

Terrestrial Animals

Protocol: Brown Bear

Parks Where Protocol Will Be Implemented: ALAG, ANIA, KATM, LACL

Justification/Issues Being Addressed: Brown bears (*Ursus arctos*) are an integral part of SWAN parks and are specifically mentioned in the enabling legislation of ANIA, KATM, and LACL. These animals play important ecological roles as top predators influencing population dynamics of other species and as means of nutrient transfer from spawning salmon (*Oncorhynchus* spp.) to the terrestrial system (Gende et al. 2002). Moreover, ALAG, ANIA, KATM, and LACL support high densities of brown bears; in fact, estimated densities of brown bears along the KATM coastline are the highest reported in North America (Sellers et al. 1999). Brown bears are drawn to these areas because of the abundant salmon runs (Hilderbrand et al. 1999), which also draw sport fishing enthusiasts from around the world. The presence of the bears has begun to draw larger numbers of bear viewers during the past two decades (National Park Service 2004). In addition, the Alaska Board of Game is interested in opening more bear hunting opportunities on state and federal land adjacent to these parks. The impacts of high numbers of backcountry anglers, hunters, and recreationalists on bear foraging behavior, habitat use, and survival are largely unknown, particularly at coastal sites, where bears feed heavily on salt marsh vegetation in addition to fish. Further, brown bears in ALAG, ANIA, KATM, and LACL are subject to subsistence hunting and are available for sport hunting in the preserves.

Specific Monitoring Questions and Objectives to be Addressed by the Protocol:

Question:

- Are numbers and distribution of brown bears remaining stable in ALAG, ANIA, KATM, and LACL?

Objective:

- Estimate long-term trends in abundance and area of occupancy of brown bears from a random sample of relevant elevations and terrains in ALAG, ANIA, KATM and LACL.

Basic Approach: An aerial double-count, line transect method (Quang and Becker 1996, 1997, 1999) will be used to estimate abundance and distribution of brown bears in ALAG, ANIA, KATM, and LACL. The double-count feature is used to relax the assumption of complete detectability of bears along the sampled transects. Using program AdfgBearTrans (see Becker 2001), random transects are selected from relevant habitats within each park across a variety of elevations and terrains (see Quang and Becker 1999 and Becker 2001 for details). A pilot and observer in a fixed-wing aircraft survey each selected transect and record perpendicular distances to each detected bear. Independence between observers is ensured through use of a curtain between the pilot and rear passenger. Distances to detected bears are estimated via flyover and recording the bear's location on a GPS unit. Other covariate information is collected at each detection, including bear species (in case black bears are detected), group size, group type (sex and age), activity at time of detection, percent vegetational cover and snow cover at detection point, and which observer (pilot, passenger, or both) detected the bear. Surveys are conducted in May after bears emerge from winter dens but prior to leaf-out.

Principal Investigators and NPS Lead:

- Tammy Olson, NPS-KATM
- Judy Putera, NPS-LACL
- Jim Woolington, ADF&G
- Bill Thompson, NPS-SWAN (NPS Lead)

Development Schedule, Budget, and Expected Interim Products: NPS and ADF&G have tested the double-count, line transect method in KATM and LACL.

- 2008 Draft SOPs (\$ to be determined).
- 2009 Test protocols (\$ to be determined).
- 2010 Implement protocol (\$ to be determined).

Literature Cited:

- Becker, E. F. 2001. Brown bear line transect technique development. Alaska Department of Fish and Game Aid in Wildlife Restoration Progress Report on Project W-27-3, Study 4.30, Juneau, Alaska, USA. Online. (http://www.wildlife.alaska.gov/pubs/techpubs/research_pdfs/a01brb_transect.pdf). (Accessed 27 May 2005).
- Gende, S. M., R. T. Edwards, M. F. Willson, and M. S. Wipfli. 2002. Pacific salmon in aquatic and terrestrial ecosystems. *Bioscience* **52**:917-928.
- Hilderbrand, G.V., C. C. Schwartz, C. T. Robbins, M. E. Jacoby, T. A. Hanley, S. M. Arthur, and C. Servheen. 1999. Importance of meat, particularly salmon, to body size, population productivity, and conservation of North American brown bears. *Canadian Journal of Zoology* **77**:132-138.
- National Park Service. 2004. Superintendent's annual report 2004: Katmai National Park and Preserve, Aniakchak National Monument and Preserve, Alagnak Wild River. National Park Service, King Salmon, AK.
- Quang, P. X., and E. F. Becker. 1996. Line transect sampling under varying conditions with application to aerial surveys. *Ecology* **77**:1297-1302.
- Quang, P. X., and E. F. Becker. 1997. Combining line transect and double count sampling techniques for aerial surveys. *Journal of Agricultural, Biological, and Environmental Statistics* **2**(2):1-14.
- Quang, P. X., and E. F. Becker. 1999. Aerial survey sampling of contour transects using double-count and covariate data. Pages 87-97 in G. W. Garner, S. C. Amstrup, J. L. Laake, B. F. L. Manley, L. L. McDonald, and D. G. Robertson, editors. *Marine mammal survey and assessment methods*. A. A. Balkema, Rotterdam, Holland.
- Sellers, R. A., S. D. Miller, T. S. Smith, and R. Potts. 1999. Population dynamics and habitat partitioning of a naturally regulated brown bear population on the coast of Katmai National Park and Preserve. Resource Report NPS/AR/NRTR – 99/36, National Park Service, Alaska Support Office, Anchorage, AK.