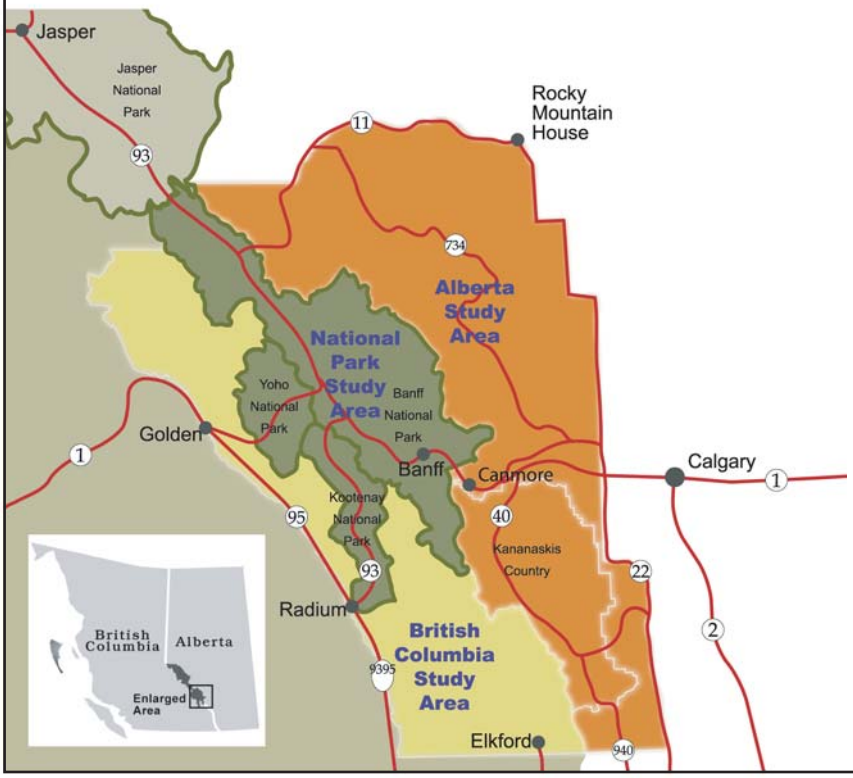
CHAPTER 12

HABITAT EFFECTIVENESS AND SECURITY AREA ANALYSES



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12. HABITAT EFFECTIVENESS AND SECURITY AREA ANALYSIS

Michael Gibeau

As demands on the land increase, cumulative effects result from individually minor yet collectively significant uses occurring over space and time. Cumulative effects analysis (CEA) assesses the effects on a system of spatial and temporal perturbations resulting from human activities (Beanlands et al. 1986). CEA explicitly deals with effects, and most importantly, whether those effects exceed or fall short of thresholds compatible with population goals of a given species or guild of species. Hence, CEA and its subsequent models, are tools to perform proactive conservation (Weaver et al. 1987) of threatened or sensitive species and landscapes.

Initial analysis of habitat effectiveness, done in the early 1990's, played a key role in underscoring the effects of development in the mountain National Parks (Gibeau 1998). For many this evaluation was the first realization that much of the mountain national parks are not inherently prime, undisturbed grizzly bear habitat. Better habitat lies to both the east and west in human-dominated multiple-use lands. The disturbance component of the model suggests the ability of the landscape to support bears has been significantly reduced by widespread human presence. The results predicted wide spread habitat alienation in areas previously considered core refugia for grizzly bears in the Canadian Rocky Mountains (Figure 1).

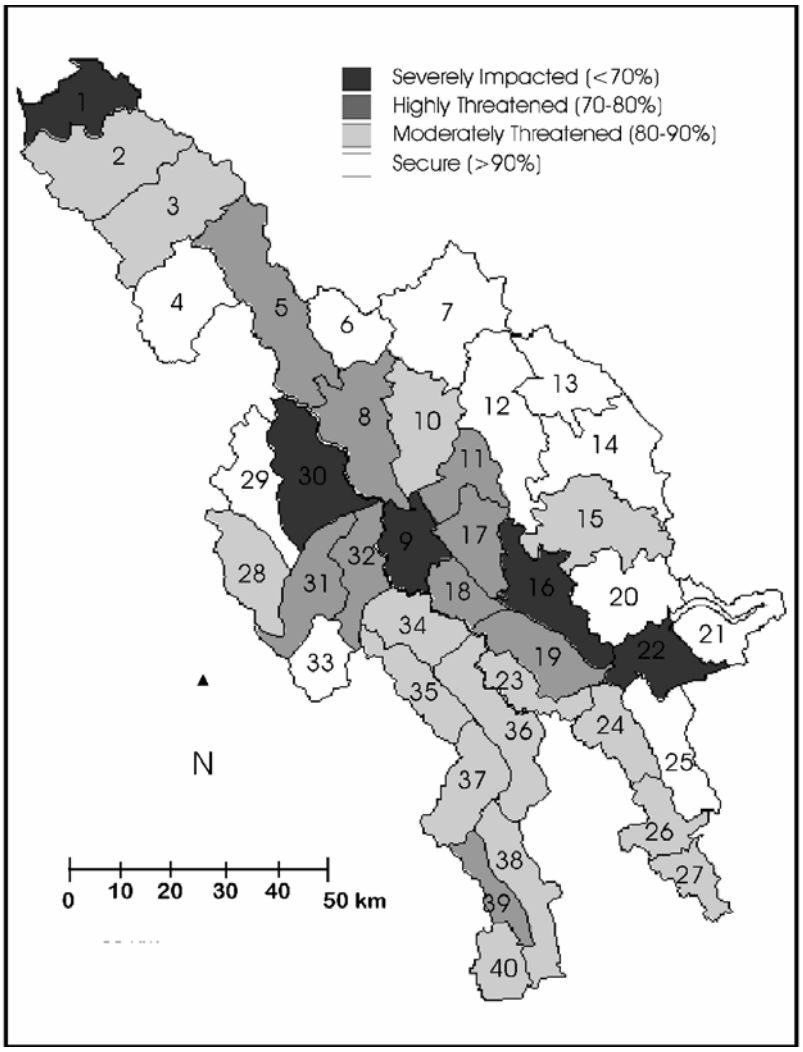

Figure 1. Habitat Effectiveness Map for bear management units in Banff, Yoho and Kootenay National Parks.

This finding questioned the long-term ability of the landscape to support a viable population. Traditional types and levels of human activities are widely accepted within national parks and had not been viewed as detrimental to grizzly bears until this point.

In a more detailed analysis of habitat effectiveness in the Lake Louise area, Jalkotzy et al. (1999) found large continuous pieces of potential grizzly bear habitat were associated with major valley bottoms, in particular the Bow River, the Pipestone River, Baker Creek, and the upper Red Deer River. Grizzly bear habitat at higher elevations tends to have a patchy distribution relative to the valley bottoms. Temporal variation in potential habitat quality for grizzly bears results from the changing availability and importance of plant foods and other food sources throughout the year. The food habitats component of the habitat effectiveness model rated habitat polygons for grizzly bears on a monthly basis to take into account this variation. As a result, the relative quality and quantity of habitats rated as good or very good for grizzly bears in the potential habitat model changed with the seasons. While the validity of expert determined habitat suitability models, a key component of habitat effectiveness modeling, has been questioned (Nielsen 2003), the fundamental point that human landscape use extensively compromises grizzly bear habitat use, remains.

With updated human use maps, Jalkotzy et al. (1999) produced realized habitat maps for each BMU in May, August, and October. Their maps predicted the extent to which the amount and distribution of grizzly bear habitats in all BMU's were altered by human disturbance. First, the extent of grizzly bear habitat within the BMU was reduced. There are fewer places for bears to forage. Second, the sizes of the remaining patches of good and very good grizzly bear habitat were reduced. There are fewer places where grizzly bears can remain within the BMU without being disturbed by humans. Finally, linkages of good and very good habitat between larger pockets of undisturbed lands were reduced in size and number. Overall their analysis demonstrated further fragmentation of a naturally-fragmented landscape makes it more difficult for grizzly bears to move throughout the BMU's without contacting humans.

SECURITY AREA ANALYSIS

In the past, habitat effectiveness modeling was the primary tool used to measure the impact of human activities on bears (USDA Forest Service 1990, Gibeau 1998). The model fell short, however, in estimating the human encounter rate and mortality risk that is equally important as foraging opportunities for population persistence. Security area analysis provides managers with a measure of the human encounter rate for adult female grizzly bears at a much more refined scale than the habitat effectiveness model. Security areas help reduce the number of habituated bears, bears killed out of self-defense, and bears killed or removed by management agencies because of unacceptable behavior (Mattson 1993).

Gibeau et al. (2001) defined security areas and land not secure due to rock and ice, human use or size for each jurisdiction in the Central Canadian Rocky Mountains (CRE) by comparing a map of the available landscape with a minimum daily area requirement of 9.0 km^2 based on an adult female's daily foraging radius. The percent of productive land base where adult female grizzly bears have a low probability of encounters with people (secure) depends on the amount of productive land available to a bear and the extent of human influence. Alberta's Kananaskis Country (52% secure habitat) and Alberta provincial lands (63%) did not meet the current target level of 68% considered to be adequate security set by the USDA Forest Service (1995) in the Northern Continental Divide grizzly bear ecosystem in northwest Montana. Only the combined National Parks (68%) and British Columbia provincial lands (68%) met the USDA's target level. Results suggest that some of the best chances for grizzly bear persistence come from outside National Parks (McLellan et al. 1999), and hence a cooperative and coordinated management approach is critical.

Analysis of security areas over time for Banff National Park and Kananaskis Country clearly demonstrated the decreasing size over time of relatively undisturbed habitat units (Figure 2). This habitat fragmentation has occurred throughout Banff National Park and Kananaskis Country, but is dramatic in the Bow River Valley. The decreasing size of security areas was paralleled by a significant decrease in total amount of security area available throughout Banff National Park and Kananaskis Country.

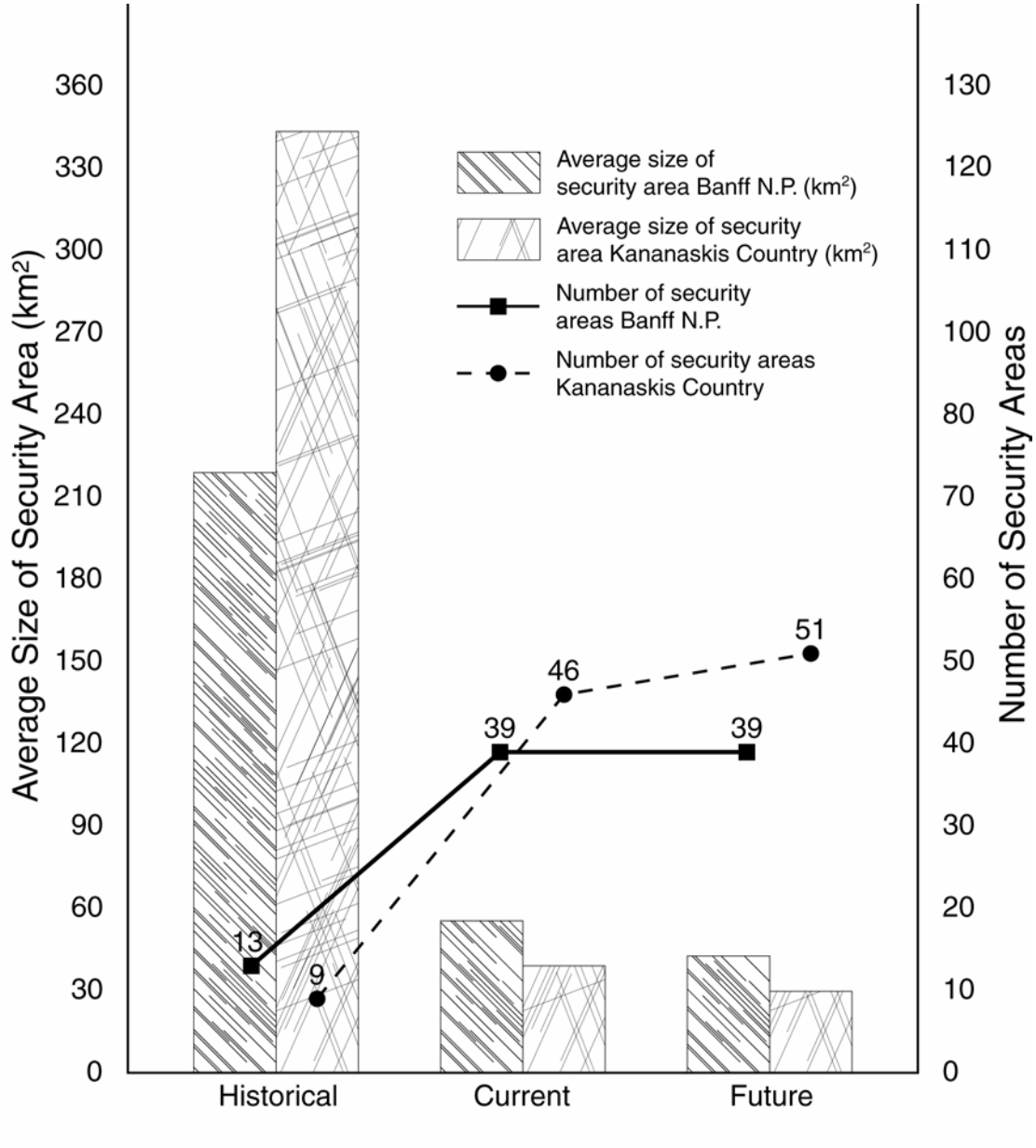

Figure 2. Analysis of grizzly bear security areas for Banff National Park and Kananaskis Country for past (1950s), present (1999), and future (2020s).

Gibeau et al. (2001) results also characterized habitat security at the level of an adult female grizzly bears' home range. For 28 adult female bears throughout the region, an average of 69% of the home range was secure. Female bears within Banff National Park, however, averaged only 60% security within their home ranges.

A more recent analysis by Stevens (2002) reran the secure area model incorporating the most recent spatial data on human use. Those results found a decrease in percent of available land base that was secure habitat across all jurisdictions. British Columbia provincial lands continue to have the largest percentage of secure habitat (50%), followed by Alberta provincial lands and National Parks with 43% secure habitat in both, and Kananaskis Country with 36%. The results suggest that either human activity and development has increased in the CRE since 1998, when Gibeau et al. (2001) developed their human use models, or the original map did not capture all the human activities. Most likely there was both an increase in development and more accurate mapping of human activities. Currently, no jurisdictions in the CRE meet the USDA Forest Service target level of 68% secure habitat (IGBC 1998).

Stevens (2002) also included habitat quality in the recent evaluation of grizzly bear security (Figure 3). Results show a small proportion of each jurisdiction encompasses secure high quality habitat. British Columbia provincial lands have the largest percentage (13%) of their available land base in secure high quality habitat. Ironically, in National Parks where it is assumed that productive core refugia for grizzly bears exist, there is the least amount of available land base in secure high quality habitat (5%). In Banff National Park, an average of 4% of BMU's are secure high quality habitat, followed by 6% in Yoho, 7% in Kananaskis Country and 12% in Kootenay National Park. It is important to identify these areas of high quality secure habitat so that managers can work to prevent further loss of habitat from the accelerating pressures of human use and ensure they remain accessible to grizzly bears over the long term.

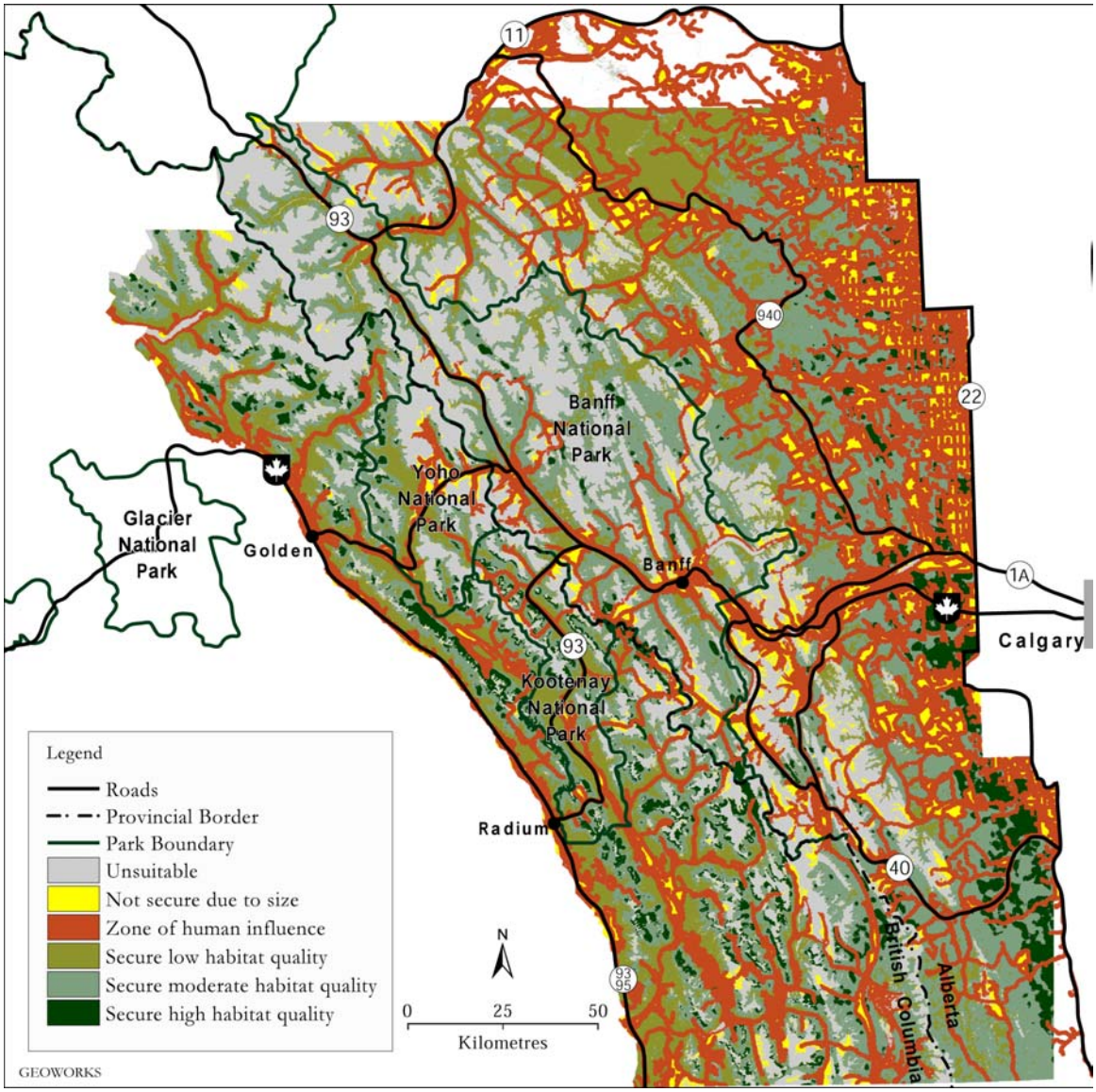

Figure 3. Secure Area map combined with habitat quality delineating secure high, moderate and low quality habitats in the Central Rockies Ecosystem. (credit: S. Stevens)

Security at the level of an adult female grizzly bears' home range revealed that for 30 female grizzly bears in the East Slopes, an average of 39% of the home range was secure, with only 7% secure high habitat quality (Table 1). For 10 adult female grizzly bears in the West Slopes, an average of 62% of the home range was secure and 22% secure high quality habitat. Secure high quality habitat for the East Slopes bears ranged between 0 and 34% of the home range (Table 1). Secure high quality habitat for the West slopes bears

ranged between 7 and 47% of the home range (Table 1). This reduction in secure area may be attributed again to the increase of human use documented, or better mapping of human use. The results raise the question whether this level of security is sufficient for a long term viable grizzly bear population and if interventions are necessary to increase the amount of secure high quality habitat. This is particularly important since the Bow River Watershed grizzly bear population's slight, positive growth rate, was possible because of 95-96% survival from year to year by adult females (Garshelis et al. 2005).

Table 1. Percent of the available land base that is secure high, moderate and low habitat quality for female grizzly bears in the East and West Slopes study areas. (credit: *S. Stevens*)

Bear ID	Home Range (Km^2)	Secure	High Habitat Quality	Moderate Habitat Quality	Low Habitat Quality
ES17	136	51	1	88	11
ES18	244	23	7	86	6
ES24	360	27	5	95	0
ES26	300	26	11	83	6
ES27	49	46	0	73	27
ES28	413	53	1	90	9
ES30	386	48	3	66	31
ES31	94	27	6	93	0
ES32	304	34	3	84	13
ES33	277	45	1	88	10
ES35	172	28	16	79	6
ES36	631	30	5	74	21
ES37	1058	34	9	83	8
ES39	213	36	9	88	4
ES40	355	60	4	79	17
ES41	249	41	22	69	10
ES46	328	38	7	81	12
ES47	260	18	34	63	3
ES48	87	23	15	74	11
ES55	339	53	1	90	10
ES56	694	44	2	64	34
ES57	465	58	2	72	26
ES59	180	55	4	81	14
ES60	251	49	3	67	30
ES61	307	36	3	91	5
ES62	149	57	1	88	11
ES63	66	31	15	56	30
ES64	293	41	9	73	18
ES65	143	32	15	77	8
ES66	466	31	1	68	31
WS35	78	51	20	61	19
WS42	109	68	13	56	31
WS44	655	58	10	48	43
WS71	147	66	12	56	32
WS74	99	63	7	65	28
WS132	401	56	19	54	28
WS282	118	58	40	45	15
WS284	58	69	38	50	13
WS289	202	66	15	49	36
WS295	78	66	47	41	12

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