

Inventory & Monitoring Protocols – Bats			
Survey Level	Questions	Methods	Products
Preliminary (office-oriented)	<ul style="list-style-type: none"> • What bats are known to occur, or could potentially occur, in the unit? • What habitat features at the unit are known to support, or might support, bats? 	<ul style="list-style-type: none"> • Conduct literature and database searches (1, 2, 3, 4, 5) • Consult with knowledgeable persons (park maintenance and other staff, etc.) and agencies (3, 4) • Review any existing documents on habitat features (geologic, biotic, hydrologic, anthropogenic/facilities) for the site (Unit data file) • • 	<ul style="list-style-type: none"> • A list of bat species that occur, or could occur, in the unit based upon their habitat affinities and ranges, and an idea of where habitat features might be located.
Reconnaissance (field-oriented)	<ul style="list-style-type: none"> • What habitat features (e.g. mines, caves, water sources, wildlife trees, etc.) that exist at the unit may be used by bats, and where are they located? • What bats are known to occur at the unit and where are they located? • Is there an apparent change in use or the used habitat feature compared to previous years? 	<ul style="list-style-type: none"> • Determine potential use areas or changes in potential use areas/features by looking for sign or animals at high potential geologic and anthropogenic roosts during the day and night (Do not knowingly disturb a colony) (6, 7, 8, 9, 11) • Use bat detectors and/or night vision at potential roost sites, in predicted high use areas, or along roads and trails at night (10) • Methods Do Not Necessarily Require Special Permits 	<ul style="list-style-type: none"> • Completed annual inspection & questionnaire • Rapid assessment of bat use or potential change in use
Baseline (field-oriented)	<ul style="list-style-type: none"> • What bat species are using the unit, and what areas and features are being used? • Where are the occupied roosts and use areas/features? • What is the colony size of occupied roosts? • Is there a change in use or the used habitat feature compared to previous years? 	<ul style="list-style-type: none"> • Methods outlined in the Preliminary and Recon Level plus: Conduct out flight surveys and counts at dusk - count with night vision, backlight or red light, mist-net or harp trap (qualified bat biologist only for captures), and take Anabat recordings (6, 7, 8, 10, 11) • Conduct roost entry surveys where feasible (day and night), identification by sight or hand net and count (by qualified bat biologist only) (6, 7, 9, 12) • Conduct stationary point surveys with mist net/harp trap (qualified bat biologist only) and Anabat at predicted high use areas (primarily over surface water and across flyways) (6, 10, 11). • Use Global Positioning System (GPS) to create a map of bat roosts and survey locations as points. • Take photos of roost sites and make general observations of the site using Roost data sheet. • Take photos of individual bats to represent each species as voucher (The state does not allow collection of voucher specimens of bats without it being specifically authorized in a permit, except for salvage). • Have experts verify the identification of taxa that are in question by having them look at voucher photo, Anabat recordings, or the bats <i>in situ</i>. • Repeat the above periodically and compare results to previous years (Monitoring). • Roost Entry and Capture Requires Special Permits from DFG 	<ul style="list-style-type: none"> • A list of all bat species detected at the unit • A bat call library of recorded calls. • Descriptions of occupied roosts, inhabitants and their location within the unit. • Colony size at occupied diurnal roosts and changes from survey to survey. • Mapped locations of bat use areas and species using them.
Comprehensive	<ul style="list-style-type: none"> • What are the species assemblages in the various habitats 	<ul style="list-style-type: none"> • Methods outlined in the Preliminary Level plus: 	<ul style="list-style-type: none"> • Products of the Preliminary Level plus:

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(field-oriented)	<p>during different seasons?</p> <ul style="list-style-type: none"> • How does use change with season or stage in reproductive cycle? • What is the reproductive output from known maternity colonies? • What is the relative number of occupied/unoccupied suitable roosts and estimated total number of individuals roosting at the unit? • What are the threats or impacts to the population? • What are the changes in the above-mentioned attributes over time? 	<p>stationary surveys within each habitat type, sampled minimum of 2 nights each, between 1 May and 30 August. (6, 11)</p> <ul style="list-style-type: none"> • Repeat stationary surveys during fall, winter, and/or early spring to determine seasonal use patterns, and presence of migratory or wintering species. • Placement of guano traps below identified roosts (clean and visit every month throughout year) to determine frequency and seasonality of use. • Repeat roost counts during non-summer season, if bats are present. • Repeat the above periodically and compare results to previous years (Monitoring). • Roost Entry and Capture Requires Special Permits from DFG 	<p>Confirmation of habitat associations and use areas, habitat preferences.</p> <ul style="list-style-type: none"> • Estimate of relative abundance in each habitat type by species • Seasonal use patterns • Detect changes and trends in the above.
Intensive (field- & laboratory-oriented)	<ul style="list-style-type: none"> • Questions related to demographics, genetics, energy/nutrient cycling, etc. • How are the population demographics or other attributes changing? 	<ul style="list-style-type: none"> • Methods will be dependent upon the nature of the question and the taxon. Standard protocols, when available and applicable, should be employed. (12) • Radio-tracking to find roosts and foraging areas (6). • Capture and band roost occupants to track demographics (6). • Determine availability of suitable roosts (first have to find and describe), such as estimate of suitable snags per acre, or acres of rock outcrops/cliffs with suitable fractures. • Focus studies to address specific management issues or interrelated factors • Repeat the above periodically and compare results to previous years (Monitoring). • Roost Entry, Capture, Banding, Radio-tracking and Tissue Sampling Requires Special Permits from DFG 	<ul style="list-style-type: none"> • Detailed and intensive studies and reports on an attribute of interest with regard to a particular sensitive species or occurrence. • Home range size and movements, use of multiple roosts or foraging areas by a colony or individual. • Location of cryptic roosts • Demographics • Estimate of absolute abundance from locating most roosts and counting colony size. • Suitable maternity roosts characteristics and availability in park • Detect changes and trends in focused attribute.

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References:

- 1) Barbour and Davis 1969. *Bats of America*, Kentucky Press. Out of print book, but available at most libraries. Copies of sections on selected taxa available from Karen Miner, Southern Service Center
- 2) Brylski et al. In Prep. *Mammal Species of Special Concern in California*. Not yet available, but watch for it from California Department of Fish and Game.
- 3) California Natural Diversity Database (CNDDDB). California Department of Fish and Game. Sacramento, CA 95814 or visit the California Department of Fish and Game, Wildlife and Habitat Data Analysis Branch website at: www.dfg.ca.gov/whdab/html/cnddb.html
- 4) California Wildlife Habitat Relationship (CWHR). California Department of Fish and Game. Sacramento, CA 95814 or visit the California Department of Fish and Game, Wildlife and Habitat Data Analysis Branch website at: <http://www.dfg.ca.gov/whdab/html/cwhr.html>
- 5) Mammalian Species. Comprehensive pamphlets on each species (most species covered). Available from the American Society of Mammalogists. <http://www.mammalsociety.org/publications/index.html>
- 6) Kunz, T.H. (Ed.). 1988. *Ecological and Behavioral Methods for the Study of Bats*. Smithsonian Institution Press, Wash. D.C. ISBN 0-87474-411-3. Book available at online bookstores, etc.
- 7) Altenbach et al.. 1999. *Evaluation of bat use in abandoned mines*. Copies available from IMAP Teams
- 8) Navo, K. 1995. *Guidelines for external surveys of mines for bat roosts*. Copies available from IMAP Teams
- 9) American Society of Mammalogists. 1992. *Guidelines for the protection of bat roosts*. *Journal of Mammalogy* 73(3): 707-710.
- 10) O'Farrell, M.J., B. W. Miller and W.L. Gannon. 1999. *Qualitative identification of free-flying bats using the Anabat detector*. *Journal of Mammalogy*, 80:11-23.
- 11) Province of British Columbia. 1998. *Inventory Methods for Bats: Standards for Components of British Columbia's Biodiversity*, No. 20. Resources Inventory Committee, Available at <http://www.for.gov.bc.ca/ric/pubs/TEBIODIV/>.
- 12) Pierson et al. 1999. *Species conservation assessment and conservation strategy for the Townsend's big-eared bat*. Idaho Conservation Effort, Dept of Fish and Game, Idaho. Copies can be obtained from IMAP team or Charles E. Harris, Idaho Dept of Fish and Game, P.O. Box 25, Boise, ID 83707-0025; 208-334-2920; charris@idfg.state.id.us

Also checkout <http://www.batcon.org> and links for bat species accounts and management