

Inventory & Monitoring Protocols – Small Mammals (rodents and shrews)			
Survey Level	Questions	Methods	Products
<b>Preliminary</b> (office-oriented)	<ul style="list-style-type: none"> <li>What species are known to occur, or could potentially occur, in the unit?</li> <li>What areas/features potentially provide habitat for the various species?</li> </ul>	<ul style="list-style-type: none"> <li>Conduct literature and database searches <b>(1, 2, 3, 4)</b></li> <li>Consult with knowledgeable persons (park maintenance and other staff, etc.) and agencies</li> <li>Review any existing documents on habitat features (geologic, biotic, hydrologic, anthropogenic/facilities) for the site (Unit data file)</li> </ul>	<ul style="list-style-type: none"> <li>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.</li> </ul>
<b>Reconnaissance</b> (field-oriented)	<ul style="list-style-type: none"> <li>What small mammal habitats exist in the unit?</li> <li>Does the predator/prey relationship seem out of balance?</li> </ul>	<ul style="list-style-type: none"> <li>Walk-through, drive-by, fly-over, and look at photos of the site to look for habitat, presence/success of predators hunting for rodents, and signs of rodent activity (runways, burrows, dust baths, droppings, gnawing, rodent carcasses).</li> </ul>	<ul style="list-style-type: none"> <li>Completed annual inspection &amp; questionnaire</li> <li>Rapid assessment of rodent activity/availability to predators.</li> </ul>
<b>Baseline</b> (field-oriented)	<ul style="list-style-type: none"> <li>What species are currently present?</li> <li>What are the species assemblages in the various habitats?</li> </ul>	<ul style="list-style-type: none"> <li>Methods outlined in the Preliminary Level plus: Conduct Live-trapping (using Sherman, Longworth, Tomohawk or pitfall depending on target species) during season appropriate for local rodent activity levels along transect lines randomly placed in representative habitats or management areas. Operate for 3-5 consecutive nights depending on trappability and check daily if accidental mortality acceptable, more often (sensitive species protocol) if not. Determine detection probabilities <b>(5, 6, 7)</b></li> <li>Use Global Positioning System (GPS) to create a map of survey locations.</li> <li>Collect voucher specimens, if none exist for the unit.</li> <li>Have experts verify the identification of taxa that are in question</li> <li>Repeat the above periodically and compare results to previous years (Monitoring).</li> <li><b>Collecting Permit Required for Capture and Voucher, esp. if sensitive species.</b></li> </ul>	<ul style="list-style-type: none"> <li>Confirmation of species currently present in park and probability of detection.</li> <li>Habitat associations using logistic regressions and species assemblages</li> </ul>
<b>Comprehensive</b> (field-oriented)	<ul style="list-style-type: none"> <li>What is the estimated relative abundance between habitat types, or areas?</li> <li>What are the changes in relative abundance over time?</li> </ul>	<ul style="list-style-type: none"> <li>Methods outlined in the Baseline Level, except mark animals to identify those previously captured during the same survey, and make sure sampling effort is the same and concurrent in the habitats/areas to be compared. <b>(5, 6, 7)</b></li> <li>Repeat the above periodically and compare results to previous years (Monitoring).</li> <li><b>Collecting Permit Required for Capture, Mark and Voucher, esp. if sensitive species.</b></li> </ul>	<ul style="list-style-type: none"> <li>Products of the Preliminary Level plus: Relative abundance by habitat type or area.</li> <li>Detect changes and trends in the above.</li> </ul>
<b>Intensive</b> (field & laboratory-oriented)	<ul style="list-style-type: none"> <li>What is the estimated absolute abundance of species in the park, habitat type or area?</li> <li>Questions related to demographics or genetics.</li> <li>Does habitat use or abundance appear to be affected by visitor use, operations or management?</li> <li>What are changes in any of the above over time?</li> </ul>	<ul style="list-style-type: none"> <li>As in Comprehensive, except mark (unique per individual) and recapture methods for estimating absolute abundance. Determine model to be used prior to initiating sampling so designed accordingly. (E.g. Closed population models for density estimate, 5 consecutive nights in 16 x 16 station grid. Open</li> </ul>	<ul style="list-style-type: none"> <li>Estimates of absolute abundance in focus habitats or management areas</li> <li>Estimates of demographic parameters</li> <li>Home range size and movements</li> <li>Detailed and intensive studies and reports on an attribute of interest with regard to a particular</li> </ul>

Inventory & Monitoring Protocols – Small Mammals (rodents and shrews)			
Survey Level	Questions	Methods	Products
		<p>population models for demographic parameters, minimum 8 sessions, 2-5 nights each, a month apart, in 7 x7 or 16 x16 grid). <b>(5, 6)</b></p> <ul style="list-style-type: none"><li>• Radio-tracking to determine home range.</li><li>• 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.</li><li>• <b>Collecting Permit Required for Capture, Mark and Radio-tracking, esp. if sensitive species.</b></li></ul>	<p>sensitive species or occurrence.</p> <ul style="list-style-type: none"><li>• Indications of visitor/operations/management effects on species.</li><li>• Changes and trends detected in any of above.</li></ul>

## Inventory & Monitoring Protocols – Small Mammals (Rodents and Shrews)

### References:

- 1) 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.
- 2) 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](http://www.dfg.ca.gov/whdab/html/cnddb.html)
- 3) 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>
- 4) Mammalian Species. Comprehensive pamphlets on each species (most species covered). Available from the American Society of Mammalogists. <http://www.mammalsociety.org/publications/index.html>
- 5) Wilson, D.E. et al. (Eds.) 1996. *Measuring and Monitoring Biological Diversity: Standard Methods for Mammals*. Smithsonian Institution Press, Washington D.C. ISBN 1-56098-637-9. Book available from on-line bookstores, etc.
- 6) Province of British Columbia. 1998. *Inventory Methods for small mammals: shrews, voles, mice and rats*. Standards for Components of British Columbia's Biodiversity, No. 31. Resources Inventory Committee. <http://www.for.gov.bc.ca/ric/pubs/TEBIODIV/smallmammals/>
- 7) Krebs, C. J. 1989. *Ecological Methodology*. Harper Collins, New York, N.Y. 654pp. Book available from on-line bookstores, etc.