1.0 EXECUTIVE SUMMARY

In 2001 and 2002, the literature review, a camera feasibility study, the Mammoth Pool migration study (observation study, boat survey, and remote camera study), and a hunter access study were completed. A map of known mule deer summer and winter ranges, migration corridors, and holding areas was created based on the literature review.

The camera feasibility study was conducted in the fall of 2001 to test the remote camera system for the spring 2002 remote camera study. The cameras were successful at capturing photographs of 82 animals, including photographs of six deer, during this testing period.

The Mammoth Pool migration study consisted of an observation study, boat survey, and remote camera study. The study focused on documenting key migration routes across the reservoir and relative use, identifying potential migration barriers, and documenting any deer mortality in the reservoir. The observation study consisted of two observers positioned with binoculars at two observation points on Mammoth Pool at dusk and dawn in order to observe migrating deer. There were no observations of deer using the dam road. Two observations of deer were made out of a total of 51 observation periods. One observation consisted of a single deer that swam from the Windy Point Boat Launch area to the Mammoth Pool Boat Launch area. The other observation was of one group of five adult deer approaching the reservoir near the observation point by the Mammoth Pool Boat Launch, but turning back up the hill. There was no sign of difficulty in the deer swimming or exiting the reservoir and no obvious disturbance to the deer that turned back.

Four boat surveys were conducted to detect potential migration routes upstream of the observation points where it was inaccessible except by boat. Many tracks were detected along the shoreline. However, it was difficult to determine if the tracks were made by deer in all cases and if the deer were moving towards or away from the water, if they were migrating across the lake, or if they were foraging near the shoreline. One deer was observed swimming the reservoir in the vicinity of Mill Creek from west to east during the boat survey. No difficulty in swimming or exiting the reservoir was observed. There were no carcasses or migration barriers detected.

Three remote cameras (Photoscout and Photohunter from Highlander Sports, Inc.®, Huntsville, Alabama) were placed along the road over Mammoth Pool Dam in order to detect deer using the road. A total of 231 photographs were obtained. Twenty-four of these photographs were of deer. All of the deer were adults. One deer was identified as male. The others were of unknown sex. Fourteen of the photographs had deer heading east with the migration, while four photographs had deer heading west. The majority of photographs were in the morning or evening. Therefore, these observations indicate that deer use the dam road during the migration period.

The hunter access study information is included in REC-12, Hunting.

2.0 STUDY OBJECTIVES

- Determine the location of deer holding areas, summer and winter habitat areas, and migration routes. Identify and characterize areas of deer mortality at Project facilities (i.e., Mammoth Pool) during migration.

3.0 STUDY IMPLEMENTATION

3.1 STUDY ELEMENTS COMPLETED

- Compiled information on mule deer holding areas, key winter and summer ranges, and migration corridors based on a review of existing literature and databases and through agency consultation. Mapped these important deer areas and incorporated into a GIS database.
- Collected information on mule deer migration (timing, numbers, barriers, and mortality) along key migration routes near Project facilities, bypass and flow-augmented reaches, and recreational facilities through literature review and agency consultation.
- Monitored mule deer migration at Mammoth Pool Reservoir in the field to document deer survival when migrating across the reservoir. Conducted focused deer migration studies, consisting of observation studies, boat surveys, and remote camera surveys, at Mammoth Pool. Recorded incidental observations of mule deer during other field surveys conducted for the Big Creek ALP.
- Assessed SCE's and CDFG's existing mitigation measures for deer at Mammoth Pool Reservoir to determine current status and adequacy.
- Created a GIS map depicting important deer areas and ALP Project roads and transmission lines in order to address the potential for increased deer harvest associated with Project facilities. Determined areas of concern based on overlap of these layers. Visited each area of concern in the fall of 2002 to assess vulnerability of migrating deer.

3.2 OUTSTANDING STUDY ELEMENTS

- Evaluate existing deer mitigation measures, implemented for the construction of the Balsam Meadows (Eastwood Power Station) Project, on SCE-owned lands around Shaver Lake.
- Assess the potential effect on migrating deer of any proposed controlled flow releases by SCE (i.e., whitewater boating releases) necessary to complete relicensing studies in the Big Creek Study Area.

4.0 STUDY METHODOLOGY

4.1 REVIEW OF EXISTING INFORMATION

During 2001 and 2002, a literature review was conducted. Appendix A provides a complete list of literature reviewed for this study plan. Information on mule deer migration (e.g., timing, numbers, barriers, and mortality) along key migration routes near Project facilities, bypass and flow-augmented reaches, and recreational facilities were collected from existing literature and through agency consultation. Important mule deer areas (i.e., summer and winter ranges, holding areas, and migration corridors) identified from the literature review were mapped and incorporated into a GIS database (Figure TERR-14-1).

4.2 CAMERA FEASIBILITY STUDY

During the fall of 2001, a feasibility study was conducted to test the multiple remote camera systems proposed for monitoring deer migration at Mammoth Pool Reservoir. Information from this feasibility study was used to assist in the design and implementation for the deer migration study at Mammoth Pool reservoir in spring 2002. In the fall of 2001, three cameras were provided by USDA-FS and consisted of two Photoscout models and one Photohunter model (Highlander Sports, Inc.®, Huntsville, Alabama). Locations for the cameras were selected and approved by the Terrestrial Resources Working Group (Figure TERR-14-2a through b). One camera was located east of the dam, one camera was placed between the dam and the spillway, and one camera was west of the spillway. The cameras were placed in these locations in order to attempt to discern whether deer were using the dam road to cross the reservoir. Cameras were placed among vegetation on the roadside on Mammoth Pool Dam Road in areas where the road was wide and vegetation was present on both sides of the road to prevent startling deer into jumping off the road. Cameras were installed on October 11, 2001; checked on October 16 to replace film, change batteries, and make repairs if necessary; and removed on October 23.

4.3 MAMMOTH POOL RESERVOIR MIGRATION STUDY

Deer migration at Mammoth Pool Reservoir was studied during the spring migration period in 2002. The study focused on documenting key migration routes across the reservoir and relative use; identifying potential migration barriers in the reservoir or along the shoreline; and documenting any deer mortality in the reservoir. Three types of surveys were completed to characterize deer migration at Mammoth Pool, including observations from fixed locations, observations during boat surveys along the perimeter of the reservoir, and photographs of migrating deer collected from remote cameras. The following describes each of these surveys.

OBSERVATION STUDY

An observation study was conducted in order to collect information on deer migrating across the reservoir, to document any observed difficulty in crossing, entering, or

exiting the reservoir, and to document any observed drowning. During deer migration studies at Mammoth Pool, observations of migrating deer were conducted in two, 1.5-hour blocks, at dawn and dusk from April 15 to June 10, 2002. The initial surveys, beginning in April, were conducted three days a week. Surveys continued at that frequency through the week of May 12 when peak migration was anticipated based on higher frequency of incidental deer encounters in the Mammoth Pool vicinity. Survey frequency then increased to four days per week for the next two weeks, and then tapered from four to three to two to one day per week until the week of June 9. Dusk observations were conducted from approximately 19:00 – 20:30 hours (hrs), and dawn observation periods were conducted from approximately 05:30 – 07:00 hrs.

During each survey, one observer was stationed at the Mammoth Pool Boat Launch and a second observer was stationed at the Windy Point Boat Launch (Figure TERR-14-2a through b). The Mammoth Pool Boat Launch was selected and approved by the Terrestrial Resources Working Group as an observation point because it afforded the widest view of the reservoir, of all the sites accessible, and provided a view of the road across the dam from a distance. This limited the potential for disturbance to deer crossing the dam. The Windy Point Boat Launch was selected and approved by the Terrestrial Resources Working Group as an observation point because it was easily accessible and provided a wide view of the reservoir, including an area documented to be a key migration route for deer in a previous deer study at the reservoir (Peabody et al. 1978). This location is not visible from the Mammoth Pool Boat Launch.

Each observer was equipped with binoculars and the person at the Mammoth Pool Boat Launch was also equipped with a spotting scope to remotely monitor deer migration from a distance to reduce disturbance. At each location, the observers recorded the time and number of deer crossing, the age-class and sex of migrating deer (if possible), the paths they took to cross (e.g., use of the road that crosses the crest of the dam or swimming across the reservoir), temperature, qualitative wind speed and direction, and any observed difficulty in crossing or in entering and exiting the reservoir.

BOAT SURVEY

Boat surveys were conducted in order to identify key migration trails and relative use (based on tracks), to identify any migration barriers, and to document any deer carcasses. Four boat surveys were conducted on May 1, May 7, May 15, and May 21, 2002, along the entire shoreline of Mammoth Pool to identify key deer migration trails and relative use (based on tracks). Surveys were conducted between 10:00 and 14:00 hrs, when deer are less active, to create the least disturbance for migrating deer. The entire shoreline of the reservoir was slowly boated by two biologists who examined the shoreline with binoculars. When evidence of tracks was detected, the boat was docked and the biologists examined the tracks to determine if they were from deer and if they were approaching or leaving the water. In general, tracks were difficult to identify to species and difficult to determine if they were approaching or

leaving the reservoir because of the coarse, loose sand that was present along many areas of the shoreline. All tracks observed were recorded during each survey regardless of whether they were counted during a previous survey due to the difficulty in erasing tracks so they would not be recounted. Therefore, tracks were recounted on subsequent visits. Data collected included GPS coordinates, number of tracks, entry or exit, slope of bank, substrate, and any deer access problems. The location of any migration barriers along the shoreline or in the reservoir was noted. During these surveys, the location and number of any deer carcasses were recorded. All key deer migration trails, migration barriers, and deer carcasses observed during the survey were mapped on a 7.5-minute quadrangle USGS map and incorporated into a GIS layer (Figure TERR-14-3a through d).

REMOTE CAMERA STUDY

A remote camera study was conducted to obtain information on deer using the road on the crest of the dam. Three remotely-triggered, infrared beam cameras obtained photographs of deer using the road on the crest of the dam during the spring 2002 migration period. Cameras were provided by USDA-FS and consisted of the Photoscout model (Highlander Sports, Inc.®, Huntsville, Alabama). For a short time, a Trailmaster® TM500 Passive Infrared Trail Monitor (Goodson and Associates, Inc., Lenexa, Kansas) was also used when one of the Photoscout models was inoperable. One camera was set up east of the dam, one camera was located between the dam and the spillway, and the third camera was west of the spillway (Figure TERR-14-2a through b). Three cameras were set up in order to capture deer traveling the length of the road. It appeared that, on at least one occasion, the same deer was photographed in multiple cameras as he traveled the road in the fall camera feasibility study. However, the deer are unmarked, and such observations are based on the appearance of the antlers on males. In the spring study, males do not have well-developed antlers. Therefore, it was not known whether the same deer were photographed multiple times. The cameras were placed among vegetation on the roadside in areas where the road was wide and vegetation was present on both sides of the road to prevent startling deer into jumping off the road. Cameras were set up on April 16, 2002. Cameras were checked approximately twice a week to replace film, change batteries, and make repairs, if necessary. Cameras were removed on June 5. Information on the timing, number, age-class, and sex (if possible) of deer migrating across the dam road was documented.

4.4 EVALUATION OF DEER MITIGATION MEASURES AT MAMMOTH POOL

SCE maintains existing mitigation measures for deer in the Mammoth Pool Dam area. The background on development of these mitigation measures is provided below.

Deer migration was monitored intermittently from 1958 to 1975 by CDFG, USDA-FS, and SCE to document deer losses, problems, and behavior associated with the construction of Mammoth Pool Reservoir (Peabody et al. 1978). It was determined that spring deer migration across Mammoth Pool Reservoir is usually in progress by

the first of May, with peak numbers crossing from May 15 to June 15. In the fall, there is usually movement across Mammoth Pool Reservoir by late October. For most years, migration was found to be well underway before heavy snow occurred. The major river crossings found to be used by deer in this area include: 1) Chawanakee, often fording Dam No. 6; 2) below the junction of the San Joaquin River and Rock Creek; 3) the confluence of Shake Flat Creek and the San Joaquin River; 4) the old Mammoth Pool area, which is the present reservoir site; and 5) the China Bar area at the confluence of Jackass Creek and the river, which is also part of the present reservoir.

Significant losses occurred at the diversion tunnel during construction and at the spillway after construction during the spring when deer were migrating through the area. Deer mortality was also determined to be caused by the Daulton Creek diversion, trash buildup at points where deer were trying to swim the reservoir, and harassment from recreational activities on the reservoir. Boating on the reservoir is now closed until mid-June, when most deer have migrated through the area. An overhanging barrel line and a fence that continues down to the reservoir have forced deer to either cross at the bridge or swim outside of the barrel line, rather than crossing in front of the spillway (Peabody et al. 1978).

SCE implemented agency-recommended measures to mitigate for the loss of deer at Mammoth Pool Reservoir when the reservoir was constructed. These measures include fencing, buoys, bridges, and sand placement on the dam to aid in deer crossing, which are described below in the results. During the focused deer migration studies described above, the numbers, response, and behavior for any deer observed at these facilities was documented. This information was used to evaluate the effectiveness of these mitigation measures. The facilities were also examined to determine if they are being maintained.

4.5 DEER HUNTER ACCESS STUDY

To address the potential for increased deer harvest associated with Project facilities and bypass and flow-augmented reaches, a GIS map was produced depicting key deer migration corridors, Project transmission line corridors, and Project roads. Areas of overlap were identified based on these layers. At each area of overlap, a site visit was conducted from September 23 to 24, 2002, to assess vulnerability of migrating deer, including documentation of vegetation screening along the roadway and the presence of adjacent parking areas. Refer to REC-12, Hunting, for a more detailed methodology.

5.0 STUDY RESULTS AND ANALYSIS

5.1 REVIEW OF EXISTING INFORMATION

Mule deer are a Sierra National Forest Management Indicator Species. A map of known mule deer summer and winter ranges, migration corridors, and holding areas was created based on the literature review. Figure TERR-14-1 provides the

comprehensive map, and Figures TERR-14-2a through b, TERR-14-3a through d, TERR-14-4a through c, and TERR-14-5a through c present the information from each data source for clarity. In the central Sierra, mule deer inhabit winter ranges at elevations of 1,200 to 3,600 feet from early October through mid-May (Holl et al. 1979). In the spring, they remain at their winter ranges at an average elevation of 3,400 feet until mid-May, and then begin a gradual upward movement, depending on snow pack (Loft et al. 1989). During the summer, mule deer are commonly found at 6,000 to 10,000 feet from late May to early November (Holl et al. 1979). The San Joaquin deer herd, the herd in the Big Creek ALP Project vicinity, ranges from about 2,000 feet along the San Joaquin River up to about 12,000 feet along the crest of the Sierra. They are commonly found in the summer from 6,500 to 8000 feet, where optimum habitat occurs. Deer commonly spend winter at 1,500 to 4,500 feet (CDFG 1983). A large number of deer using the summer range in Fresno County, winter on the north side of the San Joaquin River in Madera County. This indicates that at least half of the population must cross the San Joaquin River while migrating between summer and winter ranges (Peabody et al. 1978).

Population estimates for the San Joaquin deer herd ranged from 1,901 to 11,480 from 1953 to 1981. Population estimates were highest during the 1950's and lowest during the early to mid-1970's (CDFG 1983). The San Joaquin deer herd is divided into two population segments: the Huntington and South Fork segments. Population goals for the Huntington segment are to maintain 800 to 1,500 animals, and population goals for the South Fork segment are to maintain a population of 2,000 to 3,000 animals (CDFG 2000). There has been a steady reduction in the number of bucks harvested in the South Fork segment, which may indicate that deer numbers have dropped significantly in this area (CDFG 2000). The Huntington segment appears to be increasing in population (CDFG 2000).

The San Joaquin deer herd falls within the D7 deer hunting zone. The hunting season for this zone begins the third weekend in September and lasts for 44 consecutive days. There were 9,000 available tags in this zone, and the bag and possession limit is one buck with a forked horn or better per tag. CDFG (2002) estimated hunter success at 10 percent for the D7 zone in 2001. In the South Fork segment, estimated number of bucks killed per year from 1990 to 1999 ranged from 22 to 62, with an average of 44. In the Huntington segment, estimated number of bucks killed per year from 1990 to 1999 ranged from 37 to 90, with an average of 50.

5.2 CAMERA FEASIBILITY STUDY

The cameras were successful at capturing photographs of animals using the dam road in the fall of 2001. There were a total of 29 photographs taken in Camera One, 30 in Camera Two, and 23 in Camera Three. Camera One had one photograph of a deer (single male), 20 of cars, five of people, one of a domestic dog, and two of vegetation. Camera Two had three photographs of deer (two of lone males and one of a group of three does), two of gray fox (*Urocyon cineroargenteus*), one of mountain lion (*Felis concolor*), two of black bear (*Ursus americanus*), one of western

scrub jay (*Aphelocoma californica*), 20 of cars, and one of vegetation. Camera Three had 23 photographs of cars. All of the deer photographs were taken at night.

Occasionally, vegetation moving in the wind would break the camera's infrared beam and trigger a photograph. No problems were encountered with the cameras with the exception of a high number of cars. This should not be a problem for the spring study when the road is closed. The cameras were reliable at obtaining photographs. The locations for the cameras were successful and suitable for the spring 2002 study. Cameras were checked only once a week during this feasibility study and occasionally the film was empty upon checking. Frequency for camera checks should be higher (at least twice a week) for the spring 2002 study based on the feasibility study.

5.3 MAMMOTH POOL RESERVOIR MIGRATION STUDY

The Mammoth Pool Reservoir migration study was conducted from April 15 to June 10, 2002. The reservoir elevation at Mammoth Pool during the study ranged from 3,230 ft to 3,322 ft (Table TERR-14-1). The dam did not spill due to the low water year.

OBSERVATION STUDY

There were a total of 51 observation periods and two observations of deer in spring 2002 (Appendix B). On May 7, 2002, at 06:40 hr, one deer, an adult of unknown sex, was observed swimming the reservoir from Windy Point Boat Launch to Mammoth Pool Boat Launch (Figure TERR-14-2a through b). No difficulty in swimming or exiting the water was observed. Swim time was approximately 5 minutes. On May 8, 2002, at 20:05, one group of five adult deer of unknown sex was observed approaching the reservoir near Observation Point One, by the Mammoth Pool Boat Launch, but turning back up the hill. There was no obvious disturbance to the deer. No deer were observed using the dam road during the observation study.

BOAT SURVEY

There were many tracks observed near the water's edge during the spring 2002 boat survey (Figure TERR-14-3a through d). It was too difficult to erase the tracks and not recount the same tracks. Instead, all tracks were recorded for each survey. Therefore, it is likely that some tracks were recounted during subsequent visits. Some tracks may be from deer watering and foraging and not necessarily migrating across the lake. For example, we observed a group of deer foraging on plants on the shoreline. It was also difficult to positively identify the tracks to species and to determine whether they were traveling to or from the water due to the coarse, loose sand. Best estimates were made, but much of this data was unknown.

There were hundreds of tracks detected. There were high concentrations of tracks on both shores in the area of China Bar Campground and Fuller Meadow and across the lake from the dam. During the boat survey, biologists observed a group of seven adult deer foraging at the shoreline near the northernmost part of the reservoir. They

also observed one deer swimming the reservoir in the vicinity of Mill Creek from west to east. No difficulty in swimming or exiting the reservoir was observed. There were no deer carcasses, migration barriers, or areas with significant debris buildup detected.

REMOTE CAMERA STUDY

A total of 231 photographs were taken (Appendix C). Nineteen photographs of 24 deer, all adults of mostly unknown sex, were obtained. Fourteen of the photographs had deer heading east with the migration, while four photographs had deer heading west. The majority of the photographs were in the morning or evening. Therefore, it appears that deer do use the dam road during the migration period.

Camera One (east of the dam) had nine photographs of deer, 23 photographs of cars, 17 of vegetation, two of domestic dog, and 19 of people for a total of 70 photographs. All of the deer photographed were adults. Sex was unknown due to lack of antlers. Seven photographs were of single deer, one photograph contained a group of three deer, and one photograph contained a group of two deer. All of the photographs contained deer heading east with the migration, except for two photographs of single deer heading west. Five photographs of deer were obtained during day hours (0700-1800 hrs) and four were obtained during night hours (1800-0700 hrs).

Camera Two (between the dam and the spillway) had six photographs of deer, one of black bear, nine of cars, 16 of vegetation, and 16 of people for a total of 48 photographs. All of the deer photographed were adults. Four of the six deer photographed were of unknown sex. Two deer were identified as males based on presence of antlers. All of the photographs were of single deer. All but one of the deer were heading east with the migration. Three deer photographs were obtained during the day, while three photographs were obtained at night.

Camera Three (west of the spillway) had four photographs of deer, 84 of cars, eight of vegetation, one of the camera system, and 16 of people for a total of 110 photographs. All of the deer photographed were adults of unknown sex. One photograph contained a group of three deer, while the other photographs were of single deer. Two of the single deer were heading east with the migration, while the group of three deer and one single deer were heading west against the migration. Two photographs were obtained during the day, and two photographs were obtained at night.

Deer detected in the cameras may or may not have been using the road in order to migrate through the area. Some deer may have been on daily movements across the road instead. This may be evidenced by the number of photographs of deer traveling east to west, against the migration direction for the spring. However, because of the timing (during the migration period) and the higher numbers of deer crossing west to east (the appropriate migration direction for the spring), it appears that some deer are using the road for migration.

Several photographs of people and cars were obtained although the road was closed for the majority of the study. These photographs were obtained before the road was closed or were photographs of SCE employees conducting regular maintenance or ENTRIX employees conducting the ALP field studies. ENTRIX minimized its use of the road during the closure period as much as possible and limited use of the road to the middle of the day when the deer were less likely to be using the road.

5.4 MITIGATION MEASURE EVALUATION

FENCING AND SAND PLACEMENT ON THE SPILLWAY

When Mammoth Pool was first constructed, there were reports of deer losses from deer jumping into the spillway after being frightened by cars or people (Peabody et al. 1978). SCE and USDA-FS began closing the road to Mammoth Pool Dam to prevent such impacts to the deer. SCE also installed fencing along the west side of the spillway in order to prevent deer from jumping into the spillway. Three inches of sand were also placed on the bridge over the spillway to promote deer use in 1963. Peabody et al. (1978) reported that the fencing "seemed to be effective." The fencing and sand placement are still well maintained by SCE. One deer was observed using the spillway in the middle of the day during the deer migration study when biologists were checking the cameras along the road. This was the only deer observed in the area of the spillway or dam.

LOG BOOM, BARREL LINE, AND FENCING BY SPILLWAY

When Mammoth Pool was first created, there were reports of deer trying to swim the mouth of the spillway and being pulled into the spillway by the current when the reservoir was spilling (Peabody et al. 1978). Mammoth pool spilled for the first time in 1962. The Reservoir spilled for 69 days (May 3 to July 10). Recommendations were made to move the log boom, which had been installed across the intake of the spillway for public safety, downstream below the migration trail. Losses still occurred during a heavy runoff year in 1967, In the 1967 water year Mammoth Pool spilled for a total of 112 days (December 29 to February 3) probably due to a rain on snow event and the generating units being offline. Mammoth Pool also spilled from May 22 to August 4. SCE installed a barrel line attached to an underwater cable and built another fence blocking the trail west of the spillway. The fence was later continued down into the water in the spring of 1968 and the barrel line was hung from a cable above the spillway with each barrel on an individual line. Mammoth Pool did not spill in 2002. Therefore, there was no opportunity to observe deer near the mouth of the spillway while it was spilling. However, the fencing and the barrel line are still well maintained by SCE. There are no other records of lost deer to SCE's knowledge. Mammoth Pool spills in approximately 50 percent of the years.

BRIDGE ON DAULTON CREEK

During the construction of Mammoth Pool, the lower portion of Daulton Creek was diverted so that its water could be stored in the reservoir and would not affect the

integrity of the dam. This created a section of creek bed that was steep-sided and hazardous for deer to cross during high water flows (Peabody et al. 1978). A bridge was constructed across the creek to aid in deer migration. Sand was place on the bridge in order to make it more acceptable for deer use. Peabody et al. (1978) reports little use of this bridge by deer. The bridge was repaired in the early spring of 2002 and is in excellent condition. New sand was placed on the bridge during the early spring as well. There were no deer observed using the bridge. Tracks were observed in the sand on the bridge. However, the tracks were not distinguishable to species in the coarse, loose sand.

DEBRIS BUILDUP

Trash buildup especially around the spillway area has caused deer losses due to drownings when deer were trapped in the debris. Peabody et al. (1978) recommended removal of trash buildup. SCE does not regularly remove large debris from Mammoth Pool. It has not been a significant problem because usually whatever enters the reservoir is flushed during spill years, which average about 50 percent of the years. Debris buildup was not significant in 2002 since it was a low water year. Therefore, observations of deer near debris buildup could not be obtained.

RECREATION

Recreational activities in the Mammoth Pool area, particularly boating in the reservoir and cars and people on the dam road, have caused disturbance to deer in the past (Peabody et al. 1978). Disturbance from cars and people have forced deer to jump into the spillway before the fence was installed. This impact has been greatly reduced by closing the reservoir to boating and by closing the road to the dam during the peak migration period (May 1 to June 15). USDA-FS is responsible for closing the roads and boat launches every year. During 2002, the roads were closed on time. No deer were observed while boats were in the water before the closure period. One deer was observed on the spillway while ENTRIX biologists drove the closed road in the middle of the day. The deer crossed the spillway bridge and went up a hill on the other side.

5.5 DEER HUNTER ACCESS STUDY

The deer hunter access study results are located in REC-12, Hunting.

6.0 LITERATURE CITED

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TABLE

Southern California Edison **Summary Report** **USDAY V28 Output 02/20/2003**
Station: 156 Mammoth Pool Reservoir USGS #:
Beginning Date: 10/01/2001
Ending Date: 09/30/2002

Daily 2400 Corrected Level in Feet Water Year Oct 2001 to Sep 2002

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3211.33	3186.39	3194.71	3224.49	3199.07	3196.18	3178.08	3233.49	3314.82	3316.40	3305.04	3267.44
2	3209.81	3186.07	3198.19	3225.10	3195.63	3195.42	3177.24	3231.83	3316.26	3315.75	3304.16	3265.74
3	3208.53	3186.08	3201.09	3225.98E	3191.93	3196.25	3178.89	3230.67	3316.98	3316.08	3303.27	3264.17
4	3208.01	3185.40	3202.57	3226.51E	3188. 42	3194.64	3182.82	3235.62	3317.70	3317.25	3302.34	3262.71
5	3206.86	3185.05	3203.34	3227.04E	3185.96	3193.56	3186.18	3238.56	3318.87	3318.33	3301.58	3261.42
6	3205.78	3184.77	3203.77	3227.57E	3183.83	3192.98	3186.84	3241.44	3320.25	3319.34	3300.65	3259.92
7	3204.57	3184.49	3204.38	3228.16	3181.91	3194.21	3187.83	3244.50	3321.18	3319.59	3300.63	3258.98
8	3202.30	3183.65	3205.77	3226.56	3181.70	3198.65	3191.28	3247.05	3321.87	3319.98	3299.67	3257.91
9	3199.78	3183.04	3206.49	3224.69	3182.00	3202.38	3195.20	3249.41	3322.20	3319.88	3298.71	3256.83
10	3197.45	3183.36	3207.57	3223.68	3182.01	3202.07	3199.71	3251.19	3321.69	3319.79	3298.89	3255.69
11	3195.59	3183.69	3207.95	3222.51	3184.53	3199.92	3205.80	3250.92	3321.20	3319.85	3298.74	3254.55
12	3194.32	3183.54	3208.51	3222.81	3187.17	3197.67	3212.70	3251.10	3320.91	3319.50	3297.60	3253.38
13	3193.24	3184.54	3208.87	3222.77	3189.84	3196.52	3221.49	3253.44	3320.61	3319.52	3296.34	3252.24
14	3192.79	3184.93	3209.72	3221.32	3192.30	3194.96	3230.31	3257.07	3320.51	3319.25	3295.04	3252.45
15	3191.61	3185.08	3210.04	3219.38	3193.67	3193.44	3239.15	3261.60	3320.84	3318.92	3294.06	3251.42
16	3190.81	3185.20	3212.06	3217.18	3195.12	3191.76	3242.06	3266.78	3321.21	3318.48	3292.46	3250.47
17	3189.96	3184.74	3212.69	3214.84	3196.98	3189.86	3243.50	3272.93	3321.08	3317.91	3291.24	3249.24
18	3189.46	3184.08	3213.28	3212.71	3197.69	3188.76	3242.16	3280.77	3320.96	3317.33	3290.16	3247.74
19	3188.74	3182.86	3214.07	3212.69	3198.02	3192.14	3240.62	3287.58	3320.91	3315.62	3288.81	3246.41
20	3187.83	3181.56	3214.89	3212.52	3198.30	3194.94	3239.97	3292.73	3321.15	3314.55	3288.12	3245.15
21	3187.57	3181.67	3215.54	3210.84	3198.57	3194.55	3238.23	3294.87	3321.80	3314.84	3285.95	3243.96
22	3187.91	3183.56	3217.31	3210. 36	3198.71	3192.75	3236.97	3296.07	3321.54	3313.89	3284.03	3241.46
23	3187.45	3184.93	3218.77	3206.19	3199.29	3189.62	3236. 39	3296.55	3321.11	3313.01	3282.38	3239.96
24	3186.64	3190.67	3218.82	3206.49	3199.49	3187.22	3236.75	3296.97	3320.67	3312.09	3280.50	3238.60
25	3186.10	3193.21	3219.77	3207.97	3198.93	3183.98	3237.77	3297.93	3319.89	3311.10	3278.82	3237.45
26	3185.82	3193.49	3220.01	3209.39	3198.16	3180.60	3240.80	3299.22	3319.20	3310.20	3276.96	3236.24
27	3185.89	3190.06	3220.54	3210.70	3197.33	3176.34	3241.40	3300.89	3318.74	3309.38	3275.28	3235.44
28	3185.87	3190.75	3221.52	3210.17	3197.86	3174.89	3239.54	3302.75	3317.82	3308.55	3273.57	3234.52

Southern California Edison **Summary Report (continued)** **USDAY V28 Output 02/20/2003**
Station: 156 Mammoth Pool Reservoir USGS #:
Beginning Date: 10/01/2001
Ending Date: 09/30/2002

Daily 2400 Corrected Level in Feet Water Year Oct 2001 to Sep 2002

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
29	3186.08	3192.02	3222.55	3208.16	------	3175.08	3237.38	3305.25	3317.28	3307.70	3272.04	3233.39
30	3185.91	3193.27	3223.19	3205.01	------	3180.03	3235.22	3308.75	3316.62	3306.90	3270.78	3232.75
31	3186.89	------	3223.88	3202.28	------	3180.48	------	3311.82	------	3305.90	3269.57	------
Total	**99020.90**	**95582.15**	**99561.86**	**99726.07**	**89394.42**	**98921.85**	**96562.28**	**101389.75**	**99595.87**	**102776.88**	**101997.39**	**97487.63**
Mean	**3194.22**	**3186.07**	**3211.67**	**3216.97**	**3192.66**	**3191.03**	**3218.74**	**3270.64**	**3319.86**	**3315.38**	**3290.24**	**3249.59**
Max	**3211.33**	**3193.49**	**3223.88**	**3228.16**	**3199.49**	**3202.38**	**3243.50**	**3311.82**	**3322.20**	**3319.98**	**3305.04**	**3267.44**
Min	**3185.82**	**3181.56**	**3194.71**	**3202.28**	**3181.70**	**3174.89**	**3177.24**	**3230.67**	**3314.82**	**3305.90**	**3269.57**	**3232.75**

Wtr Year 2002 Total1182017.05 Mean 3238.40 Max 3322.20 Min 3174.89

Cal Year 2001 Total1180262.13 Mean 3233.60 Max 3330.26 Min 3174.79

FIGURES

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APPENDIX A

Mule Deer Literature Review

Appendix A. Mule Deer Literature Review

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APPENDIX B

Mule Deer Observation Study
Datasheets from Deer Observations

Appendix B. Datasheets from Deer Observations (continued)

SCE Big Creek ALP ENTRIX

Terrestrial Working Group Mule Deer Observational Study

Surveyor(s):Lourraine Tigas, Giar-Ann Kung			
Date: 5/8/02	Start Time: 1845	End Time: 2030	Weather Conditions: Clear, warm (~50), breezy to windy
Comments:			

Mule Deer Observed										
Obs. #	# Deer	Start Time	End Time	Sex/ Age	Approx Entry Point	Approx Exit Point	Method of Crossing	Habitat	Substrate and Slope of Bank	Observational Notes
A1	5	2005	2015	U/A	Near obs pt 1	NA	NA	Chaparral	Sand and rock, 25-45 degrees	Group approached observers, turned west, approached within 100 feet of water, and turned back into bushes
A2	5	2005	2015	U/A	Near obs pt 1	NA	NA	Chaparral	Sand and rock, 25-45 degrees	Group approached observers, turned west, approached within 100 feet of water, and turned back into bushes
A3	5	2005	2015	U/A	Near obs pt 1	NA	NA	Chaparral	Sand and rock, 25-45 degrees	Group approached observers, turned west, approached within 100 feet of water, and turned back into bushes
A4	5	2005	2015	U/A	Near obs pt 1	NA	NA	Chaparral	Sand and rock, 25-45 degrees	Group approached observers, turned west, approached within 100 feet of water, and turned back into bushes
A5	5	2005	2015	U/A	Near obs pt 1	NA	NA	Chaparral	Sand and rock, 25-45 degrees	Group approached observers, turned west, approached within 100 feet of water, and turned back into bushes

Appendix B. Datasheets from Deer Observations

SCE Big Creek ALP ENTRIX

Terrestrial Working Group Mule Deer Observational Study

Surveyor(s):Lourraine Tigas, Giar-Ann Kung			
Date: 5/7/02	Start Time: 0530	End Time: 0700	Weather Conditions: Clear, cool (30-40), calm
Comments:			

Mule Deer Observed										
Obs. #	# Deer	Start Time	End Time	Sex/ Age	Approx Entry Point	Approx Exit Point	Method of Crossing	Habitat	Substrate and Slope of Bank	Observational Notes
A1	1	640	646	U/A	U	#2, Mammoth Boat Launch	Swim	Sand/rock @ exit	Sand, compact 10-20 degrees	No apparent difficulty, noticed observers but didn't appear to be disturbed by them

APPENDIX C

Spring 2002 Remote Camera Study Results

Appendix C. Spring 2002 Remote Camera Survey Results

Camera	Set	Date	Time	Subject	Deer only			
					Age	Sex	Number in group	Direction
1	1	Unknown	Unknown	Car				
1	1	Unknown	Unknown	Car				
1	1	Unknown	Unknown	Vegetation				
1	1	Unknown	Unknown	Car				
1	1	Unknown	Unknown	Car				
1	1	Unknown	Unknown	Car				
1	1	Unknown	Unknown	Car				
1	1	Unknown	Unknown	Car				
1	1	Unknown	Unknown	Domestic dog				
1	1	Unknown	Unknown	2 domestic dogs and 2 people				
1	1	Unknown	Unknown	Car				
1	1	20	16:21	Car				
1	1	Unknown	Unknown	Car				
1	1	20	Unknown	Car				
1	1	Unknown	Unknown	Car				
1	1	Unknown	Unknown	Car				
1	1	Unknown	15:57	Person				
1	1	23	15:58	Vegetation				
1	2	23	16:04	2 people				
1	2	23	16:05	Car				
1	2	24	9:30	Deer	Adults	Unknown	3	East
1	2	24	10:14	Deer	Adult	Unknown	1	East
1	2	24	18:11	Car				
1	2	25	10:21	Deer	Adult	Unknown	2	East
1	2	25	11:17	2 people				
1	3	25	11:23	2 people				
1	3	25	11:25	Person				
1	3	25	16:29	Car				
1	3	26	16:55	Car				
1	3	Unknown	Unknown	Person				
1	3	Unknown	Unknown	2 people				
1	3	Unknown	Unknown	Domestic dog				
1	3	Unknown	Unknown	Person				
1	3	Unknown	Unknown	Car				
1	3	Unknown	Unknown	Car				
1	3	Unknown	Unknown	Person and truck				
1	3	Unknown	Unknown	3 people and truck				
1	3	Unknown	Unknown	2 people and truck				

Appendix C. Spring 2002 Remote Camera Survey Results (continued)

Camera	Set	Date	Time	Subject	Deer only			
					Age	Sex	Number in group	Direction
1	3	Unknown	Unknown	2 people and truck				
1	4	2	10:37	Person				
1	4	Unknown	Unknown	Vegetation				
1	4	6	15:19	Person				
1	4	9	10:23	Person				
1	4	Unknown	Unknown	Person				
1	4	16	Unknown	Person				
1	4	16	14:31	Vegetation				
1	4	16	Unknown	Person				
1	4	Unknown	Unknown	2 people				
1	5	Unknown	Unknown	Person				
1	5	24	20:43	Vegetation				
1	5	25	4:06	Deer	Adult	Unknown	1	West
1	5	Unknown	Day	Deer	Adult	Unknown	1	East
1	5	26	20:38	Deer	Adult	Unknown	1	East
1	5	27	19:05	Deer	Adult	Unknown	1	East
1	5	29	10:31	2 people				
1	5	Unknown	Unknown	Vegetation				
1	5	30	20:42	Vegetation				
1	5	30	20:44	Vegetation				
1	5	30	20:55	Vegetation				
1	5	30	21:15	Vegetation				
1	5	30	21:19	Vegetation				
1	5	30	21:27	Vegetation				
1	5	30	21:28	Vegetation				
1	5	30	21:37	Vegetation				
1	5	30	21:45	Vegetation				
1	5	31	2:38	Deer	Adult	Unknown	1	West
1	5	31	20:58	Deer	Adult	Unknown	1	East
1	5	Unknown	Unknown	Vegetation				
1	5	Unknown	Unknown	Vegetation				
1	5	Unknown	Unknown	Person				
2	1	18	Unknown	Person				
2	1	18	Unknown	Vegetation				
2	2	Unknown	Unknown	Person				
2	2	18	11:53	Person				
2	3	23	Unknown	Vegetation				
2	3	23	Unknown	2 people				
2	3	24	Unknown	Vegetation				
2	3	24	Day	Deer	Adult	Unknown	1	East
2	3	24	Unknown	Vegetation				
2	3	24	Day	Deer	Adult	Unknown	1	East
2	3	24	Night	Deer	Adult	Unknown	1	West
2	4	Unknown	Unknown	2 people				

Appendix C. Spring 2002 Remote Camera Survey Results (continued)

Camera	Set	Date	Time	Subject	Deer only			
					Age	Sex	Number in group	Direction
2	4	25	Unknown	Vegetation				
2	5	30	Unknown	2 people				
2	5	30	Unknown	Person				
2	5	30	Unknown	Person				
2	5	30	Unknown	Person				
2	5	30	Unknown	Vegetation				
2	6	2	Unknown	Person				
2	6	2	Unknown	Vegetation				
2	7	Unknown	Unknown	Person				
2	7	Unknown	Day	Deer	Adult	Unknown	1	East
2	7	7	22:24	Deer	Adult	Male	1	East
2	7	8	18:32	Deer	Adult	Male	1	East
2	7	Unknown	Unknown	Car				
2	7	Unknown	Unknown	Car				
2	7	Unknown	Unknown	Person				
2	7	Unknown	Unknown	Car				
2	7	Unknown	Unknown	Car				
2	7	Unknown	Unknown	Person				
2	7	Unknown	Unknown	Vegetation				
2	7	Unknown	Unknown	Car				
2	7	Unknown	Unknown	Car				
2	8	Unknown	Unknown	Person				
2	8	Unknown	Unknown	Vegetation				
2	8	Unknown	Unknown	Vegetation				
2	8	Unknown	Unknown	Vegetation				
2	8	Unknown	Unknown	2 people				
2	8	Unknown	Unknown	Vegetation				
2	8	Unknown	Unknown	Car				
2	8	Unknown	Unknown	2 people				
2	8	Unknown	Unknown	Vegetation				
2	8	30	19:30	Black bear				
2	8	Unknown	Unknown	Vegetation				
2	8	Unknown	Unknown	Vegetation				
2	8	Unknown	Unknown	Vegetation				
2	8	Unknown	Unknown	Car				
2	8	Unknown	Unknown	Car				
3	1	11	12:43	Car				
3	1	Unknown	Unknown	Car				
3	1	Unknown	Unknown	Vegetation				
3	1	18	16:26	Car				
3	1	18	16:31	Car				
3	1	Unknown	Unknown	Car				
3	1	19	11:51	Car				
3	1	20	7:29	Car				
3	1	Unknown	Unknown	Car				

Appendix C. Spring 2002 Remote Camera Survey Results (continued)

Camera	Set	Date	Time	Subject	Deer only			
					Age	Sex	Number in group	Direction
3	1	Unknown	Unknown	Car				
3	1	20	9:59	Car				
3	1	20	11:15	Car				
3	1	20	11:46	Car				
3	1	Unknown	Unknown	Car				
3	1	Unknown	Unknown	Car				
3	1	20	13:35	Car				
3	1	20	13:40	Car				
3	1	Unknown	Unknown	Car				
3	1	20	14:52	Car				
3	1	Unknown	Unknown	Vegetation				
3	1	Unknown	Unknown	Car				
3	1	Unknown	Unknown	Vegetation				
3	1	Unknown	Unknown	Vegetation				
3	1	Unknown	Unknown	Car				
3	1	20	16:49	Car				
3	2	Unknown	Unknown	Person				
3	2	Unknown	Unknown	Person				
3	2	24	13:11	Car				
3	2	Unknown	Unknown	Car				
3	2	Unknown	Unknown	Vegetation				
3	2	24	18:03	Car				
3	2	25	8:46	Car				
3	2	25	8:48	Vegetation				
3	2	Unknown	Unknown	Car				
3	2	Unknown	Unknown	2 people				
3	2	25	11:51	Car				
3	3	Unknown	Unknown	2 people				
3	3	Unknown	Unknown	2 people				
3	3	Unknown	Unknown	Car				
3	3	Unknown	Unknown	Vegetation				
3	3	25	13:27	Car				
3	3	25	16:18	Car				
3	3	25	16:46	Car				
3	3	26	15:05	Car				
3	3	26	15:11	Car				
3	3	26	17:02	Car				
3	3	Unknown	Unknown	Car				
3	3	27	13:47	Car				
3	3	27	14:45	Car				
3	3	Unknown	Unknown	Car				
3	3	Unknown	Unknown	Car				
3	3	28	10:14	Car				
3	3	28	10:37	Car				
3	3	28	13:21	Car				

Appendix C. Spring 2002 Remote Camera Survey Results (continued)

Camera	Set	Date	Time	Subject	Deer only			
					Age	Sex	Number in group	Direction
3	3	Unknown	Unknown	Car				
3	3	Unknown	Unknown	Car				
3	3	29	11:04	Car				
3	3	29	11:35	Car				
3	3	29	12:23	Car				
3	3	29	12:46	Car				
3	3	30	10:36	Car				
3	4	Unknown	Unknown	Person				
3	4	Unknown	Unknown	Car				
3	4	Unknown	Unknown	Car				
3	4	Unknown	Unknown	Car				
3	4	30	13:46	Car				
3	4	Unknown	Unknown	Car				
3	4	30	15:15	Car				
3	4	2	11:26	Car				
3	4	30	11:25	Car				
3	5	Unknown	Unknown	Person				
3	5	Unknown	Unknown	Car				
3	5	Unknown	Unknown	Car				
3	5	Unknown	Unknown	Car				
3	5	6	15:00	Car				
3	5	Unknown	Unknown	Person				
3	5	Unknown	Unknown	Car				
3	5	Unknown	Day	Deer	Adults	Unknown	3	West
3	5	Unknown	Unknown	Car				
3	6	Unknown	Unknown	Person				
3	6	Unknown	Unknown	Car				
3	6	Unknown	Unknown	Deer	Adult	Unknown	1	West
3	6	Unknown	Unknown	Vegetation				
3	6	Unknown	Unknown	Car				
3	6	Unknown	Unknown	Person				
3	6	Unknown	Unknown	Person				
3	6	Unknown	Unknown	Person				
3	6	Unknown	Unknown	Car				
3	6	Unknown	Unknown	Car				
3	6	Unknown	Unknown	Car				
3	6	Unknown	Unknown	Car				
3	6	Unknown	Unknown	Car				
3	6	Unknown	Unknown	Person				
3	6	17	21:09	Deer	Adult	Unknown	1	East
3	6	Unknown	Unknown	Car				
3	6	Unknown	Unknown	Car				
3	6	Unknown	Unknown	Car				
3	6	Unknown	Unknown	Car				
3	7	Unknown	Unknown	Camera				

Appendix C. Spring 2002 Remote Camera Survey Results (continued)

Camera	Set	Date	Time	Subject	Deer only			
					Age	Sex	Number in group	Direction
3	7	Unknown	Unknown	Person				
3	7	21	18:52	Deer	Adult	Unknown	1	East
3	7	Unknown	Unknown	2 people				
3	7	Unknown	Unknown	Car				
3	7	Unknown	Unknown	2 people				
3	7	Unknown	Unknown	Car				
3	7	Unknown	Unknown	Car				
3	7	29	15:53	Car				
3	7	Unknown	Unknown	Car				
3	7	Unknown	Unknown	Car				
3	7	Unknown	Unknown	Car				
3	7	Unknown	Unknown	Car				
3	7	5	10:40	Car				
3	7	5	11:14	Car				

