

Inventory & Monitoring Protocols – Terrestrial Amphibians and Reptiles			
Survey Level	Questions	Methods	Products
Preliminary (office-oriented)	- What species are known to occur, or could potentially occur, in the unit? - What areas/features potentially provide habitat for the various species?	- Conduct literature and database searches (1, 2, 3, 4, 5) - Consult with knowledgeable persons (park maintenance and other staff, etc.) and agencies - Review any existing documents on previous studies in or near the park (Unit data file)	A list of species that occur, or could occur, in the unit based upon their habitat affinities and ranges, and an idea of where habitat might be located.
Reconnaissance (field-oriented)	- What habitats exist for herptofauna in the unit? - What species are readily observed in the park? - What microhabitats or areas appear to be important to herptofauna in the park?	- Methods outlined in the Preliminary Level plus: Conduct searches in high potential areas throughout study area/park, such as around rock outcrops, under large woody debris, and along linear features, during appropriate weather conditions (cool and sunny, or warm and overcast, or after rain). (6, 8, 9) - Conduct evening road surveys during appropriate weather conditions such as after a warm day and during evening rain (best for crepuscular/nocturnal snakes and after rains amphibians). Record distance traveled, location and environmental conditions, and specimen measurements and information. (6, 8, 9) - Collect road kills for vouchers. - Requires DFG Scientific Collecting Permit (& MOU for sensitive species)	- Completed annual inspection & questionnaire - Rapid assessment of terrestrial amphibians and snake habitat and presence.
Baseline (field-oriented)	- What species are currently present and how are they distributed? - What are the species assemblages in the various habitats? - How do presence or distribution change over time?	- Methods outlined in the Reconnaissance Level, except repeat several times per season, paying attention to sampling design relative to habitats, watersheds or management zones, and to documentation, so that the data serve as baseline for repeat monitoring. (6, 7, 8, 9) - Use Global Positioning System (GPS) to create a map of survey locations/ routes. - Collect voucher specimens, if none exist for the unit. - Have experts verify the identification of taxa that are in question - Repeat the above periodically and compare results to previous years (Monitoring). - Requires DFG Scientific Collecting Permit (& MOU for sensitive species)	- Confirmation of species currently present in park, habitat, or area, and their relative abundances and observability. - Habitat associations using logistic regressions and species assemblages
Comprehensive (field-oriented)	- What is the estimated relative abundance between habitat types, or areas? - What are the changes in relative abundance over time? - Is there a difference in the number of species between sites of the same habitat type?	Conduct time-constrained searches with three-person crew (one recorder and two searchers), during spring, summer and fall (best warm days immediately after rains, but similar weather for all sites within each survey period). Check as much appropriate microhabitat as possible during 1 person- hour within min. 25 m. radius circle though exact area covered not as important here as equal effort (turn over, look under, sift through, but no destructive dismantling of rocks or logs. Return microsites to pre-search condition), 6-8 sites per	- Products of the Preliminary Level plus: Relative abundance by habitat type or area. - Detect changes and trends in the above.

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		terrestrial habitat type (locate min. 75m. from edges or aquatic habitat). Capture and record species, sex, snout-vent length, total length, and mass (rattlesnakes may be estimated), as well as temperature, weather, time and habitat information. Mark (toe or scale clip) for better estimate of relative abundance and indication of species-specific observability. (6, 7, 8, 9) And/or • Install and monitor pit-fall trap arrays with drift fences and funnel traps. Each array consists of three 15m long arms radiating at 120° from a center pitfall trap, with a pitfall trap at each end and midway along each arm (total 7 pitfall traps, either 5-gal bucket or two stacked #10 tin cans with raised cover buried so flush with surface). Drift fence (~50cm tall) erected between pitfall traps, one funnel trap per arm against drift fence and covered with debris. Install 3-4 arrays per habitat type (Six-person crew can install two arrays per day). Open arrays for 7-10 day trapping periods in spring, summer and fall (one or two persons to check morning of every day). Record species, sex, snout-vent length, total length, and mass, (except for rattlesnakes), as well as temperature, weather, and habitat info. Mark (toe or scale clip) for better estimate of relative abundance and indication of species-specific trapability. (8, 10) • Repeat the above periodically and compare results to previous years (Monitoring). • Collecting Permit Required for Capture, Mark and Voucher and MOU if sensitive species.	
Intensive (field- & laboratory-oriented)	• What is the estimated absolute abundance of species in the park, habitat type or area? • How are species moving within or using the park? • Questions related to demographics or genetics. • Does habitat use or abundance appear to be affected by visitor use, operations or management? • What are changes in any of the above over time?	• Radio-tracking to determine home range, movements, den locations. • Conduct focused intensive searches, either time- or area-constrained, for specific species with mark and recapture (6, 8, 9). • Focus studies to address specific management issues or interrelated factors. Methods will be dependent upon the nature of the question and the taxon. Standard protocols, when available and applicable, should be employed. • Collecting Permit Required for Capture, Mark and Radio-tracking, esp. if sensitive species.	• Estimates of absolute abundance/density in focus habitats or management areas • Estimates of demographic parameters • Home range size and movements • Detailed and intensive studies and reports on an attribute of interest with regard to a particular sensitive species or occurrence. • Indications of visitor/operations/management effects on species. • Changes and trends detected in any of above.

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References:

- 1) 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
- 2) 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>
- 3) Jennings, M. R and M.P. Hayes. 1994. *Amphibian and Reptile Species of Special Concern in California*. Final Report submitted to Cal. Fish and Game, Inland Fisheries Division, Contract No. 8023, 255 pp. Available from Ca Fish and Game.
- 4) Stebbins, R.C. 1985. *A field guide to western reptiles and amphibians*. The Peterson Field Guide Series. Houghton Mifflin Co. Available at most bookstores.
- 5) *A Field Guide to the Reptiles and Amphibians of Coastal Southern California*, <http://ratbert.wr.usgs.gov/fieldguide/>
- 6) Province of British Columbia. 1998. *Inventory Methods for Snakes*. Standards for Components of British Columbia's Biodiversity, No. 38. Resources Inventory Committee. Download from <http://www.for.gov.bc.ca/ric/pubs/TEBIODIV/>
- 7) Campbell, H. W. and S. P. Christman. 1982. *Field technique for herpetofaunal community analysis*. In N. J. Scott, Jr. (ed.), *Herpetological Communities*. U.S. Department of the Interior, Fish and Wildlife Service, Wildlife Research Report 13: 193-200.
- 8) Corn, P. S. and R. B. Bury. 1990. *Sampling methods for terrestrial amphibians and reptiles*. U. S. Department of Agriculture, Forest Service, PNW-GTR-256. Available at <http://www.fs.fed.us/pnw/pubs.htm> or by contacting (503) 808-2138, desmith@fs.fed.us, PNW Publications Portland Habilitation Center, 5312 NE 148th, Portland, OR 97230-3438
- 9) Chapter 6.2 *Standard techniques for inventory and monitoring*. In Heyer, W. R. et al. (eds.) 1994. *Measuring and monitoring biological diversity: standard methods for amphibians*. Smithsonian Institution Press. Available from on-line bookstores.
- 10) Pitfall trap protocols after R. Fisher of USGS-Western Ecological Research Center, San Diego Field Station (already being applied in many State Parks in So. Cal. for regional long-term monitoring). Written text in preparation. Will be available from IMAP Teams or USGS website <http://ratbert.wr.usgs.gov/products/res-prod-person.asp>