SACRAMENTO MUNICIPAL UTILITY DISTRICT
UPPER AMERICAN RIVER PROJECT
(FERC NO. 2101)

BALD EAGLE AND OSPREY
TECHNICAL REPORT

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6.1 Bald Eagle and Osprey Study Plan[1]

6.1.1 Pertinent Issue Questions

The bald eagle and osprey study addresses Terrestrial Resource Issue Questions:

7(b). What are the relevant and known factors (limiting and beneficial) affecting special status bird populations in the Project area and how/where are these factors influenced by Project operation and maintenance?
21. What are the Project impacts on special status birds with particular emphasis on Project facilities, operation, maintenance and Project-influenced recreation?
22. To what extent do Project operations and maintenance activities and Project-induced recreation affect bald eagle populations?

6.1.2 Background

Ospreys and bald eagles have the following special status designations:

- Osprey - California Species of Concern.
- Bald Eagle - Federally-listed threatened (proposed for delisting), California Endangered, California Fully Protected, and USFS Management Indicator Species.

Bald eagles may be affected by: 1) recreation activity in the vicinity of active nests and critical winter roost sites; and 2) direct and indirect disturbance to nesting and wintering birds and their prey due to Project operation (e.g., reservoir fluctuation) and maintenance activities. Biologists speculate that low reservoir levels during the breeding season may be one of the limiting factors that result in decreased bald eagle nesting success. Reservoir levels can: 1) dictate how far eagles have to travel from a nest site to suitable foraging habitat, 2) influence prey species numbers and availability; and 3) affect the amount, type, and timing of recreation disturbance in the vicinity of a nest site.

Extensive research has been conducted on foraging behavior and prey selection of osprey and bald eagles. In general, both species are opportunistic predators that typically take fish from near the surface of water bodies. Inland osprey populations in western North America take suckers, carp, bullhead, and perch when nesting near warm, shallow lakes or reservoirs, but take trout when nesting near deeper, colder waters (Swenson 1978, 1981; VanDaele and VanDaele 1982; Flook and Forbes 1983; Poole 1989). Bald eagle prey selection varies by location, ranging from an exclusive diet of fish in some areas to an exclusive diet of birds, primarily waterfowl, in others (Jenkins 1992).

Project reservoirs have increased the distribution and amount of potential foraging and nesting habitat for osprey throughout the watershed when compared to pre-project conditions. Several osprey have nested in the vicinity of Project reservoirs in recent years and ospreys are observed in the Project area on a regular basis. Furthermore, ospreys are known to have a high tolerance level for human activity in the vicinity of their nests relative to most other raptors, and often select nest sites in close proximity to high levels of human activity. As a result, the Project is not likely to have a substantial impact on osprey populations or their habitat, and no formal study is proposed to address osprey in the context of Terrestrial Resource Issues 7b, 21, and 22. Nonetheless, studies to be performed for bald eagle, as presented below, will provide relevant incidental information that can be used for osprey management in the Project area, as appropriate.

As with osprey, Project reservoirs have increased the distribution and amount of potential foraging and nesting habitat for bald eagles throughout the watershed when compared to pre-project conditions. Bald eagles winter annually in the Project area and one pair has nested at Union Valley Reservoir each year since 1986 (SMUD 2001). The first known nest site at this reservoir was located in the Wench Creek Campground (T. 12N, R. 14E, Section

[1] Note: Because of overlap between Eldorado National Forest responsibilities for eagle management and the responsibilities of the Licensee to address issues raised during the Alternative Licensing Process, the Licensee and ENF will coordinate their 2002 studies. No cost sharing will occur.

14). The Wench Creek nest fledged young successfully in 1986 and 1987; and the nest site was occupied but unsuccessful in 1988,1990 and 1991. The Wench Creek nest tree was removed for safety concerns in 1995. A second nest site, named the West Point nest, was discovered near Union Valley Dam (T. 12N, R. 14E, Section 29) in 1989. Biologists believe that the eagles began constructing the West Point nest in 1988, and the pair appeared to be feeding young in 1989, but the nest failed that year following a late-spring snowstorm. The Cleveland Fire destroyed the West Point nest in 1992. A third nest was discovered in 1992 on Granlees Point (T. 12N, R. 14E, Section 23), and this site fledged young successfully in 1992, 1993, 1994, 1997 and 2000. The Granlees Point nest was unsuccessful in 1995, 1996, 1998, 1999 and 2001.

Eldorado National Forest (ENF) has developed a Bald Eagle Management Plan for nesting eagles at Union Valley Reservoir. This plan establishes seasonal and spatial closure zones around the Granlees Point nest site and staff biologists monitor the nesting eagles annually. The Granlees Point nesting territory closure zone is effective during the critical nesting period from January 1 through August 15, or until the young have fledged or the nest is abandoned. Public entry into this zone is prohibited during this period. Closure notices are posted along the boundary of this zone and information is posted at campgrounds and boat launches around Union Valley Reservoir, as well as at the ENF Information Center and Crystal Basin Information Center. In previous years, the closure area consisted of the shoreline adjacent to the nest area, as well as the nest stand, but did not restrict use of the cove adjacent to the nest stand. This cove receives a great deal of boat traffic, which contributes to people using the restricted shoreline area. According to the Bald Eagle Management Plan, buoys were to be installed near the entrance to this cove in the fall of 1998 to restrict boat access during the closure period, and to establish a 5-mph zone in the cove the remainder of the year.

No other nest sites are known to exist currently within the Project area or anywhere else within the ENF. However, suitable nesting, summer, and winter bald eagle habitats have been mapped at various sites in the Forest, including around the following Project features:

- Loon Lake Reservoir: Summer habitat along southeast shore
- Gerle Creek Reservoir: Summer habitat around entire shoreline
- Ice House Reservoir: Summer/winter habitat along northwest & southeast shores
- SFAR: Winter habitat from about Kyburz to western edge of ENF
- Union Valley Reservoir: Nesting/winter habitat at northeast and southeast shores; Summer/winter habitat around entire reservoir

The ENF has delineated additional summer habitat at Wright's Lake just east of the UARP. Also, the CNDDB reports that eagles have wintered at Bass Lake in western El Dorado County (T. 10 N., R. 9 E., S. 31, NE Qtr.; elevation 1,250 ft.) for over 40 years. Bass Lake is about 1.5 miles south of the UARP transmission line. Residential development has been identified as a major concern to wintering eagles at Bass Lake.

6.1.3 Study Objectives

The objectives of the bald eagle study are: 1) determine the relationship of the Union Valley nesting territory, and eagle utilization of this territory, to Project operation and maintenance and Project-induced recreation; 2) determine if Project operation and maintenance and Project-induced recreation have a beneficial or adverse effect on wintering and nesting bald eagle behavior, nesting success, and general health of the population; and 3) determine if reservoir operations affect the type, number, and availability of bald eagle prey (e.g., primarily fish, waterfowl, carrion) during the critical brood-rearing period (April-June) and wintering period (December-February).

6.1.4 Study Area and Sampling Sites

The bald eagle study area will, in most cases, correspond to the territory utilized by the resident pair of bald eagles nesting at Union Valley Reservoir. However, the specific extent of this territory is currently unknown and its determination is a basic objective of this study. At this early stage of the process we speculate that Union Valley Reservoir comprises the bulk of this territory with regular low-level utilization of Ice House Reservoir, Wright's Lake, and to a lesser extent, smaller reservoirs and streams within the Crystal Basin. Defining the nesting territory

as the study area is driven by the need to establish the relative importance of habitats directly affected by the UARP versus other (e.g., non-Project) habitats used by the resident pair at Union Valley. Field studies will be restricted to those lands where the Licensee has legal access (e.g., ownership/easement rights, public lands) and will not occur on private lands without prior permission from the landowner.

6.1.5 Information Needed From Other Studies

A determination of potential Project impacts on nesting and wintering bald eagles will require information from a variety of studies including the Instream Flow Study, Hydrologic Model, Reservoir Habitat Study, Fisheries Study, Recreation Supply Study, Vegetation Mapping Study, Waterfowl Study, and the Land Management Study. Important information will be derived from past and current monitoring efforts conducted by the ENF staff biologists and from a review of the scientific literature.

6.1.6 Study Methods and Schedule

The Bald Eagle Study contains three interrelated components: 1) determination of the relationship of the Union Valley nesting territory, and eagle utilization of this territory, to potential Project-related disturbance factors; 2) Evaluation of Project-related factors influencing winter habitat availability and utilization by eagles; and 3) Evaluation of Project-related factors influencing eagle prey availability, abundance, and selection.

Pre-Field Investigations

The following data will be gathered in spring/summer 2002 from existing sources of information and/or from other UARP resource studies, as this information becomes available:

- Findings of all available studies on responses of nesting bald eagles to hydro operations and maintenance activities, recreation, and other sources of disturbance of relevance to the UARP [Source: literature review and consultation with experts].
- Location and mapping of all past and current nest sites utilized by the nesting pair at Union Valley Reservoir [Source: ENF records].
- Location, type, intensity, and season/frequency of occurrence of all existing recreation sites within the eagle nesting territory (extent of territory to be determined from field studies but currently assumed to be focused primarily around Union Valley and Ice House reservoirs [Source: ENF/SMUD records and findings of Recreation studies].
- Location, type, intensity, and season/frequency of occurrence of Project operations and maintenance activities within the eagle nesting territory [Source: SMUD records].
- Distribution of moderate- to high-quality nesting habitat within 0.5-mile of Union Valley and Ice House reservoirs [Source: Vegetation Mapping Study, ENF data, and ground-truthing/eagle monitoring as described below].
- Distribution of moderate- to high-quality foraging habitat (large reservoirs and streams with substantial fish populations) within 10 miles of Union Valley Reservoir [Source: existing maps, ENF records, and eagle monitoring as described below].
- Distribution of moderate- to high-quality wintering habitat (i.e., known preferred eagle concentration areas and preferred perch trees) within 0.25-mile of all Project waters [Source: Vegetation Mapping Study, ENF data, and ground-truthing/eagle monitoring as described below].
- Distribution of other potential sources of disturbance (e.g., major roads) within the eagle nesting/wintering territory [Source: existing maps, ENF/SMUD records, and other UARP relicensing studies].

As appropriate, relevant data obtained as described above will be plotted using Geographic Information System maps for subsequent analysis.

Field Investigations

Determination of the relationship between Project-related factors and nesting territory utilization and nesting success will involve the following field studies. Prior to implementation of any studies that require handling of bald eagles, nests, eggs, or young, all necessary state and federal permits and Memoranda of Understanding will be obtained as required by applicable laws and regulations.

- Determination of species composition and relative abundance of prey (presumably dominated by fish, waterfowl and carrion) actually taken by eagles nesting at Union Valley Reservoir [Method: inspection of prey remains at nest sites and/or direct observation of prey selection by eagles during the nesting season].
- Qualitative assessment of prey (fish, waterfowl, carrion, etc.) distribution, abundance, and availability at Project reservoirs during brood-rearing (maximum prey requirements) and winter (December-January) months. [Method/Source: review of CDFG records, Aquatic Resource and Waterfowl studies, other available data].
- Ground-truthing of moderate- to high-quality nesting and wintering habitat within 0.25-mile of all Project waters as delineated initially from the Vegetation Mapping study [characteristics representing moderate- to high-quality habitats to be determined from existing literature].
- Temporal and spatial assessment of nesting, foraging, and winter habitat utilization patterns (i.e., territory time/activity budget) of the Union Valley Reservoir resident pair over a 1-year period. Data to be derived from Global Positioning System (GPS)-based satellite telemetry, standard field telemetry, direct observation or a combination of these techniques to be determined. Habitat utilization by eagles other than the resident pair will be recorded as incidental observations. [Note: GPS-based satellite telemetry is being tentatively considered as a cost-effective option that reportedly reduces the amount of labor needed to collect the desired information. This emerging technology entails: 1) initial capture of eagles; 2) outfitting eagles with transmitters; 3) pre-determined periodic transmission of location data to a satellite; 4) data relay to an earth-based station (e.g., operated by NASA); and 5) acquisition of data as needed via the internet on a subscription fee basis. However, additional information still needs to be acquired to determine the efficacy of using this technology for this study.] This task would begin February 2002 or as soon as feasible.
- Substantial information exists on the response (e.g., flushing response) of bald eagles to the various types of disturbances that may be present in the eagle nest territory (e.g., Altman 1974, Boyle and Samson 1985, Buehler et al. 1991, Craig et al. 1988, Grubb and King 1991, Knight and Knight 1984, McGarigal et al. 1991, Pomerantz et al. 1988, Schuek and Marzluff 1995, Shapiro et al. 1982, Stalmaster and Kaiser 1998). This information will be supplemented by incidental observations of eagle behavior collected by ENF staff and the Licensee during the course of other field investigations.
- The ENF monitors eagle nesting success/failure as part of their normal management responsibilities. This study assumes that ENF will continue this effort and provide the results to the Licensee for analysis and reporting in the overall context of this study. Monitoring of nest success/failure is expected to follow the California Department of Fish and Game (CDFG) protocols for bald eagle breeding surveys, including completion of the associated field data forms and submittal of these forms to CDFG as required (CDFG 1999). These protocols emphasize the need for surveys at least three times during the nesting season, especially during the incubation (March to early April) and early nestling periods (late April to early May). The purpose of the first survey is to determine whether the territory is occupied and includes recording of adult presence, courtship behavior, evidence of nest repair or construction, and incubation. Surveys during the early nestling period confirm territory occupancy, or if confirmed during first survey, to determine if the adults are still tending the nest. A check during the late nestling period (mid-June) is intended to determine how many nestlings are approaching fledgling age. However, the protocols allow deviation from these survey dates if the territories can be checked more frequently or if particular pairs are know to begin nesting earlier or later in the season. Observers are to report the stage of nestling development as defined by Carpenter (1990). Completed forms are to be submitted to Mr. Ron Jurek at CDFG by September 1st of each year of monitoring. Mr. Mike Meinz at CDFG will also be kept apprised of study progress and/or any problems encountered during the study period.

6.1.7 Analysis

The variety of data retrieved during the implementation of the Methods will be analyzed as follows:

- Correlate past nest site selection, nest abandonment, nesting productivity, and winter habitat utilization with information collected during implementation of Methods. This includes: 1) breeding, wintering, and foraging habitat distribution and quality; 2) location, timing, duration, and intensity of all potential sources of disturbance related to project operation and maintenance activities, recreation, use of project roads, unusual weather patterns, etc.; and 3) abundance, distribution, and availability of prey.
- Review literature and contact experts regarding the findings of similar evaluations for other hydroelectric projects. Compare UARP reservoir operations to similar projects that support nesting bald eagles.

6.1.8 Study Output

Preliminary study results will be presented to the Terrestrial Resources Technical Working Group (TWG) and Plenary Group in November-December 2002. However, the ultimate study output will be a written report that includes the issues addressed, objectives, study area, methods, analysis, results, discussion, and conclusions. The reports will be prepared in a format that allows the information to be inserted directly into the Licensee-prepared Draft Environmental Assessment that will be submitted to FERC with the Licensee's application for a new license.

6.1.9 Preliminary Estimated Study Cost

SMUD's consultant estimates that this study will cost $141,000 ± 20 percent.

6.1.10 TWG and Plenary Group Endorsement

Terrestrial TWG representatives from the following agencies/organizations approved this study plan on December 21, 2001: California Department of Fish and Game, Eldorado National Forest, California Sport Fishing Alliance, and SMUD. The Plenary Group approved this study plan on February 6, 2002. The participants at the meeting who said they could "live with" the study plan were California Department of Fish and Game, California Native Plant Society, California Outdoors, California Sportsfishing Protection Alliance, El Dorado County, El Dorado County Citizens for Water, Friends of El Dorado County, National Parks Service, Placer County Water Agency, Sacramento Municipal Utility District, State Water Resources Control Board, Taxpayers or El Dorado County, U.S Bureau of Land Management and Eldorado National Forest. None of the participants at the meeting said they could not "live with" the study plan though PG&E abstained since this study plan does not apply to the Chili Bar Project.

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BALD EAGLE AND OSPREY TECHNICAL REPORT

SUMMARY

This technical report provides results of the bald eagle and osprey study performed for SMUD's Upper American River Project with emphasis on eagles at Union Valley Reservoir (UVR) and Loon Lake Reservoir (LLR). Eagle monitoring was performed primarily by the University of California, Santa Cruz Predatory Bird Research Group (SCPBRG) from November 2002 to September 2004.

Eldorado National Forest (ENF) records indicate that bald eagles have nested at UVR from 1986 to the present but have successfully fledged young in only seven of those years. Nesting occurred near the Wench Creek Campground in 1986 through 1988, in 1990, and in 1991. In 1989, the nest site was located near West Point on the west side of UVR. Beginning in 1992 and in each year since, the territorial pair nested at Granlees Point on the east side of UVR. In 2003, SCPBRG monitors recorded detailed observations on nest and foraging behavior of the resident pair, numbers and seasonality of non-resident birds, age structure of the bald eagle population, and general habitat utilization at UVR. Monitors determined that the territorial pair laid eggs between March 30 and April 2, 2003, and were incubating by April 2, 2003. A late season storm during the first week in May brought several inches of precipitation as both rain and snow, with freezing night and early morning temperatures. Observations of nesting behavior suggested that the eggs were likely not viable and on May 15, 2003, the pair abandoned the nest. As of early March 2004, the territorial pair was again nesting on Granlees Point but at a different nest than the one used in 2003. Behavior of the adults indicated that they had begun incubating nearly one month earlier than in 2003. One egg was estimated to have hatched between April 13 and April 22, 2004. The nestling was first observed branching out from the nest on June 24, 2004, and had fledged the nest by July 17, 2004.

The age structure of eagles at UVR included juveniles, sub-adults, and adults. Up to four adults were observed on the reservoir at one time although on most visits the territorial pair was the only adults detected. The frequency of juvenile and sub-adult sightings was highest during the winter of 2003 and fall of 2003, corresponding with the seasonal influx of wintering bald eagles into the Crystal Basin. Bald eagles at UVR perched on a variety of trees and snags and occasionally on shoreline boulders. The majority of perch sites were located along the south and east sides of the reservoir with few observations of perching birds on the north side. Night roosts of the territorial pair were primarily located on or near Granlees Point but with some night roosts used on the Sunset/Fashoda Peninsula. SCPBRG made several attempts to capture the resident eagles with the intent of using radio-telemetry to track their movements and behavior. On January 9, 2003, an adult eagle, believed to be the resident male, was captured in a bow net, fitted with a radio transmitter and released. The bird was not detected on subsequent visits and monitors concluded that it was a non-resident.

Prior to this study, nesting by bald eagles at LLR had not been recorded. On May 16, 2003, an adult male and a near-adult female were observed in a dominant Jeffrey pine supporting a stick nest on the south shore of LLR. These birds were observed perched on or near this nest structure on several occasions but monitors concluded that the nest was inactive or had been abandoned as no incubation, brooding, or food deliveries were seen. However, on April 9, 2004, with the reservoir drawn down and almost covered in ice and snow, monitors observed this pair in incubation posture at the same nest observed in 2003. On May 14, 2004, two eaglets were confirmed to have hatched in this nest. Adults tended to the eaglets faithfully but on June 25, 2004, monitors discovered that the birds had fallen from the nest tree onto the ground, with one chick dead and the other apparently healthy and being provisioned by the adults. On July 19, 2004, monitors found that the second chick had also died of unknown causes. Both chicks were retrieved and provided by the ENF to the U.S. Fish and Wildlife Service for analysis.

Incidental observations of osprey nests identified up to seven active osprey nests in 2002 with four at UVR, two at Ice House Reservoir (IHR), and one nest along Ice House Road approximately mid-way between the two reservoirs. In 2003, three active osprey nests were observed at UVR and one active nest at IHR. Nesting by ospreys at LLR was suspected but not confirmed during the 2002-2004 study period.

1.0 INTRODUCTION

This technical report is one in a series of reports prepared by Devine Tarbell & Associates, Inc., (DTA) and the University of California, Santa Cruz, Predatory Bird Research Group (SCPBRG) for the Sacramento Municipal Utility District (SMUD) as an appendix to SMUD's application to the Federal Energy Regulatory Commission (FERC) for a new license for the Upper American River Project (UARP or Project). The report provides the results of a study of bald eagles (*Haliaeetus leucocephalus*) and their habitat within the UARP area (Latta et al. 2004) and supplants the *UARP Bald Eagle and Osprey Interim Technical Report* issued in March 2004. The bald eagle has the following special status designations: Federally-listed Threatened - Proposed for Delisting (FTPD; Federal Register 64(128):36453-36464, July 6, 1999); State of California-listed Endangered (CE); USDA Forest Service, Region 5 Management Indicator Species (MIS; USDA 1989); California Department of Fish and Game (CDFG) Fully Protected Species (FP) and California Department of Forestry and Fire Protection (CDF) Sensitive Species. To a lesser extent, this report also addresses osprey (*Pandion haliaetus*), a CDFG Species of Special Concern (CSC) and a CDF Sensitive Species. This report includes the following sections:

- **BACKGROUND** – Summarizes the applicable study plan approved by the UARP Relicensing Plenary Group; a brief description of the issue questions addressed, in part, by the study plan; the objectives of the study plan; the study area, and agency information requests. In addition, requests by resource agencies for additions to this technical report are described in this section.
- **METHODS** – A description of the methods used in the study, including a description of study sites.
- **RESULTS** – A description of the data obtained during the study.
- **ANALYSIS** – An analysis of the results, where appropriate.
- **LITERATURE CITED** – A listing of all literature cited in the report.

This technical report does not include a detailed description of the UARP Alternative Licensing Process (ALP) or of the UARP, which can be found in the following sections of SMUD's application for a new license: The UARP Relicensing Process, Exhibit A (Project Description), Exhibit B (Project Operations), and Exhibit C (Construction).

This technical report also provides conclusions and recommendations developed by the Terrestrial Resources Technical Working Group (TWG) regarding the effects of the UARP on bald eagle, osprey, and their habitat. However, a final discussion of impacts and appropriate protection, mitigation and enhancement measures (PM&Es) is reserved for presentation in the applicant-prepared preliminary draft environmental assessment (PDEA) document, which is part of SMUD's application for a new license. Development of resource measures will occur in settlement discussions, which commenced in 2004, and will be reported on in the PDEA.

2.0 BACKGROUND

2.1 Bald Eagle and Osprey Study Plan

Bald eagles in the UARP area are protected under provisions of the Federal Endangered Species Act (FESA), Federal Migratory Bird Treaty Act, Federal Bald Eagle Protection Act, California Endangered Species Act (CESA), the California Fish and Game Code, California-Forest Practice Rules, and the Eldorado National Forest (ENF) Land and Resource Management Plan (LRMP; USDA 1989). Union Valley Reservoir was also identified as a target recovery territory for bald eagles under the Pacific Bald Eagle Recovery Plan of 1986. Ospreys are also protected under the Migratory Bird Treaty Act, California Fish and Game Code, and California Forest Practice Rules. In response to these protections and management directives, the UARP Terrestrial Resources Technical Working Group (TWG) developed the Bald Eagle and Osprey Study Plan, which was approved by the TWG on December 21, 2002, and by the UARP Relicensing Plenary Group on February 6, 2003. The study plan was designed to address, in part, the following issues questions developed by the UARP Relicensing Plenary Group:

Issue Question 7(b).	What are the relevant and known factors (limiting and beneficial) affecting special status bird populations in the Project area and how/where are these factors influenced by Project operation and maintenance?
Issue Question 21.	What are the Project impacts on special status birds with particular emphasis on Project facilities, operation, maintenance and Project-influenced recreation?
Issue Question 22.	To what extent do Project operations and maintenance activities, and Project-induced recreation affect bald eagle populations?

Based on a review and discussion of the initial issue questions, the Terrestrial Resources TWG developed the following study objectives:

1. Determine the relationship of the Union Valley Reservoir nesting territory, and eagle utilization of this territory, to Project operation and maintenance, and Project-induced recreation activities.

2. Determine if Project operation and maintenance, and Project-induced recreation activities have a beneficial or adverse effect on wintering and nesting bald eagle behavior, nesting success, and general health of the population.

3. Determine if reservoir operations affect the type, number, and availability of bald eagle prey (e.g., primarily fish, waterfowl, carrion) during the critical brood-rearing period (April-June) and wintering period (December-February).

During development of this study plan, the Union Valley Reservoir bald eagle nesting territory was believed to be the only active territory in the UARP area. As a result, the bald eagle study area was defined initially as the territory utilized by the resident pair of bald eagles nesting at Union Valley Reservoir, and determination of the extent of this territory was a basic objective of the study. Prior to this study, ENF biologists speculated that Union Valley Reservoir comprised the bulk of this territory with regular low-level utilization of Ice House Reservoir, Loon Lake Reservoir, Wright's Lake, and to a lesser extent, smaller reservoirs and streams within the Crystal Basin and the South Fork American River watershed. From November 2002 through the 2003 nesting season, monitoring was concentrated at Union Valley Reservoir with less intensive monitoring conducted at Ice House and Loon Lake reservoirs. Monitoring frequency at Loon Lake Reservoir was increased in spring 2003 following discovery of a potential new nest site at that location. Incidental observations of eagles were also recorded at other locations within the UARP area. Field studies were restricted to those lands where SMUD had legal access (e.g., ownership/easement rights, public lands) and did not occur on private lands without prior permission from the landowner.

The Terrestrial Resources TWG determined that osprey have benefited from the provision of new breeding and foraging habitat at UARP reservoirs, are not a primary issue of concern in this relicensing, and therefore, a formal study for this species was not warranted. However, the TWG acknowledged that incidental observations of osprey occurrence and habitat utilization could be obtained during the formal bald eagle study and would be presented and analyzed in this technical report.

2.2 Water Types

The information in this subsection is provided for informational purposes, as requested by agencies. The derivation of water types is described in the *UARP Water Quality Technical Report*. Table 2.2-1 presents water year types for the period that is pertinent to this *Bald Eagle and Osprey Technical Report*.

Table 2.2-1. Water types applicable to the study period - November 2002 to September 2004 (D=Dry; BN=Below Normal).

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
2002	-	-	-	-	-	-	-	-	-	-	BN	BN
2003	BN	BN	BN	D	BN	BN	BN	BN	BN	BN	BN	BN
2004	BN	BN	BN	BN	BN	BN	BN	BN	-	-	-	-

2.3 Agency Requested Information

In a letter dated December 17, 2003 to SMUD, the agencies identified, by study, information they believed they needed to begin settlement discussions, with the understanding that additional information might be requested. While the Bald Eagle and Osprey Study was not specifically addressed, the agencies provided the following general comments regarding terrestrial studies, which pertain, in part, to this study:

- All studies will need GIS shape files showing habitat/vegetation types and spatial relationships with meta-data.
- Shape files will need to include survey locations and positive sightings/responses, nesting/foraging areas, and activity centers.
- Spreadsheet formats that include: bats, bald eagle/osprey, mesocarnivores, goshawks, California spotted owl, willow flycatcher, rare plants, noxious weeds.
  - Location.
  - Date.
  - Species observed/captured and specific UTM coordinates.
  - Habitat composition.
  - On site (In situ) verification of WHR habitat types.
  - Method of capture.
  - Nest locations.
  - Activity centers.

Response: GIS shape files with the information requested above were provided to the agencies via compact disc in September 2004. All other information requested in the agencies December 17, 2003 letter that is applicable to the Bald Eagle and Osprey Study is provided in this Technical Report.

In a May 13, 2004 letter, the agencies stated in regards to the *Bald Eagle and Osprey Interim Technical Report* (March 2004) the following:

- *Bald eagle monitoring needs to continue [at] the Union Valley and new Loon Lake sites through the 2004 breeding season*.

Response: SMUD continued monitoring of the bald eagle nesting territories at Union Valley and Loon Lake reservoirs through the 2004 breeding season and the results are presented in this report.

- *To support Objective 3 of the study plan related to prey studies, attempts should be made to climb both nest trees following the end of breeding use in 2004 to assess prey remains.*

Response: Prey remains at the Union Valley Reservoir and Loon Lake Reservoir nests were collected and analyzed in September 2004, and the results are presented in this report.

- *If possible, bald eagle trapping for the purposes of radio-tagging needs to be conducted at both territories because critical information on significant roost areas (breeding and wintering) are unknown for these territories.*

Response: SMUD made reasonable attempts to trap the resident pair of eagles at Union Valley Reservoir during the 2002-2003 monitoring season. These efforts were unsuccessful as documented in this report. SMUD believes that additional capture attempts are beyond the scope of this relicensing study as determined by the Terrestrial Resources TWG. In lieu of additional

capture attempts for purposes of telemetry monitoring, significant observations were made over a two-year period, which allowed for a reasonable determination of important roost locations.

- *A study of conditions at Loon Lake (similar to the study of Union Valley Reservoir) should be completed based upon the newly discovered nest site within the UARP Boundary. This study should evaluate the availability of prey during the early breeding season when the majority of the lake is frozen. SMUD needs to provide information regarding UARP operations at Loon Lake as they influence freezing and spring thaw of the lake in order to evaluate effects on breeding opportunity and success. Additional information on actual and potential recreation disturbance will be needed for the Loon Lake nest site during the breeding and wintering season. A nest tree and nest stand characterization will be needed for the new Loon Lake nest site. These studies should relate information to normal water level fluctuations.*

Response: SMUD studied the bald eagles at Loon Lake Reservoir throughout the 2003-2004 nesting season and the results are provided in this report.

- *SMUD should also consult with the U.S. Fish and Wildlife Service to review this study report.*

Response: SMUD will provide this technical report to the U.S. Fish and Wildlife Service (USFWS) as well as to all other interested parties. In addition, SMUD will initiate formal consultation with the Service pursuant to Section 7 of the federal Endangered Species Act.

The Terrestrial Resources TWG met on June 7, 2004 to consider "conclusions" relative to bald eagles and osprey, and to develop recommendations for consideration by the Settlement Negotiations Group. The Terrestrial Resources TWG agreed on the following general conclusions:

1. The Issue Questions and Objectives stated in the Study Plan are adequately addressed by the information provided in the Interim Bald Eagle and Osprey Technical Report. Final results will be included in the final Bald Eagle and Osprey Technical Report to be issued in August 2004 (report deferred until October 2004 because field studies continued into September 2004).

2. Methods employed were adequate to address Issue Questions and Objectives.

3. Reservoir fluctuations do not appear to be a limiting factor in bald eagle/osprey nesting success. Nesting success appears to be related to unseasonable weather patterns. Eagles appear to tolerate low levels of recreation activity; however, increased recreation activities or changes in land use may affect behavior and future nesting success.

The Terrestrial Resources TWG also developed the following recommendations for consideration by the Settlement Negotiations Group:

SMUD should coordinate with the U.S. Forest Service (ENF) and the USFWS on development of a bald eagle/osprey management plan. This plan should consider the following:

1. Coordinate with the CDFG on their fish-stocking program relative to potentially increasing eagle and osprey prey availability.

2. Continue coordination with the ENF to preserve large trees within bald eagle nest territories at Union Valley and Loon Lake reservoirs to encourage additional nesting opportunities.

3. Coordinate with the ENF and USFWS to develop a plan to ensure recreation activities and proposed land use changes do not threaten any existing or potential nest territories during critical periods (e.g., egg-laying in February and March). This would include boating, winter recreation, and other seasonal recreation activities.

4. Ensure that SMUD maintenance and operations activities are coordinated with federal limited operating periods (LOPs) and that any exceptions are coordinated with federal agencies. Consider limiting vehicle stops and road maintenance along Ice House Road during critical nesting periods.

5. Coordinate with ENF and USFWS to manage nest territories in accordance with applicable federal guidelines. Incorporate information from Technical Report that would assist in management of the species.

6. Coordinate with ENF in evaluating new potential recreational facilities or expansion of existing facilities using information developed from the Technical Report.

7. Coordinate information from Technical Report with Sierra Pacific Industries (SPI) biologists; ENF could coordinate closely with SPI during evaluation of timber harvest plans (THPs).

8. SMUD supports the concept of the ongoing Engineering, Education, and Enforcement ("Triple Es") programs as administered by the ENF. There may be an opportunity to contribute to this program for the protection of bald eagle/osprey. For example, additional signage is likely needed; expansion of the interpretive program may be appropriate. Monitoring and enforcement actions must be in place to ensure compliance with all applicable management plans.

9. Delisting of the bald eagle is possible in the near future. Following the mandatory five-year review of the status of the species, and if it is determined that the bald eagle no longer needs to be monitored within the framework of the Endangered Species Act (ESA) as a federally-protected species, these measures will be evaluated in accordance with ENF guidelines.

3.0 METHODS

3.1 General Bald Eagle Monitoring

Prior to initiating field studies, SMUD consulted with ENF biologists and reviewed all available information pertaining to bald eagle occurrences, habitat distribution and utilization, and nesting history within the study area.

Field studies discussed in this interim report extended from November 2002 to September 2004, with most observations concentrated in two periods: November 2002 - December 2003 and February 2004 – July 2004. Work performed in September 2004 focused on inspection of nests following the breeding season to collect prey remains for species and biomass analyses. Bald eagle monitoring and trapping discussed in this report were performed under the direction and permit authorizations of the SCPBRG. Supplemental observations were provided throughout the study period by SMUD's staff, ENF biologists, and biologists of DTA, under contract to SMUD.

Observations were made primarily using binoculars and spotting scopes from boats and land-based vantage points. Surveys generally began at dawn and continued into the mid- to late-afternoon. Detailed notes were kept on the activities, movements, locations, abundance, and behavior of bald eagles observed, including interactions with other species. Age classes of observed birds were established according to McCollough (1986) as follows: Juvenile (up to 0.5-year old bird), Basic I (1.5-year old), Basic II (2.5-year old), Basic III (3.5-year old), Basic IV (4.5-year old), and Basic V (8.5-year old). Locational data were gathered with Garmin 3+ Global Positioning System (GPS) receivers in North American Datum (NAD) 83, Universal Trans Mercator (UTM) coordinates. Estimated position error (EPE) on the GPS receivers varied from 1 to 10 meters (m), depending on the depth of forest cover. GPS locations were plotted to GIS maps using ArcView ™ and TOPO!™.

SCPBRG bald eagle monitors recorded the locations of perches, roosts, nests, foraging sites, prey remains, and other significant locations in bald eagle use areas. Perches and roosts that adult bald eagles were observed in more than once were considered significant. All perch and roost trees were identified to species, classified as "dominant" or "subdominant", and in most cases, checked for prey remains. When found, prey remains were collected, identified, and dated. Additional locations of historical significance were provided by ENF biologists (personal communication, D. Yasuda and J. Ebert, various dates) and by other biologists engaged in relicensing studies (personal communication, R. Williams, Devine Tarbell & Associates, Inc., various dates).

While observing bald eagles in the Crystal Basin, observers made every attempt to maintain an unobtrusive presence and minimize contact with them. Observations from boats were generally made from a distance of at least 500 meters and direct approaches toward an eagle were avoided. Observations from land were typically made from behind blinds, inside vehicles, or from within populated recreation areas.

3.2 Bald Eagle Trapping

During one-week periods in January, February, and October 2003, researchers from the SCPBRG attempted to trap and radio-tag one of the Union Valley Reservoir resident nesting bald eagles. Two types of trapping techniques were used, floating fish snares (Cain and Hodges 1989; Jackman et al. 1993; Figure 3.2-1) and a radio-controlled bow net (Jackman et al. 1994; Figure 3.2-2). Chum sites or bait stations (Grubb 1988) were established prior to each trapping event in an effort to condition the birds to trap sites. Fish used at chum sites in the water and bait stations on the shore consisted of salmon (*Oncorhynchus* sp.) obtained from the CDFG Region II hatchery, rainbow trout, and brown trout. Smallmouth bass and Sacramento suckers were used as bait for floating and anchored snares in the water. Chum and bait were placed at trapping sites during pre-dawn hours, usually within a few meters of the water line. Floating snares were deployed opportunistically throughout the day.

Figure 3.2-1. Floating fish snare used in an attempt to capture bald eagles at Union Valley Reservoir.

Figure 3.2-2. Bow net baited with salmon at Union Valley Reservoir.

3.3 Osprey Monitoring

As stated in Section 2.1, the Terrestrial Resources TWG determined that osprey has benefited from the provision of new breeding and foraging habitat at UARP reservoirs, and as a result, were not a primary issue of concern in this relicensing. However, incidental observations of osprey occurrence and nesting activity were recorded, when available, and are summarized in this report.

4.0 RESULTS

4.1 Union Valley Reservoir

4.1.1 Terrestrial Habitats Surrounding Union Valley Reservoir

Terrestrial vegetation types in the study area are discussed in detail in the *UARP Vegetation Mapping Technical Report* (DTA 2004a). In summary, vegetation surrounding Union Valley Reservoir includes the Mixed Conifer – Fir Alliance on the north and east sides of the reservoir,

Ponderosa Pine forest plantation on the south side of the reservoir within the area ravaged by the Cleveland Fire in 1992, and Mixed Conifer – Pine to the west of the reservoir (Figure 4.1-1). Ponderosa Pine forests are dominated by ponderosa pine (*Pinus ponderosa)*. Dominant trees in the Mixed Conifer – Fir type are white fir (*Abies concolor*) and Jeffrey pine (*Pinus jeffreyi)* with a lesser component of red fir (*Abies magnifica*), sugar pine (*Pinus lambertiana*), and incense cedar (*Calocedrus decurrens*). The amount of understory in the Mixed Conifer – Fir vegetation association is often a function of canopy closure with open areas supporting greenleaf manzanita (*Arctostaphylos patula*), mountain whitethorn (*Ceanothus cordulatus*), and bitter cherry (*Prunus emarginata*), while sparse Sierra gooseberry (*Ribes roezlii*) and prince's pine (*Chimaphila umbellata*) may be the only shrubs under more closed canopies. The Mixed Conifer – Pine Alliance is comprised primarily of white fir, ponderosa pine, and Douglas-fir (*Pseudotsuga menziesii*).

Figure 4.1-1. Union Valley Reservoir looking north from Big Hill, May 7, 2003.

During the fall of 1997, the Union Blues Forest Health Project (UBFHP) was implemented to protect and enhance bald eagle nesting habitat on Union Valley Reservoir (ENF 1999). The project involved harvesting small trees and reduction in fuel load within the Granlees Point nest

stand. The purpose of the UBFHP was to open up the stand and to protect it from wildfire. In October 2002, the ENF conducted a prescribed burn to further manage fuel loads within the Granlees Point nest stand. No significant perching, roosting, or nesting trees were harmed during the burn or fuel removal phases (D. Yasuda, ENF Biologist, personal communication, 2002) and the nest stand has benefited from the UBFHP.

4.1.2 Bald Eagle Nesting Activity at Union Valley Reservoir

4.1.2.1 Nesting Records from 1986 through 2004

Table 4.1.2.1-1 presents the known reproductive history for the Union Valley Reservoir bald eagle nesting territory. Breeding bald eagles were first reported at Union Valley Reservoir in 1986, and have since fledged successfully 11 young among three nest sites on the reservoir in 8 of 19 years (ENF 1999): 1) Wench Creek site located in the Wench Creek Campground (T. 12N, R. 14E, Section 14); 2) West Point site located near Union Valley Dam (T. 12N, R. 14E, Section 29); and 3) Granlees Point site (T.12N, R. 14E, Section 23). The Wench Creek nest was used between 1986 and 1991, and successfully fledged one eaglet in 1986 and one in 1987. Reproductive status of the Wench Creek site for 1988 is unknown. In 1989, the pair was seen on a nest at West Point possibly feeding young but the nest failed in late April following a late spring snowstorm. The eagles returned to the Wench Creek site in 1990 and 1991, failing to reproduce both years. No subsequent nesting attempts occurred at the Wench Creek site and the historic nest tree was removed by the ENF in 1995 after lightning strikes made it unsafe for humans and uninhabitable for bald eagles (ENF 1999). Between 1995 and 2002, the resident pair focused their breeding activities in a dominant sugar pine (UTM 10726965E, 4306309N) on Granlees Point, and no other nest sites were documented at Union Valley Reservoir during this time. Clutches were successfully hatched in 1992, 1993, 1994, and 1997, and each produced two eaglets (ENF 1999). This nest site is reported to have failed in 1998, 1999, and 2001, with late season snowstorms a likely contributing factor in the failure (ENF 2001). The Granlees Point nest fledged an unknown number of eaglets in 2000 but nesting was not confirmed at this location in 2002 (D. Yasuda, ENF Biologist, personal communication, 2002).

Table 4.1.2.1-1. Productivity summary for bald eagles nesting at Union Valley Reservoir, 1986-2004.

Year	Status	Young fledged	Location
1986	Successful	1	Wench Creek
1987	Successful	1	Wench Creek
1988	Occupied/Success unknown	Unknown	Wench Creek
1989	Occupied/Unsuccessful	0	West Point
1990	Occupied/Unsuccessful	0	Wench Creek
1991	Occupied/Unsuccessful	0	Wench Creek
1992	Successful	2	Granlees Point nest #1
1993	Successful	2	Granlees Point nest #1
1994	Successful	2	Granlees Point nest #1
1995	Occupied/Unsuccessful	0	Granlees Point nest #1
1996	Occupied/Unsuccessful	0	Granlees Point nest #1
1997	Successful	2	Granlees Point nest #1
1998	Occupied/Unsuccessful	0	Granlees Point nest #1
1999	Occupied/Unsuccessful	0	Granlees Point nest #1

Table 4.1.2.1-1. Productivity summary for bald eagles nesting at Union Valley Reservoir, 1986-2004.			
Year	**Status**	**Young fledged**	**Location**
2000	Successful	Unknown	Granlees Point nest #1
2001	Occupied/Unsuccessful	0	Granlees Point nest #1
2002	Occupied/Unsuccessful	0	Granlees Point nest #1
2003	Occupied/unsuccessful	0	Granlees Point nest #2
2004	Successful	1	Granlees Point nest #1
Summary	**Nesting attempts of known outcome at Union Valley Reservoir = 17**		
	Known young produced at Union Valley Reservoir = 11		
	Young/known outcome at Union Valley Reservoir = 0.65		

4.1.2.2 Nesting Activity in 2003

In 2003, SCPBRG monitors recorded detailed observations of nesting activity of the resident bald eagle pair at Union Valley Reservoir. The pair nested in a sub-dominant ponderosa pine (UTM 107271146E, 4306022N) near the eastern edge of the Granlees Point nest stand (Appendix A). The nest tree was approximately 50 meters in height, with a diameter at breast height (dbh) of about 124 centimeters (Figure 4.1-2). Several dominant sugar pines west of the nest tree served as sentinel (pilot) perches that afforded the birds an unobstructed view of the nest. This nest tree was located approximately 15 meters east of the paved bike path that runs through the stand, and is visible from locations along Ice House Road, but not from Observation Point No. 3 (OP3; "Granlees OP"; UTM 10727224E 4305683N), which ENF biologists had used to monitor the nest stand in previous years (Appendix A). SCPBRG monitors discovered the new primary nest on March 28, 2003 after observing several stick deliveries. They also located another smaller stick structure, representing a possible alternate nest site, in a dominant sugar pine (UTM 10726965E, 4306309N) approximately 50 meters west of the primary nest tree. Although only the male was observed delivering sticks to this alternate nest site, both birds were seen actively delivering sticks and building on the primary nest. Based on the concealed nature of the 2003 primary nest, it is possible that the Union Valley Reservoir pair may have used this nest in 2002, but went undetected by ENF biologists monitoring Granlees Point from OP3 (Appendix A).

Stick deliveries to both nest sites in 2003 originated from forested stands on the Sunset/Fashoda Peninsula, Granlees Point, and within the greater Wench Creek area. The bulk of the sticks were delivered from within a radius of 1,000 meters of the nest itself, primarily within a current bald eagle closure area implemented by the ENF. Most often, the adults were observed exiting the nest to the north/northeast, below the level of the canopy, usually returning with a stick delivery from the south/southeast. The average round trip time was approximately one minute. On March 28, 2003, an adult was observed retrieving a stick from a small pine snag just down slope from OP1 ("Roadside OP") adjacent to Ice House Road (UTM 10727268E, 4305702N) (Appendix A). Surveys of the nest stand in May 2003 revealed an abundance of available sticks and twigs on the ground that were suitable for bald eagle nest construction.

Monitors observed activity at the primary nest on 13 days in March, April, and May 2003. Observations were made from the OP2 ("Cedars OP"; UTM 10727223E, 4305694N) and OP1,

both of which afforded better concealment and views of the primary nest than did OP3, which ENF biologists had used in previous years to monitor nesting activities. The nest stand was also monitored from the beach at Yellowjacket Campground during this time.

Monitors witnessed three copulations by the territorial pair of bald eagles during the 2003 breeding season. Two occurred on March 27 at 10:38 a.m. and 12:18 p.m. in a dominant sugar pine in the nest stand (UTM 10 726965E, 4306309N), which also served as an alternate nest site in 2003. The third copulation occurred on March 29 at 11:35 a.m., in a dominant sugar pine (UTM 10725212E, 4305426N) located in the middle of the Sunset/Fashoda Campground.

On April 2, 2003, monitors had their first observations of incubating adults in the nest. Incubation had not been observed on March 28 and 29, 2003, suggesting that the egg(s) were laid between March 30 and April 2, 2003. Throughout April and into early May, both sexes shared incubation duties and nest construction and maintenance continued. Periods of incubation lasted from 20 minutes to several hours between nest exchanges. Incubating eagles rose up periodically to roll eggs and reposition themselves in the nest. Monitors saw no obvious signs of neglect or disinterest on the part of the adults, and the nest structure remained intact and stable.

Assuming the egg(s) were laid between March 30 and April 2, 2003, monitors projected an expected hatch date of May 6, 2003. A late season storm during the first week of May brought several inches of precipitation as both rain and snow, with freezing night and early morning temperatures. Observations during the first two weeks in May failed to confirm brooding postures and monitors began to suspect that the eggs were not viable. On at least two occasions, monitors observed incubating adults entirely covered with snow on the nest. No food deliveries to the nest were observed but the birds continued to exchange incubation duties.

On May 15, 2003, monitors observed noticeable changes in the behavior of the incubating adult. Incubation periods diminished to about 15 minutes between 7:00 and 11:30 a.m. Between incubation periods, the adult would rise, walk to the east or south rim of the nest, and appear to be pecking at, or adjusting, the egg(s). Periods of non-incubation lasted between 1.5 and 5 minutes. At 8:33, 9:01, 9:44, and 10:44 a.m., the adult on the nest was observed eating something near its feet on the north rim of the nest. The food item was unidentifiable, and monitors observed no food deliveries to the nest. At 11:54 a.m., the adult rose and walked slowly to the north rim of the nest, flew south, and did not return. The second adult also did not return to the nest. At 1:14 p.m., an adult eagle flew at a low altitude past the nest tree and in a southward direction, followed by monitors detecting vocalizations from both birds somewhere low in the nest stand. Monitors continued to watch the nest until 5:30 p.m. and the adults never returned. Monitors returned at 5:30 a.m. the following morning and could not locate either adult. At 8:00 a.m. on May 16, 2003, monitors concluded that the nest had failed. Dates of key events during the 2003 nesting season are summarized in Table 4.1.2.2-1.

Table 4.1.2.2-1. Dates of key events in the 2003 nesting cycle of bald eagles at Union Valley Reservoir (UVR).

Date (all in 2003)	Event
January 24	Pair begins to center their activity around the nest stand on Granlees Point
February 28	First observation of courtship flights and copulation at UVR on the Sunset/Fashoda

Table 4.1.2.2-1. Dates of key events in the 2003 nesting cycle of bald eagles at Union Valley Reservoir (UVR).	
Date (all in 2003)	**Event**
	Peninsula and Granlees Point
March 21	First observation of stick deliveries to (alternate) nest site at Granlees Point
March 27 – 28	Continued copulations at the Sunset/Fashoda Peninsula and Granlees Point
March 28	Discovery of primary nest site location at Granlees Point
March 30 – April 2	Eggs laid
April 2	Confirmation of incubation posture
April 9	First observation of incubation exchanges between adults
May 15	Confirmation of UVR nest failure

4.1.2.3 Nesting Activity in 2004

In late January 2004, SCPBRG monitors began a second season of surveys of the Union Valley Reservoir breeding territory. They observed activity at the primary nest (i.e., nest tree used prior to 2003) on 28 observation days from January through July 2004. Observations were made primarily from OP2 ("Cedars OP") and OP3 ("Granlees OP") (see Section 4.1.2.2 for location description of these observation points). Supplemental monitoring was conducted from the beaches at Yellowjacket Campground and the Sunset/Fashoda Peninsula during this period.

In January 2004, monitors witnessed courtship flights and pair bonding activity, centered on the Granlees Point nest stand. On March 8, 2004, monitors discovered that the resident pair of bald eagles had resumed nesting in a dominant sugar pine (UTM 10726965E, 4306309N) near the shoreline on Granlees Point. This tree had been used unsuccessfully in 2002 (ENF 1999), and served as an alternate nest site during the 2003 breeding season, receiving the majority of early season stick deliveries. During March 8-10, 2004, monitors observed normal incubation postures and the adults regularly exchanged incubation duties. While one adult incubated, the other made periodic foraging flights, but no prey deliveries were observed. During this period, the resident male also chased off a juvenile bird that had ventured close to Granlees Point. Based on these observations, egg-laying occurred sometime prior to March 8, approximately one month earlier than the presumed date of egg laying in 2003.

By mid-April 2004, incubation exchanges continued, with both adults sharing equally in incubation duties. On April 13, 2004, monitors observed several stick deliveries and the eagles seemed to be adjusting materials or eggs at the bottom of the nest cup. At several times during the course of that day, both the male and female eagles were observed rising from incubation posture and peering down into the nest in the direction of egg(s). This behavior was not noted previously and egg manipulation was not occurring at this time. Monitors interpreted this behavior as an indicator that pipping (i.e., eggshell breaking during hatching) had likely begun.

On April 22, 2004, at 06:18 a.m., monitors observed the adult female in a low, prone, brooding posture on the nest. At 06:36 a.m., the female left the nest and one eaglet in primary/natal down plumage was detected in the nest. Monitors deduced that hatching had likely occurred between April 13 and 22, 2004. The adult female returned to the nest at 06:38 a.m. carrying a 4-6 inch salmonid, and began feeding the eaglet.

Monitors continued to observe the Union Valley Reservoir nest through mid-July 2004, and development of the eaglet proceeded normally. The parents were often observed delivering small salmonids to the nest, along with additional sticks and green sprigs. By May 17, 2004, the nestling had begun to show pinfeathers on the leading and trailing edges of its wings. Food deliveries and brooding by the adults continued. By May 29, 2004, no natal down was visible on the nestling, and on June 24, 2004, monitors first observed the eaglet leaving the nest and "branching" in the nest tree.

Monitors made only sporadic visits to the nest stand between June 24 and July 17, 2004, during which time the branching eaglet appeared to be healthy and developing normally. The final observation by monitors on July 17, 2004, confirmed that the eaglet had successfully fledged from the Granlees Point nest, but was still present in the vicinity. Both parents were also observed in and around the nest stand during that time. Dates of key events during the 2004 nesting season are summarized in Table 4.1.2.3-1.

Table 4.1.2.3-1. Dates of key events in the 2004 nesting cycle of bald eagles at Union Valley Reservoir (UVR).

Date (all in 2004)	Event
January 24	Pair present on UVR. Most activity in and around Granlees Point. Stick deliveries commence to historic (2002) nest tree.
Late February-Early March	Egg(s) laid.
March 9	Confirmation of incubation posture in historic sugar pine (2002 nest tree) on Granlees Pt.
April 1	First observations of incubation exchanges by adults.
April 13-22	Hatching occurs.
April 22	First observation of one eaglet (in natal down) and adults begin to delivery food to nest.
May 15	Food deliveries and incubation exchanges continue. Single eagle in secondary down plumage.
May 17	Nestling with pinfeathers on leading and trailing edges of wings.
May 29	No natal down visible on nestling.
June 24	First observation of branching by eaglet; food deliveries by adults continue.
July 4	Eaglet still branching, food deliveries to nest continue.
July 17	Confirmation of successful fledging of one eagle from Granlees Point nest #1.

4.1.3 Bald Eagle Numbers and Age Distribution at Union Valley Reservoir

Tables 4.1.3-1 and 4.1.3-2 summarize bald eagle observations and age classes recorded during surveys at Union Valley Reservoir during this study. Juveniles, sub-adults (Basic I through Basic V plumage; McCollough 1989), and adults were all observed on the reservoir, with all sub-adult age classes represented except the Basic IV (4.5-year old birds). The age distribution of eagles observed at Union Valley Reservoir was 83 percent adults, 8.5 percent sub-adults, and 8.5 percent juveniles. Up to four adults were observed on the reservoir at one time, although on most visits the only adults observed were the territorial pair. The frequency of sub-adult and juvenile sightings was highest during the winter and fall months, corresponding with the expected seasonal influx of wintering bald eagles into the Crystal Basin. Two ground surveys, on May 16, 2003, and June 30, 2004, yielded no eagle sightings.

The resident pair of bald eagles at Union Valley Reservoir was nearly always seen during surveys. They typically perched on favorite snags or perches, or soared over the reservoir during the warm mid-day hours. Territorial interactions between the resident adult pair and interloping sub-adults and juveniles were most common just prior to, and during the breeding season. However, sub-adults and juveniles usually assumed hidden or sheltered perches in sub-dominant trees when present. It is possible that sub-adult and juvenile age classes were under-represented in these counts due to the cryptic coloration and discreet perching behavior of immature bald eagles.

Table 4.1.3-1. Bald eagle (BAEA) observations during 89 survey days at Union Valley Reservoir (UVR) from November 2002 to July 2004.

Survey Date	Survey Mode	No. BAEA Adults	No. BAEA Sub-adults	No. BAEA Juveniles	Total Bald Eagles
Nov. 4, 2002	Ground	1	0	0	1
Nov. 5, 2002	Boat	2	2	0	4
Nov. 26, 2002	Ground	0	1	0	1
Nov. 27, 2002	Boat	2	1	0	3
Dec. 10, 2002	Ground	1	1	1	3
Dec. 11, 2002	Boat	2	1	1	4
Jan. 7, 2003	Boat/Ground	3	0	1	4
Jan. 8, 2003	Boat/Ground	4	0	0	4
Jan. 9, 2003	Boat/Ground	3	0	0	3
Jan. 10, 2003	Boat/Ground	3	0	0	3
Jan. 15, 2003	Boat	2	1	1	4
Jan. 24, 2003	Boat	2	0	0	2
Feb. 4, 2003	Boat	1	1	0	2
Feb. 5, 2003	Boat/Ground	2	1	0	3
Feb. 6, 2003	Boat/Ground	2	0	0	2
Feb. 7, 2003	Boat/Ground	2	1	0	3
Feb. 27, 2003	Ground	2	0	0	2
Feb. 28, 2003	Ground	3	0	0	3
Mar. 6, 2003	Boat	2	0	0	2
Mar. 7, 2003	Ground	2	0	0	2
Mar. 8, 2003	Ground	2	0	0	2
Mar. 21, 2003	Boat	2	0	0	2
Mar. 22, 2003	Ground	2	0	0	2
Mar. 28, 2003	Boat	3	0	0	3
Mar. 29, 2003	Ground	2	0	0	2
Mar. 30, 2003	Ground	2	0	0	2
Apr. 2, 2003	Boat/Ground	2	0	0	2
Apr. 3, 2003	Ground	1	0	0	1
Apr. 9, 2003	Boat/Ground	2	0	0	2
Apr. 10, 2003	Ground	2	0	0	2
Apr. 25, 2003	Ground	1	1	0	2
Apr. 26, 2003	Ground	2	0	0	2
May 8, 2003	Ground	1	0	0	1
May 9, 2003	Ground	2	1	0	3
May 15, 2003	Boat/Ground	2	0	0	2
May 16, 2003	Ground	0	0	0	0
May 22, 2003	Boat	2	0	0	2

Table 4.1.3-1. Bald eagle (BAEA) observations during 89 survey days at Union Valley Reservoir (UVR) from November 2002 to July 2004.

Survey Date	Survey Mode	No. BAEA Adults	No. BAEA Sub-adults	No. BAEA Juveniles	Total Bald Eagles
May 29, 2003	Ground	1	0	0	1
May 30, 2003	Ground	2	0	0	2
Jun. 5, 2003	Ground	1	0	0	1
Jun. 6, 2003	Ground	2	0	0	2
Jun. 19, 2003	Boat	2	0	0	2
Jun. 27, 2003	Ground	2	0	0	2
Oct. 2, 2003	Boat	2	0	0	2
Oct. 3, 2003	Boat	3	0	0	3
Oct. 7, 2003	Boat	3	1	0	4
Oct. 8, 2003	Boat	2	0	1	3
Oct. 9, 2003	Boat	2	0	2	4
Oct. 10, 2003	Boat	2	0	2	4
Oct. 11, 2003	Boat	2	0	1	3
Oct. 12, 2003	Boat	2	0	0	2
Oct. 28, 2003	Boat	2	0	1	3
Oct. 29, 2003	Boat	2	0	1	3
Nov. 25, 2003	Ground	0	0	1	1
Nov. 26, 2003	Ground	2	0	1	3
Jan. 24, 2004	Ground	2	0	0	2
Mar. 9, 2004	Boat	2	1	1	4
Mar. 10, 2004	Ground	2	0	0	2
Apr. 1, 2004	Ground	2	0	0	2
Apr. 2, 2004	Ground	1	1	0	2
Apr. 3, 2004	Ground	2	0	0	2
Apr. 4, 2004	Ground	2	0	0	2
Apr. 9, 2004	Ground	2	0	0	2
Apr. 10, 2004	Ground	2	1	0	3
Apr. 11, 2004	Ground	2	0	0	2
Apr. 13, 2004	Ground	2	0	0	2
Apr. 20, 2004	Ground	2	0	0	2
Apr. 21, 2004	Ground	2	0	0	2
Apr. 22, 2004	Ground	2	0	0	2
Apr. 24, 2004	Ground	2	0	0	2
Apr. 25, 2004	Ground	2	0	0	2
May 1, 2004	Ground	2	1	0	3
May 2, 2004	Ground	2	0	0	2
May 13, 2004	Ground	1	0	0	1
May 14, 2004	Ground	2	0	0	2
May 17, 2004	Ground	1	0	0	1
May 28, 2004	Boat	4	0	0	4
May 29, 2004	Ground	2	0	0	2
Jun. 10, 2004	Ground	2	0	0	2
Jun. 11, 2004	Ground	2	0	0	2
Jun. 12, 2004	Ground	2	0	0	2
Jun. 14, 2004	Ground	1	0	0	1
Jun. 24, 2004	Ground	1	0	0	1
Jun. 25, 2004	Ground	2	0	0	2
Jun. 30, 2004	Ground	0	0	0	0

Table 4.1.3-1. Bald eagle (BAEA) observations during 89 survey days at Union Valley Reservoir (UVR) from November 2002 to July 2004.					
Survey Date	**Survey Mode**	**No. BAEA Adults**	**No. BAEA Sub-adults**	**No. BAEA Juveniles**	**Total Bald Eagles**
Jul. 1, 2004	Boat	2	0	1	3
Jul. 4, 2004	Boat	2	0	1	3
Jul. 5, 2004	Boat	2	0	0	2
Totals		**166 Adults**	**17 Sub-adults**	**17 Juveniles**	**200 Total BAEA**
Mean No. Per Survey		**1.9 Adults**	**0.2 Sub-adults**	**0.2 Juveniles**	**2.3 Total BAEA**

Table 4.1.3-2. Age class distribution of bald eagles observed during 87 of 89 total survey days at Union Valley Reservoir from November 2002 to July 2004.							
Age Class	**Adult**	**Basic IV Plumage**	**Basic III Plumage**	**Basic II Plumage**	**Basic I Plumage**	**Unknown Sub-adult**	**Juvenile**
No. observed	166	0	3	5	7	2	17
% of Eagles Observed	83.0%	0%	1.5%	2.5%	3.5%	1.0%	8.5%

4.1.4 Bald Eagle Habitat Utilization and Home Range at Union Valley Reservoir

4.1.4.1 Perches and Roosts

Perches serve a number of purposes as components of bald eagle habitat; including foraging and hunting, feeding, night roosting, territorial defense, and copulation. Perch locations used most commonly by the territorial bald eagle pair at Union Valley Reservoir are shown in Appendix A. Perch structures ranged from dominant trees and snags to saplings and shoreline boulders. Bald eagles were commonly seen perched on the dominant and sub-dominant sugar pines, lodgepole pines (*Pinus contorta*), incense cedars, white firs, Jeffrey pines, ponderosa pines, and various snags that border the reservoir. Most observations of perched birds were from the south and east perimeter of the reservoir with only two observations made of perched birds on the north side of the reservoir between Yellowjacket and Wolf Creek Campgrounds.

Most foraging perch locations were less than 20 meters from the shoreline. Tree perch height varied from 2 to 70 meters. The many boulders and stumps near the waterline were also commonly used, though their availability was subject to changes in reservoir levels. Most habitually used foraging perches were located along the west and south shores of the reservoir, in the forest stands adjacent to Union Valley Dam, and in the stands on the Sunset/Fashoda Peninsula and Granlees Point.

Night roosts of the territorial pair were generally located on or near Granlees Point based on the frequency of early morning observations of perched adults at that location. In addition, monitors visited the nest stand on several occasions and found molted eagle feathers and droppings under two of the dominant sugar pines, both of which had been previously marked by the ENF as critical components of the Union Valley Reservoir bald eagle habitat. On October 2, 3, and 7, 2003, monitors watched the pair fly up out of the nest stand on Granlees Point at first light. On

each of these days, bald eagle vocalizations were heard from within the nest stand between 6:05 and 6:30 a.m., prior to visual detection of the pair.

The territorial pair also night roosted at other locations around Union Valley Reservoir. On October 11, 2003, monitors observed the pair perched together in the crown of a dominant sugar pine (UTM 10724902E, 4304926N) near the tip of the Sunset/Fashoda Peninsula between 5:42 p.m. and 7:00 p.m. At 7:00 p.m., the adult male flew down into the surrounding forest. The following morning, at 6:41 a.m., both birds vocalized from within the Sunset/Fashoda Peninsula forest stand and then flew up to the sugar pine perch used the prior evening. While the territorial adults were confirmed to night roost in the forest stands on the Sunset/Fashoda Peninsula and Granlees Point, other night roost locations could also exist. Any number of trees in the forest surrounding Union Valley Reservoir could provide adequate night roosts, and the birds' choice of night roost locations may be determined by such factors as: season, weather, prey availability, human activities, breeding behavior, territorial defense, and disturbance.

4.1.4.2 Home Range

While monitors have identified some of the key bald eagle use areas at Union Valley Reservoir, an accurate assessment of the resident bald eagles' home range is not possible with available data and in the absence of radio-telemetry (see Section 4.1.6: Bald Eagle Trapping at Union Valley Reservoir). At this time, it is not clear exactly how much of the ENF is included in the Union Valley Reservoir eagles' home range. However, consistent observations of the resident birds habitual foraging, perching, and roosting at Union Valley Reservoir indicates that the reservoir and surrounding groves provides most of habitat requirements to support the breeding pair.

4.1.5 Foraging Activity, Prey Base, and Prey Analyses for Bald Eagles at Union Valley Reservoir

4.1.5.1 Foraging Activity

Monitors frequently observed bald eagles in low, hunting flights, perching for hours on potential foraging perches, and unsuccessfully striking the water. However, only a few successful foraging events in the Crystal Basin were witnessed during this study. Bald eagles were often observed perched in the early morning hours, apparently hunting (i.e., watching the water). Early morning perches were usually less than 10 meters from the shoreline, offering a strategic view of the reservoir. While hunting, perched eagles most often had their backs to the morning sun. Foraging flights were mostly over shallow water near the west, south, and southwest shorelines, with the highest concentration of foraging activity near Union Valley Dam and off the tip of the Sunset/Fashoda Peninsula. Although osprey forage frequently at Union Valley, Loon Lake, and Ice House reservoirs, eagle monitors observed only one kleptoparasitism (piracy) event by a bald eagle against an osprey. Table 4.1.5.1-1 summarizes bald eagle foraging and feeding activity observed by monitors at Union Valley Reservoir.

Table 4.1.5.1-1. Summary of bald eagle foraging and feeding activity observed at Union Valley Reservoir (UVR) from November 2002 to July 2004.	
Observation Date	**Activity**
November 27, 2002	Adult bald eagle flew to a stump perch on the south shore of UVR opposite the Sunset boat ramp. The eagle appeared to already have a small fish in its talons as it landed on the stump. The eagle fed on the fish for approximately five minutes before it flushed. No prey remains were found at this site.
January 8, 2003	Three adult bald eagles observed feeding close to the shoreline on the southern edge of UVR, near the Jones Fork inflow. Monitors visited the location hours later and found the remains of a smoked turkey, obviously left behind by campers. No prey remains were collected.
February 6, 2003	An adult bald eagle hit shallow water on the north shore of UVR three times, eventually catching a small fish. The eagle flew directly to a boulder perch (UTM 10724502E, 4306084N) just above the water line and immediately consumed the fish. Monitors collected salmonid scales at this site. Blood and droppings were also seen at this perch, suggesting recurrent use of this boulder when it is not submerged. No other prey remains were found.
May 15, 2003	Between 9:30 and 10:15 a.m., the UVR resident adult male was observed feeding on the northeast rim of the Granlees Point nest. The food item was apparently already at the nest, as no food delivery was observed prior to feeding. The bird fed intermittently for five minutes before resuming incubation. Monitors were unable to identify the prey item, and a later visit to the ground beneath nest site yielded no prey remains.
October 4, 2003	Between 4:02 and 4:14 p.m., the UVR resident adult male was observed flying to a boulder perch and consuming prey. Mountain quail (*Oreotyx pictus*) feathers were later collected at this location.
October 6, 2003	Between 3:30 and 4:00 p.m., both resident adults at UVR were observed catching small Salmonids off the tip of the Sunset/Fashoda Peninsula. The adult female perched on a stump and consumed a fish. Scales and bones were later collected at this location.
October 8, 2003	At 9:40 a.m. monitors observed an adult eagle pick up a dead northern flicker off the water, just west of the Granlees Point nest stand. The bird flew to a sub-dominant Jeffrey pine (UTM 10726859E, 4306689N) near the water's edge on Granlees Point and consumed the prey. Monitors collected and catalogued the remains of the northern flicker (*Colaptes auratus*).
October 9, 2003	Between 4:00 and 5:30 p.m., monitors watched the adult pair tandem hunting near the western tip of the Sunset/Fashoda Peninsula. They observed five successful forages in the shallow waters around the peninsula. The eagles were apparently taking small (2-3 inch) salmonids and consuming them on the wing.
October 9, 2003	At 5:00 p.m. monitors observed the adult resident male pick a bird up off the water near the tip of the Sunset/Fashoda Peninsula. The eagle flew to a stump perch (UTM 10725061E, 4304177E) on the south shore of UVR and consumed the prey. Monitors collected/catalogued mountain quail remains at the site.
October 9, 2003	At 5:40 p.m., monitors observed the adult resident female feeding at a stump perch (UTM 10724723E, 4304995N). Monitors visited the location the following day (October 10) and collected/catalogued mountain quail remains.
October 10, 2003	At 6:06 p.m. monitors observed the UVR pair tandem hunting from a dominant sugar pine perch (UTM 10 725212E, 4304425N). The birds flew south from the perch and out over the water south of the Sunset/Fashoda Peninsula, the male flew high and the female low. The female hit a small mountain quail attempting to fly across the reservoir and dropped it to the water. The male doubled back, picked the bird up off the water, and flew to a small grove of white firs on the south shore. Monitors visited the perch location (UTM 10724870E, 4304175N) and collected/catalogued the remains of two mountain quail.

Table 4.1.5.1-1. Summary of bald eagle foraging and feeding activity observed at Union Valley Reservoir (UVR) from November 2002 to July 2004.	
Observation Date	**Activity**
June 10, 2004	At 6:38 a.m., one of the adult bald eagles delivered an unidentified avian prey item to the eaglet on the Granlees Point nest.
June 10, 2004	At 7:00 a.m., one of the adult bald eagles delivered one 6-8 inch salmonid to the eaglet on the Granlees Point Nest.
July 1, 2004	Monitors witnessed kleptoparasitism (piracy) by an adult bald eagle against an osprey over the Sunset/Fashoda Peninsula. The osprey dropped one small salmonid and the adult eagle consumed the fish in flight.

4.1.5.2 Prey Base at Union Valley Reservoir

Extensive research has been conducted on foraging behavior and prey selection of bald eagles. Prey selection by bald eagles varies by location, ranging from an exclusive diet of fish in some areas to an exclusive diet of birds, primarily waterfowl, in others (Jenkins 1992). Fisheries in the lakes and streams within the study area are addressed in detail in the UARP *Reservoir Fisheries Technical Report* (DTA and Stillwater Sciences 2004a) and UARP *Stream Fisheries Technical Report* (DTA and Stillwater Sciences 2004b). In summary, 21 species of fish have been observed within the UARP area either historically or during relicensing studies conducted in 2002 and 2003 (Tables 4.1.5.2-1 and 4.1.5.2-2). These records indicate that 10 species of fish have been recorded at Union Valley Reservoir. The CDFG actively stocks Union Valley Reservoir with rainbow trout, brown trout, lake trout, kokanee, smallmouth bass, and Sacramento sucker (ENF 1999).

Research has shown that bald eagles nesting in isolated lakes and reservoirs, or in trout-managed reservoirs (i.e., stocked with trout), often consume more birds than fish (Jackman et al. 1999). The study area supports a diverse avifauna as described in the UARP *Waterfowl Nesting Habitat Technical Report* (DTA 2004b). At Union Valley Reservoir, the most common species of waterfowl observed during the study were Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), and common merganser (*Mergus merganser*). Monitors observed bald eagles taking two species of birds at Union Valley Reservoir, mountain quail and northern flicker (Table 4.1.5.1-1). Both of these species are common in the study area.

Table 4.1.5.2-1. Fish Species Composition for UARP Reservoirs.[1] [Table excerpted from DTA and Stillwater Sciences 2002a]

	Species[2]																				
Reservoir	**RBT**	**BRN**	**BRK**	**CR**	**CT**	**CH**	**GS**	**GSH**	**GT**	**HH**	**KS**	**LT**	**MF**	**MN**	**SB**	**SD**	**SS**	**RS**	**TP**	**SPM**	**References**
Rubicon	●	●	●						●												CDFG surveys, various dates
Buck Island	●	●	●																		CDFG surveys, various dates
Loon Lake	● o	● o	●	● o		●	●										● o		●		SMUD 2001; EDAW 1978
Gerle Creek	●	●o	●	o																	Turney 1986
Robbs Peak	●	●																			CDFG surveys, various dates; EA 1982, SMUD 2001
Union Valley	● o	●			●		●	●			● o	● o	●		● o		● o				SMUD 2001, CDFG surveys, various dates; EA 1980, ENF various dates
Ice House	● o	● o	●	o			●				●										SMUD 2001, EA 1980, EDAW 1978; CDFG surveys, various dates
Junction	●	● o	●								●						● o				Thomas 1994a
Camino	●	●	●	●										●			●	●			SMUD 2001, ENF Stream Survey, not dated
Brush Creek	●	●																			ENF Stream Survey 1974
Slab Creek	● o	● o	●	●						● o	●				●	●	● o			o	SMUD 2001, Thomas 1994b; Jordan and Brown 1992; Jones and Stokes 1994; WESCO 1980

[1] ● Historical data
o 2002 and 2003 Surveys

[2] Species:

BRK=Brook trout	GSH=Golden shiner	MN=Minnows	SS= Sacramento sucker
BRN=Brown trout	GT=Golden trout	RBT=Rainbow trout	TP=Tule perch
CH=Chubs	HH=Hardhead	RS=Riffle sculpin	
CR=California roach	KS=Kokanee salmon	SB=Smallmouth bass	
CT= Cutthroat	LT=Lake trout	SD= Speckled dace	
GS=Green sunfish	MF=Mosquitofish	SPM=Sacramento pikeminnow	

Table 4.1.5.2-2. Fish species composition for UARP stream reaches.[1] [Table excerpted from DTA and Stillwater Sciences 2002b]

	Species[2]														
Stream Reach	**RBT**	**BRN**	**BRK**	**RS**	**PS**	**SS**	**HH**	**SPM**	**GSH**	**CR**	**SD**	**GSF**	**BG**	**SB**	**References**
Rubicon Dam Reach	●o	o	●			o				o	o				USDA 1979a
Rubicon Tunnel Outlet Reach															No species composition data
Rockbound Dam Reach															No species composition data
Buck Island Dam Reach	o								o	o					No historical species composition data
Loon Lake Dam Reach	●o	●o	●							●					CDFG Gerle Creek surveys, various dates
Gerle Creek Dam Reach	●o	●o	●							●					Turney 1986; CDFG Gerle Creek surveys, various dates
S.F. Rubicon Upstream of Robbs Reservoir	o														No historical species composition data
Robbs Peak Dam Reach	o	o													No historical species composition data
Ice House Dam Reach	●o	●o				●o									USDA South Fork Silver Creek survey 1979b
Junction Dam Reach	●o	●o		●		●o									CDFG Silver Creek surveys, various dates
Camino Dam Reach	●o	●o		●		●o									Thomas 1994
South Fork American Reach	●o			●		●o	●o	●o		●o	●o				TRPA (1998). Survey at El Dorado Powerhouse, downstream of the falls 1 mile below Silver Creek. Sculpin cited were presumed to be riffle sculpin.
Brush Creek Dam Reach	●o	●o													CDFG Brush Creek surveys, various dates
Slab Creek Dam Reach	●o	●o		●o	o	●o	●o	●o		o	●o	●		●	WESCO 1980, Ramsey 1949

[1] ● Historical data o 2002 and 2003 Surveys

[2] Species:
BG= Blue Gill
BRK=Brook trout
BRN=Brown trout
CR=California roach
GSF= Green sunfish
GSH=Golden shiner
HH=Hardhead
PS = Prickly sculpin
RBT=Rainbow trout
RS=Riffle sculpin
SPM= Sacramento pikeminnow
SD=Speckled dace
SB = Smallmouth bass
SS=Sacramento sucker

4.1.5.3 Prey Analysis at Union Valley Reservoir

On September 26, 1987, prey remains were collected by USFWS biologists from beneath the Wench Creek nest following a successful breeding season ((R. Jackman, personal files). The remains were analyzed (see Jackman et al. 1999 for methods) and the results are summarized in Table 4.1.5.3-1.

Table 4.1.5.3-1. Total number and estimated biomass (grams) of prey identified from remains collected in and below the Union Valley Reservoir Wench Creek nest on September 26, 1987.

Prey Species	No. Individuals	Percent of Total Prey Species	Biomass (g)	Percent of Total Biomass
Sacramento sucker	10	35.7	10,141	47.8
Unidentified Centrarchidae	4	14.3	3,725	17.6
Unidentified Salmonidae	1	3.6	132	0.6
TOTAL FISH	**15**	**53.6**	**13,998**	**66.0**
American coot	3	10.7	1,926	9.1
Unidentified gull (*Larus* sp.)	3	10.7	1,473	6.9
Western meadowlark	2	7.1	196	0.9
Mallard	1	3.6	1,082	5.1
Ruddy duck	1	3.6	545	2.6
Common goldeneye	1	3.6	900	4.2
Mountain quail	1	3.6	233	1.1
TOTAL BIRDS	**12**	**42.9**	**6,355**	**30.0**
Unidentified Sciuridae	1	3.6	850	4.0
GRAND TOTAL	**28**	**100.0**	**21,203**	**100.0**

Based on the data presented in Table 4.1.5.3-1, the bald eagles nesting at the Wench Creek site in 1987 were eating mostly fish, with an assortment of waterbirds, landbirds, and one squirrel. Salmonids (trout, kokanee) were likely utilized more often than indicated in the prey collections because: (1) salmonids were commonly stocked at Union Valley Reservoir, and (2) prey analysis based solely on prey remains collected at nest sites often underestimate soft-boned fish such as trout (Hunt et al. 1992).

Prey remains were also collected from beneath or on feeding perches around Union Valley Reservoir in 2003 as part of this study (Table 4.1.5.3-2). Before October 2003, the only prey remains collected were a sample of salmonid scales discovered after watching an adult eagle catch a small trout near Camino Cove and consume it on a nearby boulder perch. Few foraging events were observed during early morning and afternoon monitoring throughout 2003. Monitoring frequency increased in October 2003 and continued later in the afternoon and evening than had been the case during previous surveys. As a result, monitors witnessed 10 successful foraging events from October 3-12, 2003, and were able to collect prey remains from seven of these sites.

Surprisingly, monitors found the adults to be taking a number of birds in October and the remains of one northern flicker and at least three mountain quail were recovered. The territorial pair was observed tandem hunting on two occasions from the dominant sugar pines on the Sunset/Fashoda Peninsula. Mountain quail were taken as they attempted to fly across the

reservoir to the south shore. Small salmonids were taken from the open water surrounding the point. Salmonids are likely taken as both carrion and alive from the surface of the water; stocked trout and salmon often die from diseases acquired in captivity and are generally less wary at the surface of the water than wild trout.

Table 4.1.5.3-2. Prey remains collected at Union Valley Reservoir, February – November 2003.

Collection Number	Date Collected	Collection Location (UTM)	Description of prey remains
UVR 1	Feb. 6, 2003	10724502E 4306084N	Small pile of *Salmonid* scales collected on boulder perch.
UVR 2	Oct. 4, 2003	10726859E 4306689N	Mountain quail feathers collected from boulder perch.
UVR 3	Oct. 6, 2003	10723634E 4304543N	Salmonid scales and bones collected from stump perch.
UVR 4	Oct. 8, 2003	10724927E 4304946N	Feathers from a mountain quail collected from stump perch.
UVR 5	Oct. 8, 2003	10726859E 4306689N	Northern flicker feathers and wing sections collected from under Jeffrey pine perch.
UVR 6	Oct. 9, 2003	10724287E 4304326N	Mountain quail feathers collected on stump perch.
UVR 7	Oct. 9, 2003	10727083 E 4303926 N	Kokanee salmon with puncture marks and talon scratches collected near water line in Jones Fork.
UVR 8	Oct. 9, 2003	10724927E 4304946N	Small pile of *Salmonid* scales collected on stump perch.
UVR 7	Oct. 9, 2003	10725061E 4304177N	Mountain quail feathers collected on stump perch.
UVR 9	Oct. 10, 2003	10 725212E 4304425N	Mountain quail feathers collected beneath white fir perch.
UVR10	Nov. 26, 2003	10 725212E 4304425N	Mountain quail feathers collected beneath white fir perch.
UVR 11	Nov. 26, 2003	10 725212E 4304425N	Mountain quail feathers collected on stump perch.
UVR 12	Nov. 26, 2003	10 725212E 4304425N	Mountain quail feathers collected on stump perch.

Prey remains were also collected below the nest tree at Union Valley Reservoirs in September 2004, following the active 2004 breeding season (Table 4.1.5.3-3). The stick nest had fallen completely from the nest tree, precluding collection of fish scales from the fine nest lining, which had scattered following impact with the ground. As a result, an accurate analysis of fish prey selection by species was not possible, and only one salmonid bone was found in the other remains around the nest tree at Union Valley Reservoir. Prey remains consisted primarily of birds. The lack of fish remains at the Union Valley Reservoir nest contrasts sharply with the 1987 prey analysis (see Table 4.1.5.3-1), which used similar techniques, suggesting that shallow water species such as suckers and bass may have declined, while salmonids have increased. However, the *Reservoir Fisheries Technical Report* reported that suckers and bass persist in the reservoir. The relatively hard-boned suckers would likely appear in prey remains if they were being used. Therefore, selection of these species by eagles may be limited by size, availability (e.g., spawning activity), and eagle foraging preferences. For reasons mentioned above, both

pairs were likely taking more salmonids than exhibited by prey analysis; and continued stocking of these species in the reservoirs by CDFG will likely benefit eagles.

Table 4.1.5.3-3. Total number and estimated biomass (grams) of prey identified from remains collected in and below the Union Valley Reservoir Granlees Point bald eagle nest on September 3, 2004.

Prey Species	No. Individuals	Percent of Total Prey Species	Biomass (g)	Percent of Total Biomass
Unidentified Salmonidae	1	11.1	322	7.6
TOTAL FISH	**1**	**11.1**	**322**	**7.6**
American coot	1	11.1	578	13.6
Unidentified duck	2	22.2	1,417	33.4
Mountain quail	1	11.1	210	4.9
Northern flicker	1	11.1	128	3.0
Unidentified woodpecker	1	11.1	72	1.7
Unidentified bird	1	11.1	752	17.7
TOTAL BIRDS	**7**	**77.8**	**3,157**	**74.4**
Unidentified Sciuridae	1	11.1	765	18.0
GRAND TOTAL	**8**	**100.0**	**4,244**	**100.0**

4.1.6 Bald Eagle Trapping Results at Union Valley Reservoir

Bald eagles were generally attracted to bait at chum and trap sites, and eagle activity at these locations provided supplemental insight into their foraging behavior. All species of bait-fish were readily consumed and territorial behavior at both chum and trap sites was observed. Attempts to capture the resident pair of bald eagles for subsequent tagging and radio-telemetry monitoring were unsuccessful. Eagles were generally wary of floating fish snares and when they did take the bait at these snares, the eagles were adept at removing the bait without being caught in the monofilament noose snares. On January 9, 2003, an adult eagle that was believed to be the resident male based on behavior and proximity of the resident female, was captured at the radio-controlled bow net placed on the tip of West Point peninsula. This eagle was measured, weighed, fitted with a radio transmitter for subsequent telemetry monitoring, and released (Figures 4.1-2 through 4.1-5). Upon release, the eagle flew to the area northeast of Camino Cove Campground and perched in a conifer for the remainder of the monitoring period that day. Monitors attempted to detect the transmitter signal of this bird the following day without success and the eagle was not observed during subsequent monitoring visits. Monitors categorized the bird as a non-resident interloper. No other eagles were captured during this study. Foraging and trapping observations at chum and trap sites are summarized in Table 4.1.6-1.

Table 4.1.6-1. Summary of trapping results at Union Valley Reservoir.

Date of Observation	Activity
Dec. 11, 2002	Three bald eagles (2 adults, 1 juvenile) were observed feeding on salmon chum placed at the tip of West Point peninsula (UTM 10723163E, 4305428N) north of Union Valley Dam.
Jan. 4, 2003	Three bald eagles (2 adults, 1 sub-adult) were observed feeding on salmon chum on the tip of West Point peninsula (UTM 10723163E, 4305428N) north of Union Valley dam.
Jan. 7, 2003	An adult bald eagle captured and consumed one smallmouth bass used as bait for a floating snare. The snare was located approximately 50 meters due west of Granlees Point.

Table 4.1.6-1. Summary of trapping results at Union Valley Reservoir.	
Date of Observation	**Activity**
Jan. 8, 2003	Three adult bald eagles were observed feeding on a bait salmon at bow net trap site located on the tip of West Point peninsula (UTM 10723163E, 4305428N) immediately north of Union Valley Dam. An electronic malfunction prevented capture of the resident adult male.
Jan. 9, 2003	Two adult bald eagles were observed feeding on a bait salmon at bow net trap site located on the tip of West Point peninsula (UTM 10723163E, 4305428N) immediately north of Union Valley Dam. One adult male bald eagle, thought to be the resident male, was captured using the radio-controlled bow net. However, this eagle was subsequently found to not be one of the resident pair and departed the study area the following day.
Jan. 24, 2003	Two adult bald eagles observed feeding on salmon chum placed at the tip of West Point peninsula (UTM 10723163E, 4305428N) immediately north of Union Valley Dam.
Jan.27, 2003	An adult bald eagle captured and consumed one smallmouth bass used as bait for a floating snare located approximately 100 meters due east of Union Valley Dam.
October 3, 2003	At 9:00 a.m., the resident adult male flew from a sugar pine perch in the Granlees Point nest stand to a chum site in Sunset Beach cove (UTM 1075984E, 4306708N). The eagle consumed one small rainbow trout.

Figure 4.1-2. Mike Smith and Brian Latta of the Santa Cruz Predatory Bird Research Group with captured bald eagle.

Figure 4.1-3. Captured bald eagle fitted with backpack radio transmitter.

Figure 4.1-4. Brian Latta and Ron Jackman of Santa Cruz Predatory Bird Research Group taking wing measurements of bald eagle.

Figure 4.1-5. Bald eagle just prior to release.

4.1.7 Recreation and Bald Eagle Response at Union Valley Reservoir

There are 11 developed public campgrounds surrounding Union Valley Reservoir that are managed by the ENF: West Point, Camino Cove, Wolf Creek, Yellowjacket, Wench Creek, Azalea Cove, Big Silver, Fashoda, Sunset, Lone Rock, and Jones Fork. One other campground, privately owned and operated by the SMUD Employees' Association (SMUDEA), is located near Robbs Peak Powerhouse. Public boat launching ramps are located near the West Point and Sunset campgrounds, but the Sunset Boat Launch is closed during winter months. A paved public bike/pedestrian path currently extends along the eastern side of Union Valley Reservoir from near Jones Fork Campground on the south to near Tells Creek on the north. This path runs directly through the nest stand on Granlees Point. The ENF has proposed an extension of this path around the entire perimeter of the reservoir and has directed an expansion of the Big Silver Group Campground and other new recreation facilities around the reservoir. Siting of the proposed extension of the bike/pedestrian path and any new recreation facilities should consider potential effects on bald eagles resulting from direct and indirect disturbance by recreationists, and diminished habitat suitability that may affect long-term viability of the Union Valley Reservoir nest territory.

Table 4.1.7-1 lists the number of public users observed at Union Valley Reservoir by eagle monitors during this study. More extensive information on recreational use of the UARP area is presented in the following technical reports prepared for the UARP relicensing: *Visitor Use and Impact Technical Report, Recreation Demand Technical Report, Recreation Supply Technical Report, and Recreation Carrying Capacity Technical Report*. In general, public use of the reservoir is greatest during the summer months when camping, fishing, water skiing, wake boarding, jet-skiing, mountain biking, and off-road vehicle use are all found around the reservoir. Winter recreation includes camping, cross-country skiing, snowshoeing, snowmobiling, and fishing. Fishing was the most common recreational activity observed on the reservoir during this study and occurred throughout the year.

Table 4.1.7-1. Public Use of Union Valley Reservoir during bald eagle surveys from November 2002 to November 2003.

Survey Date	Day	No. Water craft	Estimated No. users	Activity
Nov. 4, 2002	Monday	0	0	-
Nov. 5, 2002	Tuesday	0	0	-
Nov. 26, 2002	Tuesday	2	4	Fishing
Nov. 27, 2002	Wednesday	2	1	Fishing
Dec. 10, 2002	Tuesday	1	2	Fishing
Dec. 11, 2002	Wednesday	2	1	Fishing
Jan 7, 2003	Tuesday	1	2	Fishing
Jan. 8, 2003	Wednesday	1	2	Fishing
Jan 9, 2003	Thursday	0	0	Fishing
Jan 10, 2003	Friday	3	6	Fishing
Jan. 15, 2003	Wednesday	0	0	-
Jan 24, 2003	Friday	1	1	Fishing
Feb. 4, 2003	Tuesday	1	2	Fishing
Feb. 5, 2003	Wednesday	2	4	Fishing
Feb. 6, 2003	Thursday	0	0	-
Feb. 7, 2003	Friday	1	1	Fishing
Feb. 27, 2003	Thursday	unknown	unknown	Unknown
Feb. 28, 2003	Friday	unknown	unknown	Unknown
Mar. 6, 2003	Thursday	unknown	unknown	Unknown
Mar. 7, 2003	Friday	unknown	unknown	Unknown
Mar. 8, 2003	Saturday	unknown	unknown	Unknown
Mar. 21, 2003	Friday	4	4	Fishing
Mar. 22, 2003	Saturday	unknown	unknown	Unknown
Mar. 28, 2003	Friday	unknown	unknown	Unknown
Mar. 29, 2003	Saturday	unknown	unknown	Unknown
Mar. 30, 2003	Sunday	unknown	unknown	Unknown
Apr. 2, 2003	Wednesday	2	2	Fishing
Apr. 3, 2003	Thursday	unknown	unknown	Unknown
Apr. 9, 2003	Wednesday	1	1	Fishing
Apr. 10, 2003	Thursday	unknown	unknown	Unknown
Apr. 25, 2003	Friday	unknown	unknown	Unknown
Apr. 26, 2003	Saturday	unknown	unknown	Unknown
May 8, 2003	Thursday	unknown	unknown	Unknown

Table 4.1.7-1. Public Use of Union Valley Reservoir during bald eagle surveys from November 2002 to November 2003.

Survey Date	Day	No. Water craft	Estimated No. users	Activity
May 9, 2003	Friday	unknown	unknown	unknown
May 15, 2003	Thursday	3	4	fishing
May 16, 2003	Friday	5	8	fishing
May 22, 2003	Thursday	4	10	fishing
May 29, 2003	Thursday	unknown	unknown	unknown
May 30, 2003	Friday	unknown	unknown	unknown
Jun. 5, 2003	Thursday	unknown	unknown	unknown
Jun 6, 2003	Friday	unknown	unknown	unknown
Jun. 19, 2003	Thursday	6	20	fishing, skiing
Jun. 27, 2003	Friday	10	35	fishing, skiing, jet-skiing
Oct. 2, 2003	Thursday	2	5	Fishing
Oct. 3, 2003	Friday	4	12	Fishing
Oct. 7, 2003	Tuesday	2	5	Fishing
Oct. 8, 2003	Wednesday	1	3	Fishing
Oct. 9, 2003	Thursday	2	6	Fishing
Oct. 10, 2003	Friday	4	10	fishing, kayaking
Oct. 11, 2003	Saturday	6	16	fishing, jet-skiing, sailing
Oct. 12, 2003	Sunday	8	14	fishing, kayaking, sailing
Nov. 26, 2003	Wednesday	3	6	Fishing

Boaters and campers were often observed in proximity to perched eagles, but usually appeared oblivious to the presence of eagles. Knight (1984) suggested that bald eagles residing in areas of high boating activity could habituate to boating activity provided there is no intentional perturbation. The bald eagles at Union Valley Reservoir may have become similarly habituated but it is not clear at this time how boating activity during the breeding season may affect their foraging patterns and breeding behavior.

The greatest potential for disturbance of nesting bald eagles at Union Valley Reservoir comes from the proximity of the bike path and Sunset and Fashoda campgrounds to the Granlees Point nest stand. These recreation facilities receive a large influx of public users beginning in the spring, and the ENF establishes closures around the nest stand, including the portion of the public bike/pedestrian path through the nest stand, from January 1 to August 15, or until eaglets have fledged or the nest is abandoned (ENF 1999). In 1988, buoys were installed near the entrance to Fashoda Cove, adjacent to the nest stand, to restrict boater access during the critical nesting period (SMUD 2002).

4.2 Loon Lake Reservoir

4.2.1 Terrestrial Habitats Surrounding Loon Lake Reservoir

Terrestrial vegetation types surrounding Loon Lake Reservoir are discussed in detail in the *UARP Vegetation Mapping Technical Report* (DTA 2004a). In summary, vegetation surrounding Loon Lake Reservoir is predominantly Mixed Conifer – Fir Alliance within

extensive areas of barren granite (Figure 4.2-1). Characteristic species of the Mixed Conifer – Fir Alliance are presented in Section 4.1.1.

Figure 4.2-1. Loon Lake Reservoir.

4.2.2 Bald Eagle Nesting Activity at Loon Lake Reservoir

4.2.2.1 Nesting Activity in 2003

Prior to this study, breeding bald eagles had not been reported at Loon Lake Reservoir (ENF 1999), and little was known about their occupation and use of this reservoir. From May through October 2003, SCPBRG monitors made several observations of a pair of bald eagles using Loon Lake Reservoir (including the now contiguous "Pleasant Lake" area on the northeast arm of the reservoir). On May 16, 2003, monitors observed the pair in a dominant Jeffrey Pine (UTM 10 733235E, 4319432 N) supporting an eagle-sized stick nest on the south shore of Loon Lake Reservoir, approximately 400 meters west of a private campground owned by the Boy Scouts of America (Figure 4.2-2). The top of this Jeffrey pine was broken off, possibly due to wind or lightening, and the stick nest was at the top of the tree. The male was an adult and the female was classified as a near-adult (i.e., Basic IV, 4.5-year old; McCollough 1986) based on the slight

melanistic flecking on her head. The birds were seen perched on and near the nest structure on several surveys, but monitors determined that the nest was either inactive or unsuccessful as no incubation, brooding, or food deliveries were seen. Observations of this pair were also made on May 22, 23, 29, and 30, and on June 20, 2003. The pair was seen perching close together, vocalizing to each other, and apparently defending their territory against osprey, and sub-adult and juvenile bald eagles. Frequently used perch sites for this pair were located on the south and northeast ("Pleasant Lake") sectors of the reservoir (Appendix B).

Figure 4.2-2. Bald eagle nest on broken top Jeffrey Pine at Loon Lake Reservoir.

4.2.2.2 Nesting Activity in 2004

SCPBRG monitors continued to survey the Loon Lake Reservoir nesting territory for bald eagles in 2004. On March 10 and April 4, 2004, only one adult was located, but extreme winds and poor visibility hindered observations. On April 9, 2004, with the reservoir still extensively covered in ice and snow, a pair of adults was observed perched in the south shore nest tree that had been first recorded in 2003. Several hours of observation confirmed that the nest was active, and both adults were seen assuming incubation postures in the nest.

Subsequent surveys in late April and early May 2004, confirmed continued incubation by the pair. On May 14, 2004, two eaglets in secondary down plumage were observed peering over the edge of the nest. Observers estimated that hatching occurred in late April or early May 2004. Observers recorded prey deliveries to the nest by both adults on June 10-11, 2004, and both adults appeared to be attentive and committed to the nest.

On June 25, 2004, observers could not confirm the presence of the two eaglets in the nest. The adults were seen in the area, but did not perch in the nest tree or enter the nest. Therefore, the monitors approached the nest tree on foot and discovered one dead eaglet and one live eaglet at the base of the tree. At that time, ENF biologists Don Yasuda and Jennifer Ebert were contacted and they salvaged the remains of the dead eaglet. The live eaglet was in an open area below the nest tree, and after close observations of the adult's proximity and behavior, the ENF biologists and SCPBRG monitors made a collective decision to not intervene and to allow the adults to continue provisioning the eaglet on the ground.

On June 30, 2004, monitors returned to Loon Lake Reservoir and observed both adults delivering sticks to the south shore nest and apparently continuing to provision the grounded eaglet. On July 17, 2004, monitors were unable to locate the adults in or near the nest stand, but observed courtship-like flights over the northeast ("Pleasant Lake") arm of the reservoir. On July 19, 2004, unable to locate the adult pair, monitors returned on foot to the base of the south shore nest tree and found the remains of the second eaglet. The remains of the eaglet were collected and delivered to Don Yasuda, ENF biologist, for potential necropsy and/or burial. The cause of death of these eaglets was undetermined. It is probable that the first eaglet sustained lethal trauma after falling from the nest. Observations of the second eaglet on June 25, 2004, suggested that it was healthy and developing normally, providing no clues to the possible cause of death.

Table 4.2.2.2-1. Dates of key events in the 2004 nesting cycle of bald eagles at Loon Lake Reservoir.

Date (all in 2004)	Event
April 9	Confirmation that nest site first observed in 2003 was active. Both adults present and nest exchanges occur.
April 22	Incubation exchanges occur.
Late April – Early May	Hatching occurs.
May 14	Confirmation of hatching and brooding posture. Two eaglets in natal down observed.
June 10	Unidentified prey item delivered to nest.
June 11	6-8 inch salmonid delivered to nest.
June 25	Eaglets not observed in nest. An area search reveals one dead eaglet and one live eaglet at base of nest tree. Dead eaglet salvaged and taken to ENF. Adults provisioning live eaglet.
June 30	Adults still present in nest stand. Observations of stick deliveries and provisioning of live eaglet by parents.
July 17	Both adults observed flying over northeast arm of reservoir exhibiting undulating flights and courtship-like behavior. No obvious provisioning of live eaglet.
July 19	Confirmation of nest failure. Second eaglet found dead at base of nest tree (UTM 10 0733599E, 4319260N) and delivered to ENF.

4.2.3 Bald Eagle Numbers and Age Distribution at Loon Lake Reservoir

Tables 4.2.3-1 and 4.2.3-2 summarize the results of bald eagle surveys conducted at Loon Lake Reservoir during this study. Adult, sub-adult, and juvenile bald eagles were seen frequently during both boat and ground-based surveys. Eagles were sighted during seven of eight survey days in 2003 and during 20 of 23 survey days in 2004.

Adults were by far the most common age class of bald eagles observed at Loon Lake Reservoir (71.4% of all age classes), although no more than two adults were observed on the reservoir during a single survey day. Sub-adults comprised a large segment of the population (25%), relative to the number of sub-adults observed at Union Valley Reservoir (8.5%). However, as at Union Valley Reservoir, it is possible that sub-adult and juvenile age classes were under-represented in these counts due to the cryptic coloration and discreet perching behavior of immature bald eagles. Four ground surveys, February 4, 2003, and July 5, 18, and 19, 2004, yielded no eagle sightings.

Table 4.2.3-1. Bald eagle (BAEA) observations during 31 survey days at Loon Lake Reservoir from February 2003 to July 2004.

Survey Date	Survey Mode	No. BAEA Adults	No. BAEA Sub-adults	No. BAEA Juveniles	Total Bald Eagles
Feb. 4, 2003	Ground	0	0	0	0
May 16, 2003	Ground	1	1	1	3
May 22, 2003	Boat	0	1	0	1
May 23, 2003	Ground	1	2	0	3
May 30, 2003	Ground	1	3	0	4
Jun. 5, 2003	Boat	1	3	0	4
Jun. 20, 2003	Ground	1	1	0	2
Oct. 9, 2003	Ground	1	0	0	1
Mar. 10, 2004	Ground	1	1	0	2
Apr. 4, 2004	Ground	1	0	0	1
Apr. 9, 2004	Boat	2	0	0	2
Apr. 10, 2004	Ground	2	0	0	2
Apr. 22, 2004	Boat	2	0	0	2
Apr. 23, 2004	Ground	1	0	0	1
Apr. 24, 2004	Ground	1	0	0	1
Apr. 25, 2004	Ground	2	0	0	2
May 2, 2004	Ground	2	0	1	3
May 14, 2004	Ground	2	1	0	3
May 15, 2004	Ground	1	0	0	1
May 16, 2004	Ground	2	0	0	2
May 28, 2004	Boat	2	0	0	2
Jun. 10, 2004	Ground	2	0	0	2
Jun. 11, 2004	Ground	2	0	0	2
Jun. 13, 2004	Ground	2	0	0	2
Jun. 24, 2004	Ground	2	0	0	2
Jun. 25, 2004	Ground	1	0	0	1
Jun. 30, 2004	Ground	2	1	0	3
Jul. 5, 2004	Ground	0	0	0	0
Jul. 17, 2004	Ground	2	0	0	2
Jul. 18, 2004	Ground	0	0	0	0

Table 4.2.3-1. Bald eagle (BAEA) observations during 31 survey days at Loon Lake Reservoir from February 2003 to July 2004.					
Survey Date	**Survey Mode**	**No. BAEA Adults**	**No. BAEA Sub-adults**	**No. BAEA Juveniles**	**Total Bald Eagles**
Jul. 19, 2004	Ground	0	0	0	0
Totals: 31 Survey Days		**40 Adults**	**14 Sub-adults**	**2 Juveniles**	**56 Total BAEA**
Mean No. Per Survey		**1.3 Adults**	**0.5 Sub-adults**	**0.1 Juveniles**	**1.8 Total BAEA**

Table 4.2.3-2. Age class distribution of bald eagles observed during 28 of 31 total surveys at Loon Lake Reservoir from February 2003 to July 2004.							
Age Class	**Adult**	**Basic IV Plumage**	**Basic III Plumage**	**Basic II Plumage**	**Basic I Plumage**	**Unknown Sub-adult**	**Juvenile**
No. observed	40	5	2	3	4	0	2
% of Eagles Observed	71.4%	8.9%	3.6%	5.4%	7.1%	0%	3.6%

4.2.4 Bald Eagle Habitat Utilization and Home Range at Loon Lake Reservoir

Frequently used perch, roost and foraging locations used by the territorial pair of bald eagles at Loon Lake Reservoir during 2004 surveys are shown in Appendix B. As at Union Valley Reservoir, favored perches ranged from dominant trees and snags to saplings and shoreline boulders.

4.2.4.1 Home Range

Little is known about the extent of the nesting territory and home range of the bald eagles nesting at Loon Lake Reservoir. It is possible, based on the elevation and freezing of Loon Lake Reservoir, that the nesting pair are not year-round residents of the Crystal Basin, unlike the resident eagles at Union Valley Reservoir.

4.2.5 Bald Eagle Foraging Activity, Prey Base, and Prey Analysis at Loon Lake Reservoir

4.2.5.1 Foraging Activity

Observations of foraging activity were limited at Loon Lake Reservoir. On May 23, 2003, monitors observed an adult bald eagle, in a low foraging flight from east to west, strike deep water in the middle of the northeast arm ("Pleasant Lake") of the reservoir. The bird flew directly to a Jeffrey pine (UTM 10 733408E, 4321613N) approximately 15 meters up slope on the west shore of this arm and began to consume what appeared to be a small fish. Moments later, the bird was flushed by a nearby group of campers and apparently carried off the remainder of its prey. A visit to this perch yielded no prey remains. Table 4.2.5.1-1 summarizes bald eagle foraging and feeding activity observed by monitors at Loon Lake Reservoir.

Table 4.2.5.1-1. Summary of bald eagle foraging and feeding activity observed at Loon Lake Reservoir during April, May, and June 2004.	
Observation Date	**Activity**
April 9, 2004	At 1:50 p.m., the adult male captured and consumed one 6-8 inch salmonid at UTM coordinates 10S 0733965 E, 4319773 N.
May 16, 2004	At 7:54 a.m., monitors witnessed kleptoparasitism by an adult bald eagle against an osprey over the northeast arm ("Pleasant Lake") of Loon Lake Reservoir. The osprey dropped one small salmonid that the adult eagle then carried to the nest on the south shore.
May 28, 2004	Monitors observed an adult bald eagle capture a mountain quail and carry it to the south shore nest.
June 11, 2004	At 9:10 a.m., an adult bald eagle delivered one 6-8 inch salmonid to the eaglets at the nest on the south shore of the reservoir.

4.2.5.2 Prey Base

As discussed in Section 4.1.5.2, extensive research has shown that prey selection by bald eagles can vary by location, ranging from an exclusive diet of fish in some areas to an exclusive diet of birds, primarily waterfowl, in others (Jenkins 1992). Fisheries in the lakes and streams within the study area are addressed in detail in the UARP *Reservoir Fisheries Technical Report* (DTA and Stillwater Sciences 2004a) and UARP *Stream Fisheries Technical Report* (DTA and Stillwater Sciences 2004b). Fish species recorded in UARP reservoirs and streams both historically and during relicensing studies conducted in 2002 and 2003 are listed in Tables 4.1.5.2-1 and 4.1.5.2-2. These records identify eight species of fish known to occur at Loon Lake Reservoir. The CDFG actively stocks Loon Lake Reservoir with rainbow trout and brown trout (ENF 1999). Access to fish by foraging eagles during the winter may be limited, if not precluded by the seasonal drawdown and freezing of the water surface. However, reconnaissance performed on March 7, 2003, and March 10, 2004, revealed that the some open water exists, at least periodically, at the outflow of the Buck Island-Loon Lake Tunnel along the northeast shoreline of the reservoir. This open water may provide foraging eagles with access to fish. Alternatively, the territorial pair at Loon Lake Reservoir may also forage at lower elevations where fish, birds, and other prey are more readily available through the winter. Also, it is possible based on the elevation and freezing of Loon Lake Reservoir, that the nesting pair are not year-round residents of the Crystal Basin. Current information on the breeding and foraging ecology of this pair is limited at this time, precluding a complete and accurate characterization of their behavior and phenology.

As described in the in the UARP *Waterfowl Nesting Habitat Technical Report* (DTA 2004b), Loon Lake Reservoir supports a variety of waterfowl and other avian species that serve as potential prey for eagles. The most common species of waterfowl observed at this reservoir during the study were Canada goose, common merganser, mallard, and bufflehead (*Bucephala albeola*). Few waterfowl are present during late fall and winter as the reservoir is drawn down and the surface freezes. Waterfowl numbers gradually increase after spring thaw and peak in June and July. Monitors observed one event of a bald eagle taking a live bird, mountain quail, at Loon Lake Reservoir (Table 4.2.5.1-1). Other species of birds were detected in analysis of prey remains at the nest site as described in the following Section 4.2.5.3.

4.2.5.3 Prey Analysis

Prey remains were collected below the nest tree at Loon Lake Reservoir in September 2004, following the active 2004 breeding season (Table 4.2.5.3-1). As occurred at Union Valley Reservoir, the stick nest had fallen from the nest tree, precluding collection of fish scales from the fine nest lining, which had scattered upon impact with the ground. As a result, an accurate analysis of fish prey selection by species was not possible, and no other fish remains were found around the nest. Detectable prey remains consisted entirely of birds.

Table 4.2.5.3-1. Total number and estimated biomass (grams) of prey identified from remains collected in and below the Loon Lake Reservoir bald eagle nest on September 8, 2004.

Prey Species	No. Individuals	Percent of Total Prey Species	Biomass (g)	Percent of Total Biomass
Western grebe	1	14.3	1,329	28.5
Mallard	1	14.3	974	20.9
Unidentified waterbird	1	14.3	1,003	21.5
Western meadowlark	1	14.3	176	3.8
Common raven	1	14.3	1,079	23.1
Unidentified passerine	2	28.6	101	2.2
GRAND TOTAL	**7**	**100.0**	**4,662**	**100.0**

4.2.6 Recreation and Bald Eagle Response at Loon Lake Reservoir

Extensive information on recreational use and demand in the UARP area, including in the vicinity of Loon Lake Reservoir, is presented in the following technical reports prepared for the UARP relicensing: *Visitor Use and Impact Technical Report, Recreation Demand Technical Report, Recreation Supply Technical Report, and Recreation Carrying Capacity Technical Report*. In general, public use of the reservoir is greatest from late-spring through early fall when camping, fishing, hiking, mountain biking, and off-road vehicle use are all found around the reservoir. Winter recreation includes camping, cross-country skiing, and snowshoeing. Fishing was the most common recreational activity observed on the reservoir during this study and occurred throughout the year.

The area surrounding Loon Lake Reservoir supports numerous developed campgrounds, boat launches, equestrian trails, off-highway vehicle (OHV) trails, hiking trails, and day-use facilities. The Boy Scouts of America operate a campground with buildings and other facilities within one mile of the south shore bald eagle nest, and the Rubicon Hiking Trail, extending from the Loon Lake Wilderness Trailhead to Rubicon Reservoir, passes within 100 meters of the nest tree. This trail is open to hiking, horseback riding, and mountain biking throughout the recreation season. The ENF established an emergency closure of this trail during the 2004 bald eagle nesting season.

Few observations of eagle response to recreation activity are available from this study. The territorial pair generally avoided areas with high levels of human activity when foraging or perching. However, both the territorial pair and visiting eagles were observed perching and foraging near campgrounds and boaters on several occasions with no avoidance response.

4.3 Incidental Observations of Osprey Nesting Activity in the Study Area

Ospreys were observed commonly throughout the study area from early spring through late summer. The earliest observation was of an osprey flying over Big Hill south of Union Valley Reservoir on March 26, 2003. Seven active osprey nests that were presumed successful were recorded in the study area in 2002 and four active nests were recorded in 2003 (Appendix C). At Union Valley Reservoir, these active nests were located at the top of dominant snags, primarily along the south shore within the area burned by the Cleveland Fire in 1992, and in the Jones Fork arm. At Ice House Reservoir, all active nests were located on the southeast sector of the reservoir. An active osprey nest was also recorded in 2002 immediately adjacent to Ice House Road mid-way between Union Valley and Ice House reservoirs (Figure 4.3-1), but this nest was inactive in 2003. Several snags that had been used in 2002 fell during the winter of 2002/2003 and were unavailable to osprey during the 2003 breeding season. Nesting was suspected at Loon Lake Reservoir based on osprey foraging behavior but no nests were detected.

Figure 4.3-1. Osprey on nest along Ice House Road, 2002.

5.0 ANALYSIS

5.1 Reservoir Operations

5.1.1 Union Valley Reservoir

The operation of Union Valley Reservoir follows an annual cycle of reservoir fill and release that coincides with natural patterns of rain and snowmelt runoff in the Sierra Nevada (SMUD 2001). Typically, from mid-summer to mid-fall each year, the elevation of the reservoir is gradually lowered to generate electricity and provide adequate storage space to store winter/spring runoff and minimize the frequency and amount of spillage. Reservoir elevations then rise slowly during the spring and early summer, as rain and snowmelt runoff fill the reservoir.

The maximum surface elevation (top of spill gates) at Union Valley Reservoir is 4,870 feet. The 23-year averages for March, April, May, and June are 4,816, 4,828, 4,849, and 4,845 feet, respectively (Table 5.1.1-1). Detailed data on reservoir storage levels in acre-feet (ac-ft) for the Water Year October 2002 to September 2003 are available from the U.S. Geological Survey website at: http://water.usgs.gov/pubs/wdr/wdr-ca-03-4/WDR.CA.03.vol4.pdf. A graphic depiction of these monthly average surface water elevations relative to reservoir topography is provided in the *Waterfowl Nesting Habitat Technical Report*, Appendix A, Figure 3.2-1.

Table 5.1.1-1. Union Valley Reservoir average monthly water elevations (in feet), 1980-2003.

Year	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Max	Min
1980	4841	4845	4846	4844	4850	4855	4858	4852	4839	4825	4821	4808	4859	4801
1981	4794	4787	4790	4810	4827	4831	4819	4801	4776	4764	4781	4815	4839	4763
1982	4843	4845	4848	4849	4856	4859	4855	4845	4828	4824	4836	4838	4860	4820
1983	4840	4844	4844	4842	4839	4855	4859	4857	4856	4853	4850	4849	4859	4835
1984	4846	4839	4838	4836	4842	4855	4857	4850	4839	4828	4831	4840	4859	4826
1985	4840	4832	4829	4840	4852	4856	4850	4839	4824	4814	4820	4821	4856	4812
1986	4822	4837	4850	4852	4856	4857	4851	4841	4824	4815	4809	4798	4859	4792
1987	4790	4786	4786	4801	4811	4803	4784	4756	4724	4721	4750	4763	4812	4709
1988	4757	4748	4746	4750	4768	4778	4775	4770	4756	4740	4733	4733	4779	4728
1989	4724	4715	4761	4821	4847	4858	4855	4845	4832	4825	4833	4836	4859	4711
1990	4833	4832	4836	4847	4853	4857	4852	4841	4826	4813	4805	4791	4858	4783
1991	4776	4765	4770	4794	4819	4835	4833	4821	4809	4809	4804	4792	4838	4761
1992	4779	4776	4800	4818	4821	4814	4813	4808	4796	4783	4777	4771	4823	4768
1993	4773	4791	4809	4835	4850	4858	4857	4851	4838	4833	4825	4812	4858	4765
1994	4803	4801	4808	4821	4829	4828	4820	4814	4806	4798	4795	4799	4831	4793
1995	4814	4830	4843	4852	4856	4858	4859	4856	4848	4837	4823	4819	4859	4800
1996	4824	4841	4848	4851	4857	4858	4857	4852	4846	4837	4837	4845	4859	4821
1997	4848	4844	4843	4845	4856	4859	4855	4850	4841	4826	4820	4814	4859	4810
1998	4815	4829	4827	4837	4850	4857	4859	4850	4834	4822	4817	4818	4859	4807
1999	4822	4838	4840	4831	4842	4855	4855	4842	4825	4813	4813	4802	4858	4794
2000	4797	4824	4832	4847	4862	4866	4856	4845	4818	4809	4793	4764	4868	4747
2001	4731	4727	4741	4770	4796	4800	4793	4785	4781	4784	4789	4796	4801	4724
2002	4806	4811	4824	4846	4862	4867	4864	4853	4837	4823	4814	4818	4868	4801

Table 5.1.1-1. Union Valley Reservoir average monthly water elevations (in feet), 1980-2003.

Year	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Max	Min
2003	4823	4820	4828	4842	4858	4866	4861	4847	4842	4836	4830	4826	4867	4819
Max	4855	4851	4852	4856	4868	4868	4868	4859	4857	4857	4851	4851	4868	N/A
Min	4719	4711	4720	4746	4761	4775	4771	4738	4712	4709	4731	4728	N/A	4709
Average	4806	4809	4816	4828	4840	4845	4842	4832	4819	4810	4809	4807	N/A	N/A

5.1.2 Loon Lake Reservoir

As with Union Valley Reservoir, operation of Loon Lake Reservoir follows an annual cycle of reservoir filling and release that coincides with the natural patterns of rain and snowmelt runoff characteristic of the Sierra Nevada (SMUD 2001). Loon Lake Reservoir stores water captured from the Gerle Creek watershed upstream of the lake and water transported from Buck Island Reservoir via the Buck Island-Loon Lake Tunnel. The maximum gross storage capacity is 76,200 ac-ft at spillway elevation 6,410 feet, with a maximum usable storage capacity of 70,700 ac-ft. Water is released from storage into Gerle Creek to meet the minimum release requirement of eight cubic-feet/second (cfs). The remaining water stored in Loon Lake Reservoir is used for daily, weekly, monthly and seasonal regulation. The reservoir level generally reaches its peak during early summer months and then gradually lower throughout the summer as the water is passed through the underground Loon Lake Powerhouse. This gradual lowering of the reservoir continues into the fall and winter months, enabling SMUD to create adequate space for storage of rain and snowmelt runoff during the winter/spring months, thus minimizing potential for seasonal spillage. The water elevation slowly rises in Loon Lake Reservoir during the spring and early summer as the rain and snowmelt runoff refill the reservoir. Figure 5.2.1-1 shows the historical reservoir elevations by month for the water years 1976 through 1990 (SMUD 2001). Over this 23-year period, median high water elevation for June and July were near full pool, averaging 6,406 feet. Median low water elevation occurred in March, averaging 6,370 feet. This represents a typical seasonal change in water elevation of about 36 feet. Because SMUD manages the operating storage reservoir levels based, in part, on the projected runoff for the remainder of the water year, more significant seasonal fluctuation may occur in individual years. Detailed data on reservoir storage levels in acre-feet (ac-ft) for the Water Year October 2002 to September 2003 are available from the U.S. Geological Survey website at: http://water.usgs.gov/pubs/wdr/wdr-ca-03-4/WDR.CA.03.vol4.pdf.

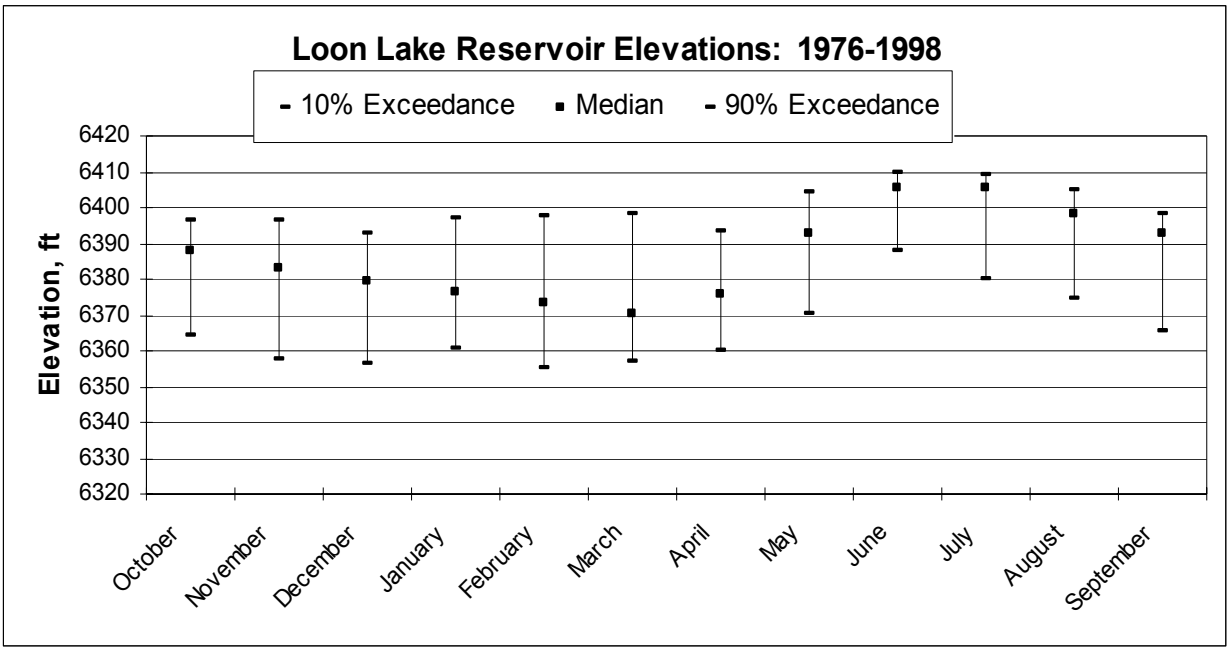

Figure 5.2.1-1. Loon Lake Reservoir Elevations (in feet) from 1976-1998.

5.2 Evaluation of Weather and Recreation Effects on Bald Eagle Nest Success and Foraging Behavior

Bald eagles commonly use reservoirs throughout California and the rest of the United States for nesting and foraging (Busch 1981, Brown 1996, Bryan et al. 1996, Hunt et al. 1992, Jenkins 1992). CDFG data from 1997 indicates that of 171 nesting bald eagles in California, 63 percent were located on reservoirs, 18 percent on natural lakes, 16 percent along rivers and streams, and 4 percent on the ocean (Personal Communication with R. Jurek, CDFG Non-game Bird and Mammal Program, on January 17, 2002). Reservoir operations associated with hydroelectric projects are generally compatible with eagle-nesting activity, provided extreme drawdowns do not occur (Hunt et al. 2002, Jackman et al. 2001).

5.2.1 Weather Influences on Bald Eagle Nest Success

Past nest failures at Union Valley Reservoir appear to be influenced by, and possibly a direct result of, late spring storms that bring unusual amounts of snow and rain during the incubation period. Appendix D provides a summary of monthly average temperatures, monthly total precipitation, and monthly total snowfall for December-July (i.e., typical bald eagle nesting season) during the 1986-2004 period of recorded nesting history for Union Valley Reservoir, as recorded at the Georgetown Ranger Station (UTM 10 691610E 4310766N). These weather data are not directly comparable due to differences in general location and elevation (3,004 feet at Georgetown Ranger Station versus 4,865 feet at Union Valley Reservoir). In addition, as monthly averages and totals, these data do not specifically reflect storms of shorter duration (e.g., several days) that could be severe enough to cause a nest to fail. However, these data do provide a general view of weather patterns for the region in a particular month and year for assessment of

potential relationships with bald eagle nesting success. In general, nest failures at Union Valley Reservoir may be associated with late spring storms with unseasonable freezing temperatures and precipitation alternating between rain and snow. More data is necessary, however, to draw any firm conclusions related to weather effects on bald eagle nesting success.

5.2.2 Recreation Influences on Bald Eagle Nest Success and Foraging Behavior

Union Valley and Loon Lake reservoirs receive relatively high levels of recreation, especially during the latter part of the bald eagle nesting season. Bald eagles are known to be sensitive to a variety of recreational and other human activities (Joslin and Youmans 1999). Disturbances to eagles may result in increased energy expenditures due to flushing response and avoidance flights, and decreased energy intake due to interference with feeding activity (McGarigal et al. 1991, Stalmaster 1983, Stalmaster and Kaiser 1998). Responses of eagles may vary from ephemeral, temporal, and spatial avoidance of an activity to total reproductive failure and abandonment of breeding areas. Less adequately documented is that bald eagles may tolerate apparently significant disturbances (Harmata and Oakleaf 1992). Relationships of human activity and eagle responses are highly complex, difficult to quantify, and often site-specific (Hamann et al. 1999). Responses vary depending on type, intensity, duration, timing, predictability, and location of human activity (Boyle and Samson 1985; Buehler et al. 1991; Grubb and King 1991; Joslin and Youmans 1999; Knight and Knight 1984; McGarigal et al. 1991; Schueck and Marzluff 1995; Stalmaster and Kaiser 1997, 1998). The ways in which these variables interact depends on the age, gender, physiological condition, sensitivity, residence, and mated status of affected eagles. Prey base, season, weather, geographic area, topography, and vegetation in the vicinity of activities and eagles (plus other variables probably not perceived by humans) also influence eagle responses. Cumulative effects of many seemingly insignificant or sequential activities may result in disruption of normal behavior (Montopoli and Anderson 1991).

McGarigal et al. (1991) studied the response of breeding bald eagles to human activities in foraging areas on the Columbia River estuary in Washington and Oregon. Their study found that only 20 percent of all observed human activities resulted in human-eagle encounters within 500 meters, and less than six percent of these encounters resulted in a visible disturbance to an eagle. However, eagles typically avoided areas within 400 meters of an experimental stationary boat, although avoidance areas ranged between 200-900 meters among eagle pairs. These results confirmed that boating activities have the potential to significantly affect eagle spatial use patterns. In contrast, Knight (1984) suggested that bald eagles residing in areas of high boating activity could habituate to boating activity provided there is no intentional perturbation. The bald eagles at Union Valley and Loon Lake reservoirs may have become similarly habituated but it is not clear at this time how boating activity during the breeding season may affect their foraging patterns and breeding behavior.

Stalmaster and Kaiser (1998) studied effects of recreation on wintering bald eagles in northwest Washington and found a negative correlation between the numbers of eagles in an area and the intensity, frequency, and duration of recreational activities. Based on flushing responses of eagles and flushing distances, they determined that foot traffic was most disturbing to eagles,

fishing boats were intermediate in effect, and eagle-viewing boats were least disturbing. However, boat traffic, especially motorboats, disturbed a greater portion of the eagle population in their study area than foot traffic. Boats operating in the early morning hours were most disruptive to eagle behavior. Eagles foraging on the ground were less tolerant of recreationists than eagles perching in trees. Eagles required nearly four hours to resume foraging after disturbances by foot traffic compared to 36 minutes after boat traffic. These results highlight the potential for significant disturbance to nesting eagles at Union Valley Reservoir due to pedestrian or bicycle traffic along the paved path that extends through the Granlees Point nest stand. Similarly, pedestrian, mountain biking, and equestrian traffic along the Rubicon Hiking Trail adjacent to the south shore nest at Loon Lake Reservoir is a significant concern during the eagle-nesting season.

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APPENDIX A

EAGLE OBSERVATION SITES
UNION VALLEY RESERVOIR

OP 1. Roadside OP,off Icehouse Rd. used for nest observation.
OP 2. Cedars OP, off Icehouse Rd. used for nest observation.
OP 3. Granlees OP, off Icehouse Rd. established by USFS.
1. BAEA 2004 nest site in dominant sugar pine. Last activity for this site reported by USFS in 2001 (Yasuda, 2002).
2. BAEA 2003 nest site in sub-dominant ponderosa pine.
3. BAEA perch in dominant sugar pine near UVR bike path. Foraging and nest sentry perch.
4. BAEA perch in dominant sugar pine near UVR bike path. Foraging and nest sentry perch.
5. BAEA perch in dominant sugar pine near UVR bike path. Foraging and nest sentry perch.
6. Incense cedar snag near Tell's powerhouse. Frequently used as a foraging perch.
7. Dominant ponderosa pine identified by USFS as BAEA perch tree (Yasuda, 2002).
8. Dominant sugar pine identified by USFS roost location (Yasuda, 2002).
9. Sub-dominant sugar pine adjacent ro bike trail identitied by USFS as BAEA perch tree (Yasuda. 2002).
10. Intermediate red fir used as foraging perch.
11. Intermediate red fir used as foraging perch.
12. Dominant incense cedar used as foraging perch.
13. Dominant red fir used as foraging perch.
14. Fish scales, blood, and BAEA mutes on boulder at current water line. BAEA was observed. Foraging along shoreline in cove just west of this location. After capture, prey was brought to this location and consumed.
15. Dominant sugar pine just east of tree with yellow rope swing. Frequently used as foraging perch.
16. Dominant sugar pine with "trident shaped" top. BAEA copulation site and frequent perch site.
17. Dominant sugar pine with forked top. Frequently used as BAEA foraging perch.
18. Dominant sugar pine frequently used as BAEA foraging perch.
19. Dominant ponderosa pine frequently used as BAEA foraging perch.
20. Pine snag frequently used as BAEA foraging perch.
21. Dominant pine snag frwquently used as BAEA foraging perch.
22. Dominant red fir frequently used as BAEA foraging perch.
23. Large, barkless snag of unknown species. Frequently used as a foraging perch.
24. Snag of unknown species. Osprey nest site and bald eagle foraging perch.
25. Tree stump at shoreline used as foraging perch.
26. Intermediate sugar pine used as foraging perch.
27. Dominant sugar pine identified by USFS. Possible night roost location.
28. Sub-dominant jeffery pine used as BAEA perch tree.
29. SCBRG Chum site used in Feb. 2003
30. Dominant ponderosa pine used as copulation site.
31. Small pile of Salmonid scales collected on boulder perch.
32. Northern flicker plumage and wing sections collected from under jeffery pine perch.
33. Small pile of Salmonid scales collected on stump perch.
34. Mountain quail plumage collected on stump perch.
35. Mountain quail plumage collected beneath white fir perch
36. Mountain quail plumage collected on stump perch.
37. Mountain quail plumage collected on stump perch.
38. Large, barkless snag used as a foraging perch.
39. Ponderosa pine with osprey nest. Often used as bald eagle foraging perch.
40. Mountain quail plumage collected beneath white fire perch.
41. Mountain quail plumage collected beneath white fire perch.
42. Mountain quail plumage collected on stump perch.
43. BAEA foraging location.
44. Intermediate sugar pine used as feeding perch. Mutes and prey feathers recovered.
45. Bald eagle capture site.

Union Valley Reservoir
Junction Reservoir
Camino Cove Campground
Wolf Creek Campground
Yellowjacket Campground
Wench Creek Campground
Azalea Cove Campground
Big Silver Campground
Granlees Point
West Point
West Point Campground
Fashoda Campground
Fashoda Sunset Peninsula
Sunset Campground
Lone Rock Campground
Jones Fork Campground
Wolf Creek
Yellow Jacket Creek
Tells Creek
Cheese
Silver
Little Silver
Jones Fork Silver
South Fork Horse Creek
Jones
Driscoll

Prepared by VESTRA Resources, Inc., Redding. CA. Aug. 05, 2004

Upper American River Project

SMUD

Appendix A
Bald Eagle Data Points at Union Valley Reservoir

- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Campground
- Boat Launch
- Bike Path

PNT_TYPE_1

- Chum
- Copulation
- Foraging
- Nesting
- Observation
- Perch
- Perch and Nest
- Roosting

N

SCALE 1:32,000

0 0.25 0.5 0.75 1 Miles

APPENDIX B

EAGLE OBSERVATION SITES
LOON LAKE RESERVOIR

LOP1. Spillway area point used for nest site observation.
LOP2. Powerhouse parking area point used for nest site observation.
52. BAEA perch site in dominant jeffery pine.
53. BAEA perch site in dominant lodgepole pine.
54. BAEA perch site in dominant pine snag.
55. BAEA perch site in dominant jeffery pine.
56. BAEA perch site in dominant jeffery pine.
57. BAEA perch site in sub-dominant red fir stand. Possibly used as a foraging perch.
58. BAEA perch site in dominant lodgepole pine.
59. BAEA foraging perch in dominant jeffery pine.
60. BAEA foraging perch in dominant fir with dead top.
61. BAEA foraging perch in dominant fir with dead top.
62. BAEA foraging perch in dominant fir with dying top.
63. BAEA foraging perch in dominant snag.
64. BAEA foraging perch in intermediate jeffery pine.
65. BAEA prey capture location, one 6"-8" Salmonid.
66. BAEA prey capture location, one 6"-8" Salmonid, pirated from osprey.
67. BAEA foraging perch in dominant snag.
68. Mountain quail plumage collected beneath white fir perch.

Bugle Lake
Creek
Wentworth Springs Campground
Creek
Pleasant Campground
Spider Lake
Little Rubicon River
Rubicon River
Hidden Lake
Lake Winifred
Buck Island Reservoir
Rockbound
Red Fir Group Campground
North Shore Campground
Loon Lake Reservoir
Francis Lake
Loon Lake Campground
South Fork Rubicon River

Upper American River Project

SMUD

Appendix B
Bald Eagle Data Points at Loon Lake Reservoir

- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Campground
- Boat Launch

PNT_TYPE_1

- Chum
- Copulation
- Foraging
- Nesting
- Observation
- Perch
- Perch and Nest
- Roosting

N

SCALE 1:28,000

0 0.2 0.4 0.6 0.8 Miles

Prepared by VESTRA Resources, Inc., Redding. CA. Aug. 05, 2004

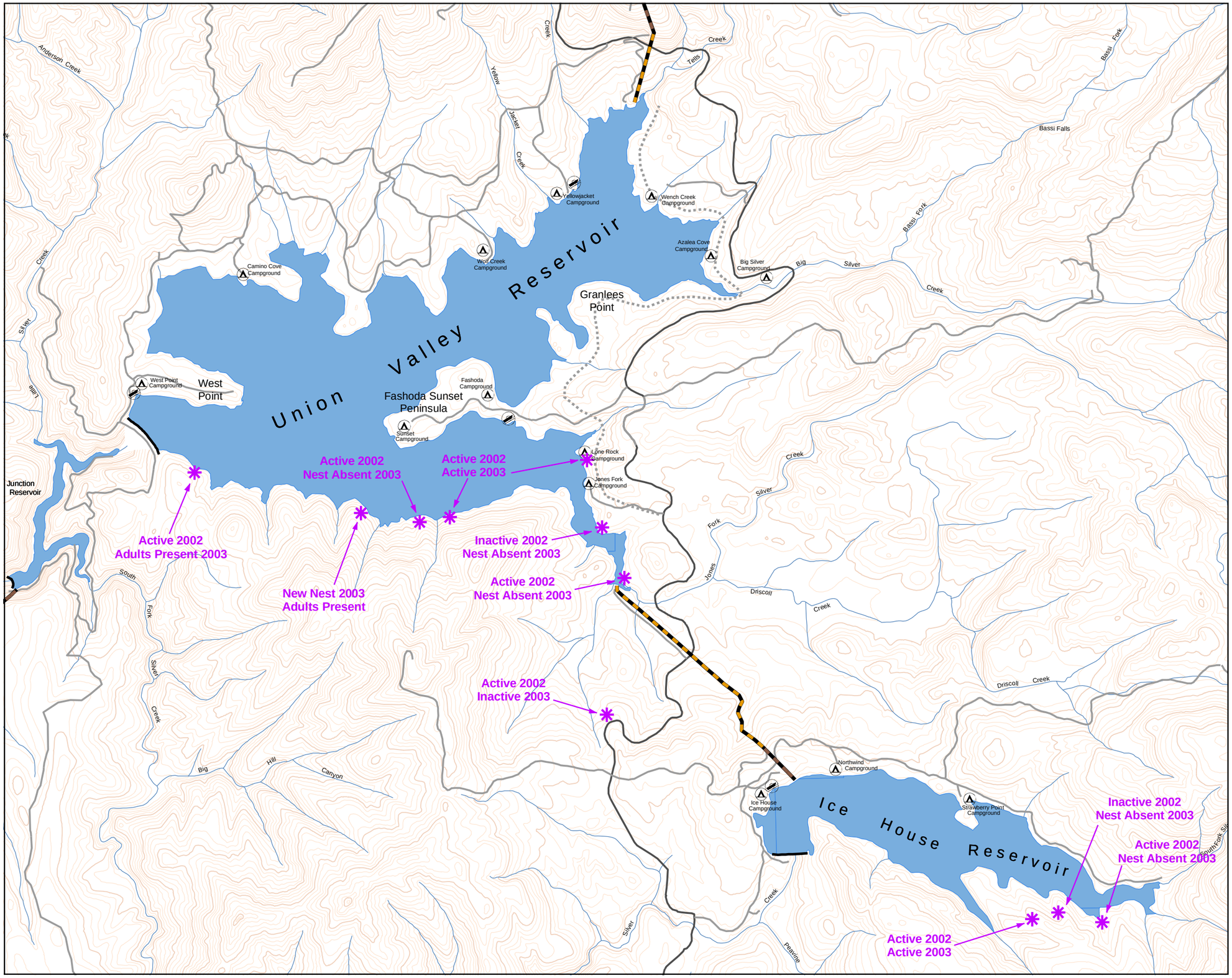
APPENDIC C

UARP OSPREY NEST OBSERVATIONS FOR 2002 AND 2003

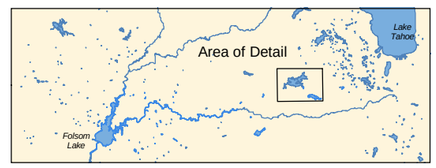
Upper American River Project

SMUD

Appendix C
Osprey Nest Locations at Union Valley and Ice House Reservoirs in 2002 and 2003



- Observation Waypoint
- Campground
- Boat Launch
- Bike Path
- Adit
- Canal
- Channel
- Penstock
- Tunnel



N

SCALE 1:40,000

0 0.3 0.6 0.9 1.2 Miles

Prepared by VESTRA Resources, Inc., Redding. CA. Mar. 19, 2004

APPENDIX D

MONTHLY WEATHER DATA APPLICABLE TO BALD EAGLE NESTING SEASON, 1986-2004

Table D-1. Monthly Average Temperature (Degrees Farhrenheit), January-June, 1985-2004.

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
1985-1986	46.69	47.86	46.47	52.93	50.80	59.32	70.08	72.11
1986-1987	45.92	40.50	45.03	47.11	60.07	63.02	71.52	70.05
1987-1988	38.74	43.97	50.72	51.55	53.67	56.97	66.83	80.16
1988-1989	43.47	44.08	41.59	47.95	58.40	59.15	69.38	75.66
1989-1990	49.02	42.76	40.75	50.00	56.95	56.41	65.40	75.11
1990-1991	43.25	45.43	53.55	39.41	49.88	-	64.87	76.16
1991-1992	45.69	46.38	47.06	49.80	57.60	67.92	67.88	72.82
1992-1993	39.75	40.39	42.36	51.31	51.87	58.65	66.05	73.60
1993-1994	43.95	46.25	43.47	51.92	55.50	59.39	69.70	78.90
1994-1995	42.16	41.50	52.32	46.88	50.93	55.21	64.50	73.66
1995-1996	47.62	42.10	47.17	48.97	54.25	59.06	70.17	79.37
1996-1997	44.22	43.80	46.75	55.40	54.84	66.21	67.65	75.71
1997-1998	45.16	42.72	40.84	50.20	50.52	51.33	63.50	76.29
1998-1999	43.82	46.37	41.95	45.65	51.61	60.82	67.92	74.26
1999-2000	45.07	43.03	44.68	48.19	52.94	57.65	73.29	71.08
2000-2001	48.30	43.22	42.91	54.30	49.76	69.12	67.00	71.24
2001-2002	40.24	44.02	50.79	48.04	49.37	59.11	71.18	77.35
2002-2003	38.65	45.02	40.66	46.33	44.98	61.12	71.63	-
2003-2004	42.28	42.55	42.87	55.81	55.58	60.74	70.80	77.16

Source: Western Regional Climate Center. http://www,wrcc@dri.edu
Station: Georgetown Ranger Station, Eldorado National Forest, California.

Table D-2. Monthly Total Precipitation (Inches), January-June, 1985-2004.

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
1985-1986	6.15	9.55	29.36	12.36	1.81	1.68	0.00	0.00
1986-1987	1.52	5.92	6.61	9.02	0.99	0.40	0.10	0.00
1987-1988	10.89	7.18	0.88	1.93	4.97	1.71	0.78	0.00
1988-1989	6.73	2.42	3.13	8.94	2.24	0.53	0.64	0.00
1989-1990	0.00	8.90	5.70	4.00	2.37	3.70	0.00	0.12
1990-1991	2.29	1.06	3.48	21.96	2.36	0.00	2.28	0.00
1991-1992	4.94	3.02	12.79	4.84	2.02	0.00	1.48	0.06
1992-1993	13.62	15.81	12.30	7.98	3.45	2.80	2.36	0.00
1993-1994	6.35	3.62	4.04	0.68	0.00	2.43	0.28	0.00
1994-1995	7.17	20.29	1.80	20.62	7.27	6.00	2.81	0.02
1995-1996	10.16	14.96	9.80	6.79	5.83	5.05	0.17	0.06
1996-1997	28.60	25.81	0.70	1.40	2.29	0.51	1.45	0.07
1997-1998	5.15	19.06	18.85	7.32	7.69	7.88	1.23	0.01
1998-1999	4.11	13.16	14.74	5.58	0.63	0.00	0.00	0.00
1999-2000	1.31	15.14	21.25	3.34	1.74	4.96	0.93	0.00
2000-2001	2.62	4.28	8.26	2.81	4.94	0.00	0.12	0.00
2001-2002	14.48	5.63	4.85	9.70	2.11	2.90	0.00	0.00
2002-2003	12.56	2.51	3.56	3.19	10.60	2.63	0.00	0.00
2003-2004	14.11	5.15	10.91	2.05	1.06	0.29	0.00	0.00

Source: Western Regional Climate Center. http://www,wrcc@dri.edu
Station: Georgetown Ranger Station, Eldorado National Forest, California.

Table D-3. Monthly Total Snowfall (Inches), January-June, 1985-2004.

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
1985-1986	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1986-1987	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1987-1988	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988-1989	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989-1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990-1991	**2.50**	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991-1992	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992-1993	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993-1994	0.00	0.00	**3.90**	**0.20**	0.00	0.00	0.00	0.00
1994-1995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1995-1996	0.00	**0.20**	0.00	0.00	0.00	0.00	0.00	0.00
1996-1997	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1997-1998	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1998-1999	0.50	0.00	0.00	0.00	**2.10**	0.00	0.00	0.00
1999-2000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000-2001	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2001-2002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2002-2003	**6.90**	0.00	0.00	0.00	**10.80**	0.00	0.00	0.00
2003-2004	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Western Regional Climate Center. http://www,wrcc@dri.edu
Station: Georgetown Ranger Station, Eldorado National Forest, California.

APPENDIX E

UTM COORDINATES

Appendix E. UTM Coordinates for Significant Locations Recorded During the UARP Bald Eagle Study.		
Point Name	UTM	Description
OP1	10 727268 E 4305702 N	"Roadside" OP, off Icehouse Rd. used for nest observation.
OP2	10 727223 E 4305694 N	"Cedars" OP, off Icehouse Rd. used for nest observation.
OP3	10 727224 E 4305683 N	"Granlees" OP, off Icehouse Rd. established by ENF.
UVR1	10 726965 E 4306309 N	BAEA nest site in dominant sugar pine. Last activity for this site reported by ENF in 2001. Not used in 2002.
UVR2	10 727146 E 4306022 N	Current BAEA nest site in sub-dominant ponderosa pine.
UVR3	10 726851 E 4306405 N	BAEA perch in dominant sugar pine near UVR bike path. May serve as foraging and nest sentry perch.
UVR4	10 726964 E 4306441 N	BAEA perch in dominant sugar pine near UVR bike path. May serve as foraging and nest sentry perch.
UVR5	10 727031 E 4306457 N	BAEA perch in dominant sugar pine near UVR bike path. May serve as foraging and nest sentry perch.
UVR6	10 727511 E 4308635 N	Incense cedar snag near Tell's powerhouse. Frequently used as a foraging perch.
UVR7	10 726857 E 4306421 N	Dominant ponderosa pine identified by ENF as BAEA perch tree (Yasuda 2002).
UVR8	10 726855 E 4306396 N	Dominant sugar pine identified by ENF roost location (Yasuda 2002).
UVR9	10727084 E 4306171 N	Sub-dominant sugar pine adjacent to bike trail identified by ENF as BAEA perch tree (Yasuda 2002).
UVR10	10 722660 E 4305358 N	Intermediate red fir used as foraging perch.
UVR11	10 723007 E 4305360 N	Intermediate red fir used as foraging perch.
UVR12	10 723170 E 4305522 N	Dominant incense cedar used as foraging perch.
UVR13	10 723114 E 4305597 N	Dominant red fir used as foraging perch.
UVR14	10 724502 E 4306084 N	Fish scales, blood, and BAEA droppings on boulder at current water line. BAEA was observed foraging along shoreline in cove just west of this location. After capture, prey was brought to this location and consumed.
UVR15	10 725262 E 4305711 N	Dominant sugar pine just east of tree with yellow rope swing. Frequently used as foraging perch.
UVR16	10 725212 E 4305426 N	Dominant sugar pine with "trident shaped" top. BAEA copulation site and frequent perch site.
UVR17	10 724799 E 4305267 N	Dominant sugar pine with "bayonet shaped" top. Frequently used as BAEA foraging perch.
UVR18	10 724902 E 4304926 N	Dominant sugar pine frequently used as BAEA foraging perch.
UVR19	10 724927 E 4304946 N	Dominant ponderosa pine frequently used as BAEA foraging perch.
UVR20	10 725212 E 4304425 N	Pine snag frequently used as BAEA foraging perch.
UVR21	10 723675 E 4304471 N	Dominant pine snag frequently used as BAEA foraging perch.
(cont') UVR22	10 722331 E 4304847 N	Dominant red fir frequently used as BAEA foraging perch.
UVR23	10 724484 E 4304244 N	Large, barkless snag of unknown species. Frequently used as a foraging perch.

Appendix E. UTM Coordinates for Significant Locations Recorded During the UARP Bald Eagle Study.		
UVR24	10 724287 E 4304498 N	Snag of unknown species. Osprey nest site and bald eagle foraging perch.
UVR25	10 723634 E 4304543 N	Tree stump at shoreline used as foraging perch.
UVR26	10 724287 E 4304326 N	Intermediate sugar pine used as foraging perch.
UVR27	10 726994 E 4306432 N	Dominant sugar pine identified by USFS. Possible night roost location.
UVR28	10 727038 E 4306465 N	Sub-dominant Jeffrey pine used as BAEA perch tree.
UVR29	10 725984 E 4306708 N	Chum site used in Feb. 2003
UVR30	10 726800 E 4306407 N	Dominant ponderosa pine used as copulation site.
UVR31	10 724502 E 4306084N	Small pile of salmonid scales collected on boulder perch.
UVR32	10 726859 E 4306689 N	Northern flicker feathers and wing sections collected from under Jeffrey pine perch.
UVR33	10 724927 E 4304946 N	Small pile of salmonid scales collected on stump perch.
UVR34	10 725061 E 4304177 N	Mountain quail feathers collected on stump perch.
UVR34	10 724404E 4304425 N	Mountain quail feathers collected beneath white fir perch.
UVR35	10 725061 E 4304319 N	Mountain quail feathers collected beneath white fir perch.
UVR36	10 724623 E 4304155 N	Mountain quail feathers collected on stump perch.
UVR37	10 724565 E 4304170 N	Mountain quail feathers collected on stump perch.
UVR38	10724484 E 4304244 N	Large, barkless snag used as a foraging perch.
UVR39	10723522 E 4304498 N	Ponderosa pine with osprey nest. Often used as bald eagle foraging perch.
UVR40	10 724863 E 4304456 N	Mountain quail feathers collected beneath white fir perch.
UVR41	10 724637 E 4304227 N	Mountain quail feathers collected beneath white fir perch.
UVR42	10 724511 E 4304243 N	Mountain quail feathers collected on stump perch.
UVR43	10 727821 E 4307165 N	BAEA foraging location.
UVR44	10 724216 E 4306316 N	Intermediate sugar pine used as feeding perch. Whitewash, and prey feathers recovered.