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June 17, 2008
File No. 01030A

RE: Middle Fork American River Project Relicensing / Final 2007 Technical Study Reports
TERR 1 – Vegetation Communities and Wildlife Habitat
TERR 6 – Special-Status Bats

Dear Terrestrial Resources Technical Working Group Member –

On January 31, 2008, Draft TERR 1 – Vegetation Communities and Wildlife Habitat Technical Study Report (TSR) – 2007 was distributed to the Terrestrial Technical Working Group (TWG) for review and comment by March 31, 2008. On March 5, 2008, Draft TERR 6 – Special-status Bats TSR was distributed to the TWG for review and comment by May 5, 2008. No comments were received on either draft TSR; therefore, PCWA deems TERR 1 and TERR 6 Technical Study Reports approved.

Attached for your use is the CD containing the final study reports.

If you have any questions, please don't hesitate to call me at (530) 823-4889.

Sincerely,
PLACER COUNTY WATER AGENCY

Mal Toy
Director of Resource Development

MT:bb

Enclosures:
Final 2007 TERR 1 – Vegetation Communities and Wildlife Habitat
Final 2007 TERR 6 – Special-Status Bats

Placer County Water Agency
Middle Fork American River Project
(FERC No. 2079)

FINAL

TERR 6 - SPECIAL-STATUS BATS TECHNICAL STUDY REPORT - 2007

Placer County Water Agency
P.O. Box 6570
Auburn, CA 95604

June 2008

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1.0 INTRODUCTION

This report describes surveys conducted by the Placer County Water Agency (PCWA) in accordance with the TERR 6 - Special-Status Bats Technical Study Plan (TERR 6 - TSP) for the Middle Fork American River Project (MFP or Project), which was included in Supporting Document (SD) H of the Pre-Application Document (PAD) (PCWA 2007). Specifically, this report provides a detailed description of the methods and results of special-status bats studies completed in 2007. A draft report was distributed to the Terrestrial Technical Working Group (TWG) on March 5, 2008 for a 60 day comment period. The comment period ended on May 5, 2008. No comments were received.

2.0 STUDY OBJECTIVES

The objectives of the special-status bat studies described in the TERR 6 - TSP are:

- Document special-status bats and roosts at existing Project facilities, features, and recreation features
- Document special-status bats and roosts at potential Project betterments

Figure 1 shows the TERR 6 - TSP study objectives and the study elements associated with each objective. It also shows where information developed is documented.

3.0 STUDY IMPLEMENTATION

All study elements described in the TERR 6 - TSP were completed in 2007. A summary of study elements that have been completed is provided below.

3.1 STUDY ELEMENTS COMPLETED

- Developed a preliminary map of known occurrences of special-status bats in the MFP area based on agency and stakeholder consultation and literature review.
- Conducted an assessment of Project facilities, features, recreation facilities, and potential Project betterments, in consultation with the Terrestrial Technical Working Group (TWG), to identify locations supporting or potentially supporting special-status bat roosts.
- Selected reproductive and seasonal habitat use survey locations and site-specific methods in consultation with the Terrestrial TWG, including representatives from the U.S. Department of Agriculture - Forest Service (USDA-FS) and California Department of Fish and Game (CDFG).
- Conducted reproductive surveys at Terrestrial TWG selected sampling sites using one or more of the following methods: visual roost, handheld acoustic, and/or infrared video.

- Conducted seasonal habitat use surveys at Terrestrial TWG selected sampling sites using one or more of the following methods: long-term acoustic, 5-night acoustic, and/or mist netting.
- Documented special-status bat occurrences, roosts, and seasonal habitat use in the study area based on the results of reproductive and seasonal habitat use survey results.

3.1.1 Deviations from the TERR 6 - TSP

There were no deviations from the TERR 6 - Special-Status Bat Technical Study Plan.

3.2 OUTSTANDING STUDY ELEMENTS

There are no outstanding elements to be completed.

3.2.1 Proposed modifications to the TERR 6 - TSP

There are no proposed modifications to the TERR 6 - TSP.

4.0 EXTENT OF STUDY AREA

The study area for the documentation of special-status bats and roosts includes:

- Project facilities and features and recreation facilities.
- One hundred feet around potential Project betterments, including new facilities, roads, trails, staging and disposal sites; and new inundation areas.

5.0 STUDY APPROACH

This section describes the study approach used to document special-status bats and roosts in the study area.

5.1 DEVELOP PRELIMINARY INFORMATION AND MAPS OF KNOWN OCCURRENCES

Preliminary maps of known occurrences of special-status bats were developed in 2006 based on data obtained from the USDA-FS, the California Natural Diversity Database (CDFG 2006), and a Master's thesis on bats of the Tahoe National Forest (TNF) (Clevenger 2005). Life history information on special-status bats potentially occurring in the study area was based on a variety of sources cited in this document as appropriate.

5.2 CONDUCT FACILITY ASSESSMENTS

Assessment surveys were conducted at Project facilities and features, recreation facilities, and at proposed Project betterments to identify facilities potentially supporting special-status bat roosts and, where appropriate and/or possible, to characterize the type and extent of bat use.

The following types of bat roosts were considered during the assessment:

- **Maternity roosts:** Sites that provide protection from the elements and predators and provide the correct thermal environment for reproduction. Maternity roosts tend to be warmer in temperature because breeding females need to maintain a high metabolism to aid in lactation. Juvenile bats need to keep warm to maintain a metabolic rate that allows for rapid growth.
- **Day roosts:** Areas where bats are able to spend the non-active period of the day resting or in torpor, depending on weather conditions. Day roosts provide shelter from the elements and safety from predators.
- **Night roosts:** Areas used by bats to rest between foraging bouts, to allow for digestions of prey, to escape from predators, as shelter from weather, and possibly for social purposes. Night roosts are typically sites or structures that retain heat to aid the bats in maintaining the higher metabolism necessary for digestion.

Facility assessment surveys were conducted in June 2007 by two qualified bat biologists and PCWA staff who are knowledgeable about historic bat use of PCWA facilities. The exterior and/or interior of facility structures were visually inspected to assess the suitability of a structure for bat use. Criteria used to assess suitability include presence of appropriate crevice or cave-like features and appropriate thermodynamic conditions. In addition, the facilities were examined to determine the accessibility of the structure to bats (e.g., presence of small cracks or openings for bats to enter the interior of the structure). The suitability of support facilities including stream gages and weirs, communication lines and powerlines, photovoltaic poles, microwave reflectors and radio towers, fences, and some recreation facilities (e.g., flush and toilets and prefabricated toilets) were assessed based on inspections of a representative structure for each support facility type and consultation with PCWA staff.

All facilities potentially supporting bat use were photographed and examined for signs of bat use, including presence of bats and/or bat skeletons, guano deposition (droppings), urine staining, or prey remains (e.g., insect parts). If bat roosts were observed, then the time of day was noted, number of individuals was estimated, and the bats using the roost were identified to species, if possible. If bat sign was present, the type, amount, and age of sign were noted. The size of guano droppings were also noted to aid in the identification of bat species.

Site assessment data were entered into a database for analysis. Tables were developed identifying which facilities are suitable and/or accessible to bats, and bat use was categorized (where applicable) according to the type of activity (day, night, or maternity roost) and level of activity (minor, moderate, or extensive).

5.3 SELECT SURVEY LOCATIONS AND METHODS

Following completion of the facility assessment, the Terrestrial TWG (including agency representatives from TNF, Eldorado National Forest (ENF), and CDFG) participated in a

conference call on August 13, 2007 to review the assessment results and select locations to conduct focused reproductive or seasonal habitat use surveys. As part of this process, the Terrestrial TWG further clarified the scope of the TERR 6 - TSP. Specifically, the Terrestrial TWG recommended that reproductive surveys be conducted August and September at Project facilities, features, and recreation facilities where bat roosts and/or bat sign were identified during the facilities assessment. The Terrestrial TWG also recommended that reproductive surveys be conducted at facilities and features that were determined to be suitable for bat use, but for which the presence of bat roosts or bat sign could not be adequately evaluated during the facility assessment. In addition, the Terrestrial TWG recommended that seasonal habitat use surveys be spatially distributed across the elevation range of the study area at Project reservoirs and diversion pools as well as areas associated with proposed Project betterments. These seasonal habitat use surveys would be focused in potential flight paths near potential foraging habitat or commuting corridors (e.g., riparian corridors), and would be conducted August through October, the peak activity in which young of the year are volant (i.e., able to fly).

The results of the facility assessment were also reviewed by the Terrestrial TWG to select site-specific methods to be implemented at each sampling location. These site-specific methods included one or more of the following:

Reproductive Surveys

- Additional Visual Roost Surveys
- Handheld Acoustic Sampling
- Infrared Video Sampling

Seasonal Habitat Use Surveys

- Mist Netting Sampling
- Stationary Acoustic Sampling
  - Five-night Acoustic Sampling
  - Long-term Acoustic Sampling

During the August 13, 2007 conference call, the Terrestrial TWG approved a table of reproductive and seasonal habitat use survey locations, as well as recommendations for site-specific survey methods to be implemented at each location, pending approval by Terrestrial TWG members not able to participate in the conference call. Terrestrial TWG members that were not able to participate in the conference call were contacted individually, via telephone, to review and discuss the proposed survey table. Table 1 was approved by the Terrestrial TWG on August 17, 2007.

5.4 CONDUCT REPRODUCTIVE SURVEYS

The primary purpose of reproductive surveys was to determine the location of any special-status bat maternity roosts present at Project facilities and features. In addition, the surveys also identified day and night roosts. As stated in Section 5.3, reproductive surveys were conducted August and September at Project facilities, features, and recreation facilities where bat roosts and/or bat sign were identified during the facilities assessment and at facilities and features that were determined to be suitable for bat use but for which the presence of bat roosts or bat sign could not be adequately evaluated during the facility assessment.

Five special-status bat species could potentially breed in the study area: western red bat (*Lasiurus blossevillii* , FSS), Townsend's big-eared bat (*Corynorhinus townsendii*, FSS, CSC), pallid bat (*Antrozous pallidus*, FSS, CSC), spotted bat (*Euderma maculatum*, CSC), and western mastiff bat (*Eumops perotis californicus*, CSC). However, only Townsend's big-eared bat and pallid bat are likely to roost in man-made structures. Western red bat roosts in the foliage of trees and shrubs, and spotted bat and western mastiff bat are primarily cliff-dwelling species.

Three site-specific sampling methods were implemented to identify and characterize bat roosts at Project facilities and features: visual roost surveys, acoustic sampling, and infrared video sampling. Visual roost surveys were conducted to assess bat presence or bat sign at Project facilities and features identified as potentially suitable for bats during the facility assessment, but where further sampling was necessary to determine species presence and use. Handheld acoustic sampling and/or infrared video sampling were implemented, as necessary, to obtain more information on bat species present at locations where roosts were identified during site assessment and/or visual roost surveys. Details on the implementation of each method are provided below.

Visual Roost Surveys

Visual roost surveys were concentrated in August and September 2007 at facilities that were identified as potentially supporting bat species during facility assessment surveys, but surveyors were unable to determine if bat species were present either because access to the interior of a facility was limited or because facilities were only accessible by boat or by repelling. One or two surveys were conducted at each location. Surveys were conducted by two qualified biologists.

Facilities were photographed and examined for signs of bat use including presence of bats, bat skeletons, guano (droppings) deposition, urine staining, or prey remains (e.g., insect parts). If bat roosts were present, then the time of day was noted, number of individuals was estimated and the bats were identified to species. If bat sign was present, the type, amount, and age of sign were noted. For guano, size of droppings was also noted, as this may help to identify bat species.

Data were entered into a database for analysis, and tables were developed categorizing bat use at each visual roost survey location according to the type of activity (day, night, or maternity roosting) and level of activity (minor, moderate, or extensive).

Handheld Acoustic Sampling

Handheld acoustic bat detectors were used at facilities where bat roosts were identified through site assessment and/or visual roost surveys and where follow-up sampling was necessary to identify bats to species. Handheld acoustic sampling was concentrated in August through September 2007. Surveys were conducted by two qualified biologists, and consisted of a single visit to each location. Surveys began after sunset and were conducted for as long as required to identify bat echolocation calls to species.

An Anabat II detector (Titley Electronics) was attached to a high-frequency microphone and to an Anabat Compact Flash Zero-Crossings Interface Module (Titley Electronics) recording device and a handheld computer using Anapocket software v. 2.4. Active monitoring of echolocation activity was used to confirm species identification during emergence or at roosts where appropriate.

Identifying bat species with acoustic sampling is dependent on the reliability of detecting a bat in the field and of identifying a bat by its echolocation call parameters once detected. Detectability depends on call intensity, call frequency, and distance from the detector. In general, species with low frequency, high intensity calls are detected at the greatest distance, and, therefore, are more frequently represented in acoustic sampling surveys (Pierson et al. 2001). Identifying bat species by echolocation calls involves analyzing several call parameters such as characteristic frequency, call shape, call pattern, call duration, and interpulse time interval. Some species have more distinct echolocation signatures and therefore are more readily identifiable using acoustic data.

Table 2 provides a summary of reliability of acoustic detection and identification of bat species potentially occurring in the study area. Three special-status bats species potentially occurring in the study area—pallid bat, Townsend's big-eared bat, and western red bat—are reliably identifiable to species using time-frequency output graphs in Analook software. Townsend's big-eared bat, however, emits low-intensity calls that can be difficult to detect. Both western mastiff bat and spotted bat emit low-frequency (<15 kHz) echolocation calls that are not reliably detected by standard Anabat hi-frequency microphones, but which are detectable to the human ear.

Infrared Video Sampling

Infrared video sampling was an alternate method used at facilities where bat roosts were identified through site assessment and/or visual roost surveys and where follow-up sampling was necessary to identify bats to species. Infrared video sampling was implemented August through September 2007 by two qualified biologists, and consisted of a single visit to each location.

An infrared closed circuit video camera (Nuvico ® Day/Night) attached to a mini digital video recorder (DVR) (SecuMate®) was set up in the interior of a facility near a roost site to record bat activity from sunset to sunrise. When the infrared sensor was triggered by bat motion, video footage was taken by the camera and stored on the DVR for later review and analysis. Visual resolution of the recordings was adequate to determine the presence of special-status species. However, visual resolution was not adequate to distinguish among *Myotis* bat species.

5.5 CONDUCT SEASONAL HABITAT USE SURVEYS

Seasonal habitat use surveys were conducted to obtain information on special-status bat use of habitats spatially distributed across the elevation range of the study area at Project reservoirs and diversion pools as well as areas associated with proposed

Project betterments. These seasonal habitat use surveys were focused in potential flight paths near potential foraging habitat or commuting corridors (e.g., riparian corridors), and were conducted during August through October, the peak activity period in which young of the year are volant (i.e., able to fly).

Two sampling methods were implemented during the special-status bat seasonal habitat use surveys: stationary acoustic sampling and mist net sampling. Details on the implementation of each method are provided below.

Stationary Acoustic Sampling

Stationary acoustic bat detectors were used to obtain information on the spatial and temporal distribution of bats in the study area, as well as relative activity of each species. Stationary acoustic sampling using passive Anabat detectors was conducted August through October 2007. Equipment was run continuously for three months at four long-term sampling sites and for three five-day sessions at five additional "five-day" sampling sites. Some variation in sampling duration occurred from site to site, dependent on weather conditions and on equipment reliability.

At each sampling location, an Anabat II detector (Titley Electronics) was attached to a high-frequency microphone and to an Anabat Compact Flash Zero-Crossings Interface Module (Titley Electronics) recording device. Equipment was housed in a waterproof shroud with a 45° reflector mounted on a 1-meter pole. Anabat acoustic recordings were used to assess relative levels of bat echolocation activity. Bat activity is measured as the number of "bat passes" recorded. A bat pass is defined as a single bat call sequence of one or more echolocation pulses. Recordings at the long-term sampling sites were downloaded every two weeks. Recordings at the five-day sampling sites were downloaded at the end of each five-day period.

Echolocation activity was analyzed using Analook W software (v3.3g) to identify bat passes to species or phonic group and to quantify relative levels of bat activity by site and season. For the long-term sampling sites, data are presented as graphs showing: 1) the total number of bat passes per night; and 2) special-status bat passes per night recorded at each site over time. For the five-day sampling sites, data are presented as bar graphs showing the mean number of bat passes per night for common species and for special-status species each of the three five-day periods (August, September, and October). In addition, tables are provided showing the mean number of bat passes per night for each individual species. Data are provided as means to account for differences in the actual length of each "five-day" period (i.e., some five-day periods were shorter or longer than five days dependent on weather conditions and equipment functioning).

Mist Net Sampling

Mist net sampling was implemented to obtain information on the bat species present in the study area, as well as to obtain data on the sex and reproductive status of the individuals captured.

Fine mesh, low visibility mist nets were set up to maximize potential bat captures along potential foraging habitat or commuting corridors (such as riparian corridors, diversion pools, or roads). Mist nests were set up perpendicular to the estimated direction of bat movement. Nets were approximately 2.6 meters high and either 6- or 12-meters wide.

Each mist net was monitored continuously for one evening at each location from sunset until 1 a.m. or, during inclement weather, after 2 hours of no captures. Captured bats were removed and identified to species. Their sex, age (juvenile or adult), and reproductive status were determined, and their forearm measurements were recorded. Juvenile status was determined by lack of epiphyseal (i.e., bone joint) closure (Anthony 1988). Reproductive status for females was determined by abdominal palpation and mammary condition, and females are classified as pregnant, lactating, post-lactating, parous (i.e., given birth, but not currently reproductively active), or nulliparous (i.e., never given birth). Males are considered reproductively active if the testes were scrotal (Racey 1988). Bats were released on-site. Echolocation calls were also recorded at the time of release to facilitate the identification of bat species that are difficult to identify solely from morphological characteristics.

5.6 Document Special-Status Bat Occurrences and Seasonal Habitat Use in the Study Area

Final maps showing bat occurrences in the study area were developed based on the results of reproductive and seasonal use surveys. The GPS location of each sampling location was plotted on a map of the study area. Symbols showing each bat species detected were also plotted.

6.0 RESULTS

6.1 Key Finding

Based on the results of the TERR 6 studies, between 9 and 15 bat species were detected in the study area (Table 3). A range of species detected is provided because there is uncertainty in detecting some common bat species. Three special-status bat species were detected including pallid bat, Townsend's bat, and western red bat. Special-status bat species activity was detected only during long-term and five-night acoustic sampling conducted as part of seasonal use surveys. Special-status bat species were documented based on echolocation calls near French Meadows Dam and Outlet Works, Middle Fork Interbay Dam, Ralston Afterbay Dam, Duncan Creek Diversion Dam, North Fork Long Canyon Creek Diversion Dam, South Fork Long Canyon Creek Diversion Dam, the upper end of Hell Hole Reservoir, and French

Meadows Powerhouse Penstock and Butterfly Valve House. The majority of the activity at these facilities was concentrated in the month of August.

Special-status species were *not* observed during facility assessment surveys or during reproductive surveys. All roosts identified at Project facilities, features, and recreation facilities were roosts of common bat species (i.e., *Myotis* species). Refer to Table 4 for a summary of bat roosts identified during the facility site assessment and reproductive surveys. Therefore, while pallid bat, Townsend's bat, and western bat were confirmed to be present in the study area, they are not using Project facilities, features, or recreation facilities as roosting habitat.

Provided below is a description of the results of each of the study elements included in the TERR 6 - TSP.

6.2 DEVELOP PRELIMINARY INFORMATION AND MAPS OF KNOWN OCCURRENCES

As stated previously, five special-status bat species may potentially occur in the study area: western red bat, Townsend's big-eared bat, pallid bat, spotted bat, and western mastiff bat. Refer to Appendix A for life histories of each of these species. Preliminary maps of known occurrences of special-status bat species are available in SD F, Section 7.0 Botanical and Wildlife Reources of the PAD (PCWA 2007).

6.3 CONDUCT FACILITY ASSESSMENTS

Assessment surveys were conducted at Project facilities and features and Project recreation facilities on June 21-23, 2007. Refer to Tables 5 and 6 for a summary of the results, and to Appendix B for photographs taken during the site assessments.

No special-status species bats, roosts or bat sign were detected at any of the Project facilities, features, or recreation facilities.

Bat roosts and/or bat sign of common bat species were identified at the following Project facilities and features:

- Ralston Afterbay Dam
- French Meadows - Hell Hole Tunnel Gatehouse
- Hell Hole-Middle Fork Tunnel Gatehouse
- Ralston Powerhouse Penstock and Butterfly Valve House
- French Meadows Powerhouse and Switchyard
- Ralston Powerhouse and Switchyard
- Oxbow Powerhouse and Switchyard
- Operator Cottages and Shop
- Ralston Afterbay Generator Building

The following Project facilities or features were determined to be suitable for bat use, but could not be adequately evaluated during the facility assessment and required additional surveys to determine the presence of bat roosts or bat sign:

- Dormitory Facility
- Ralston Afterbay Dam
- Duncan Creek - Middle Fork Tunnel and Portal
- Hell Hole Dam and Outlet Works

Project recreation facilities support three types of structures representing potential roosting habitat for bats: pit restrooms, flush restrooms, and pre-fabricated restrooms. It was determined that flush and pre-fabricated restrooms were not suitable for use by roosting bat species because these facilities do not have shingle roofs or other crevices that represent potential roosting habitat for bats. Pit restrooms all had shingle roofs that were suitable for use by roosting bat species. No bats or bat sign were observed in any restroom facility.

6.4 CONDUCT REPRODUCTIVE SURVEYS

Reproductive surveys were conducted at the following Project facilities, features, or proposed betterments:

- Hell Hole Dam and Outlet Works
- Ralston Afterbay Dam
- Duncan Creek - Middle Fork Tunnel and Portal
- French Meadows - Hell Hole Tunnel Gatehouse
- Hell Hole-Middle Fork Tunnel Gatehouse
- Ralston Powerhouse Penstock and Butterfly Valve House
- French Meadows Powerhouse and Switchyard
- Ralston Powerhouse and Switchyard
- Oxbow Powerhouse and Switchyard
- Operator Cottages and Shop
- Dormitory Facility
- Ralston Afterbay Generator Building

The surveys were conducted June through October, but were concentrated in August and September as recommended by the Terrestrial TWG. Visual roost surveys, handheld acoustic sampling, and infrared video sampling were conducted as recommended by the TWG with minor modifications as described in Table 7. No special-status species were observed during reproductive surveys. Refer to Table 4 for a summary of the location of roosts confirmed and/or identified during reproductive surveys, and the common bat species associated with each roost. Survey locations and site-specific methods are shown in Map 1a.

Provided below is a summary of results for each survey or sampling method implemented.

Visual Roost Surveys

Visual roost surveys were conducted at the following Project facilities and features:

- Hell Hole Dam and Outlet Works
- Ralston Afterbay Dam
- Duncan Creek - Middle Fork Tunnel and Portal
- Ralston Powerhouse Penstock and Butterfly Valve House
- French Meadows Powerhouse and Switchyard
- Operator Cottages and Shop

A summary of visual roost survey results is provided in Table 8. Roosts of *Myotis* species bats were identified at Ralston Afterbay Dam, Ralston Powerhouse Penstock and Butterfly Valve House, French Meadows Powerhouse and Switchyard, and the Operator Cottages and Shop. No roosts were observed at Hell Hole Dam and Outlet Works or at Duncan Creek - Middle Fork Tunnel and Portal.

Handheld Acoustic Sampling

Handheld acoustic sampling was conducted at the following Project facilities and features:

- Hell Hole Dam and Outlet Works
- Oxbow Powerhouse and Switchyard
- Ralston Powerhouse and Switchyard
- Dormitory Facility

A summary of handheld acoustic sampling results is provided as Table 9. Echolocation calls detected near roosts at Oxbow Powerhouse and Switchyard and Ralston Powerhouse and Switchyard were 50 KHz *Myotis* species calls, indicating that the roosts are occupied by common bat species including Yuma *myotis* and/or California *myotis* bats. Common bat species echolocations were detected at Hell Hole Dam and Outlet Works and at the Dormitory Facility. However, no roosts were observed at these two locations.

Infrared Video Sampling

Infrared video sampling was conducted at the following Project facilities and features:

- French Meadows - Hell Hole Tunnel Gatehouse
- Hell Hole-Middle Fork Tunnel Gatehouse
- Ralston Powerhouse and Switchyard
- Oxbow Powerhouse and Switchyard
- Ralston Afterbay Generator Building

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A summary of infrared video sampling results is provided as Table 10. Review of the video recordings for each site indicated that all roosts sampled were occupied by *Myotis* bat species.

6.5 CONDUCT SEASONAL HABITAT USE SURVEYS

Seasonal habitat use surveys were conducted at nine locations from August through October 2007 using stationary acoustic and mist nest sampling. Three special-status bat species, including pallid bat, Townsends' big-eared bat, and western red bat were detected during the surveys. Common species detected include hoary bat, western pipistrelle, big brown bat, silver-haired bat, Mexican free-tailed bat, and at least four *Myotis* bat species (some echolocation calls are not distinguishable to species, as described in Section 5.4). Sampling was conducted as recommended by the TWG with minor modifications that are described in Table 7. Provided below is a summary of results for each survey or sampling method implemented. Seasonal habitat survey locations and site-specific methods are shown in Map 1b.

Long-Term Acoustic Sampling

Long-term acoustic sampling was conducted at the following Project facilities and features:

- French Meadows Dam and Outlet Works
- Ralston Afterbay Dam
- French Meadows Powerhouse Penstock and Butterly Valve House
- Hell Hole Reservoir - Upper End

Table 11 provides a summary of the bat species detected at each sampling location. Figure 2 shows relative bat activity over time at each sampling location for: 1) all bat species combined (calculated as the total number of bat passes per night); and 2) special-status bat species (calculated as bat passes per species per night). Bat activity data were not obtained for some dates during the long-term acoustic sampling because of equipment failure and/or inclement weather. Heavy rain can interfere with the microphone causing it not to record echolocation calls (e.g., microphone become saturated with water).

Between nine and 15 bat species were detected during the long-term acoustic sampling. There is uncertainty in detecting some common bat species. Refer to Section 5.4 for more information on sampling reliability for these species. Three special-status bat species were detected including pallid bat, Townsend's big-eared bat, and western red bat. Map 2 provides the location special-status species were detected during acoustic sampling.

Generally, special-status bat species activity comprised a relatively small portion of the total bat species activity. Special-status bat activity levels were similar at all sampling locations and were concentrated in mid-to-late August.

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Five-Night Acoustic Sampling

Five-night acoustic sampling was conducted at the following Project facilities and features:

- Middle Fork Interbay Dam
- Duncan Creek Diversion Dam
- North Fork Long Canyon Creek Diversion Dam
- South Fork Long Canyon Creek Diversion Dam
- French Meadows - Hell Hole Tunnel Surge Shaft and Tank and Access Road

Figure 3 provides a bar graph showing: 1) relative bat activity for common bats (calculated as the mean of bat passes for all common bat species per night); and 2) relative special-status bat species activity (calculated as mean bat passes for all special-status species per night) for each sampling location. Appendix C shows relative bat activity (calculated as mean bat passes per individual species per night) for all bat species.

Between eight and 14 bat species were detected during the five-night acoustic sampling. As stated above, there is uncertainty in detecting some common-status bat species. Three special-status bat species were detected including pallid bat, Townsend's big-eared bat, and western red bat. Map 2 shows the location of special-status species that were detected during acoustic sampling.

Results for the five-night sampling showed patterns similar to the long-term acoustic sampling. Relative total bat activity and special-status bat activity were highest in mid-to-late August, and special-status bats activity comprised a relatively small portion of the total bat species activity. Special-status bat species were detected at all sampling locations listed above except for French Meadows - Hell Hole Tunnel Surge Shaft and Tank and Access Road.

Mist Net Sampling

Mist net sampling was conducted at the following locations:

- French Meadows Dam and Outlet Works
- Middle Fork Interbay Dam
- North Fork Long Canyon Creek Diversion Dam
- South Fork Long Canyon Creek Diversion Dam
- French Meadows - Hell Hole Tunnel Surge Shaft and Tank and Access Road
- Ralston Afterbay Picnic Area

Table 12 provides results of mist net sampling conducted August through October 2007 at six sampling locations. No special-status bat species were captured during the mist nest sampling. Common bat species captured include silver-haired bat, hoary bat, Yuma *myotis*, and California *myotis*. There were no bat captures at two of the six

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locations: French Meadows - Hell Hole Tunnel Surge Shaft and Tank and Access Road, and North Fork Long Canyon Diversion Dam.

Twenty-six individual bats were captured including four juveniles. Of the 22 adult bats, 11 were non-reproductive adult males (i.e., testes were not scrotal). The 11 adult female bats included one lactating, six post-lactating, and four nulliparous (i.e., have never given birth) females.

6.6 DOCUMENT SPECIAL-STATUS BAT OCCURRENCES AND SEASONAL HABITAT USE IN THE STUDY AREA

Refer to Map 2 for final maps showing the locations of special-status bat detections from surveys completed in 2007 in accordance with the TERR 6 - TSP, as well as locations of special-status bat detections obtained from the literature review and agency consultation as described in Section 5.1 and 6.1 of this report.

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TABLES

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TERR 6 Table 1. Reproductive and Seasonal Use Survey Locations and Site-Specific Methods.

(Approved by the Technical Working Group August 17, 2007)

Project Facility or Feature	Terrestrial TWG Approved Method
Reproductive Surveys	
Dams, Reservoirs, and Diversion Pools	
Large Dams	
Hell Hole Dam and Outlet Works	Handheld acoustic and/or infrared video sampling
Medium Dams	
Ralston Afterbay Dam	Visual roost survey
Water Conveyance Systems	
Tunnels and Portals	
Duncan Creek - Middle Fork Tunnel and Portal	Visual roost survey
Intakes and Gatehouses	
French Meadows - Hell Hole Tunnel Gatehouse	Handheld acoustic and/or infrared video sampling
Hell Hole-Middle Fork Tunnel Gatehouse	Handheld acoustic and/or infrared video sampling
Penstocks and Valve Houses	
Ralston Powerhouse Penstock and Butterfly Valve House	Handheld acoustic and/or infrared video sampling
Powerhouses, Switchyards, and Substations	
French Meadows Powerhouse and Switchyard	Handheld acoustic and/or infrared video sampling
Ralston Powerhouse and Switchyard	Handheld acoustic and/or infrared video sampling
Oxbow Powerhouse and Switchyard	Handheld acoustic and/or infrared video sampling
Ancillary Facilities	
Operator Cottages and Shop	Handheld acoustic and/or infrared video sampling
Dormitory Facility	Handheld acoustic and/or infrared video sampling
Ralston Afterbay Generator Building	Handheld acoustic and/or infrared video sampling

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TERR 6 Table 1. Reproductive and Seasonal Use Survey Locations and Site-Specific Methods (continued).

(Approved by the Technical Working Group August 17, 2007)

Project Facility or Feature	Terrestrial TWG Approved Method
Reproductive Surveys	
Seasonal Habitat Use Surveys	
Dams, Reservoirs, and Diversion Pools	
Large Dams	
French Meadows Dam and Outlet Works	Long-term acoustic and mist net sampling
Medium Dams	
Middle Fork Interbay Dam	Five-night acoustic and mist net sampling
Ralston Afterbay Dam	Five-night acoustic and mist net sampling
Small Dams	
Duncan Creek Diversion Dam	Five-night acoustic and mist net sampling
North Fork Long Canyon Diversion Dam	Five-night acoustic and mist net sampling
South Fork Long Canyon Diversion Dam	Five-night acoustic and mist net sampling
Large Reservoirs	
Hell Hole Reservoir-Upper End	Long-term acoustic sampling
Water Conveyance Systems	
Penstocks and Valve Houses	
French Meadows Powerhouse and Penstock and Butterfly Valve House	Long-term acoustic and mist netting
Project Roads and Access Points	
French Meadows Area	
French Meadows-Hell Hole Tunnel Surge Shaft and Tank and Access Road	Five-night acoustic and mist net sampling

[1]No minor modifications to Terrestrial Technical Working Group approved methods were implemented.

TERR 6 Table 2. Acoustic Detection and Identification Reliability for Bat Species.

Bat Species	Reliability of Call Detection	Reliability of Call Identification
Special-Status Bat Species		
Western red bat *Lasiurus blossevillii*	Readily detected	Easily identified
Townsend's big-eared bat *Corynorhinus townsendii*	Difficult to detect. Low-intensity calls.	Easily identified
Pallid bat *Antrozous pallidus*	Readily detected	Easily identified
Spotted bat *Euderma maculatum*	Difficult to detect. Low-frequency calls.	Easily identified
Western mastiff bat *Eumops perotis*	Difficult to detect. Low-frequency calls.	Easily identified
Common Bat Species		
Hoary bat *Lasiurus cinereus*	Readily detected	Easily identified
Silver-haired bat *Lasionycteris noctivagens*	Readily detected	Not easily identified. Some calls similar to big brown bat and Mexican free-tailed bat. Part of Q25 acoustic group.
Big brown bat *Eptesicus fuscus*	Readily detected	Not easily identified. Some calls similar to silver-haired bat and Mexican free-tailed bat. Part of Q25 acoustic group.
Western pipistrelle *Pipistrellus hesperus*	Readily detected	Easily identified
California myotis *Myotis californicus*	Readily detected	Not easily identified. Similar to Yuma myotis. Part of M50 acoustic group.
Western small-footed myotis *Myotis ciliolabrum*	Readily detected	Not easily identified. Similar to long-legged myotis and little brown bat. Part of M40 acoustic group.
Long-eared myotis *Myotis evotis*	Readily detected	Easily identified
Fringed myotis *Myotis thysanodes*	Readily detected	Easily identified
Long-legged myotis *Myotis volans*	Readily detected	Not easily identified. Similar to western small-footed myotis and little brown bat. Part of M40 acoustic group.
Yuma myotis *Myotis yumanensis*	Readily detected	Not easily identified. Similar to California myotis. Part of M50 acoustic group
Mexican free-tailed bat *Tadarida brasiliensis*	Readily detected	Not easily identified. Some calls similar to silver-haired bat and big brown bat. Part of Q25 acoustic group.

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TERR 6 Table 3. Special-Status and Common Bat Species Detected in the Study Area.

Common Name	Scientific Name	Status[1]	Location Detected	Type of Detection				
				Roost			Acoustic Detection(s)	Individual Capture(s)
				Maternal	Night	Day		
Special-Status Bat Species								
Western red bat	*Lasiurus blossevillii*	FSS	French Meadows Dam and Outlet Works				X	
			Middle Fork Interbay Dam				X	
			Ralston Afterbay Dam				X	
			North Fork Long Canyon Diversion Dam				X	
			South Fork Long Canyon Diversion Dam				X	
			French Meadows Powerhouse and Penstock and Butterfly Valve House				X	
			Hell Hole Reservoir - Upper End				X	
Townsend's big-eared bat	*Corynorhinus townsendii*	FSS CSC	French Meadows Dam and Outlet Works				X	
			Ralston Afterbay Dam				X	
			North Fork Long Canyon Diversion Dam				X	
			Hell Hole Reservoir - Upper End				X	
			French Meadows Powerhouse and Penstock and Butterfly Valve House				X	
Pallid bat	*Antrozous pallidus*	FSS CSC	French Meadows Dam and Outlet Works					X
			Middle Fork Interbay Dam				X	
			Ralston Afterbay Dam				X	
			Duncan Creek Diversion Dam				X	
			North Fork Long Canyon Diversion Dam				X	
			French Meadows Powerhouse and Penstock and Butterfly Valve House				X	
Spotted bat	*Euderma maculatum*	CSC	None					
Western mastiff bat	*Eumops perotis californicus*	CSC	None					
Common Bat Species								
Hoary bat	*Lasiurus cinereus*	—	French Meadows Dam and Outlet Works				X	
			Hell Hole Dam and Outlet Works				X	
			Middle Fork Interbay Dam				X	
			Ralston Afterbay Dam				X	
			North Fork Long Canyon Diversion Dam				X	
			South Fork Long Canyon Diversion Dam					X
			Hell Hole Reservoir - Upper End				X	
			French Meadows Powerhouse and Penstock and Butterfly Valve House				X	
			French Meadows - Hell Hole Tunnel Surge Shaft and Tank and Access Road				X	
Silver-haired bat	*Lasionycteris noctivagans*	—	French Meadows Dam and Outlet Works				X	X
			Middle Fork Interbay Dam				X	
			Ralston Afterbay Dam				X	
			Duncan Creek Diversion Dam				X	
			North Fork Long Canyon Diversion Dam				X	
			South Fork Long Canyon Diversion Dam				X	X
			Hell Hole Reservoir - Upper End				X	
			French Meadows Powerhouse and Penstock and Butterfly Valve House				X	
			French Meadows - Hell Hole Tunnel Surge Shaft and Tank and Access Road				X	
Big brown bat	*Eptesicus fuscus*	—	French Meadows Dam and Outlet Works				X	
			Middle Fork Interbay Dam				X	
			Ralston Afterbay Dam				X	
			Duncan Creek Diversion Dam				X	
			North Fork Long Canyon Diversion Dam				X	
			South Fork Long Canyon Diversion Dam				X	
			Hell Hole Reservoir - Upper End				X	
			French Meadows Powerhouse and Penstock and Butterfly Valve House				X	
			French Meadows - Hell Hole Tunnel Surge Shaft and Tank and Access Road				X	
Western pipistrelle	*Pipistrellus hesperus*	—	French Meadows Dam and Outlet Works				X	
			Middle Fork Interbay Dam				X	
			Ralston Afterbay Dam				X	
			Duncan Creek Diversion Dam				X	
			North Fork Long Canyon Diversion Dam				X	
			Hell Hole Reservoir - Upper End				X	
			French Meadows Powerhouse and Penstock and Butterfly Valve House				X	
California myotis	*Myotis californicus*	—	Middle Fork Interbay Dam					X
			South Fork Long Canyon Diversion Dam					X
Long-eared myotis	*Myotis evotis*	—	French Meadows Dam and Outlet Works				X	
			Middle Fork Interbay Dam				X	
			Ralston Afterbay Dam				X	
			Duncan Creek Diversion Dam				X	
			North Fork Long Canyon Diversion Dam				X	
			South Fork Long Canyon Diversion Dam				X	
			Hell Hole Reservoir - Upper End				X	
			French Meadows - Hell Hole Tunnel Surge Shaft and Tank and Access Road				X	

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TERR 6 Table 3. Special-Status and Common Bat Species Detected in the Study Area (continued).

Common Name	Scientific Name	Status[1]	Location Detected	Type of Detection				
				Roost			Acoustic Detection(s)	Individual Capture(s)
				Maternal	Night	Day		
Common Bat Species (continued)								
Fringed myotis	*Myotis thysanodes*	—	French Meadows Dam and Outlet Works				X	
			Middle Fork Interbay Dam				X	
			Ralston Afterbay Dam				X	
			Duncan Creek Diversion Dam				X	
			South Fork Long Canyon Diversion Dam				X	
			Hell Hole Reservoir - Upper End				X	
			French Meadows Powerhouse and Penstock and Butterfly Valve House				X	
Yuma myotis	*Myotis yumanensis*	—	French Meadows Dam and Outlet Works					X
			Middle Fork Interbay Dam					X
			Ralston Afterbay Dam	X		X		X
			South Fork Long Canyon Diversion Dam					X
			Ralston Powerhouse Penstock and Butterfly Valve House		X			
			French Meadows Powerhouse and Switchyard		X			
			Ralston Powerhouse and Switchyard	X		X		
			Operator Shop and Cottages	X				
			French Meadows - Hell Hole Tunnel Surge Shaft and Tank and Access Road					X
Myotis spp.	—	—	French Meadows - Hell Hole Tunnel Gatehouse		X	X		
			Hell Hole - Middle Fork Tunnel Gatehouse		X	X		
			Ralston Powerhouse Penstock and Butterfly Valve House		X			
			French Meadows Powerhouse and Switchyard		X			
			Oxbow Powerhouse and Switchyard		X	X		
			Operator Cottages and Shop	X				
			Ralston Afterbay and Generator Building		X			
Mexican free-tailed bat	*Tadarida brasiliensis*	—	French Meadows Dam and Outlet Works				X	
			Middle Fork Interbay Dam				X	
			Ralston Afterbay Dam				X	
			Duncan Creek Diversion Dam				X	
			North Fork Long Canyon Diversion Dam				X	
			French Meadows Powerhouse and Penstock and Butterfly Valve House				X	
			French Meadows - Hell Hole Tunnel Surge Shaft and Tank and Access Road				X	
Q25 Acoustic group (silver-haired, Mexican free-tailed, and big brown bat)[2]	(*Lasionycteris noctivagans, Tadarida brasiliensis,* and *Eptesicus fuscus*)	—	French Meadows Dam and Outlet Works				X	
			Middle Fork Interbay Dam				X	
			Ralston Afterbay Dam				X	
			Duncan Creek Diversion Dam				X	
			North Fork Long Canyon Diversion Dam				X	
			South Fork Long Canyon Diversion Dam				X	
			Upper End of Hell Hole Reservoir				X	
			French Meadows Powerhouse and Penstock and Butterfly Valve House				X	
			French Meadows - Hell Hole Tunnel Surge Shaft and Tank and Access Road				X	
M50 Acoustic group (Yuma and California myotis)[2]	(*Myotis yumanensis* and *Myotis californicus*)	—	French Meadows Dam and Outlet Works				X	
			Hell Hole Dam and Outlet Works				X	
			Middle Fork Interbay Dam				X	
			Duncan Creek Diversion Dam				X	
			North Fork Long Canyon Diversion Dam				X	
			South Fork Long Canyon Diversion Dam				X	
			Upper End of Hell Hole Reservoir				X	
			French Meadows Powerhouse and Penstock and Butterfly Valve House				X	
			Ralston Powerhouse and Switchyard				X	
			Oxbow Powerhouse and Switchyard				X	
			Dormitory Facility				X	
			French Meadows - Hell Hole Tunnel Surge Shaft and Tank and Access Road				X	
M40 Acoustic group (long-legged, little brown, and western small footed myotis)[2]	(*Myotis volans, Myotis lucifugus,* and *Myotis ciliolabrus*)	—	French Meadows Dam and Outlet Works				X	
			Hell Hole Dam and Outlet Works				X	
			Middle Fork Interbay Dam				X	
			Ralston Afterbay Dam				X	
			Duncan Creek Diversion Dam				X	
			North Fork Long Canyon Diversion Dam				X	
			South Fork Long Canyon Diversion Dam				X	
			Hell Hole Reservoir - Upper End				X	
			French Meadows Powerhouse and Penstock and Butterfly Valve House				X	
			French Meadows - Hell Hole Tunnel Surge Shaft and Tank and Access Road				X	

[1]FSS = Forest Service Sensitive, CSC = California Species of Special Concern
[2]Some echolocation calls fall within a similar frequency range and are combined as a group because species-specific identification is not possible.

TERR 6 Table 4. Bat Roosts Detected in the Study Area.

Facilities or Features	Method Facility Assessment	Implemented Visual Roost Survey	Handheld Acoustic Samplings	Infrared Video Sampling	Roost Type	Species	Status
Dams, Reservoirs and Diversion Pools							
Medium Dams							
Ralston Afterbay Dam	√	+			Maternal/day roost	Yuma myotis	Common species
Water Conveyance Systems							
Intakes and Gatehouses							
French Meadows - Hell Hole Tunnel Gatehouse	+			+	Night/day roost	*Myotis* spp.	Common species
Hell Hole - Middle Fork Tunnel Gatehouse	+			+	Night/day roost	*Myotis* spp.	Common species
Penstocks and Valve Houses							
Ralston Powerhouse Penstock and Butterfly Valve House	√	+			Night roost	*Myotis* spp.	Common species
Powerhouses, Switchyards and Substations							
French Meadows Powerhouse and Switchyard	√	+			Night roost	*Myotis* spp including Yuma myotis	Common species
Ralston Powerhouse and Switchyard	+		+	+	Maternal/day roost	Yuma myotis	Common species
Oxbow Powerhouse and Switchyard	√		+	+	Night/day roost	*Myotis spp*.	Common species
Ancillary Facilities							
Operator Cottages and Shop	+	+			Maternal roost	*Myotis* spp.	Common species
Ralston Afterbay Generator Building	√			+	Night roost	*Myotis* spp.	Common species

√ = Roost identified, species unknown
+ = Roost identified, species known

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TERR 6 Table 5. Existing Project Facility Assessment Results.

Project Facility or Feature	Date Surveyed	Facility Suitable for Bat Use (y/n)	Interior of Facility Accessible to Bats (y/n)	Sign of Bat Use (y/n)
Dams, Reservoirs, and Diversion Pools				
Large Dams				
French Meadows Dam and Outlet Works	22-Jun-07	Yes; riprap; alcove has cool temp	N/A	No
Hell Hole Dam and Outlet Works	20-Jun-07	Yes; riprap; bridge	N/A	No
Medium Dams				
Middle Fork Interbay Dam	21-Jun-07	Yes; bridge	No	No
Ralston Afterbay Dam	21-Jun-07	Yes; sluice valve, galley, & alcoves	Yes; mesh gate into galley; bottom of sluice valve open	Yes; minor day roost in spare rags in galley; guano inside sluice valve
Small Dams				
Duncan Creek Diversion Dam	20-Jun-07	No	No	No
North Fork Long Canyon Diversion Dam	22-Jun-07	No	No	No
South Fork Long Canyon Diversion Dam	22-Jun-07	No	No	No
Large Reservoirs				
All Large Reservoirs	N/A[1]	No	No	No
Medium Reservoirs				
All Medium Reservoirs	N/A[1]	No	No	No
Small Diversion Pools				
All Small Diversion Pools	N/A[1]	No	No	No
Water Conveyance Systems				
Tunnels				
Duncan Creek - Middle Fork Tunnel	20-Jun-07	Yes; inlet dry, outlet may be seasonably dry	Yes; at inlet	Unknown
French Meadows - Hell Hole Tunnel	N/A[1]	No; underground facility	No	No
Hell Hole - Middle Fork Tunnel	N/A[1]	No; underground facility	No	No
Middle Fork - Ralston Tunnel	N/A[1]	No; underground facility	No	No
Ralston - Oxbow Tunnel	N/A[1]	No; underground facility	No	No

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TERR 6 Table 5. Existing Project Facility Assessment Results (continued).

Project Facility or Feature	Date Surveyed	Facility Suitable for Bat Use (y/n)	Interior of Facility Accessible to Bats (y/n)	Sign of Bat Use (y/n)
Water Conveyance Systems (continued)				
Diversion Pipes and Drop Inlets				
North Fork Long Canyon Diversion Pipe and Drop Inlet	22-Jun-07	No	No	No
South Fork Long Canyon Diversion Pipe and Drop Inlet	22-Jun-07	No	No	No
Surge Shafts and Adits				
Brushy Canyon Adit	N/A[1]	No; buried by landslide	No	No
Hell Hole - Middle Fork Tunnel Surge Shaft and Tank	N/A[1]	No	No	No
Middle Fork - Ralston Tunnel Surge Shaft and Tank	21-Jun-07	No	No	No
Removable Sections and Portals				
Duncan Creek - Middle Fork Tunnel Portal	20-Jun-07	Yes; inlet dry, outlet may be seasonably dry	Yes; at inlet	Unknown
All Other Removable Sections and Portals	N/A[1]	No	No	No
Intakes and Gatehouses				
Duncan Creek - Middle Fork Tunnel Intake	20-Jun-07	No	No	No
French Meadows - Hell Hole Tunnel Gatehouse	21-Jun-07	Yes; inside of gatehouse	Yes; cracks around sliding door and roof line	Yes; moderate night roost, single day roost (*Myotis* spp
French Meadows - Hell Hole Tunnel Intake	N/A[1]	No; underwater	No	No
Hell Hole - Middle Fork Tunnel Gatehouse	22-Jun-07	Yes; inside of gatehouse	Yes; cracks at doors	Yes; minor night roost, single day roost (*Myotis* spp
Hell Hole - Middle Fork Tunnel Intake	N/A[1]	No; underwater	No	No
Middle Fork - Ralston Tunnel Intake and Gatehouse	21-Jun-07	No[2]	No	No
Ralston - Oxbow Tunnel Intake	21-Jun-07	No[2]	No	No

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TERR 6 Table 5. Existing Project Facility Assessment Results (continued).

Project Facility or Feature	Date Surveyed	Facility Suitable for Bat Use (y/n)	Interior of Facility Accessible to Bats (y/n)	Sign of Bat Use (y/n)
Water Conveyance Systems (continued)				
Penstocks and Valve Houses				
French Meadows Powerhouse Penstock and Butterfly Valve House	22-Jun-07	Yes; inside structure	Yes; cracks	No
Middle Fork Powerhouse Penstock and Butterfly Valve House	21-Jun-07	Yes; inside structure	Yes; cracks	No
Ralston Powerhouse Penstock and Butterfly Valve House	21-Jun-07	Yes; inside structure	Yes	Yes; no interior use; minor night roost in relief valve alcove
Powerhouses, Switchyards, and Substations				
French Meadows Powerhouse and Switchyard	22-Jun-07	Yes; alcove under PH	No	Yes; extensive night roost
Hell Hole Powerhouse	22-Jun-07	Yes; mesh gate	No	No
Middle Fork Powerhouse and Upper and Lower Switchyards	21-Jun-07	Yes; open areas under PH	No	No
Ralston Powerhouse and Switchyard	21-Jun-07	Yes; garage	Yes; garage only: cracks around doors and gaps at windows	Yes; large maternity day roost *(Myotis yumanensis*)
Oxbow Powerhouse and Switchyard	21-Jun-07	Yes; alcove under PH; winch, peeled flashing on PH building	Yes; cracks in door and hatch of PH building	Yes; extensive night roost in alcoves under PH, day roc in winch, minor night roost inside PH, single day roost in peeled flashing
Hell Hole Substation	22-Jun-07	No; no structure	No	No

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TERR 6 Table 5. Existing Project Facility Assessment Results (continued).

Project Facility or Feature	Date Surveyed	Facility Suitable for Bat Use (y/n)	Interior of Facility Accessible to Bats (y/n)	Sign of Bat Use (y/n)
Gaging Stations and Weirs				
Stream Gages and Weirs				
All Stream Gages and Weirs	20-Jun-07	No	No	No
Diversion Gages				
All Diversion Gages	20-Jun-07	No	No	No
Reservoir Gages				
All Reservoir Gages	N/A[1]	No	No	No
Powerhouse Gages				
All Powerhouse Gages	N/A[1]	No	No	No
Leakage Weirs				
All Leakage Weirs	N/A[1]	No	No	No
Project Communication Lines and Powerlines				
French Meadows Area				
All French Meadows Area Powerlines	N/A[1]	No	No	No
Hell Hole Area				
All Hell Hole Area Communication Lines and Powerlines	N/A[1]	No	No	No
Middle Fork Interbay Area				
All Middle Fork Interbay Area Communication Lines and Powerlines	N/A[1]	No	No	No
Ralston - Oxbow Area				
All Ralston - Oxbow Area Communication Lines and Powerlines	N/A[1]	No	No	No
Photovoltaic Poles and Powerlines				
All Photovoltaic Poles and Powerlines	N/A[1]	No	No	No
Microwave Reflectors and Radio Towers				
All Microwave Reflectors and Radio Towers	N/A[1]	No	No	No

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TERR 6 Table 5. Existing Project Facility Assessment Results (continued).

Project Facility or Feature	Date Surveyed	Facility Suitable for Bat Use (y/n)	Interior of Facility Accessible to Bats (y/n)	Sign of Bat Use (y/n)
Disposal Sites				
All Disposal Sites	N/A[1]	No	No	No
Ancillary Facilities				
French Meadows Dam Generator Building	20-Jun-07	Yes; corrugated roof edges	No	No
Dormitory Facility	23-Jun-07	Yes; roof edges	No	Unknown
Dormitory and Cottages Water Supply Tank	23-Jun-07	No	No	No
Hell Hole Staging Areas	N/A[1]	No	No	No
Operator Cottages and Shop	22-Jun-07	Yes; peeled flashing and roof trim	Yes; shop has interior access, but not cottages	Yes; small maternity colonie in roof trim (*Myotis* spp.)
Ralston Afterbay Generator Building	21-Jun-07	Yes	Yes; small cracks around pipe	Yes; trace night roost guan
Storage Building at Middle Fork - Ralston Tunnel surge Shaft and Tank	21-Jun-07	Yes	Yes; wide gage screening	No
Wabena Meadows Snow Course	N/A[1]	No	No	No
Miranda Cabin Snow Course	N/A[1]	No	No	No
Diamond Crossing Snow Course	N/A[1]	No	No	No
Talbot Camp Snow Course	N/A[1]	No	No	No
Project Fences				
All Slope Fences	N/A[1]	No	No	No
All Public Safety Fences	N/A[1]	No	No	No
Project Roads and Access Points				
Duncan Creek Area				
All Duncan Creek Area Roads and Access Points	N/A[1]	No	No	No

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TERR 6 Table 5. Existing Project Facility Assessment Results (continued).

Project Facility or Feature	Date Surveyed	Facility Suitable for Bat Use (y/n)	Interior of Facility Accessible to Bats (y/n)	Sign of Bat Use (y/n)
Project Roads and Access Points (continued)				
French Meadows Area				
All French Meadows Area Roads and Access Points	N/A[1]	No	No	No
Hell Hole Area				
All Hell Hole Area Roads and Access Points	N/A[1]	No	No	No
Long Canyon Area				
All Long Canyon Area Roads and Parking Area	N/A[1]	No	No	No
Middle Fork Interbay Area				
All Middle Fork Interbay Area Roads and Access Points	N/A[1]	No	No	No
Ralston - Oxbow Area				
All Ralston - Oxbow Area Roads, Access Points, and Boat Ramp	N/A[1]	No	No	No
Project Trails				
Duncan Creek Area				
All Duncan Creek Area Trails	N/A[1]	No	No	No
French Meadows Area				
All French Meadows Area Trails	N/A[1]	No	No	No
Middle Fork Interbay Area				
All Middle Fork Interbay Area Trails	N/A[1]	No	No	No
Ralston - Oxbow Area				
All Ralston - Oxbow Area Trails	N/A[1]	No	No	No

[1]Project facility determined to be unsuitable for bat use based on consultation with PCWA maintenance staff or evaluation of similar facility.

[2]Project facility does not represent potential bat habitat at this time. Facility could provide habitat in the future if access to the interior of the facility is permitted overtime (e.g., cracks around doors or roof line).

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TERR 6 Table 6. Existing Project Recreation Facility Assessment Results.

Recreation Facility	Date Surveyed	Associated Restroom Facilities[1]			Facility Suitable for Bat Use/Sign of Bat Use
		Number of Pit Restrooms	Number of Flush Restrooms	Number of Pre-Fabricated Restrooms	
French Meadows Area					
Ahart Campground	20-Jun-07	2	0	0	No
Coyote Group Campground	20-Jun-07	3	1	0	No
Poppy Campground	N/A[2]	1	0	0	No
French Meadows Campground	20-Jun-07	3	3	0	No
Gates Group Campground	20-Jun-07	4	0	0	No
Lewis Campground	20-Jun-07	2	2	0	No
French Meadows Picnic Area	20-Jun-07	1	0	0	No
McGuire Picnic Area	20-Jun-07	0	2	0	No
French Meadows Boat Ramp	20-Jun-07	0	1	0	No
McGuire Boat Ramp	20-Jun-07	1	1	0	No
Dolly Creek Water Supply	N/A[2]	0	0	0	No
French Meadows Campground Water Supply	N/A[2]	0	0	0	No
Hell Hole Area					
Big Meadows Campground	23-Jun-07	1	2	3	No
Hell Hole Campground	23-Jun-07	0	0	1	No
Upper Hell Hole Campground	N/A[2]	1	0	0	No
Hell Hole Vista	22-Jun-07	0	0	1	No
Hell Hole General Parking Area	23-Jun-07	0	0	1	No
Hell Hole Boat Ramp Parking Area	21-Jun-07	0	0	1	No
Hell Hole Boat Ramp	21-Jun-07	0	0	0	No
Big Meadows Campground Water Supply	23-Jun-07	0	0	2	No
Ralston Afterbay Area					
Ralston Picnic Area	23-Jun-07	0	0	1	No
Ralston Picnic Area Cartop Boat Ramp	23-Jun-07	0	0	0	No
Indian Bar Rafting Access					

TERR 6 Table 7. Minor Modifications to Reproductive and Seasonal Use Site-Specific Survey Methods.

Project Facility or Feature	Terrestrial TWG Approved Method	Method Implemented	Rationale
Reproductive Surveys			
Water Conveyance Systems			
Penstocks and Valve Houses			
Ralston Powerhouse Penstock and Butterfly Valve House	Handheld acoustic and/or infrared video sampling	Visual roost survey	Visual inspection was sufficient to determine bat species and bat use at this facility.
Powerhouses, Switchyards, and Substations			
French Meadows Powerhouse and Switchyard	Handheld acoustic and/or infrared video sampling	Visual roost survey	Visual inspection was sufficient to determine bat species and bat use at this facility.
Ancillary Facilities			
Operator Cottages and Shop	Handheld acoustic and/or infrared video sampling	Visual roost survey	Visual inspection was sufficient to determine bat species and bat use at this facility.
Seasonal Habitat Use Surveys			
Dams, Reservoirs, and Diversion Pools			
Large Dams			
Medium Dams			
Ralston Afterbay Dam	Five-night acoustic and mist net sampling	Long-term acoustic and mist net sampling	Voluntary enhancement: long-term acoustic sampling was conducted at this site instead of five-night acoustic sampling. Mist net surveys were conducted at the Ralston Picnic Area where site conditions (e.g., topography and vegetative cover) were more appropriate to maximize bat captures.
Small Dams			
Duncan Creek Diversion Dam	Five-night acoustic and mist net sampling	Five-night acoustic	Duncan Creek Bridge construction activities were ongoing; therefore mist netting was not completed at this site.
Water Conveyance Systems			
Penstocks and Valve Houses			
French Meadows Powerhouse and Penstock and Butterfly Valve House	Long-term acoustic and mist netting	Long-term acoustic sampling	Site topography and vegetative cover was not appropriate for mist net surveys.

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TERR 6 Table 8. Summary of Visual Roost Reproductive Survey Results.

Project Facility	Date Surveyed	Sign of Bat Use	Bat Species Observed	Status
Dams, Reservoirs, and Diversion Pools				
Large Dams				
Hell Hole Dam and Outlet Works	9/20/2007	No	-	-
Medium Dams				
Ralston Afterbay Dam	8/14/2007	Maternity colony roosting in a crevice-like feature underneath the dam deck.	Yuma myotis	Common Species
Water Conveyance Systems				
Tunnels and Portals				
Duncan Creek Middle Fork Tunnel and Portal	8/14/2007	No sign of bat use	-	-
Penstocks and Valve Houses				
Ralston Powerhouse Penstock and Butterfly Valve House	9/20/2007	No interior use; minor night roost in relief valve alcove.	*Myotis* spp.	Common Species
Powerhouses, Switchyards, and Substations				
French Meadows Powerhouse and Switchyard	9/20/2007 & 10/11/2007	Extensive night roost.	*Myotis* spp., including Yuma myotis	Common Species
Ancillary Facilities				
Operator Shop and Cottages	10/11/2007	Small maternity colonies in roof trim detected in June. Crevice was sealed up after reproductive season and all bats had left roost so bats could not re-enter. No sign of bat use or access during October survey.	*Myotis* spp.	Common Species

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TERR 6 Table 9. Summary of Handheld Acoustic Reproductive Survey Results.

Project Facility or Feature	Date Surveyed	Bat Species Detected	
		Species Detected	Status
Dams, Reservoirs, and Diversion Pools			
Large Dams			
Hell Hole Dam and Outlet Works[3]	9/20/2007	Hoary bat	Common species
		M50 acoustic group[1]	Common species
		M40 acoustic group[2]	Common species
Powerhouses, Switchyards, and Substations			
Oxbow Powerhouse and Switchyard	8/14/2007	M50 acoustic group	Common species
Ralston Powerhouse and Switchyard	6/23/2007	M50 acoustic group	Common species
Ancillary Facilities			
Dormitory Facility[3]	8/13/2007	M50 acoustic group	Common species

[1]Echolocation calls for Yuma myotis and California myotis fall within a similar frequency range and are combined into the M50 acoustic group because species-specific identification is not possible.
[2]Echolocation calls for long-legged myotis, little brown bat, and western small-footed myotis fall within a similar frequency range and are combined into the M40 acoustic group because species-specific identification is not possible.
[3]Bat calls at this facility were not associated with roosting activity

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TERR 6 Table 10. Summary of Infrared Video Reproductive Survey Results.

Project Facility or Feature	Date Surveyed	Bat Species Detected	
		Species Detected	Status
Water Conveyance Systems			
Intakes and Gatehouses			
French Meadows - Hell Hole Tunnel Gatehouse	9/21/07 and 9/22/07	*Myotis* spp.	Common species
Hell Hole - Middle Fork Tunnel Gatehouse	9/21/07 and 9/22/07	*Myotis* spp.	Common species
Powerhouses, Switchyards, and Substations			
Ralston Powerhouse and Switchyard	6/23/07	Yuma myotis	Common species
Oxbow Powerhouse and Switchyard	8/15/07	*Myotis* spp.	Common species
Ancillary Facilities			
Ralston Afterbay Generator Building	8/14/07	*Myotis* spp.	Common species

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TERR 6 Table 11. Summary of Long-Term Acoustic Seasonal Habitat Use Survey Results.

Project Facility or Feature	Date Surveyed	Bat Species Detected[1]														
		Special-Status Species					Common Species									
		Western red bat	Townsend's big-eared bat	Pallid bat	Spotted bat	Western mastiff bat	Hoary bat	Silver-haired bat	Big brown bat	Western pipistrelle	Fringed myotis	Long-eared Myotis	Mexican free-tailed bat	Q25 acoustic group[2]	M50 acoustic group[3]	M40 acoustic group[4]
Dams, Reservoirs, and Diversion Pools																
Large Dams																
French Meadows Dam and Outlet Works	Aug-Oct 2007	X	X	X	-	-	X	X	X	X	X	X	X	X	X	X
Medium Dams																
Ralston Afterbay Dam	Aug-Oct 2007	X	X	X	-	-	X	X	X	X	X	X	X	X	-	X
Large Reservoirs																
Hell Hole Reservoir - Upper End	Aug-Oct 2007	X	X	-	-	-	X	X	X	X	X	X		X	X	X
Water Conveyance Systems																
Penstocks and Valve Houses																
French Meadow Powerhouse and Penstock and Butterfly Valve House	Aug-Oct 2007	X	X	X	-	-	X	X	X	X	X	X	X	X	X	X

[1]Present based on echolocation recordings collected

[2]Some echolocation calls for silver-haired bat, big brown bat, and Mexican free-tailed bat fall within a similarly frequency range and re combined into the Q25 acoustic group because species specific identification is not possible

[3]Echolocation calls for Yuma myotis and California myotis fall within a similar frequency range and are combined into the M50 acoustic group because species-specific identification is not possible.

[4]Echolocation calls for long-legged myotis, little brown bat, and western small-footed myotis fall within a similar frequency range and are combined into the M40 acoustic group because species-specific identification is not possible.

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TERR 6 Table 12. Summary of Mist Net Seasonal Habitat Use Survey Results.

Project Facility or Feature	Date Surveyed	Species Captured	Age Class	Sex	Reproductive Status [1]	Forearm Length (mm)
Dams, Reservoir, and Diversion Pools						
Large Dams						
French Meadows Dam and Outlet Works	8/13/07	Yuma myotis	Adult	Male	Non	34.14
		Yuma myotis	Adult	Male	Non	34.61
		silver-haired bat	Adult	Female	Lactating	42.28
	10/11/07	Yuma myotis	Adult	Male	Non	33.09
		Yuma myotis	Adult	Male	Non	34.35
Medium Dams						
Middle Fork Interbay Dam	9/21/07	Yuma myotis	Adult	Female	Post-lactating	35.02
		Yuma myotis	Adult	Female	Post-lactating	34.20
		California myotis	Adult	Male	Non	31.97
		Yuma myotis	Adult	Male	Non	34.16
		Yuma myotis	Adult	Male	Non	35.44
		Yuma myotis	Juvenile	Male	Non	33.97
Small Dams						
North Fork Long Canyon Diversion Dam	9/28/07	No captures	N/A	N/A	N/A	N/A
South Fork Long Canyon Diversion Dam	9/27/07	hoary bat	Adult	Male	Non	53.36
		silver-haired bat	Adult	Male	Non	40.19
		California myotis	Adult	Female	Post-lactating	32.10
		Yuma myotis	Adult	Male	Non	34.17
		Yuma myotis	Adult	Female	Post-lactating	35.92
		Yuma myotis	Adult	Female	Post-lactating	36.49

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TERR 6 Table 12. Summary of Mist Net Seasonal Habitat Use Survey Results (continued).

Project Feature or Facility	Date Surveyed	Species Captured	Age Class	Sex	Reproductive Status[1]	Forearm Length (mm)
Project Roads and Access Points						
French Meadows Area						
French Meadows - Hell Hole Tunnel Surge Shaft and Tank and Access Road	9/20/07	No captures	N/A	N/A	N/A	N/A
Project Recreation Facilities						
Ralston Afterbay Area						
Ralston Afterbay Picnic Area	8/15/07	Yuma myotis	Adult	Male	Non	33.92
		Yuma myotis	Adult	Male	Non	33.82
		Yuma myotis	Juvenile	Male	Non	34.45
		Yuma myotis	Juvenile	Male	Non	33.62
		Yuma myotis	Adult	Female	Non	34.43
		Yuma myotis	Adult	Female	Post-lactating	34.27
		Yuma myotis	Adult	Female	Nulliparous	35.01
		Yuma myotis	Adult	Female	Nulliparous	34.83
		Yuma myotis	Juvenile	Female	Nulliparous	35.16
		Yuma myotis	Adult	Female	Nulliparous	34.51

[1]Reproductive status includes the following: **Pregnant** = carrying developing offspring; **Lactating** = given birth this season, currently nursing young; **Post-lactating** = with exposed but reduced nipples; **Parous** = given birth, but not currently reproductively active; **Nulliparous** = never given birth; **Non** = Non-reproductive

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FIGURES

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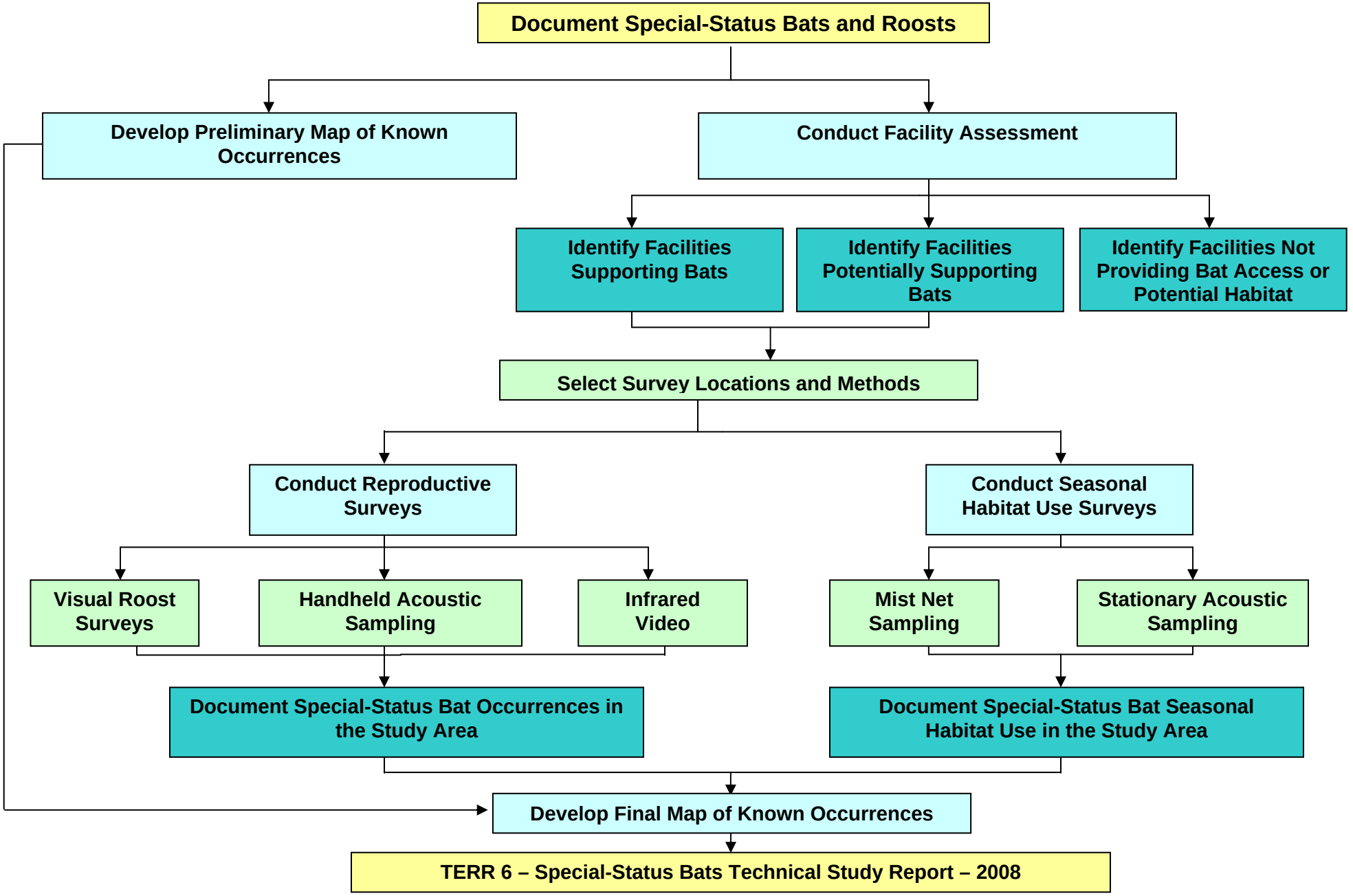
TERR 6 Figure 1. TERR 6 – Special-Status Bats Study Objectives and Related Study Elements and Reports.



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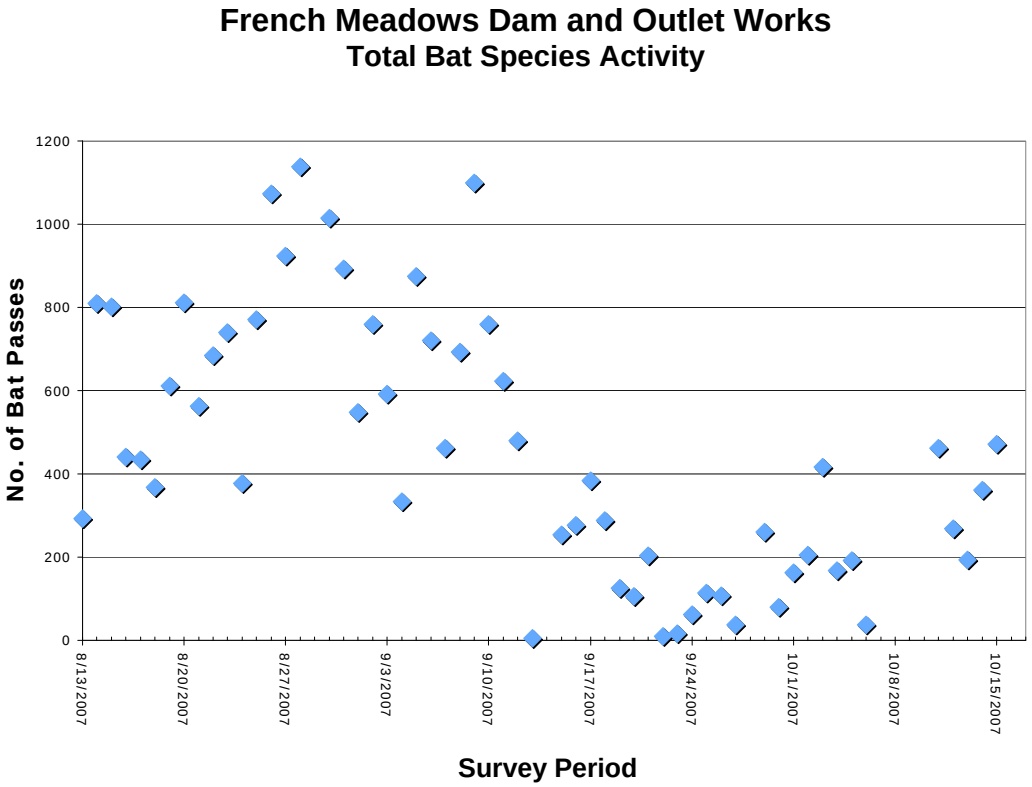
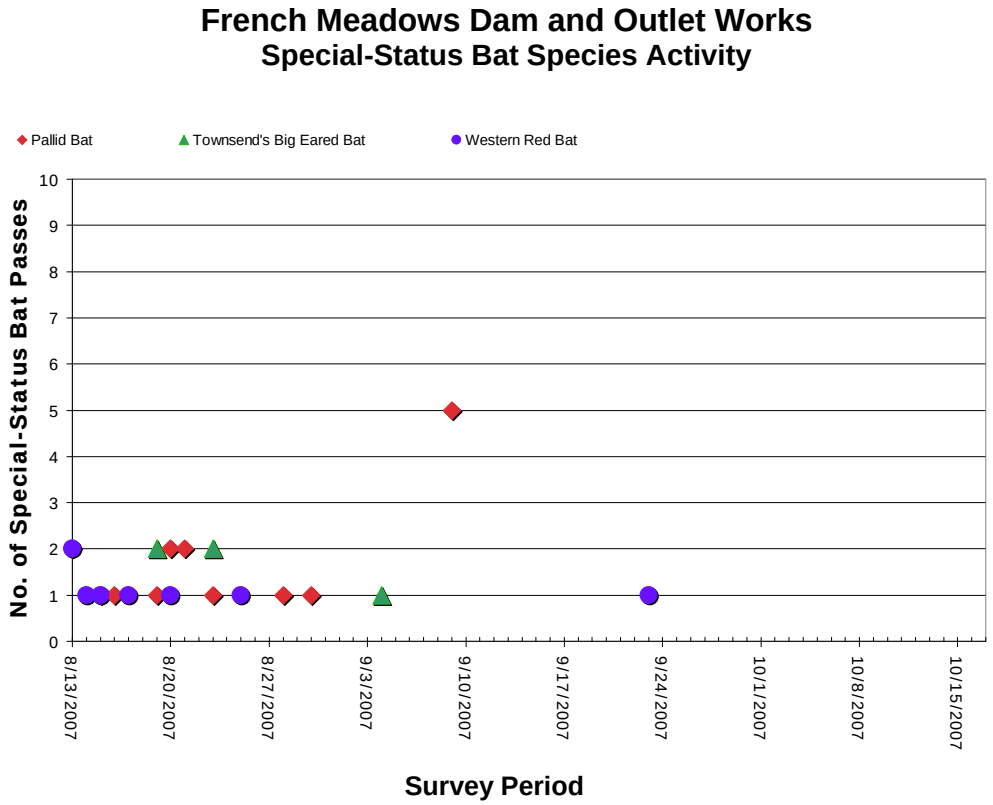
TERR 6 Figure 2. Long-Term Acoustic Seasonal Habitat Use Survey Results.

(note scales of graphs)





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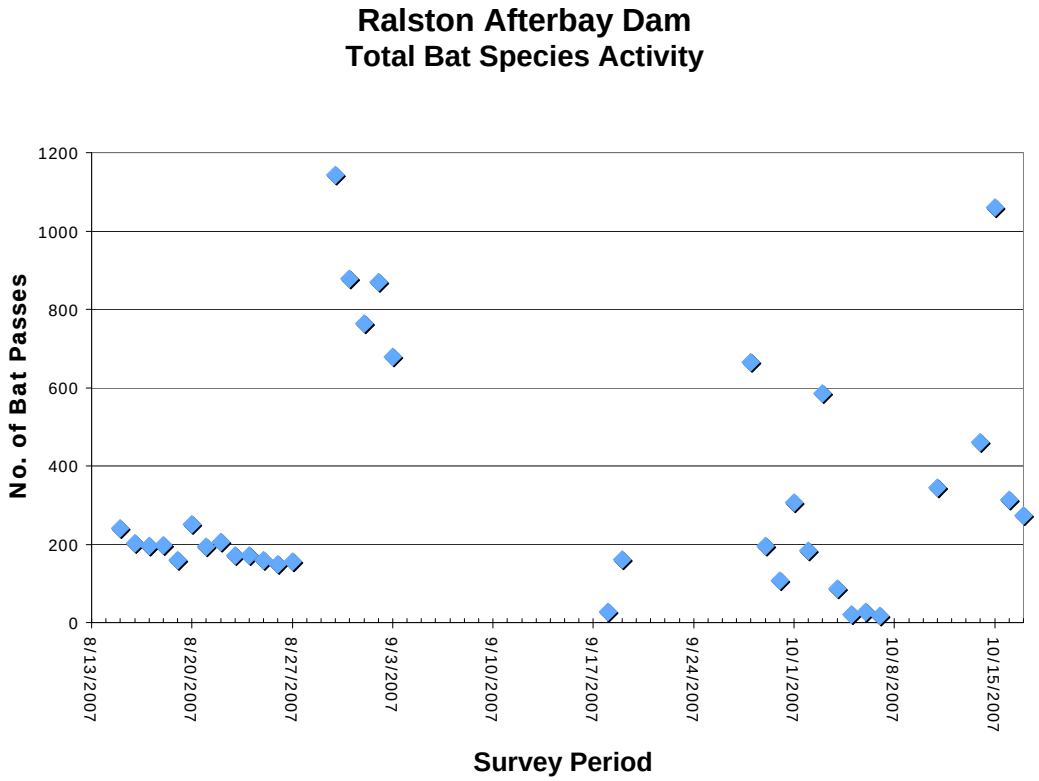
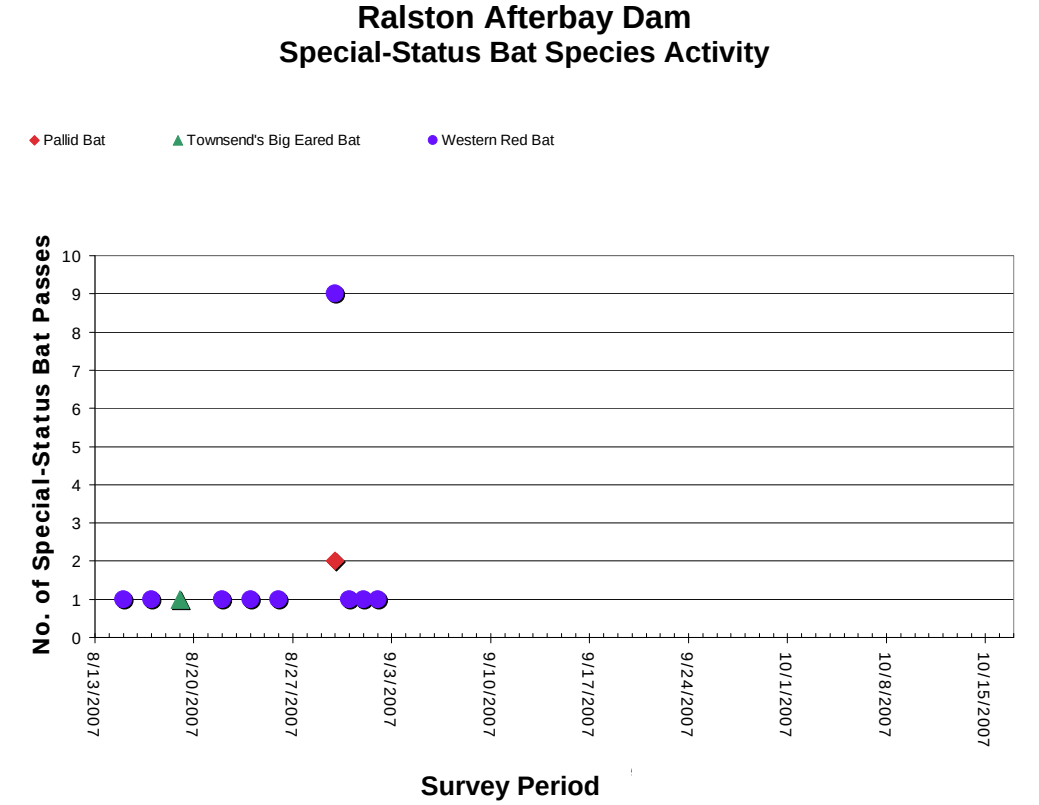
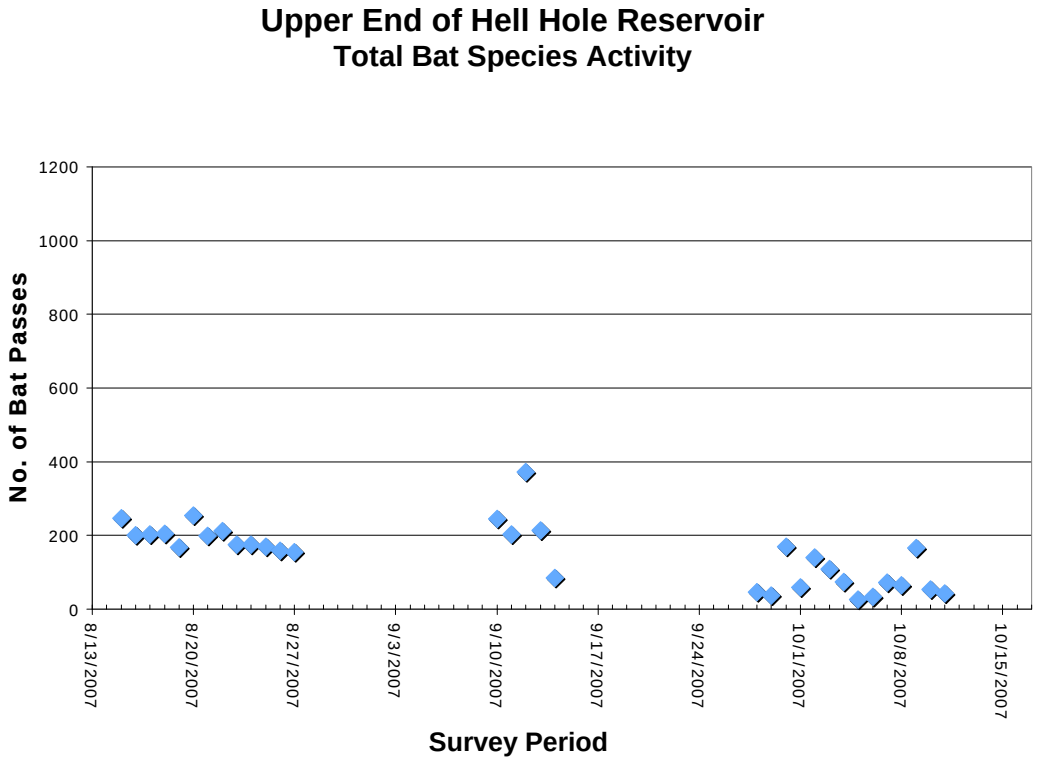
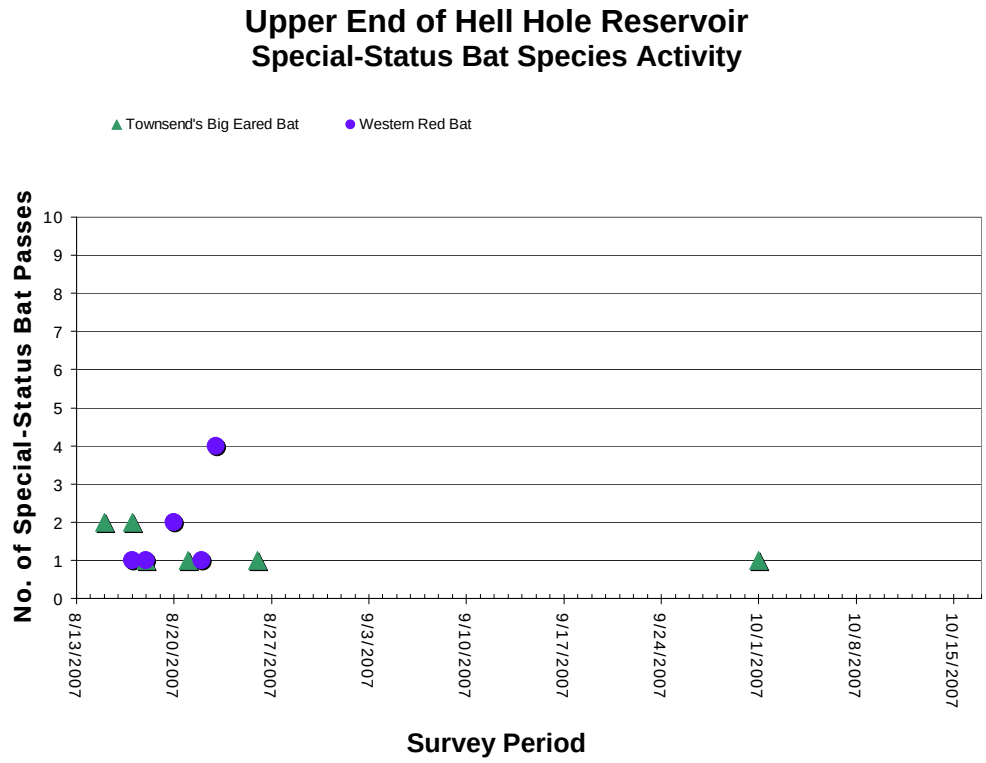
TERR 6 Figure 2. Long-Term Acoustic Seasonal Habitat Use Survey Results (continued).
(note scales of graphs)





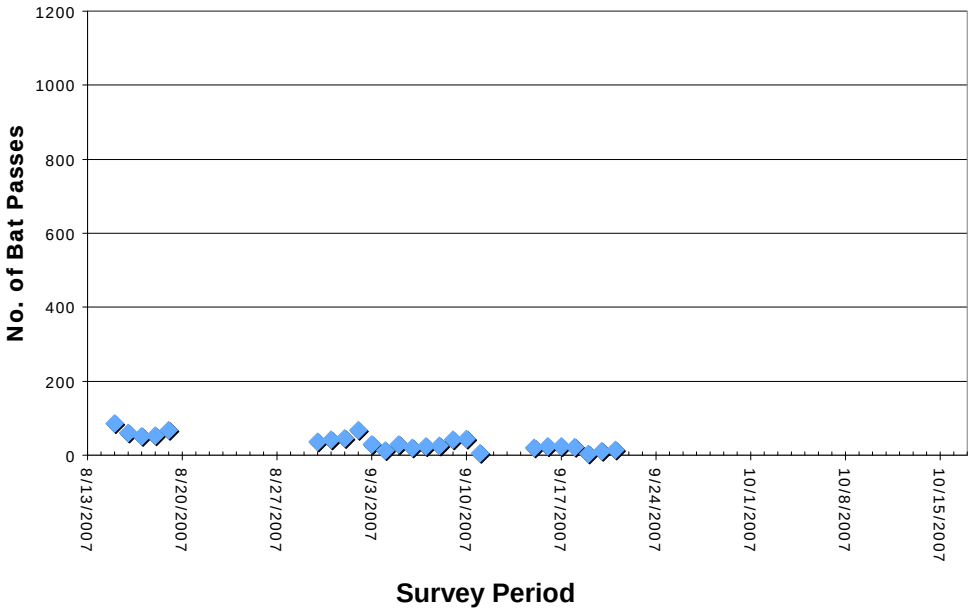
TERR 6 Figure 2. Long-Term Acoustic Seasonal Habitat Use Survey Results (continued).
(note scales of graphs)



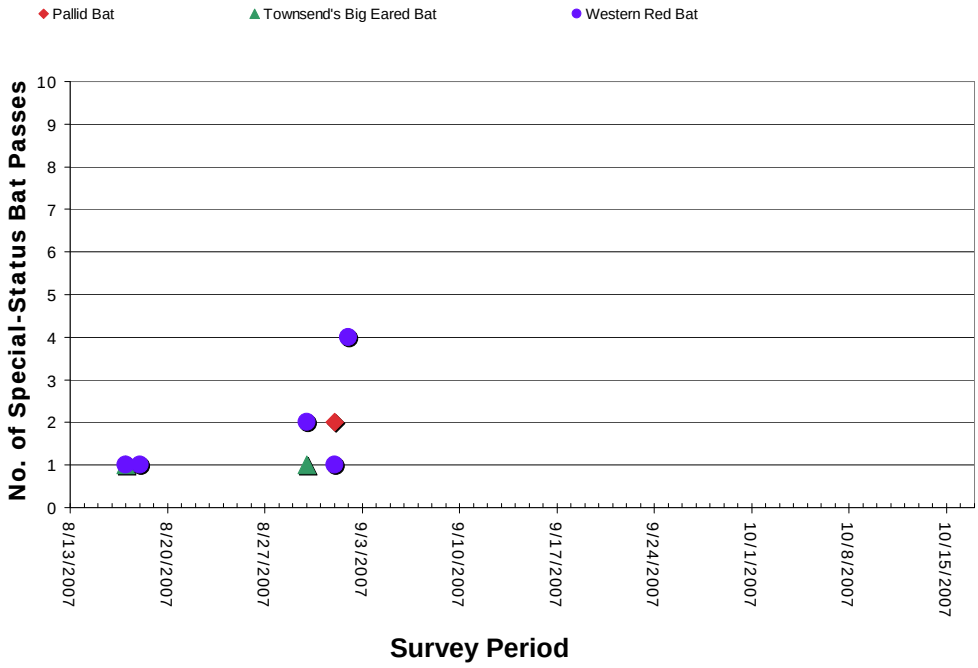


TERR 6 Figure 2. Long-Term Acoustic Seasonal Habitat Use Survey Results (continued).
(note scales of graphs)

French Meadows Powerhouse Penstock and Butterfly Valve House
Total Bat Species Activity



French Meadows Powerhouse Penstock and Butterfly Valve House
Special-Status Bat Species Activity



TERR 6 Figure 3. Five-Night Acoustic Seasonal Habitat Use Survey Results.

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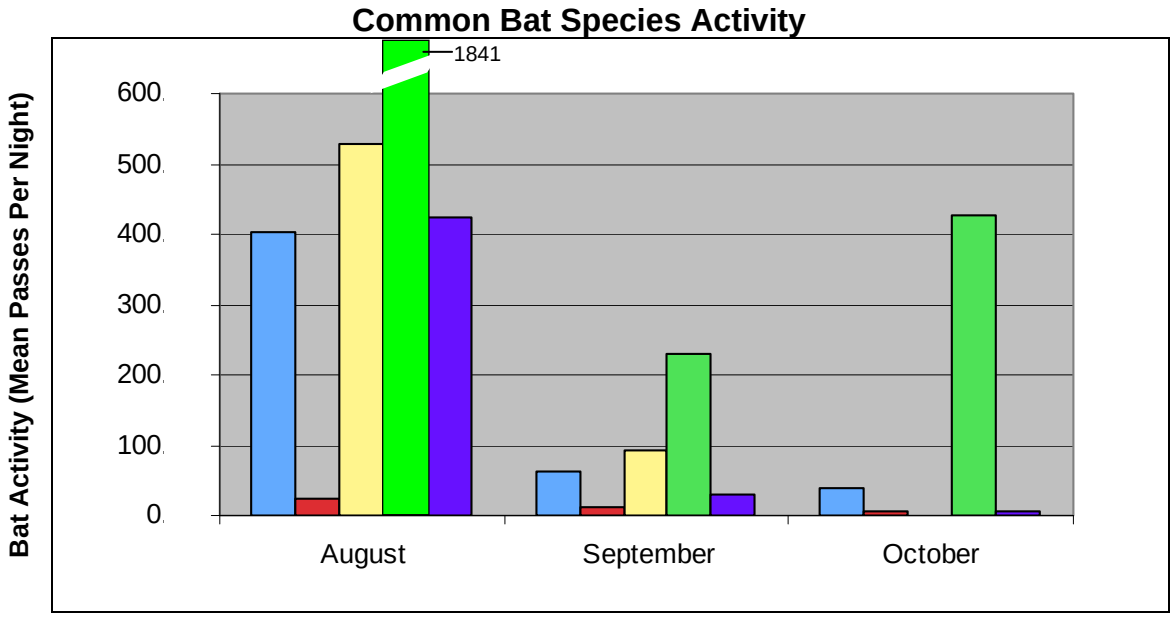

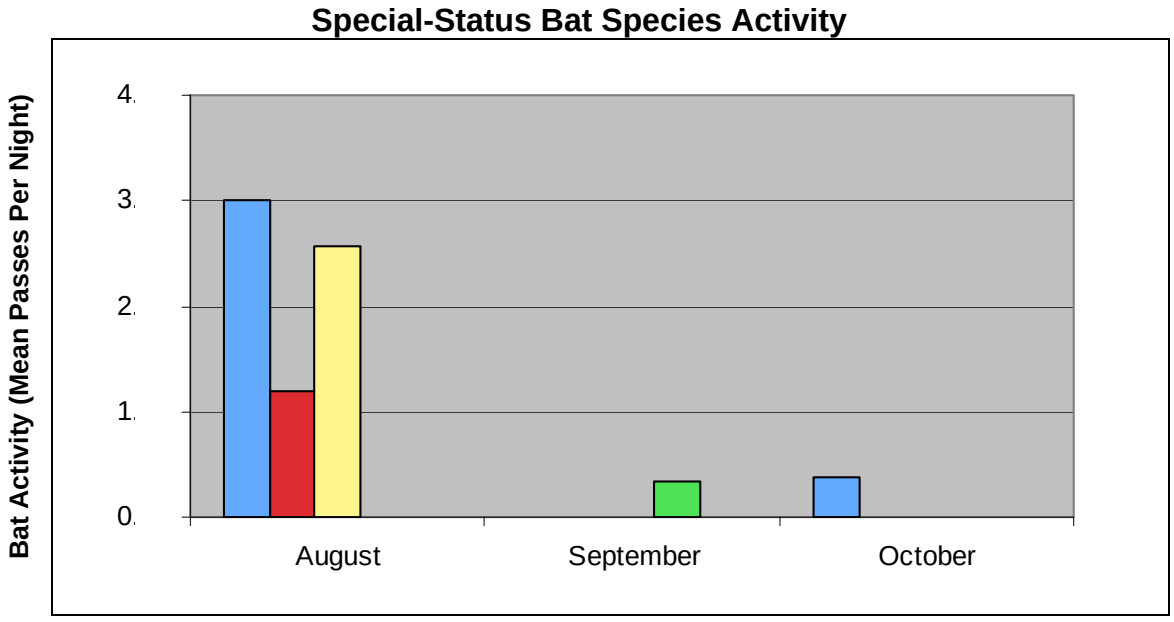

Legend

- Middle Fork Interbay Dam
- Duncan Creek Diversion Dam
- North Fork Long Canyon Diversion Dam
- South Fork Long Canyon Diversion Dam
- French Meadows-Hell Hole Tunnel Surge Shaft and Tank and Access Road

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MAPS

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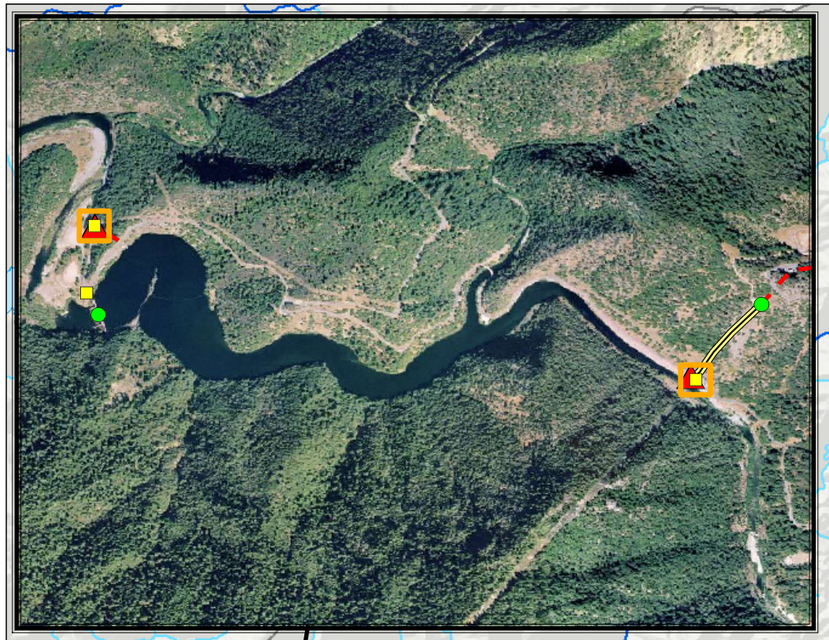


PLACER COUNTY

EL DORADO COUNTY

Duncan Creek Diversion Dam

Duncan Creek - Middle Fork Tunnel & Portal

French Meadows - Hell Hole Tunnel Gatehouse

French Meadows Reservoir

French Meadows Dam and Outlet Works

French Meadows P.H. and Switchyard

Hell Hole - Middle Fork Tunnel Gatehouse

Hell Hole Reservoir

Hell Hole Dam and Outlet Works

Hell Hole P.H.

N. Fk. Long Canyon Diversion Dam

S. Fk. Long Canyon Diversion Dam

Interbay Dam

Middle Fork Interbay

Middle Fork P.H.

Oxbow P.H.

Ralston - Oxbow Tunnel

Ralston Afterbay Dam

Ralston Afterbay

Ralston P.H.

Middle Fork - Ralston Tunnel

Hell Hole - Middle Fork Tunnel

Duncan Creek

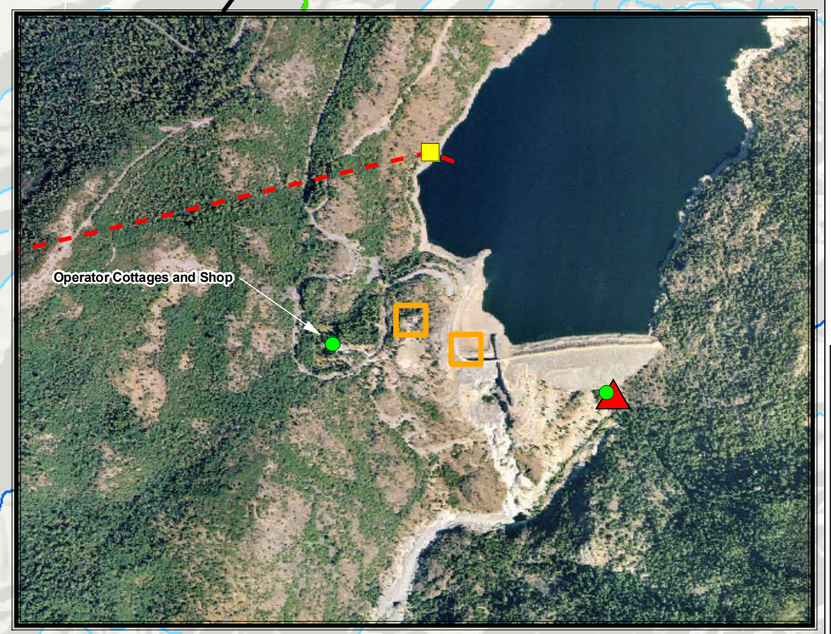
N. Fk. Long Canyon

S. Fk. Long Canyon

Long Canyon

N. Fk. of Middle Fork American River

Rubicon River



Project Facilities

- Powerhouse
- Dam
- Tunnel
- Penstock

Transportation

- Major Road
- Minor Road

Hydrography

- Watercourse
- Water Body

Designated Boundary

- County Boundary
- Granite Chief Wilderness

Survey Type

- Visual Roost
- Handheld Acoustic
- Infrared Video

PCWA

Placer County Water Agency
Middle Fork American River Project

Map 1a

2007 Special-Status Bat Reproductive Survey Locations

0 0.5 1 2 Miles

Projection: CA State Plane, Zone 2
Datum: NAD 83

Date: 2/25/08

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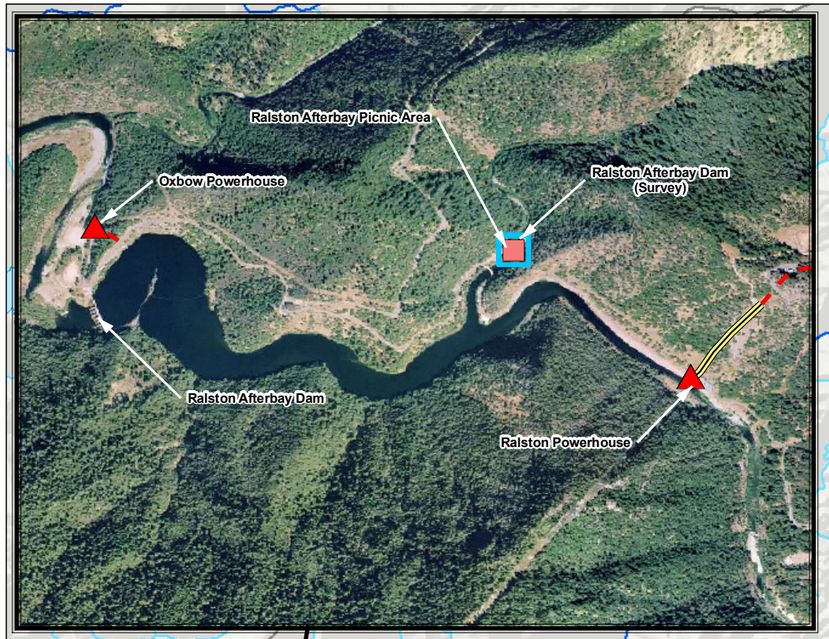


PLACER COUNTY

EL DORADO COUNTY

Duncan Creek Diversion Dam

Duncan Creek - Middle Fork Tunnel

French Meadows Reservoir

French Meadows - Hell Hole Tunnel

French Meadows Dam and Outlet Works

French Meadows P.H. and Switchyard

Duncan Creek

N. Fk. Long Canyon

Hell Hole Reservoir

Upper end of Hell Hole Reservoir

Hell Hole Dam

N. Fk. Long Canyon Diversion Dam

S. Fk. Long Canyon Diversion Dam

Hell Hole P.H.

S. Fk. Long Canyon

N. Fk. of Middle Fork American River

Interbay Dam

Middle Fork Interbay

Lower Middle Fk. Interbay

Upper Middle Fk. Interbay

Oxbow P.H.

Ralston - Oxbow Tunnel

Middle Fork P.H.

Ralston Afterbay Dam

Ralston Afterbay

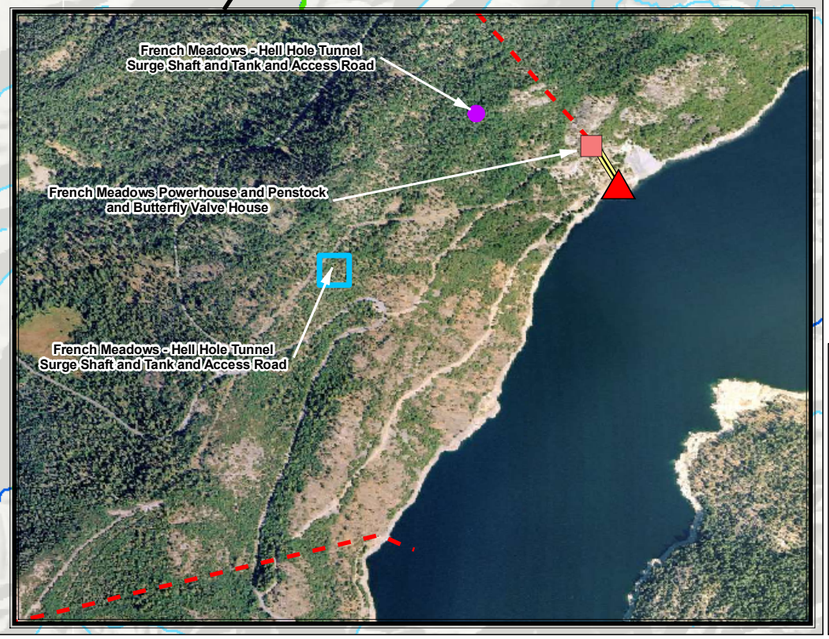
Middle Fork - Ralston Tunnel

Hell Hole - Middle Fork Tunnel

Ralston P.H.

Long Canyon

Rubicon River



Project Facilities

- Powerhouse
- Dam
- Tunnel
- Penstock

Transportation

- Major Road
- Minor Road

Hydrography

- Watercourse
- Water Body

Designated Boundary

- County Boundary
- Granite Chief Wilderness

Survey Type

- Mist Net
- 5-Night Acoustic
- Long-Term Acoustic

PCWA

Placer County Water Agency
Middle Fork American River Project

Map 1b

2007 Special-Status Bat Seasonal Habitat Use Survey Locations

Date: 2/25/08

0 0.5 1 2 Miles

Projection: CA State Plane, Zone 2
Datum: NAD 83

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Duncan Creek Diversion Dam
Duncan Creek - Middle Fork Tunnel
French Meadows Reservoir
French Meadows Dam and Outlet Works
French Meadows - Hell Hole Tunnel
French Meadows Powerhouse and Penstock and Butterfly Valve House
Hell Hole Reservoir
Upper end of Hell Hole Reservoir
French Meadows P.H.
PLACER COUNTY
Duncan Creek
N. Fk. Long Canyon
N. Fk. Long Canyon Diversion Dam
Hell Hole Dam and Outlet Works
S. Fk. Long Canyon Diversion Dam
Hell Hole P.H.
Middle Fork Interbay
Lower Middle Fork Interbay
S. Fk. Long Canyon
Middle Fork P.H.
Oxbow P.H.
North Fork of Middle Fork American River
Ralston - Oxbow Tunnel
Ralston Afterbay Dam
Ralston Afterbay
Middle Fork - Ralston Tunnel
Hell Hole - Middle Fork Tunnel
Ralston P.H.
Long Canyon
Rubicon River
South Fork Rubicon River
EL DORADO COUNTY

CONFIDENTIAL
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Project Facilities

- Powerhouse
- Dam
- Tunnel
- Penstock

Transportation

- Major Road
- Minor Road

Hydrography

- Watercourse
- Water Body

Designated Boundary

- County Boundary
- Granite Chief Wilderness

Bat Survey Data

Documented Occurrences (prior to 2007)

- pallid bat

PCWA Special-Status Bat Surveys (2007)

- pallid bat
- Townsend's big-eared bat
- western red bat

PCWA

Placer County Water Agency
Middle Fork American River Project

Map 2

PCWA Special-Status Bat Seasonal Use Results and Historic Occurrences (2007)

0 0.5 1 2 Miles

Date: 2/26/08

Projection: CA State Plane, Zone 2
Datum: NAD 83

Z:\Entrix\3116501\map\TerrestrialMaps\PCWA_SS_Bat_2007SurveyPresence_17i11i_01.mxd

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APPENDIX A.

Life Histories for Special-Status Bat Species Potentially Occurring in the Middle Fork American River Watershed

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APPENDIX A

Life Histories for Special-Status Bat Species Potentially Occurring In the Middle Fork American River Watershed

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Western red bat *(Lasiurus blossevillii*; Forest Service Sensitive) is a solitary, foliage-roosting bat in the genus *Lasiurus*, the hairy-tailed bats. These bats are adapted for exposed roosting behavior with their hairy tail membrane and small ears. The range of the western red bat is from British Columbia to Central and South America. Western red bats are highly migratory throughout their range. Bats of Canada move into the coastal lowlands of California during winter, and the California population is thought to winter in Central America (Nagorsen and Brigham 1993). Although this species is typically solitary, migration appears to occur in groups and foraging in close association of one another occurs in the summer (Bolster 2005). Day roosts are commonly in edge habitats adjacent to streams or open fields, in orchards, and sometimes in urban areas (Bolster 2005). There may be an association with intact riparian habitat, particularly with broad-leaved species such as willows, cottonwoods, and sycamores (Bolster 2005). Western red bats may also occasionally use caves for roosts. In California, this species is known to roost in cottonwood trees and willows, but is commonly detected in a variety of habitats, including chaparral. Roost heights range from 10-50 feet (Pierson and Heady 1997). Mating takes place in the late summer and early fall, sperm is stored over the winter, and fertilization occurs in the early spring. Following a gestation period of 80 to 90 days, one to five young are born in late May to early July. The young are born small, naked, and underdeveloped (Nowak 1994). Females leave the young at the roosting site while foraging, but will carry them when moving to a new roosting site. Young are capable of sustained flight at 6 weeks. Large moths are the primary prey of the western red bat. This bat is a fast flyer, foraging in straight flights or large circles (Nagorsen and Brigham 1993). The echolocation calls are highly variable depending on the terrain. Though variable, these calls are very distinct.

Townsend's big-eared bat (*Corynorhinus townsendii*; California Species of Special Concern, and Forest Service Sensitive) is a year-round resident in California, occurring from low desert to mid-elevation montane habitats. It is found primarily in rural settings, from inland deserts to coastal redwoods, oak woodland of the inner Coast Ranges and Sierra Nevada foothills, and low to mid-elevation mixed coniferous-deciduous forests. It typically roosts during the day in caves and mines, but can roost in buildings that offer suitable conditions (Kunz and Martin 1982). Night roosts are in more open settings and include bridges. It has also been reported to utilize rock crevices and hollow trees as roost sites (Sherwin 1998a, Piaggio 2005). Winter hibernating colonies are composed of mixed-sex groups and number in size from single bats to colonies of several hundred individuals (Sherwin 1998a, Piaggio 2005). Hibernation occurs for prolonged periods in colder areas and intermittently in non-freezing areas. Townsend's big-eared bat arouses periodically and moves to alternative roosts, and actively forages and drinks throughout the winter. Mating occurs between October and February and females give birth to a single pup per individual between May and July (Sherwin 1998a, Piaggio 2005). Females form maternity colonies of 35 to 200 individuals, while males roost individually (Kunz and Martin 1982). Townsend's big-eared bat is a moth specialist, with moths composing 90% of its diet.

Pallid bat (*Antrozous pallidus*; California Species of Special Concern and Forest Service Sensitive), a year-round resident in California, is found in arid desert areas, grasslands, oak savanna, coastal forested areas, and coniferous forests of the montane

regions of California. Roost sites of this species include rock outcroppings, caves, crevices, tree hollows, mines, and both vacant and occupied buildings (Sherwin 1998b, Rambaldini 2005). Pallid bats make use of similar structures for night roosting and will use more open sites such as eaves, awnings, and open areas under bridges for feeding roosts. Pallid bats are largely inactive in the winter months. They are not known to migrate long distances between summers and winter sites and will hibernate as solitary individuals or in small numbers (Sherwin 1998b, Rambaldini 2005). Pallid bats have been observed foraging during the winter when prey is available (Hermanson and O'Shea 1983). Copulation occurs in the fall, usually October through December, but has been observed to occur as late as February in coastal California. Females store the sperm until ovulation occurs the following spring. Parturition timing is determined by local climate, and embryonic development usually takes about nine weeks with birth occurring from May to July. Twins are most common in northern California, but in other areas the pallid bat is known to have triplets. Maternity colonies range from 20 to 200 individual adult bats. Males roost in much smaller groupings (Hermanson and O'Shea 1983). The pallid bat feeds on large insects (20 to 70 mm in length). Prey is most often caught on the ground. Jerusalem crickets, scorpions, and beetles make up most of the diet of pallid bat in central California.

Spotted bat (*Euderma maculatum*; California Species of Special Concern) is a rare and uncommon bat with a patchy distribution throughout its range across western North America. In California, this bat is found in the Sierra Nevada and the lower reaches of the Cascade Range (Nagorsen and Brigham 1993). The spotted bat is dependent on rock-faced cliff roosting habitat. Typically, roosts occur in rock crevices that are 325 feet or more in height and located in vertical cliff faces. Therefore, the distribution of the spotted bat is limited to a small geographic area with these specific geologic features. The spotted bat is found from below sea level to high elevations in the Sierra Nevada. The females give birth to a single young in solitary roosts in late spring. Lactating females have been captured in Texas and New Mexico in June and July and as late as August in Utah (Nowak 1994). The diet of the spotted bat consists mainly of moths and other insects caught in flight. Foraging is known to occur in forest openings, pinyon-juniper woodlands, large riverine/riparian habitats, riparian habitat associated with small to mid-sized streams in narrow canyons, meadows, marshy areas, and old agricultural fields (Luce 1998, Chambers and Herder 2005). Echolocation calls of the spotted bat (6-16 kHz) are low frequency and generally audible to the human up to distances of 800 feet.

Greater western mastiff bat (*Eumops perotis californicus;* California Species of Special Concern) is the largest bat species in North America and has an unusual distribution consisting of two widely separated populations. The northern population occurs from the southwestern United States to Central Mexico, and the southern population occurs from northern South America to north central Argentina. In California, this species is found as far north as Butte County, and recent acoustic data has placed it in Shasta County (Pierson 1998). The mastiff bat has been documented in the Sierra Nevada Mountain range at elevations of 7,200 feet and at higher elevations in Sequoia National Park and Yosemite National Park (Pierson and Heady 1997). This species is known from Fresno, Tulare, and Mariposa counties (Constantine 1998). Maternity

colonies of western mastiff bat range from 30 to several 100 individuals but are typically small (<100 individuals). Males are often found roosting with the maternity colonies. Roosting sites are typically in crevices high in rock faces in dry arid places. The mastiff bat is not capable of achieving flight from the ground and requires an unobstructed drop of at least 10 feet to obtain flight speed. In southern California, western mastiff bat is known to roost in buildings and manmade structures (Best et al. 1996). The western mastiff bat does not undergo prolonged hibernation and appears to be periodically active all winter and may seek refugia that are protected from prolonged freezing temperatures. In California, it is most frequently encountered in broad open areas. Foraging is known to occur in dry desert washes, flood plains, chaparral, oak woodland, open ponderosa pine forest grassland, montane meadows and agricultural areas (Pierson 1998, Siders 2005). As with most molossid bats, mating occurs in the later winter/ early spring. One young is born per female from June through August. Dates of reproduction for this species vary more than any North American species, even within one colony. Little is known of the rate of development of the young or the longevity of adults (Best et al. 1996). The diet primarily consists of moths but also includes crickets and katydids. Prey selection varies with geographic location. A high level of weak flying insects found in guano and the stomachs of individuals suggest that western mastiff bat may forage low to the ground.

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APPENDIX B

Facility Site Assessment Photographs

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APPENDIX B

Facility Site Assessment Photographs

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French Meadows Dam

Hell Hole Dam

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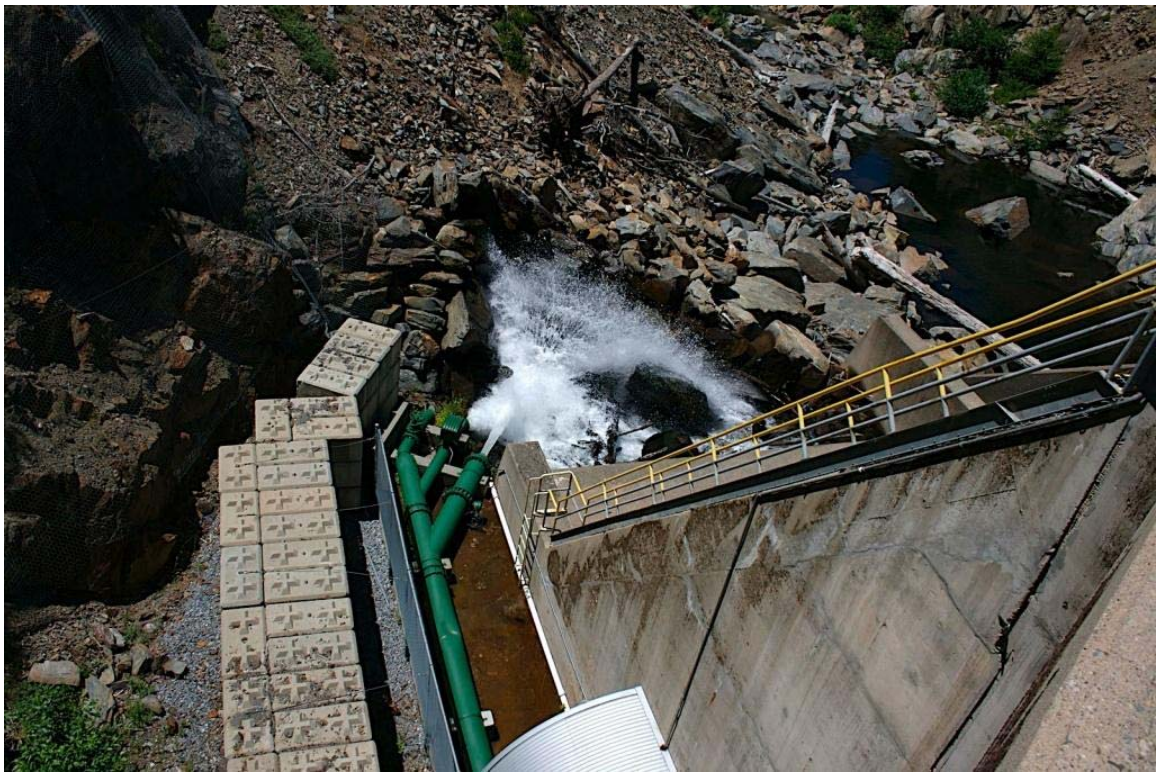
Middle Fork Interbay Dam - upstream view



Middle Fork Interbay Dam - downstream view

Ralston Afterbay Dam

Ralston Afterbay Dam - guano on spare rags in galley

Duncan Creek Diversion Dam

French Meadows - Hell Hole Tunnel Gatehouse

Hell Hole - Middle Fork Tunnel Gatehouse - single roosting bat inside gatehouse

Hell Hole - Middle Fork Tunnel Gatehouse - minor night roost area inside gatehouse

Ralston Powerhouse Penstock and Butterfly Valve House

French Meadows Powerhouse - sign of extensive night roosting activity in alcoves

French Meadows Powerhouse - guano deposition indicating extensive night roosting activity by bats in alcoves

French Meadows Powerhouse - small day roosting site

Oxbow Powerhouse

Oxbow Powerhouse - alcove ceiling

Oxbow Powerhouse - winch used as day roost

Ralston Powerhouse Garage Wall

Ralston Powerhouse Garage Wall

Ralston Powerhouse Garage - Yuma myotis (Myotis *yumanensis*) maternity colony, non-volant young were present at the time of survey on June 21, 2007

French Meadows Dam Generator Building

Ralston Afterbay Generator Building - bat access to interior

Silver-haired Bat (***Lasionycteris noctivagans***)

Flush-Style Toilet - no suitable habitat for bat use

Pit Toilet - shingles provide habitat for minor day roosting, but surveys indicate no sign of use

Pre-Fabricated Toilet - no suitable habitat for bat use

APPENDIX C

Five-Night Acoustic Seasonal Habitat Use Survey (by Species)

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APPENDIX C

Five-Night Acoustic Seasonal Habitat Use Survey Results (by Species)

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Location/Survey Date(s)	Bat Species Activity[1]														
	Special-Status Species					Common Species									
	Western red bat	Townsend's big-eared bat	Pallid bat	Spotted bat	Western mastiff bat	Hoary bat	Long-eared Myotis	Fringed myotis	Western pipistrelle	Big brown bat	Silver-haired bat	Mexican free-tailed bat	Q25 Phonic group[1]	50K Myotis[2]	40K Myotis[3]
French Meadows-Hell Hole Tunnel Surge Shaft and Tank and Access Road															
8/15-8/21/2007	0	0	0	0	0	0	0.43 (0.30)	0	0	0.14 (0.14)	0.29 (0.29)	0.14 (0.14)	0	17.0 (3.63)	5.71 (1.29)
9/20-9/26/2007	0	0	0	0	0	1.57 (1.07)	0.29 (0.29)	0	0	0.29 (0.29)	0.14 (0.14)	-	2.29 (2.12)	7.29 (6.63)	0.14 (0.14)
10/11-10/17/2007	0	0	0	0	0	2.14 (1.53)	0.29 (0.29)	0	0	-	-	-	2.43 (1.21)	2.57 (1.72)	0
Duncan Creek Diversion Dam															
8/13-8/17/2007	0	0	1.2 (0.73)	0	0	0	5.20 (1.46)	7.40 (2.58)	0.60 (0.24)	10.4 (5.16)	40.6 (11.7)	-	41.4 (10.87)	301.6 (44.9)	17.80 (4.86)
9/21-9/24/2007	0	0	0	0	0	0	3.0 (3.0)	0.75 (0.75)	0	-	0.75 (0.75)	0.25 (0.25)	7.5 (7.5)	16.25 (16.25)	0.75 (0.75)
10/10-10/16/2007	0	0	0	0	0	0	0.71 (0.71)	0	0	-	-	-	0.14 (0.14)	5.29 (2.97)	0
South Fork Long Canyon Diversion Dam															
8/13-8/18/2007	0	0	0	0	0	0	0.67 (0.33)	0	0	6.0 (3.16)	39.67 (12.0)	-	4.67 (2.93)	1446.0 (249.0)	343.50 (48.96)
9/20-9/22/2007	0	0	0	0	0	0	0	0.33 (0.33)	0	2.0 (2.0)	7.33 (6.36)	-	5.0 (4.51)	208.3 (208.3)	7.33 (7.33)
10/11-10/16/2007	0.33 (0.21)	0	0	0	0	0.17 (0.17)	0	0.50 (0.34)	0	0.67 (0.67)	1.83 (1.83)	-	3.17 (2.21)	11.00 (10.22)	409.67 (167.9)
North Fork Long Canyon Diversion Dam															
8/13-8/19/2007	0.14 (0.14)	0.57 (0.30)	1.86 (1.16)	0	0	0	2.86 (0.88)	0	1.0 (1.0)	23.43 (4.17)	23.43 (4.00)	5.29 (2.74)	82.43 (11.54)	272.0 (17.71)	118.0 (12.77)
9/20-9/25/2007	0	0	0	0	0	0.33 (0.21)	0.5 (0.5)	0	0	1.33 (0.80)	19.0 (11.85)	-	13.17 (9.0)	42.50 (18.26)	14.83 (13.86)
10/11-10/12/2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[1]Relative bat species activity calculated as the mean number of bat passes per species per night. Standard errors are provided in parenthesis.

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Location/Survey Date(s)	Bat Species Activity														
	Special-Status Species					Common Species									
	Western red bat	Townsend's big-eared bat	Pallid bat	Spotted bat	Western mastiff bat	Hoary bat	Long-eared Myotis	Fringed myotis	Western pipistrelle	Big brown bat	Silver-haired bat	Mexican free-tailed bat	Q25 Phonic group[4]	50K Myotis[5]	40K Myotis[6]
Middle Fork Interbay															
8/14-8/18/2007	0.20 (0.20)	0	2.4 (1.24)	0	0	8.6 (4.12)	2.20 (0.92)	0.40 (0.24)	108.6 (27.5)	5.40 (2.86)	1.8 (0.80)	165.0 (69.2)	2.4 (1.69)	108.20 (28.07)	0.80 (0.37)
9/2-9/-26/2007	0.50 (0.34)	0	0	0	0	1.17 (0.75)	3.00 (1.26)	0.50 (0.22)	7.33 (3.70)	1.17 (0.65)	0.33 (0.33)	0.17 (0.17)	16.83 (7.09)	51.33 (20.76)	2.33 (0.61)
10/11-10/17/2007	0	0	0	0	0	0	1.29 (0.71)	0.14 (0.14)	0	1.86 (0.99)	0.43 (0.43)	-	9.43 (3.46)	24.14 (8.89)	0.86 (0.34)

[1] Q25 Phonic: Acoustic group includes silver-haired bat, Mexican free tailed bat, and big brown bat
[2] 50K Myotis: Acoustic group includes Yuma myotis and California myotis
[3] 40K Myotis: Acoustic group includes long-legged myotis, little brown bat, western small-footed myotis
[4] Q25 Phonic: Acoustic group includes silver-haired bat, Mexican free tailed bat, and big brown bat
[5] 50K Myotis: Acoustic group includes Yuma myotis and California myotis
[6] 40K Myotis: Acoustic group includes long-legged myotis, little brown bat, western small-footed myotis

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