

BLACK BEAR RESEARCH, REDWOOD NATIONAL PARK

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ABSTRACT

A newly acquired portion of Redwood National Park, lying within Redwood Creek Basin, is a mosaic of logged-over areas in different stages of revegetation that vary in relative productivity. Little is known about behavior, habitat preference and selection patterns of black bear *Ursus americanus* in these cutover lands. Research was begun in 1981 to obtain this type of information. The study employs radio-telemetry, detailed vegetation mapping, scat collection, stomach and blood analyses, standard body measurements, and premolar extraction for age determination. Home ranges were determined for bears utilizing old-growth and cutover lands, and preliminary results of food habits are presented. Of particular interest is insight being gained into tree girdling and the utilization of cambium as a food resource. Denning behavior, which had been questioned because of moderated coastal climate, has been documented.

INTRODUCTION

The expanded portion of Redwood National Park that lies within the Redwood Creek drainage is a mosaic of virgin and logged-over areas in various stages of revegetation. Depending upon age of cut slope, aspect, soil type, etc., these areas vary greatly in rates of succession and relative productivity. Therefore, a variety of habitat types is available.

Cutover lands represent the largest proportion of available habitat in northcoast areas, since approximately 90% of the old-growth redwood forest has been logged. When compared to old-growth forests, such cutover land is prime habitat for bears, providing seasonally abundant food resources. Bears' fear of humans is no longer reinforced by hunting in the newly acquired portion of the Park and their numbers are likely rising. Increased numbers of bears and visitors will increase the opportunity for human/bear encounters. The distribution of optimum bear habitat is one important factor to consider when planning the location and use of visitor facilities.

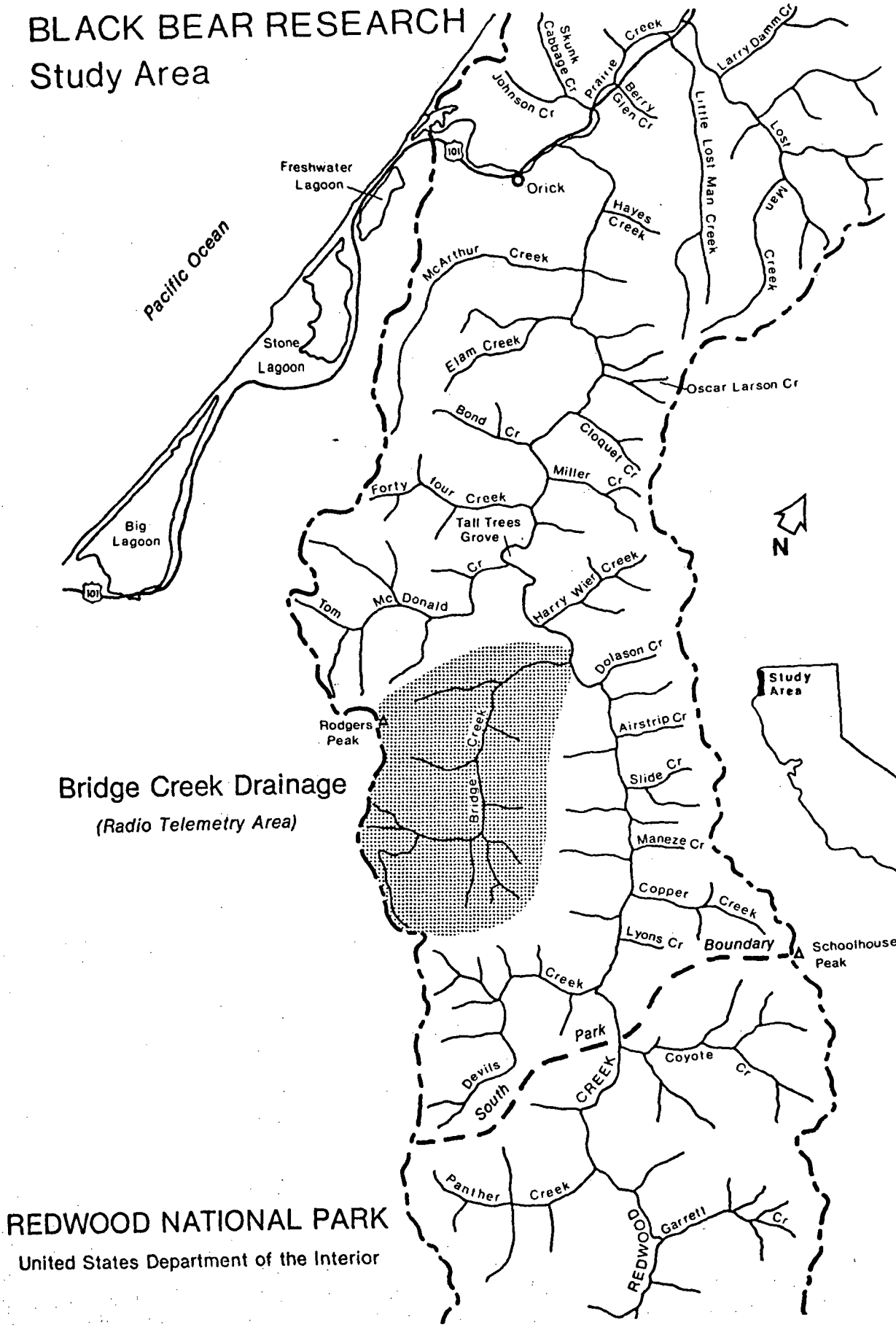
Black bears in the northcoast region feed on cambium of conifers, which causes thousands of dollars in damages annually. Large portions of bark from healthy conifers, typically 10 - 18 in DBH, are removed by the bear and thin strips of cambium scraped off with the incisors. Local timber companies claim to be suffering such a high degree of damage that depredation kills and extended hunting seasons were developed to reduce bear numbers in heavily damaged areas.

The objectives of this study were to determine the abundance, distribution, habitat selection and activity patterns of black bears in cutover lands in the redwood region. This report covers field work accomplished between 10 September 1981 and 10 September 1982. Analyses of data presented in this report are preliminary. More complete analyses are in progress.

STUDY AREA

This study is being conducted in the Redwood Creek basin of Redwood National Park near the town of Orick, California (Fig. 1). The area is characterized by mild, wet winters and cool summers with frequent coastal fog. An average of 72 to 100 in of precipitation is received annually with a daily mean minimum temperature of 6° C and a daily mean maximum of 16.2° C. Elevations range from sea level to 2,280 ft at Rodgers Peak. Upland areas are characterized by cutover lands in various stages of succession. Active logging occurred from pre-1953 to 1978. Several discontinuous stands of old-growth redwood also remain. The primary tree species present are redwood *Sequoia sempervirens*,

BLACK BEAR RESEARCH Study Area



REDWOOD NATIONAL PARK
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Figure 1

Douglas-fir *Pseudotsuga menziesii*, red alder *Alnus oregana*, and tanoak *Lithocarpus densiflorus*. Major brush species present include salal *Gaultheria shallon*, evergreen huckleberry *Vaccinium vitifolium*, and manzanita *Arctostaphylos columbiana*.

Radio telemetry studies are limited to the Bridge Creek drainage, a second-order stream flowing into Redwood Creek. The Bridge Creek watershed has several haul roads that provide access to most portions of the drainage, reducing time between successive telemetry bearings and allowing close approach to bears.

METHODS AND MATERIALS

Bears were captured using Aldrich foot snares or a culvert trap and immobilized with a 2:1 mixture of Vetalar (ketamine hydrochloride) and Rompum (Xylazine hydrochloride). Numbered aluminum cattle tags were placed in an ear of each bear. A numbered tattoo matching the ear tag was placed in the upper lip of each bear, and a bottom first premolar extracted to allow determination of age. Body measurements and weight were taken on most bears. Hair, blood, and ectoparasite samples also were collected.

Collars containing motion-sensitive radio transmitters (Telonics, Mesa, AZ) were placed on selected bears. The radio collars were equipped with activity sensors that allow evaluation of head position and movement. The rate of signal transmission changes based upon "head up," "head down," or after 2 min of inactivity. Transmitters operate in the 164 mHz range.

Most collared bears were located weekly by visual observation or triangulation from known points using a receiver/scanner/digital processor and 2-element Yagi antenna. Each location was plotted on an ortho-quad photo-map and Universal Transverse Mercator coordinates determined. Relocations were then transferred to a detailed vegetation map to determine use of habitat types.

Time of day and activity state at each bearing determination were recorded. Bears also were monitored randomly for 1-min periods throughout the field season. An activity state, based on head position, was assigned a value of 0, 1, or 2 representing inactivity, "head down," and "head up" respectively. A 24-hr time-sequence monitoring period, at 10-min intervals, was also performed.

Collared bears were located in their dens during winter. After bears emerged, dens were analyzed for chamber dimensions, site specific vegetation analysis, slope, aspect, elevation, and lining materials. Proximity to logging roads and association with woodrat nests also were noted.

Scats which could be reliably determined to be less than one week old were collected and dried at 60° C for 72 hrs. The samples were weighed, soaked with water, and analyzed according to visual estimate of percent volume of food items. Sample contents were classified into leaves and stems, fruits and seeds, animal matter and debris.

Stomachs and skulls were collected from bears killed by trappers with depredation permits on adjacent timber company lands. Stomach contents were rinsed in a 2 mm sieve and a visual estimate of percent volume of food items was made. Components were assigned to the same classification scheme as in scats. Representative samples of each stomach were frozen.

Whole blood and serum samples drawn from immobilized bears were mailed to Central Pathology Laboratory (Santa Rosa, CA) for hematology and blood chemistry analyses. Hair, ectoparasites, and tooth samples were stored for later analysis.

RESULTS

Capture, Relocations and Activity Monitoring

Thirteen bears were captured 15 different times between 12 September 1981 and 24 August 1982 (Table 1). Transmitting collars were placed on eight bears. Two hundred ten independent locations were determined for 208 collar/wks on bears representing various age and sex classes in Bridge Creek (Table 2). Locations were assumed to be independent if at least 2 hrs had passed between successive triangulations or observations. Random activity monitoring was recorded. Seven collars are currently being monitored.

Table 1

**Black Bears Trapped in Redwood National Park, California
10 September 1981 to 10 September 1982**

Bear	Sex	Estimated Age At Capture	Date of Capture	Weight at Capture	Current Status
001	F	6	9-12-81	250	Recaptured 5-10-82
002	M	6	9-24-81	290	Active in Maple Creek
003	F	4	10-12-81	190 est.	Recaptured 10-27-81
004	M	3	10-21-81	225	Not collared
005	M	5	10-23-81	180	Not collared
003	F	4	10-27-81	180	Slipped collar
006	M	2	12-16-81	105	Slipped collar
008	F	5	12-22-81	190	Killed in snare by bear
001	F	7	5-10-82	235	Active in Bridge Creek
007	F	10	5-24-82	180	Active in McArthur Creek
000	F	5	6-4-82	180	Not collared
009	F	12	6-23-82	155	Active in Tom McDonald Creek
010	F	2	7-15-82	80	Active in Tom McDonald Creek
011	F	3	7-15-82	125	Active in Pitcher Creek
012	M	9	8-24-82	200 est.	Escaped from snare

Table 2
Relocation Data for Radio-Collared
Black Bears Between 12 September 1981 and 9 September 1982
in Redwood National Park

Bear	Sex	Estimated Age	Weeks With Collar	Relocations	
				Visual Observations	Triangulation
001	F	7	52	4	54
002	M	7	51	3	45
003	F	5	44	8	57
006	M	3	17	6	22
007	F	10	16	4	11
009	F	12	12	4	8
010	F	2	8	2	8
011	F	3	8	1	5
TOTALS			208	32	210

Four bears were monitored through the denning period. Eight dens of three bears were examined. The adult male was not found in any dens throughout the winter, but was triangulated to a few locations roughly every 2 wks, traveling as far as 2.6 km between relocations. We approached the adult male on three occasions (once each during December, January, and February); however, he ran off at each attempt. One bear remained in a den throughout the denning period, one redenned at least twice, and the third was known to utilize four different dens (Table 3).

Food Habits

Forty-seven scats were analyzed, representing food habits of fall, 1981 and spring, 1982. Another 22 scats, representing the remainder of the year, have been dried for later analysis. Fifteen stomachs were collected; their contents represent black bear food habits between 5 May and 9 July, 1982.

Black bear damage to conifers by tree girdling, was first observed on 28 April, 1982. Intensive damage was observed in some areas, and continued until 9 August, 1982. Tree girdling occurred at all elevations in the park, with most damage being found at mid-elevations. Generally a damaged tree had a large portion of bark stripped and cambium removed. In several instances, trees appeared to have been "tasted," i.e., a small portion of bark was removed leaving a few incisor marks. These "tasted" trees were found near undamaged and girdled trees.

Table 3
Denning Characteristics of Black Bears in
Redwood National Park During Winter 1981 - 1982

Bear	Den Description	Dominant Vegetation Type/ Age of Cut	Elevation (m)	Slope Aspect (Degrees)
001	Man-severed stump	Alder/1956	512.1	333
	Man-severed log	Alder/1958	512.1	311
003	Base of old-growth redwood tree	Old-growth redwood	243.8	266
006	Man-severed logs	Alder/1972	350.5	300
	Man-severed stump	Alder/1970	350.5	320
	Man-severed logs	Tanoak/1973	384.0	321
	Man-severed logs	Alder/1970	231.7	224

DISCUSSION AND CONCLUSIONS

Preliminary analyses indicate that females with cubs have extremely small home ranges when compared to barren adult females. Sows with cubs appear to be most highly associated with old-growth timber at lower elevations, remaining in a small stand until late summer when they venture out to higher elevations. Barren adult females utilize home ranges encompassing a variety of habitat types that include old-growth, but appear most dependent upon 25-year-old alder stands. Subadult males exhibit habitat preferences similar to barren adult females. No subadult females were captured until midsummer, 1982.

The adult male utilized an extensive area encompassing four adjacent drainages. In several instances this male could not be located except by aerial telemetry. More rigorous monitoring, utilizing monthly aerial telemetry, will greatly aid in delineating the home ranges of adult males. Monitoring data will later be analyzed as to time spent in respective vegetation types relative to availability and distances to other vegetation types. Associated activity patterns and weather conditions also will be analyzed according to habitat selection patterns.

Researcher presence appears to be one factor determining whether a bear will reden. It should be noted, however, that bears redenned three times without researcher approach, excluding the movements of the adult male. The only bear not to reden was a sow with cubs, although she was observed within the den on six occasions.

Preliminary analyses of activity data indicate that bears are active at most times during daylight hours, resembling crepuscular behavior. Inactivity was noted most often at mid-day and soon after sunset. Bears remained inactive until just before sunrise. Aside from the winter season, there do not appear to be any differences in activity between bears of different sex or age.

One of two collared barren females produced cubs in 1981/82. The unsuccessful female redenned after what is believed to be a lost litter. More data on cub production and mortality will become available during the winter of 1982/83 with the addition of two collared reproductive age females.

Observations on tree girdling behavior indicate that heavy damage is clumped in localized areas. Available data indicate that all bears may be capable of this behavior, however, just how many do or what factor(s) stimulates tree girdling is unknown. Studies in Trinity County, California, indicate that bears maintain their emergence weights through the late spring and quite possibly lose weight in the early summer (T. Burton, pers. comm.). Preliminary observations indicate that tree girdling is an adaptation that allows a high northcoast bear concentration to sustain itself through a period of low food availability.

To evaluate a possible decline in food resources and subsequent nutritional condition, blood studies were initiated to assess annual health fluctuations of the northcoast black bear. A small sample size prevents any conclusions at this time.

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