNATIVE

Changes in Resource Condition

Mono Lake

Under the 6,377-Ft Alternative, lake level thresholds for low phalarope observability would be exceeded 20% of the time compared to 100% of the time under point-of-reference conditions. This condition would improve opportunities for birdwatching and nature study. A slight (3%) increase in visitor use is also projected.

In the near term, opportunities for observing phalaropes would be similar to those over the long term; during droughts, opportunities would be less frequent.

Lower Reaches of Affected Tributaries

The generally higher flows relative to point-of-reference conditions would substantially increase (33%) recreation use of the tributaries relative to point-of-reference conditions (Table 3J-12).

Over the long term, flows would be less than under near-term conditions, but would not substantially affect recreation opportunities. During droughts, flows would constantly exceed the threshold for limited spawning habitat.

Grant Lake Reservoir

Under the 6,377-Ft Alternative, lake level thresholds for upper reservoir inaccessibility and unusability of the boat ramp would be exceeded about 80% and 87% of the time, respectively, compared to 50% of the time under the point-of-reference scenario. These conditions would substantially affect opportunities for boating and waterskiing at the reservoir. Recreation use would decline by a projected 6%.

Over the long term, recreation conditions would be similar to near-term conditions. During droughts, thresholds for reservoir inaccessibility would be exceeded constantly.

Upper Owens River

Under the 6,377-Ft Alternative, the water temperature threshold on the Upper Owens River would be exceeded more frequently than under point-of-reference conditions, while adult trout habitat would be restricted less frequently than under point-of-reference conditions (Table 3J-11). The net effect of these opposing impacts on fishing opportunities is inconclusive and likely to be relatively minor.

During prolonged droughts, the stream temperature and adult trout habitat availability thresholds would be exceeded more frequently than over the near term.

Lake Crowley Reservoir

Under the 6,377-Ft Alternative, waterskiing opportunities would be substantially affected because the course would be unusable 50% of the time compared to 20% of the time under the point-of-reference conditions. Recreation use at Lake Crowley reservoir would not change compared to use under point-of-reference conditions.

Over the long term, waterskiing opportunities would decline relative to near-term conditions; during droughts, waterskiing and fishing opportunities would decline relative to near-term conditions.

Indirect Impacts

Under the 6,377-Ft Alternative, use at Mono Lake and the lower tributaries would increase relative to the point-of-reference scenario (Table 3J-12); consequently, no congestion impacts would occur at other recreation areas.

At Grant Lake reservoir, recreation use would decrease by an estimated 6% or approximately 2,800 visitor days per year. At Lake Crowley reservoir, recreation use would decrease by an estimated 6% or approximately 7,600 visitor days per year. Displacing approximately 10,000 annual visitor days to other recreation areas in the eastern and southern Sierra Nevada would not be expected to have a significant impact on congestion at such areas.

Summary of Benefits and Significant Impacts and Identification of Mitigation Measures (6,377-Ft Alternative)

- # Enhances birdwatching opportunities at Mono Lake because of increased phalarope observability.

- # Enhances overall fishing opportunities on the lower tributaries because of generally higher flows, contributing to an estimated 33% increase in annual recreation use.

Mitigation Measures. Adverse effects on fishing access could be reduced by limiting flows during daylight hours and increasing them proportionately at night.

- # Significantly reduces boating and waterskiing opportunities at Grant Lake reservoir.

Mitigation Measures. Reduced boating and waterskiing opportunities at Grant Lake reservoir could be compensated for by extending the boat ramp at the Grant Lake marina or by modifying water releases from Grant Lake reservoir to maintain a higher lake level through the recreation season.

- # Significantly reduces waterskiing opportunities at Lake Crowley reservoir.

Mitigation Measures. This effect could be mitigated by constructing a new waterskiing course in an area not susceptible to lake level fluctuations.

IMPACTS AND MITIGATION MEASURES FOR THE 6,383.5-FT ALTERNATIVE

Changes in Resource Condition

Mono Lake

Under the 6,383.5-Ft Alternative, lake level thresholds for low phalarope observability would be exceeded, thereby improving opportunities for birdwatching and nature study. A 6% increase in visitor use is also projected.

In the near term and during droughts, opportunities for observing phalaropes would be similar to those over the long term.

Affected Reaches of Lower Tributaries

Under the 6,383.5-Ft Alternative, the generally higher flows relative to point-of-reference conditions would substantially increase recreation use of the tributaries (60% increase) (Table 3J-12).

Over the long term, flows would be less than under near-term conditions but would not substantially affect recreation opportunities. During droughts, flows would constantly exceed the threshold for limited spawning habitat.

Grant Lake Reservoir

Under the 6,383.5-Ft Alternative, lake level thresholds for upper lake inaccessibility and unusability of the boat ramp would be exceeded about 80% and 87% of the time, respectively, compared to 50% under point-of-reference conditions. These conditions would substantially affect opportunities for boating and waterskiing at the reservoir. Recreation use would decline by a projected 7%.

Over the long term, recreation opportunities would be similar to those under near-term conditions. During droughts, thresholds for reservoir inaccessibility would be exceeded constantly.

Upper Owens River

Under the 6,383.5-Ft Alternative, the thresholds for stream temperature and adult trout habitat availability would be exceeded more often than under point-of-reference conditions (Table 3J-11). These adverse effects would outweigh the beneficial effect of less frequent occurrences of excessive streambank erosion.

During prolonged droughts, the stream temperature and habitat availability thresholds would be exceeded significantly more often than over the near term.

Lake Crowley Reservoir

Under the 6,383.5-Ft Alternative, waterskiing opportunities would be substantially affected because the course would be unusable 80% of the time compared to 20% of the time under point-of-reference conditions. Recreation use at Lake Crowley reservoir would decline by a projected 9% compared to point-of-reference conditions.

Over the long term, recreation opportunities would be similar to those under near-term conditions. During droughts, the McGee Bay ecosystem would have low productivity and the waterskiing course would be unusable more often than under near-term conditions.

Indirect Impacts

Under the 6,383.5-Ft Alternative, use would increase at Mono Lake and the lower tributaries; consequently, no congestion impacts would occur at other areas. At Grant Lake reservoir, recreation use

would decrease by an estimated 7%, or 3,200 visitor days per year. At Lake Crowley reservoir, recreation use would decrease by about 9%, or approximately 11,500 visitor days. If the total amount of displaced use were distributed evenly among Lake Topaz, Bridgeport Lake, Isabella Lake, Big Bear Lake, Lake Shaver, and Lake Huntington, average daily use at each of these lakes would increase by approximately 13 visitor days. This increase in use would have a less-than-significant effect on congestion at these areas.

**Summary of Benefits and Significant Impacts
and Identification of Mitigation Measures
(6,383.5-Ft Alternative)**

- # Enhances birdwatching opportunities at Mono Lake because of increased phalarope observability.
- # Enhances overall fishing opportunities on the lower tributaries because of generally higher flows, contributing to an estimated 60% increase in annual recreation use.
- # Significantly reduces boating and waterskiing opportunities at Grant Lake reservoir.

Mitigation Measures. Reductions in boating and waterskiing opportunities could be lessened by extending the boat ramp or by modifying water releases.

- # Significantly reduces fishing opportunities on the Upper Owens River.

Mitigation Measures. The adverse effects on fishing on the Upper Owens River could be lessened by scheduling water exports from Mono Basin to increase the uniformity of flows in the Upper Owens River. The effects also could be lessened by reducing diversions from the river for irrigation. (See Chapter 3D, "Fishery Resources", for a more detailed description of this mitigation measure.)

- # Significantly reduces waterskiing opportunities at Lake Crowley reservoir.

Mitigation Measures. This effect could be avoided by constructing a new waterskiing course in an area not sensitive to lake level fluctuations.

IMPACTS AND MITIGATION MEASURES OF THE 6,390-FT ALTERNATIVE

Changes in Resource Condition

Mono Lake

Under the 6,390-Ft Alternative, lake level thresholds for low phalarope observability would never be exceeded, thereby improving opportunities for birdwatching and nature study.

Lake level thresholds for severe dust storms would be exceeded substantially less often under the 6,390-Ft Alternative than under point-of-reference conditions, enhancing sightseeing and lake-viewing opportunities; however, thresholds for inundating or topping most small tufa formations at South Tufa grove and most sand tufa at Navy Beach would be exceeded almost constantly under this alternative, adversely affecting sightseeing and lake viewing.

These conflicting effects must be considered to determine the net impact on sightseeing and lake viewing. Tufa towers are a very important visual feature at Mono Lake; however, visitor use, which is based on visitor survey responses, is projected to increase by 12% under the 6,390-Ft Alternative. Based on this result, the net effect on sightseeing and lake viewing under this alternative is considered beneficial.

In the near term and during droughts, tufa inundation at South Tufa grove would be much less extensive than over the long term. However, severe dust storms would occur relatively often in the near term and during droughts.

Lower Reaches of the Affected Tributaries

Under the 6,390-Ft Alternative, high stream flows that make access to the streams difficult would occur 23% of the time compared to 10% under point-of-reference conditions. This condition would substantially affect fishing opportunities. The generally higher flows relative to point-of-reference conditions, however, would substantially increase recreation use, although no estimates of the percent change could be made (Table 3J-12).

Over the long term, flows would be less than under near-term conditions but would not substantially affect recreation opportunities. During droughts, flows would constantly exceed the threshold for limiting spawning habitat.

Grant Lake Reservoir

Under the 6,390-Ft Alternative, lake level thresholds for upper lake inaccessibility and unusability of the boat ramp would be exceeded about 90% of the time compared to 50% under the point-of-reference scenario. Recreation use at Grant Lake reservoir would decline by a projected 8% compared to use under point-of-reference conditions.

Over the long term, recreation opportunities would be similar to those under near-term conditions. During droughts, thresholds for reservoir inaccessibility would be exceeded constantly.

Upper Owens River

Under the 6,390-Ft Alternative, the stream temperature and trout habitat availability thresholds would be exceeded more frequently than at the point of reference, while streamflows exceeding 200 cfs would occur less frequently. The net effect on fishing opportunities would be adverse and significant.

During droughts, the stream temperature and habitat availability thresholds would be exceeded more often than over the near term.

Lake Crowley Reservoir

Under the 6,390-Ft Alternative, waterskiing opportunities at Lake Crowley reservoir would be substantially affected because the course would be unusable 80% of the time compared to 20% under point-of-reference conditions. Recreation use at Lake Crowley reservoir would decline by a projected 9% compared to use under point-of-reference conditions.

Over the long term, recreation opportunities would be similar to those under near-term conditions. During droughts, the thresholds for low productivity of the McGee Bay ecosystem and for inaccessibility of the waterskiing course would be exceeded more often than under near-term conditions.

Indirect Impacts

Under the 6,390-Ft Alternative, annual use relative to the point-of-reference scenario would increase at Mono Lake and on the lower tributaries, but would decrease by 8% (3,700 visitor days) at Grant Lake reservoir and by 10% (12,800 visitor days) at Lake Crowley reservoir (Tables 3J-1 and 3J-12). These levels of displaced use could be accommodated by substitute lakes and reservoirs without significantly increasing congestion at these areas.

**Summary of Benefits and Significant Impacts
and Identification of Mitigation Measures
(6,390-Ft Alternative)**

- # Enhances birdwatching opportunities at Mono Lake contributing to an estimated 12% increase in visitor use.
- # Enhances overall sightseeing and lake-viewing opportunities at Mono Lake contributing to an estimated 12% increase in visitor use.
- # Significantly reduces opportunities for viewing tufa towers and sand tufa.

Mitigation Measures. The effects on sightseeing from tufa tower inundation and toppling cannot be effectively mitigated.

- # Enhances overall fishing opportunities on the lower tributaries because of generally higher flows, contributing to a substantial increase in recreation use.
- # Significantly reduces boating and waterskiing opportunities at Grant Lake reservoir.

Mitigation Measures. This impact could be mitigated by extending the boat ramp or by modifying water releases.

- # Significantly reduces waterskiing opportunities at Lake Crowley reservoir.

Mitigation Measures. This effect could be avoided by constructing a new waterskiing course in an area not sensitive to lake level fluctuations.

- # Significantly reduces fishing opportunities on the Upper Owens River.

Mitigation Measures. This impact could be lessened by scheduling exports from Mono Basin to increase the uniformity of flows in the Upper Owens River and by reducing diversions from the river for irrigation.

IMPACTS AND MITIGATION MEASURES FOR THE 6,410-FT ALTERNATIVE

Changes in Resource Condition

Mono Lake

Under the 6,410-Ft Alternative, potential waterfowl habitat at Mono Lake would increase substantially, which is expected to eventually result in larger waterfowl populations at the lake. As a result, the lake level threshold for low waterfowl abundance at Mono Lake would be exceeded 29% of the time compared to 100% under point-of-reference conditions. In addition, phalaropes would be more observable compared to point-of-reference conditions. Consequently, birdwatching and nature study opportunities would be enhanced.

Dust storms would be relatively uncommon under the 6,410-Ft Alternative, but almost all tufa formations at South Tufa grove are likely to be toppled or flooded. As suggested by a predicted 3% decline in visitor use, the net effect on sightseeing and lake-viewing opportunities is considered adverse under this alternative.

In the near term, the adverse effects of high lake levels on sightseeing and lake-viewing would be less substantial than over the long term. During droughts, waterfowl habitat would be less abundant and inundation of tufa towers would be less extensive than over the long term.

Lower Reaches of the Affected Tributaries

Under the 6,410-Ft Alternative, flows that limit spawning habitat would occur only 20% of the time compared to 80% under point-of-reference conditions. These conditions would enhance fishing opportunities. Effects on average use are unpredictable under this alternative because median streamflows exceed the range for which information on use is available. Overall, the generally higher flows relative to point-of-reference conditions would improve fishing opportunities.

Over the long term, flows would be less than under near-term conditions, but would not substantially affect recreation opportunities. During droughts, flows would frequently exceed the threshold for limiting spawning habitat and would also impair fishing access less often.

Grant Lake Reservoir

Under the 6,410-Ft Alternative, lake level thresholds for upper lake inaccessibility and unusability of the boat ramp would be exceeded almost all of the time compared to 50% of the time under point-of-

reference conditions. Recreation use at Grant Lake reservoir would decline by an estimated 9% compared to use under point-of-reference conditions.

Upper Owens River

Under the 6,410-Ft Alternative, high stream temperatures and low habitat availability would limit fishing opportunities more than under point-of-reference conditions, while streamflows sufficient to cause excessive bank erosion would occur relatively infrequently. This alternative would have a net adverse effect on fishing opportunities.

During drought conditions, the stream temperature threshold would be exceeded significantly more often than over the near term.

Lake Crowley Reservoir

Under the 6,410-Ft Alternative, recreation effects would be the same as under the 6,390-Ft Alternative.

Indirect Impacts

Under the 6,410-Ft Alternative, displacement of use from directly affected areas would be approximately the same as under the 6,390-Ft Alternative, except that annual use of Mono Lake would decrease by roughly 3% (8,100 visitor days). No significant increases in congestion would result at other recreation areas.

Summary of Benefits and Significant Impacts and Identification of Mitigation Measures (6,410-Ft Alternative)

- # Enhances birdwatching opportunities at Mono Lake because of greater numbers of waterfowl that are expected to eventually visit the lake because phalaropes would be more observable.
- # Enhances overall fishing opportunities on the lower tributaries because of generally higher flows.
- # Significantly reduces sightseeing and lake-viewing opportunities at Mono Lake because of inundation and toppling of tufa.

Mitigation Measures. The effect on sightseeing from tufa tower inundation and toppling cannot be mitigated.

Significantly reduces boating and waterskiing opportunities at Grant Lake reservoir.

Mitigation Measures. See measure described above for the 6,377-Ft Alternative.

Significantly reduces fishing opportunities on the Upper Owens River.

Mitigation Measures. This impact could be reduced by regulating exports from Mono Basin and by reducing diversions from the Upper Owens River for irrigation.

Significantly reduces waterskiing opportunities at Lake Crowley reservoir contributing to an estimated 12% decline in recreation use.

Mitigation Measures. See measure described above for the 6,372-Ft Alternative.

IMPACTS AND MITIGATION MEASURES FOR THE NO-DIVERSION ALTERNATIVE

Changes in Resource Condition

Mono Lake

Under the No-Diversion Alternative, the lake level threshold for low waterfowl abundance would be exceeded 65% of the time compared to 100% under the point-of-reference conditions. The threshold for low phalarope observability would almost never be exceeded. Consequently, bird watching and nature study opportunities would be enhanced.

As under the 6,410-Ft Alternative, severe dust storms would be relatively uncommon under the No-Diversion Alternative. Thresholds for inundation and toppling of large tufa formations would be exceeded 16% of the time. The net effect on sightseeing and lake-viewing opportunities is considered adverse.

During droughts, the adverse and beneficial effects of high lake levels would be reduced relative to long-term conditions.

Lower Reaches of the Affected Tributaries

Under the No-Diversion Alternative, effects on fishing opportunities would be similar to those under the 6,410-Ft Alternative.

Grant Lake Reservoir

Under the No-Diversion Alternative, the opportunity thresholds would never be exceeded. Fishing, boating, and waterskiing opportunities would thus be enhanced relative to the point-of-reference scenario.

Upper Owens River

Under the No-Diversion Alternative, high stream temperatures and low trout habitat availability would limit fishing opportunities more than under point-of-reference conditions, while excessive streambank erosion would occur relatively infrequently. The net effect of this alternative on fishing opportunities would be adverse.

During prolonged droughts, high stream temperatures would limit fishing opportunities significantly more often than over the near term.

Lake Crowley Reservoir

Recreation impacts under the No-Diversion Alternative would be the same as under the 6,390-Ft Alternative.

Indirect Impacts

Under the No-Diversion Alternative, use would increase at all directly affected areas except Lake Crowley reservoir, where annual use would decrease by 12% (about 15,400 visitor days) relative to the point-of-reference scenario (Tables 3J-1 and 3J-12). This level of displacement of use from Lake Crowley reservoir would not be expected to increase congestion significantly at any substitute lakes or reservoirs.

Summary of Benefits and Significant Impacts and Identification of Mitigation Measures

- # Enhances birdwatching opportunities at Mono Lake because of greater numbers of waterfowl and increased phalarope observability.

- # Significantly reduces sightseeing and lake-viewing opportunities at Mono Lake because of toppling and inundation of large tufa formations.

Mitigation Measures. The effects on sightseeing of tufa tower and sand tufa inundation and toppling cannot be mitigated.

- # Enhances overall fishing opportunities on the lower tributaries because of generally higher flows.

- # Enhances fishing, boating, and waterskiing opportunities at Grant Lake reservoir.

- # Significantly reduces fishing opportunities on the Upper Owens River.

Mitigation Measures. This impact could be reduced by regulating exports from Mono Basin and by restricting stream diversions for irrigation.

- # Significantly reduces waterskiing opportunities at Lake Crowley reservoir, contributing to an estimated 12% decline in recreation use.

Mitigation Measures. This impact could be avoided by constructing a new waterskiing course in an area that is not sensitive to lake level fluctuations.

CUMULATIVE IMPACTS OF THE ALTERNATIVES

As discussed in the "Impact Assessment Methodology" section, the analysis of cumulative impacts focuses on effects at Mono Lake, the lower tributaries, and the Upper Owens River.

Related Impacts of Earlier Stream Diversions by LADWP

Cumulative recreation effects of LADWP diversions were not analyzed for Grant Lake or Lake Crowley reservoirs or the Upper Owens River because their recreation resources were beneficially affected by implementation of LADWP's Mono Basin diversion project.

Mono Lake

Historical diversions of the Mono Lake tributaries by LADWP resulted in a decline in lake level from 6,417 feet in 1940 to the 1992 level of 6,375 feet. As discussed above under "Prediversion Conditions" and "Environmental Setting", historical reductions in lake level have substantially reduced

opportunities for motorboating, sunbathing and beach uses, waterfowl hunting, and swimming and wading at Mono Lake.

Motorboating and waterskiing are limited primarily by the high salinity of Mono Lake's water, which increased from 51.3 grams per liter (g/l) of total dissolved solids in 1940 to 93.4 g/l in 1991 (NAS 1987). Boating and waterskiing were also adversely affected as the declining lake level made the boat ramp at Old Marina unusable. Swimming and wading may have declined because of water-quality changes resulting from diversions. Sunbathing and beach uses have declined as the lake's western shore changed from a sandy surface to a muddy surface. Hunting for ducks and geese, which was an important autumn recreational activity at Mono Lake in the prediversion period, declined substantially with reductions in seasonal waterfowl abundance.

Recession of Mono Lake during the postdiversion period has exposed and made accessible formerly submerged groves of tufa and sand tufa, some of which are currently land based and some of which stand in shallow water. Over recent decades, the tufa formations have become popular tourist attractions and the most recognizable feature of the Mono Lake environment. (See discussion of tufa as a visual resource in Chapter 3I, "Visual Resources".) The increased recreational importance of the Mono Lake tufa resulting from historical diversions represents a beneficial cumulative recreation impact of historical diversions.

At lake levels exceeding approximately 6,400 feet, water quality, beaches, and waterfowl habitat at Mono Lake would resemble their prediversion conditions. At levels exceeding 6,400 feet, the lake's tufa formations would similarly resemble their prediversion condition (i.e., they would largely be inundated and relatively inaccessible and invisible). Over the long term, the net cumulative recreation impact for the 6,410-Ft and No-Diversion Alternatives would be less than significant. All other alternatives would have significant cumulative impacts on recreation opportunities at Mono Lake.

Lower Reaches of Affected Tributaries

The lower reaches of the affected tributaries supported recreationally important fisheries in the prediversion period. In particular, Rush Creek was recognized as a trophy trout fishery. Restored flows for these reaches will improve their fisheries relative to recent decades when streamflows were intermittent and no fisheries existed there. As discussed in Chapter 3D, "Fishery Resources", however, the diversions resulted in geomorphic changes to portions of the Rush and Lee Vining Creek channels east of U.S. 395 that will have long-term adverse impacts on these streams' fisheries. Restoration work currently being implemented will reduce these impacts and accelerate the recovery of the fisheries and other riparian features enjoyed by recreationists.

Related Impacts of Other Past, Present, or Anticipated Projects or Events

Proposed Groundwater Extraction from the Aquifer Supplying Big Springs and the Upper Owens River

Groundwater extraction from the aquifer that supplies Big Springs could reduce flows in the Upper Owens River and impair trout spawning and production. Such reductions in trout production would adversely affect fishing on the Upper Owens River, particularly upstream from East Portal where Big Springs accounts for the river's entire flow. Because the headwaters of the Upper Owens River provide spawning habitat for fish that reside downstream from East Portal, fishing on the Upper Owens River could be adversely affected by reduced discharge from Big Springs. To date, however, no hydrologic studies have been conducted of the effects of groundwater extraction on discharge from Big Springs.

Significant Cumulative Adverse Impacts

No-Restriction Alternative

- # Reduces opportunities for motorboating, waterskiing, sunbathing and beach uses, waterfowl hunting, and swimming and wading at Mono Lake.
- # Reduces or eliminates fishing opportunities on the lower reaches of Rush and Lee Vining Creeks.
- # Possibly reduces fishing opportunities on the Upper Owens River.

6,372-Ft Alternative

Significant cumulative adverse impacts would be the same under this alternative as under the No-Restriction Alternative, except that fishing opportunities on the tributary streams would be reduced but not eliminated.

6,377-Ft Alternative

Significant cumulative adverse impacts would be the same under this alternative as under the 6,372-Ft Alternative.

6,383.5-Ft Alternative

Significant cumulative adverse impacts would be the same under this alternative as under the 6,372-Ft Alternative.

6,390-Ft Alternative

Significant cumulative adverse impacts would be the same under this alternative as under the 6,372-Ft Alternative.

6,410-Ft Alternative

Reduces fishing opportunities on the lower reaches of Rush and Lee Vining Creeks.

Possibly reduces fishing opportunities on the Upper Owens River.

No-Diversion Alternative

Significant cumulative adverse impacts would be the same under this alternative as under the 6,410-Ft Alternative.

Mitigation Measures for Significant Cumulative Impacts

Mono Lake

Reduced recreation opportunities resulting from changes in water quality at Mono Lake due to historical diversions cannot be fully mitigated. Impacts on sunbathing and beach uses and on waterfowl hunting could be lessened by creation of appropriate facilities. For example, sandy beaches could be created at selected sites on the western lakeshore. Similarly, waterfowl abundance and hunting could be enhanced by creation of freshwater or brackish lagoons and other habitat improvements adjacent to Mono Lake.

Lower Reaches of Rush and Lee Vining Creeks

The adverse effects on fishing of permanent changes in channel morphology on lower Rush and Lee Vining Creeks could be compensated for by construction of in-stream trout habitat improvements such as pools and overhanging banks. Reduction or elimination of livestock grazing along the lower tributaries

would also hasten habitat recovery. A detailed discussion of supplementary mitigation projects for the lower tributaries is presented in Chapter 3D, "Fishery Resources".

Upper Owens River

Hydrologic studies are needed to assess the effects on Big Springs of groundwater extraction by the Town of Mammoth Lakes. Any adverse effects on fishing on the Upper Owens River resulting from reduced discharge from Big Springs could be lessened by restricting pumping for municipal use, particularly during drought events, and by reducing diversions from the river for irrigation.

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