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REVIEW OF LITERATURE ON INTERTIDAL HABITAT
USE BY BLACK BEAR

TERRESTRIAL MAMMAL STUDY NUMBER 2

FINAL REPORT

BETSY McCracken
ALASKA DEPARTMENT OF FISH AND GAME
333 RASPBERRY ROAD
ANCHORAGE ALASKA

ARLIS

Alaska Resources
Library & Information Services
Anchorage, Alaska

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Alaska Resources Library & Information Services
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Study Title: Review of Literature on Intertidal Habitat Use by Black Bear

Lead Agency: ADF&G

EXECUTIVE SUMMARY

The purpose of this study is to conduct a literature search on intertidal habitat use by black bear and to discuss personal accounts of this use with knowledgeable people to determine the extent and type of coastal habitat use by black bear (Ursus americanus).

Eight major relevant computerized data bases were searched from 1981 to present. The bibliographic aid, *Wildlife Review*, was hand searched. The Black Bear Bibliography (Tracy, et al. 1982), which contains approximately 4,000 references, was also searched. The Strategy was to target on black bear populations in the Pacific northwest coastal regions. The search was made inclusive in order to minimize loss of relevant material. Relevant information and literature was obtained from eleven Alaska biologists knowledgeable about bears.

There is a lack of specific information on intertidal habitat use by black bear, with the exception of Prince William Sound (PWS). It is clear that black bears do use coastal habitat. The extent of this use is not well defined; however, it is known that there is a large population of bears in the PWS area and that many of these bears use the intertidal habitat throughout the non-denning season. Beach and marsh grasses (Elymus mollis, Carex spp.) and salmon (Oncorhynchus gorboscha and O. keta) are very important components of the black bears diet. In years of poor berry crops the importance of these maritime food sources is further emphasized. The loss of salmon runs or their contamination by oil could be devastating to bear populations.

OBJECTIVE

Determine importance of intertidal habitat use by black bear to establish the likelihood of significant impact due to beached oil.

INTRODUCTION

There is a dense population of black bear (Euarctos americanus) in PWS. They are omnivorous, opportunistic feeders near the top of the food chain. Black bears are known to feed in the intertidal areas and, therefore, have the potential to contact oil directly by eating sludge washed ashore, grooming oiled hair, eating contaminated intertidal organisms, or scavenging carcasses of mammals and birds killed by oil offshore and deposited on beaches.

A study of the impact of the EVOS on black bear populations was proposed in the 1989 damage assessment plan. That effort proved unfeasible, given the logistical difficulties of bear capture in the densely forested habitat of Prince William Sound (PWS). The literature search will provide helpful background information for evaluating the need for a revised detailed population study.

METHODS

Black bear literature has been searched to identify and retrieve information on the importance of intertidal habitat use. Computer searches using the following databases were conducted: BIOSIS, ZOOLOGICAL RECORD, ENVIROLINE, LIFE SCIENCES COLLECTION, AQUATIC SCIENCES AND FISHERIES ABSTRACTS, CAB (Agricultural and Biological Abstracts), and OCEANIC ABSTRACTS. Fred Dean (UAF), Sterling D. Miller (ADF&G, Anchorage), Bruce Campbell (ADF&G, Anchorage), Ron Modaferrri (ADF&G, Palmer), Tom McCarthy (ADF&G, Douglas), Chuck Shwartz (ADF&G, Soldotna), Sid Morgan (ADF&G, Publications Technician, Juneau), Jon Lewis (ADF&G, Anchorage), Gerald Garner (USFWS, Anchorage), Ted Huer (USFWS, Anchorage) and Herman Griese (ADF&G, Cordova) were all contacted either in person or via telephone in an effort to locate grey literature or otherwise relevant material. Wildlife Review, a bibliographic aid, was hand searched at the Habitat Library at ADF&G and at the Resource Library in Anchorage. The card catalog at the Resource library was also scanned for pertinent information. A literature search on black bear habitat was requested from the Fish and Wildlife Reference Service. Dr. Fred Dean's extensive, but uncatalogued bear files of current published and unpublished literature were also searched.

The immediate literature search has been restricted to encompass the years 1981 to the present. This is because of the extensive bibliography conducted by Fred Dean and Diane M. Tracy for prior years; that bibliography was searched by computer effectively completing the search of library literature. The final product includes citations from all years pertaining to the importance of intertidal habitat use by black bear. It has also been geographically selected for Oregon, Washington, Alaska, and British Columbia.

RESULTS

Hunting pressure on black bears in PWS has increased steadily. Sealing records reflect a record harvest of 294 black bears killed in PWS during 1988; record harvest occurred in Subunit 6A, Subunit 6B, and Subunit 6D. Individual areas achieving record high harvest levels were western Subunit 6A and the Port Gravina to Port Fidalgo, Port Wells, Port Nellie Juan to Johnstone Bay, Bainbridge to Latouche Island, and Knight Island areas in Subunit 6D (Griese, 1990). Seventy-nine percent of the bear harvest came from Subunit 6D, an area containing beaches and estuaries heavily impacted by the oil spill.

Black bear hunting season in PWS runs from September 1 - June 30.

This is a generous season; yet, in 1988 the majority (85%) of black bears were taken during the spring (Griese, 1990). In the spring black bears are most vulnerable to hunting because of their concentration along shorelines following den emergence. Hunters harvest the bears from boats during this time, making for a quick and convenient hunt. This manner of hunting has gained popularity due to the high rate of success in combination with high index of comfort.

Black bears extensively utilize the coastal habitat areas of PWS affected by the Exxon Valdez oil spill. Salmon and intertidal vegetation are significant food sources. They are opportunistic, omnivorous feeders and could ingest oil directly by eating "mousse", tar balls, oiled plants, animals and invertebrates or by scavenging oiled carcasses found among the tidal marshes and along shorelines.

Black bears leave their dens in the spring in search of food. They graze on the emerging beach and marsh grasses consisting mainly of (Carex spp, and Elymus mollis (McIlroy, 1970; Grauvogel, 1967). During the summer months spawning runs of salmon (Oncorhynchus gorbuscha and O. keta) are common food sources (Frame 1974, 1976). In the fall, preceding the salmon runs, bears scavenge carcasses on the beaches and stream banks.

Feeding and fishing behavior (Boehm, 1975; Leeson, 1984; Frame 1974, 1976; McIlroy, 1970) indicate that black bears plunge, run and leap into the water capturing salmon in their mouths. Fish brought to shore were manipulated with teeth or claws to open the body cavity. Feeding on female salmon often ended with bear licking spilled eggs (including gravel) from the ground. Bears had greater success on tidal sloughs than along brush covered forest streams and during low tide rather than high tide. Distinct periods of bear activity occurred on the tidal flat at dawn and dusk (Frame 1974, 1976). Large grass and sedge flats provide ideal foraging conditions in the spring (Modaferrri, 1978). Some of the sedges grow in the intertidal zone, and many grass meadows are subject to storm tides.

Male black bears are exceptionally susceptible to encountering oiled food matter. Males tend to exhibit more aggressive behavior, have larger home ranges, leave their dens earlier in the spring, and frequent the more open unprotected habitats of the tidal zones (Modaferrri, 1982). Females, especially those with exhibit more conservative behavior patterns.

Female reproductive consequences as a result of oil ingestion are unknown. Reproductive success is however, dependent upon nutritional health of the female in the fall (Herrero, 1978). It is conceivable that food contamination by oil could severely threaten the overall health of the female.

The geography of available habitat in PWS is limited by extensive snow fields and glaciers. Numerous fjords and bays restrict free range of movement by resident bears. It is likely that distinct sub populations of bears inhabit PWS (Modaferrri, 1978).

Past density estimates of resident black bear populations report 9.8 bears/mi² in good habitat (Grauvogel, 1967); 1.0 to 14.0 bears/mi² in a moderately to heavily hunted good habitat (McIlroy, 1970); and 1.3 bears/mi² in a moderately to heavily hunted area for which habitat quality was unspecified (Modaferrri, 1987).

STATUS OF INJURY ASSESSMENT

It is difficult to accurately assess the injury to the PWS black bear population from the EVOS by conducting a literature search. The results of the literature search do, however suggest significant impacts.

The bibliography section (Appendix I) of this report is the result of the search for pertinent information.

APPENDIX I
BIBLIOGRAPHY

Alaska Dept. of Fish and Game. 1971. The black bear in Alaska. Wildlife notebook series.

Abstract: A two page summary of black bear (Ursus americanus) range, physical characteristics, life history, food habits, winter dormancy, human utilization, and danger to animals.

Agathon, Oshin. 1965. A wild bear and a goose chase. Explrs. Jmi. 43 (1): 2-9

Boehm, William D. 1975. Glacier Bay-Old Ice, New Land. Alaska Geographic 3 (1): 86-88.

Abstract: A chapter on mammals makes reference to bears presence in Glacier Bay. Includes one photo of a swimming black bear.

Chatelain, Edward F. 1950 Bear-moose relationships on the Kenai Peninsula. Trans. N. Am. Wildl. Conf. 15: 224-234.

Abstract: This study was made to secure facts on the importance of bear predation on moose, particularly calves, on the Kenai Peninsula. The procedure and history of the problem are stated. Bear food materials are given based on frequency of occurrence in bear scat. Remains of both adult and calf moose were noted in the scats. The adult hair was not found in many droppings; however, calf remains were located in increasing amounts from 1.5 percent in May, 16.2 percent in June, to 26.3 percent in July and early August.

Crawford, John S. 1967. The fishing lesson. Outdoor life 139 (1): 50-58, 91.

Abstract: Includes photographs of fishing brown bears on the McNeil River and another stream running into Kamishak Bay. Reference is made to the fishing techniques of both brown and black bears.

Eicher, George Jr. 1943. Bears of Alaska. Alaska Life 6(4): 44-47.

Summary: This article gives general descriptions and characteristics of the bear species of Alaska. Black bear are reported to maintain a diet of salmon, supplemented with fruit, berries, grasses, birds, eggs and worms. All of the bear family reproduce very slowly. When the bear population has been depleted in an area, it is very hard to bring back.

Erickson, A. W. 1965. The black bear in Alaska; its ecology and management. Alaska Dept. Fish and Game. Fed. Aid in Wildl. Restor. Proj. W-6-R-5, Work Plan F. Juneau. 19pp.

Abstract: Describes the status, general biology and ecology of the black bear in Alaska. Includes physical description, Distribution and abundance, population dynamics, foods, predatory habits and cannibalism, parasites, diseases and pathological conditions, behavior, hibernation, physiological condition, and management.

Frame, George W. 1976. Alaska's fishing black bears. Pacific Discovery 19(3).

Summary: Documentation of a summer studying the fishing behavior of black bear predation on salmon in Prince William Sound Alaska. Each year from July through September, bears were especially active on the tide flat around dawn and dusk. Black bears kept slightly more than half of all salmon caught. Fishing behavior is discussed at length. There is no indication that black bears defended special fishing territories; all bears freely used every area. Photographs included.

_____. George W. 1974. Black bear salmon at Olsen Creek, Alaska. Z. Tierpsychol. 35(1): 23-38.

Summary: Activities of black bears (Ursus americanus) were observed on a stream used for spawning by chum salmon (Oncorhynchus keta) and pink salmon (O. gorbuscha) at Olsen Bay, Alaska, during the summer of 1967. Black bears were most active for 2 hours beginning at dawn and for several hours before and after dusk. The most common activity was eating salmon killed and abandoned by other black bears. An average of seven attempts was made for each salmon captured and retained. Black bears preferred eggs over the rest of the carcass and were able to recognize live unspawned female salmon. Although equal numbers were retained; 65% of the females were relatively unspawned when captured. Black bears captured about 8% of the female salmon population before they spawned. There was no evidence of fishing territories.

Grauvogel, Carl. 1967. Prince William Sound black bears. Dept. of Wildlife and Fisheries, University of Alaska, Fairbanks. (Unpubl. manuscript) N.P. 49

Summary: Black bear in Prince William Sound were studied during the summers of 1966 and 1967. Emphasis is on harvest and population density. Density estimates are based on hunter kill, available habitat, and personal observation. Seasonal movements and related food habits are also discussed.

Griese, Herman. 1989. Unit 6 black bear survey-inventory progress report. Pages 32-35 in S.O. Morgan, ed. Annual report of Survey-inventory activities. Part IV. Black bear. Vol. XIX. Alaska Dept. Fish and Game Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-23-1, Study 17.0. Juneau.

Summary: A survey-inventory progress report of Prince William Sound and North Gulf Coast Black bear including harvest statistics, population status and trend, and recommendations.

_____. Herman. 1990. Unit 6 black bear survey-inventory progress report. Pages 37-41 in S.O. Morgan, ed. Annual report of survey-inventory activities. Part IV. Black bear. Vol XX. Alaska Dept. Fish and Game Fed. Aid in Wildl. Rest. Prog. Rep. Proj. W-23-2, Study 17.0. Juneau.

Summary: A survey-inventory progress report of Prince William Sound and North Gulf Coast black bear including harvest statistics, population status and trend, and recommendations.

Herrero, Stephen. 1978. A comparison of some features of the evolution, ecology, and behavior of black and grizzly/brown bears. *Carnivore* 1(1) : 7-17.

Abstract: Evolutionary, ecological and behavioral literature is surveyed and related to the adaptive strategy of black and brown bears. A series of hypotheses based on existing data, deduction, inference, and speculation is presented. From an evolutionary perspective black bears are more similar to ancestral forest-dwelling miacids than are brown bears. The brown bear's niche, in contrast with the black bears, includes more exploitation of open habitat types. Various adaptations of each species are opportunistic omnivores which have relatively unspecialized guts and ingest high quality food items. When these are not available hibernation occurs. Brown bears are normally 1.5 to 2 times as large as black bears within the same biogeoclimatic zone. This is interpreted in terms of evolutionary history, and habitat preference and productivity. Reproductive rates for both species are low. The reproductive strategy for females of each species involves extended, intensive maternal investment. No paternal investment beyond the copulatory act has been identified. Individuals of species are somewhat flexible in their use of space for foraging and reproduction, depending upon the distribution of critical resources such as food and mates.

Hubbs, Carl. 1940. Predator control in relation to fish management in Alaska. Trans. N. Am. Wildl. Conf. (5) 153-162.

Summary: Reference to the presence and distribution pattern of black bear in the southern coastal region of Alaska. Map included.

Leeson, Pat, Tom Leeson. 1984. Black bear and pink salmon. Audubon 86(4) : 86.

Abstract: Four pictures of a black bear (Ursus americanus) fishing for salmon in a stream.

Lindzey, Frederick G., Meslow, Charles E. 1997. Population characteristics of black bears on an island in Washington. J. Wildl. Manage. 41 (3) : 408-4122.

Abstract: Twenty-three black bears (Ursus americanus) were captured on an island in southwestern Washington. Age structure of the population indicated that it was young and growing, and that breeding was relatively synchronized. Density of bears over a year of age (1 bear per 89-67 ha) on the island was high in comparison to estimates of density elsewhere in North America.

_____. Frederick G., Meslow, Charles E. 1977. Home range and habitat use by black bears in southwestern Washington. J. Wildl. Manage. 41 (3) : 413-425.

Abstract: Movement and activity of 16 black bears (Ursus americanus) of a population of 23 were monitored by radio telemetry between March 1973 and October 1975 on an island in southwestern Washington. Average home-range sizes of adult males (505 ha) and females (235 ha) were markedly smaller than home-range estimates for bears in other parts of the United States. Richness of habitat on the island presumably allowed smaller home ranges. Home ranges of sex and age groups overlapped, with use of shaded areas apparently determined by social hierarchy. Males varied more than females in seasonal use of their home ranges. Bears used certain vegetation types on the island disproportionately to their availability, apparently selecting for areas logged since 1963 and against areas logged before 1935.

Massey, Jay. 1977. Prince William Sound black bears. Fish Tales and Game Trails. July-August 1977. Alaska Dept. Fish and Game 1pp.

Summary: Prince William Sound black bears were captured and tagged in effort to learn more about their population size, movements, and survival. Photos included.

McIlroy, Carl W. 1970. Aspects of the ecology and hunter harvest of the black bear in

Prince William Sound. M.S. Thesis. University of Alaska, Fairbanks. 69 pp.

Abstract: Black bears in the Prince William Sound region were generally opportunistic in their selection of food items. Some of the principle foods were Gramineae in early spring; Equisetum spp., Carex spp., Polypodiaceae, and Rubus spectabilis in spring and summer; and Vaccinium berries in the fall. The abundance of black bear in lightly hunted regions appeared to correlate with the abundance and variety of food items.

Black bear hunting has markedly increased in this region during the last decade. The length of time an area has been heavily hunted was found to be inversely correlated with the mean age of bears removed. The success of unguided hunters has declined markedly since 1966, greater numbers of hunters are going on guided hunts, and relatively more bears are being killed at greater distances from Valdez. Net population recruitment has not kept pace with removal in heavily hunted areas. However, bear hunting has been effective only in certain areas and at specific times. There appears to be a black bear density level below which further hunting with the techniques employed in unproductive.

Additional restrictions on unguided hunters are not justified. Game regulations should be enforced to curtail illegal hunting. Bear hunting in the immediate vicinity of Valdez has not been compatible with aesthetic enjoyment benefits to recreationists. Considering the importance of wildlife to the nonhunter, the area adjacent to the city should be closed to all hunting.

Modaferrì, Ronald D. 1977. The black bear in modern north America. Alaska black bear report. Proceedings of the workshop on the management biology of north American black bear.

Summary: Distribution and status report of black bear in Alaska.

_____. Ronald D. 1978. Black bear management technique development. Alaska Dept. Fish and Game. Fed. Aid in Wildl. Rest. Proj. W-17-8 and W-17-9. Job 17. 1R. Juneau. 76 pp.

Summary: In July 1974, nearly 30 streams in the western Prince William sound portion of Alaska's Game Management Unit 6 contained spawning salmon and were identified as possible sites for trapping black bears.

Trapping was precluded in 1975 due to poor salmon runs and lack of bear activity.

In July and August 1976 and 1977, 24 Different black bears were captured with Aldrich spring-activated foot snares set along six streams in the Port Wells, Blackstone Bay and Cochrane Bay area of western Prince William Sound.

The technique of capturing black bears along salmon streams was found to be effective and efficient. Attempts to capture bears at baited snares set in July 1977 proved ineffective.

Questions are raised regarding the interpretations of sex and age data gathered from the skull sealing program.

Simple models are used to simulate densities and harvest rates for populations of black bears in GMU 6. Hypotheses are put forth to explain observed sex and age composition of the harvest sample and of the five captured sample.

_____. Ronald D. 1979. Black bear movements and home range study. Alaska Dept. Fish and Game. Fed. Aid _____ in Rest. Rep. Proj. W-17-11, Job 17.2. Juneau. 18pp.

Summary: In August 1978, one black bear was captured with and Aldrich spring-activated foot snare. A maximum of 71 foot snares were set along four streams in the Blackstone and Cochrane Bay area of western Prince William Sound.

In contrast to August 1976 and 1977, bears appeared to spend little time feeding on salmon along streams. In view of poor success in snaring bears and evidence gained in previous years, different capturing procedures were considered.

Twenty-four radio tracking flights were conducted from a light fixed-wing airplane (PA-8_).

In view of data gathered, movements of bears are related to various ecological factors.

Recommendations for future research are made.

_____. Ronald D. 1982. Black bear movements and home range study. Alaska Dept. Fish and Game. Fed. Aid _____ in Wildl. Rest. Rep. Proj. W-17-10, W-17-11, W-21-2, Job 17.2R. Juneau. 73 pp.1.

Summary: Population identity, density, habitat use, sex and age composition, vulnerability to hunting and behavior of black bears were studied from 1976-1980 in northwestern Prince William Sound, southcentral Alaska. The study was based on field observations and information obtained from 60 bears live-captured while testing foot snare, barrel-type live trap, and helicopter sampling techniques. Thirty of the 41 different individual bears captured were collared with radio transmitters and radio-relocated with fixed-wing aircraft.

Data indicated that individual bears moved freely within the study area despite large bodies of saltwater, large glaciers and extensive snowfields; liberal flow of

individual bears and genes probably occurred throughout the area.

Males were found to range over much larger areas than females. Both sexes exhibited communal use of portions of ranges. Estimated densities approached the greatest reported for areas in the contiguous United States.

Sex and age composition of the samples of bears obtained spring with a helicopter most closely represented the hypothetical composition for the live population. Types of access available to hunters, methods of hunting, hunter selectivity, and differential behavior between sexes of bears, in combination, greatly biased hunter-killed spring samples towards adult males.

The live population was believed to be composed predominantly of females (many over 10 years of age) and \leq 6-years-old males.

Sampling, in summer, along streams containing spawning salmon was unpredictable and yielded biased samples; few adult male bears were captured, bears were not always found to gather at the same streams each year, and in some years, few bears gathered at any stream to feed on salmon. Behavior of bears appeared to indicate preference to feed on berries rather than salmon.

Differences in behavior between sexes of bears indicates that males and females selected different habitats in spring. Circumstantial evidence indicated that bears were mobile, opportunistic feeders and selected diets high in protein and low in structural carbohydrates or fats in late summer and fall. Bears appear to eat large quantities of food and process it relatively inefficiently. Movement patterns were related to habitat use, feeding strategy, and reproductive behavior.

Recommendations were made for additional research to study movement patterns of adult males, to determine minimum sex ratios required for optimum productivity, and to determine the effects of sex and age hunter-kill selectivity on genetic variability and long-term population stability.

Pelton, Michael. 1987. The black bear. Audubon Wildl. Rep. 521-529 pp.

Summary: The general description and natural history of black bear in the United States is presented. The significance of species, historical perspective, current population trends, management, prognosis and recommendations are discussed.

Poelker, Richard J., Harry D. Hartwell. 1973. Black bear of Washington, its biology, natural history and relationship to forest regeneration. Washington State Game Department. Fed. Aid in Wildl. Rest. Proj. W-71-R. Biological Bull. No. 14. 180 pp.

Reynolds, Julius. 1979. Unit 6 black bear survey-inventory progress report. Pages 22-23 in R. A. Hinman, ed. Annual report of survey-inventory activities. Part III. Black bear, brown bear, polar bear, caribou. Vol. IX. Alaska Dept. Fish and Game Fed. Aid in Wildl. Rest. Prog. Rep. W-17-10, Job N^os 3.0, 4.0, 5.0, 17.0, 22.0. Juneau.

Summary: A survey-inventory progress report of Prince William Sound and North Gulf Coast. Discusses harvest and hunting pressure, management and conclusions.

Rogers, Lynn. 1976. Effects of mast and berry crop failures on survival, growth and reproduction success of black bears. Trans N. Am. Wildl. Nat. Resour. Conf. 41:431-438.

Smith, Paul A. 1984. Kenai black bears and cranberries: bear food habits and densities. M.S. Thesis. University of Alaska, Fairbanks. 143 pp.

Abstract: Fecal droppings collected from 1979 through 1983 were analyzed to determine seasonal food habits of black bears (Ursus americanus) on the northwest Kenai Peninsula, Alaska. Lowbush cranberries (Vaccinium vitis-idaea) were sampled in areas of different successional stage and habitat types to assess production levels. Methods for scat analysis and cranberry sampling were developed or improved upon, and evaluated. Berries, animal matter and green vegetation all formed major portions of the black bear diet. Lowbush cranberry was an important spring food overall and was important in both spring and fall where it was highly abundant. Black bears were more carnivorous and predatory than had been reported elsewhere.

Shwartz, Charles C., Sterling D. Miller, Albert W. Franzmann. 1986. Denning ecology of three black bear populations in Alaska. Int. Conf. Bear Res. and Manage. 7:281-291.

Abstract: Between 1978 and 1985, denning ecology of the black bear (Ursus americanus) was studied in the Kenai Peninsula, the Susitna basin, and Prince William Sound, Alaska. All three populations are near the northern extension of their range. In different years the mean number of days spent in dens by an individual bear was 247 days. Timing of emergence in the spring and entrance in the fall appeared most related to time of the year and secondly to weather, snow accumulation, and melt, and food availability. Bears in the more severe climate along the Susitna River entered dens almost two weeks earlier and emerged later than bears on the warmer Kenai Peninsula. Chronology of denning differed among pregnant with all age and sex groups. Site selection, vegetation type, and den type (cave, tree, excavated) varied with area and was related to winter weather conditions (rain vs. snow), soil type (deep vs. shallow and rocky), and topography of the areas (mountains vs. flats). Den morphometry was compared among areas.

Denning chronology was compared with that of other North American black bear populations and with current denning theory.

____. Charles C., Harry V. Reynolds, Steven C. Amstrup. 1987. Bears of Alaska, in life and legend. Roberts Rinehart, Inc. Publishers.

Summary: Discusses natural history, ecology and outlook for each specie of Alaska bear.

Shea, Lana C. 1980. Habitat suitability index model for black bear (Ursus americanus). (Unpublsh. report), USFWS.

Summary: A descriptive modes that applies only to black bear in the coastal forest and adjacent vegetative communities, which extend from Afognak Island and the shores of lower Cook Inlet to the southern tip of Southeast Alaska. The model was developed for the evaluation of black bear habitat in the Kachemak Bay area in regard to a hydrological development project at Bradley Lake.

Tracy, Diane M., Frederick C. Dean, Candy M. Anderson, Teresa M. Jordan. 1982. Black bear Bibliography 1982. Alaska Cooperative Park Studies Unit. Biology and Resource Management Program. University of Alaska, Fairbanks.

Abstract: An exhaustive bear bibliography containing over 3,500 entries of pre-1982 literature.

Vequist, Gary W. 1989. Management of beach camping to reduce human-bear conflicts in Glacier Bay National Park, Alaska. Bear-people conflicts - Proc. of a symposium on management strategies (1989). Northwest Territories Dept. of Renew. Res.

Abstract: Soon after the bears emerged from their dens, they were attracted to beach meadows where they foraged on grasses and sedges. Comparing levels of seasonal visitor use with patterns of habitat use by bears made it possible to predict when and where human-bear conflicts might occur. To avoid such conflicts, beach meadows with a high density of foraging bears were closed to overnight camping. Black bear numbers in the beach meadow habitats were monitored prior to and during the closed periods. The restriction of human use in certain beach meadows during critical periods of May and June resulted in a reduction of bear incidents at those locations. The restrictions will help maintain a wild and natural black bear population.