

## **CUMULATIVE EFFECTS MODEL FOR BROWN BEAR ON THE KENAI PENINSULA, ALASKA**

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The Kenai Peninsula has received some of the most significant human impacts in Alaska to the detriment of some wildlife populations and habitat. Logging, mineral and energy development, and water impoundments all occur on the Kenai Peninsula and lead to modification or destruction of habitat for brown bears (*Ursus arctos*). Subdivision development, livestock grazing, recreational development, and sport hunting also all occur on the Kenai Peninsula. These activities often lead to an increased likelihood of human/bear conflicts and may lead to bear mortality. The brown bear population on the Kenai Peninsula was recently estimated to be 150-250 and has characteristics similar to grizzly bear populations listed as Threatened in the lower 48 United States.

This model provides an analytical tool to simultaneously evaluate the cumulative effects of human actions on all state, federal and private lands on habitat capability for brown bear on the Kenai Peninsula. Changes in quality of habitat for brown bears (habitat submodel) as a result of habitat modification and the reduction in the effectiveness of that habitat (human activities submodel) as a result of disturbance and mortality are evaluated. The habitat submodel contains 6 major habitat categories which are evaluated separately for spring and summer. Summer is probably the most important of the 2 seasons to the survival of brown bears because this is when the most abundant and highest quality food is available (spawning salmon). It is also the time of the year with the greatest potential for human/bear conflicts.

A Habitat Capability Index was assigned to each habitat category for each season. In spring, the habitat categories differentiated the relative abundance of plant forage species. The second major factor is the availability of ungulate carcasses. Southern aspects are also important to foraging bears in the spring. Habitat selection by brown bears in the summer is highly correlated to the presence and abundance of spawning salmon. Availability of cover was also assumed to influence brown bear use of riparian forests, especially in avoiding contact with humans.

Human induced impacts on brown bear populations can be indirect through habitat modification and disturbance, or direct through mortality. Reduction coefficients are applied to 2 zones of influence for each evaluated activity in both cover and noncover habitats. The impact associated with the actual source of the activity in this model occurs in the first zone of influence. The less severe impact resulting from dispersed activities radiating from the mapped activity source occurs in the second zone of influence. The impact to bears from multiple, simultaneous sources of human activity and the reduction in habitat capability within overlapping zones of influence is cumulative.

This model allows a comprehensive evaluation of the cumulative impacts to brown bears of management activities on the Kenai Peninsula through a Geographic Information System. Application of the model demonstrates the degree of influence human activities currently have on the capability of habitats to support brown bears. Results of the model's application during land management planning activities will play a key role in averting crisis management in this area and in maintaining a viable population of brown bear on the Kenai Peninsula.

# ABSTRACTS

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