To the Graduate Council:

I am submitting herewith a thesis written by Julie Devereux LaFollette entitled "Some Aspects of the History of the Black Bear (Ursus americanus) in the Great Smoky Mountains." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Wildlife Management.

Michael R. Pelton, Major Professor

We have read this thesis
and recommend its acceptance:

Accepted for the Council:

Vice Chancellor
Graduate Studies and Research

SOME ASPECTS OF THE HISTORY OF THE BLACK BEAR (*URSUS AMERICANUS*) IN THE GREAT SMOKY MOUNTAINS

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee

Julie Devereux LaFollette

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ABSTRACT

The purpose of this study was to assess the factors which have affected the black bear (Ursus americanus) in the Great Smoky Mountains from earliest recorded history of the area until 1960. Local historical records, both public and private, were examined for pertinent information.

The historical data for the investigation were gathered from both interviews and written and pictorial material. Interviews included bear hunters, National Park Service employees, and former residents of the area. Written material was taken from diaries, journals, newspapers, National Park Service records, records of companies that operated in the area, and old historical documents. Photographs from the Great Smoky Mountains National Park archives and from private sources yielded additional information.

All data gathered were combined and categorized into major topics and time sequences. The material for each section (topic) was then assessed and summarized. Pre-Park hunting characteristics, major vegetation changes, and problems of the Great Smoky Mountains National Park in regard to bears were considered separately.

It was found that there were no obvious limiting factors on the bear population before the settlement of the Great Smoky Mountains. Since 1880, primarily vegetation change, and secondarily hunting, have apparently acted to decrease the bear population. With the establishment of the Great Smoky Mountains National Park, the bear density

temporarily increased. However, the death of the American chestnut (Castenea dentata) left the bear population vulnerable to mast failures; this combined with increased poaching resulted in a decline in the black bear population where it remains. However, the decline was apparently not as serious as in the early 1900's.

The majority of the problems currently concerning the black bear within the Park involve the relatively low production of mast associated with earlier vegetation disturbances, high numbers of Park visitors with a concomitant disregard by a few for regulations regarding bears, and the hostile attitude of some residents on the Park periphery. It was thought that black bear habitat within the Park may improve as more stands of mast-producing species mature. Finally, it was concluded that the National Park Service should improve programs of visitor education, adopt stricter law enforcement standards, and establish better relations with peripheral communities.

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CHAPTER I

INTRODUCTION

Since establishment of the Great Smoky Mountains National Park (GSMNP or Park), the black bear (Ursus americanus) has become a conspicuous point of conflict between the general public and many of the issues of wildlife management. So far, no completely satisfactory answer has been found to the problem of how to manage populations of bears while providing for the complete safety of Park visitors. Some of the temporary solutions have been so poor that one author wrote that there could be "no scientific basis for the dogmatic assertion that the Park Service or anyone else is obligated to save it (bear) or any other species without regard for the human cost in money, lives, or health" (Moment, 1968). The lack of basic knowledge of the ecology and behavior of the black bear by both the biologist and the layman, together with frequent conflicts between bears and people, is proving to be an increasingly complex problem as pressures grow from Park visitation and concomitant bear-person interactions.

In 1969, the Departments of Forestry and Psychology at The University of Tennessee, in conjunction with the National Park Service, began a five-year ecological investigation of the black bear in the GSMNP. This study is attempting to determine the population dynamics, range, growth rate, food habits, habitat potentials of the black bear within the various Park environments, and patterns of man-bear relationships for the purpose of formulating a wise and more effective bear management program (National Park Service, 1969).

The present study attempts to compile aspects of available ecological and behavioral material from the beginning of recorded history of the Great Smoky Mountains (GSM) area up to 1960. The above will include information from all areas mentioned in the management plan written for the GSMNP in 1969.

Historical information concerning wildlife populations is scanty at best and must be gleaned from all available sources: former bear hunters, libraries, public and private collections, newspapers, company records, old correspondence, Park records and reports, and local historical societies. Data from the above sources might include records of fluctuations in bear population size and the factors causing these fluctuations, population concentrations, preferences in habitat, bear-person interactions, any changes in habit or behavior in bear caused by the establishment of the Park, and general life history information. Although these kinds of information are difficult to locate, they may be valuable for establishing a long-range management program by providing data which normally can otherwise be revealed only by long-term biological studies. Probably because of the time involved and the difficulty of obtaining historical data, only two prior studies, one by McKinley (1962) and one by Schorger (1949), were found in the literature and neither was detailed enough to provide any biological information. The present researcher feels that an examination of factors that have affected the natural history of a population in the past might help to shed light on present and future research or management problems.

CHAPTER II

DESCRIPTION OF STUDY AREA

Location and Physiography

The Great Smoky Mountains National Park encompasses 800 square miles (2072 square kilometers) or 512,000 acres (207,203 hectares) along the border of Tennessee and North Carolina. It is 54 miles (87 kilometers) long and 19 miles (31 kilometers) wide at its greatest width (King and Stupka, 1950). Parts of Blount, Cocke, and Sevier Counties are included from Tennessee, while North Carolina has contributed sections of Haywood and Swain Counties. Large areas of the Nantahala, Pisgah, and Cherokee National Forests border the Park. Several large artificial lakes, maintained by the Tennessee Valley Authority and the Aluminum Company of America, also lie close to the Park. In addition, the Cherokee Indian Reservation borders the Park to the south. U. S. Highway 441 bisects the Park north to south running between Gatlinburg, Tennessee, and Cherokee, North Carolina. There is only one other major road in the Park, running along the Little River inside the northern boundary of the Park from Headquarters at Sugarlands to Cades Cove (Figure 1).

The Great Smoky Mountains is an area of rugged topography where valleys are cut deeply into the mountain mass, with steep slopes and narrow flood plains. The slopes form most of the area of the mountains. It has been estimated that less than 10 percent of the surface has less than 10 degrees of slope (Whittaker, 1956). The slopes of the

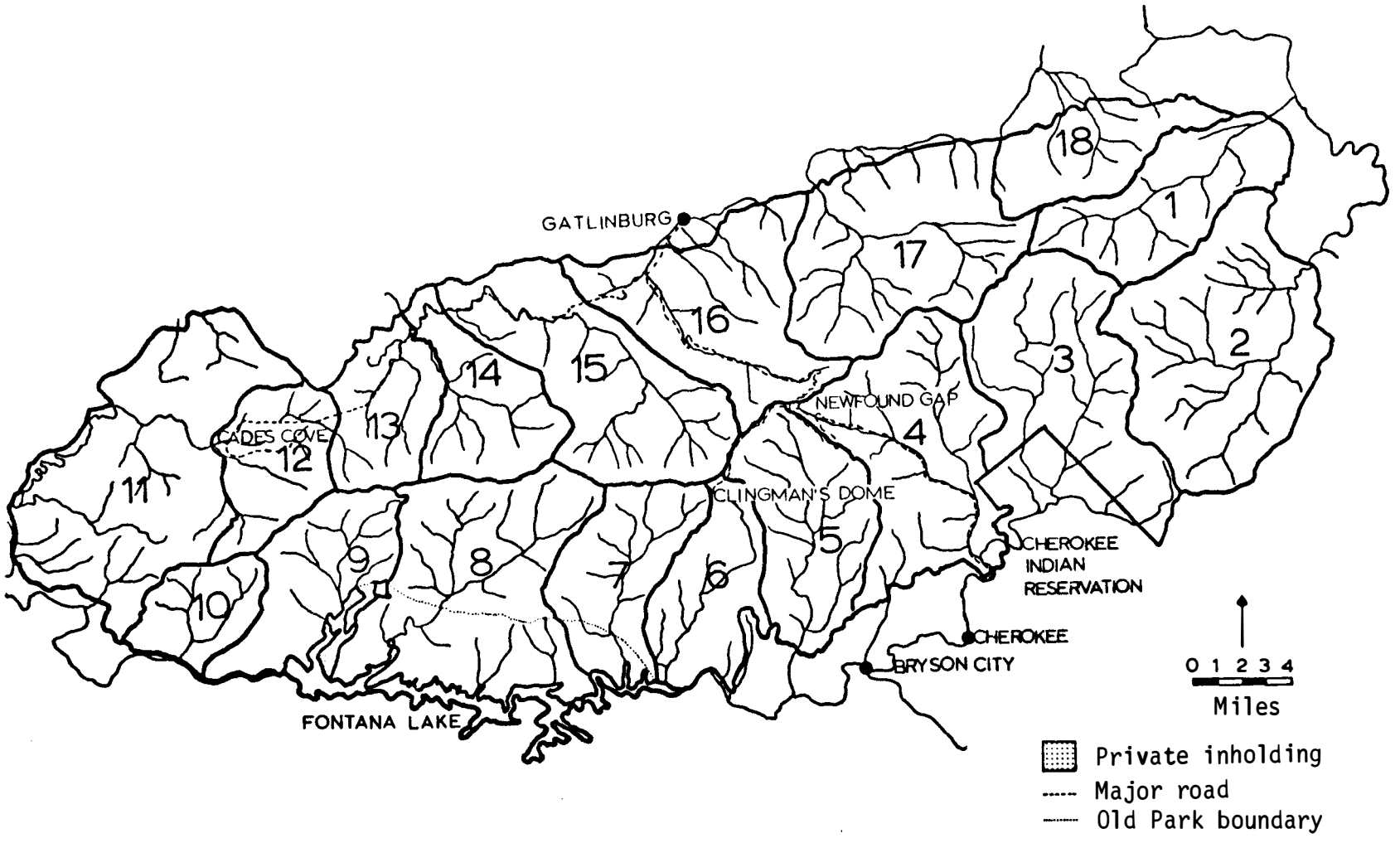


Figure 1. Map of the Great Smoky Mountains National Park.

Tennessee side are steeper and generally more barren and rocky than those on the North Carolina side. Elevations range from 888 feet (271 meters) at the mouth of Abrams Creek to 6643 feet (2025 meters) at Clingman's Dome. The dominant feature of the Park is the uninterrupted chain of mountains that bisects the area from northeast to southwest. For 36 miles (58 kilometers) the crest remains above 5000 feet (1524 meters) (Huheey and Stupka, 1967). Six major rivers along the Park boundary receive several hundred miles of small, swift, clear mountain streams; they are the Big Pigeon River, Little Pigeon River, Little Tennessee River, Little River, Oconaluftee River, and Tuckaseegee River (King and Stupka, 1950). No lakes or permanent ponds are found within the Park, although a few limestone sinkholes in and near Cades Cove contain small temporary ponds (Huheey and Stupka, 1967).

Climate

The Great Smoky Mountains has a cool, humid climate. Temperature changes with altitude, following a typical pattern, decreasing as a mean rate of 2.23 degrees Fahrenheit (1.24 degrees Centigrade) per 1000-foot (305-meter) rise in elevation resulting in a 10 to 15 degree Fahrenheit (5.5 to 9.0 degree Centigrade) temperature difference between the base and the peaks of the higher mountains during the growing season (Whittaker, 1956). The mean annual temperatures range from 74.4 degrees Fahrenheit (23.6 degrees Centigrade) at Gatlinburg to 58.5 degrees Fahrenheit (14.7 degrees Centigrade) at Newfound Gap in July to 39.1 degrees Fahrenheit (3.9 degrees Centigrade) to 22.6 degrees Fahrenheit (-5.2 degrees Centigrade), respectively, in January with fast cooling coming in October and November and rapid warming in March

and April (Shanks, 1954a). Precipitation also varies with season and altitude. The driest month is September while July and August usually have the greatest precipitation. Shanks (1954a) states that the precipitation at the base of the mountains is not far different from that of the adjacent valley area, but that it increases sharply with altitude and has increased 50 percent by the lower limits of the spruce-fir zone at 4500 to 5000 feet (1372 to 1524 meters). Average annual precipitation ranges from 50 to 60 inches (130 to 150 centimeters) in the lower valleys to over 80 inches (200 centimeters) at higher elevations. Contrasts also exist between north- and south-facing slopes, but these are not as easy to document (Records of the National Park Service, Gatlinburg, Tennessee; Records of the Tennessee Valley Authority, Knoxville, Tennessee).

Vegetation

The Great Smoky Mountains National Park has the largest variety of plants known to any area in the Eastern United States, listing nearly 400 species, including 130 species of native trees (Whittaker, 1956; Stupka, 1960b). Almost all of the vegetation can be classified as belonging to topographic climax or secondary succession.

Several botanists have attempted to classify the vegetation of the Great Smoky Mountains National Park. Shanks presented the simplest classification, dividing the complex vegetation into six broad physiognomic types (Figure 2). Table 1 lists the vegetation types and their important plant species.

The cove hardwood forests cover 67,350 acres (27,256 hectares) of

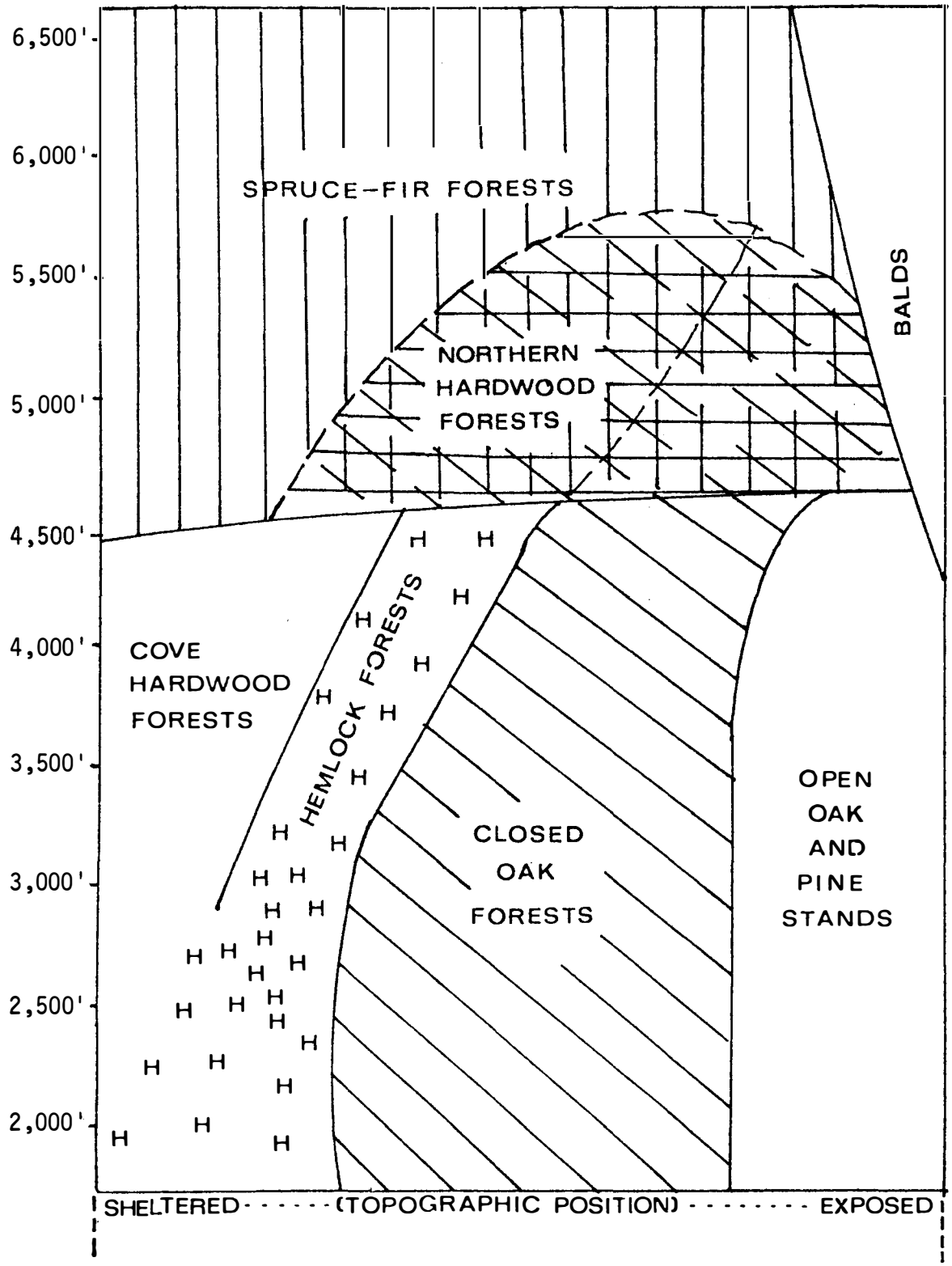


Figure 2. Vegetation pattern of the Great Smoky Mountains (Shanks, 1954a).

TABLE 1

VEGETATION TYPES AND THEIR IMPORTANT SPECIES IN THE GREAT SMOKY MOUNTAINS NATIONAL PARK

Vegetation Type	Important Species
Cove hardwood	Basswood (*Tilia heterophylla*)
	Beech (*Fagus grandifolia*)
	Sugar maple (*Acer saccharum*)
	Yellow buckeye (*Aesculus octandra*)
	Silverbell (*Halesia carolina*)
	Tulip tree (*Liriodendron tulipifera*)
	Hemlock (*Tsuga canadensis*)
	Black cherry (*Prunus serotina*)
	Cucumber magnolia (*Magnolia acuminata*)
	Northern red oak (*Quercus rubra*)
	White ash (*Fraxinus americana*)
	Yellow birch (*Betula alleghaniensis*)
Hemlock	Canopy Trees
	Silverbell
	Beech
	Tulip tree
	Frasier magnolia (*Magnolia fraseri*)
	Hemlock
	Small Trees
	Striped maple (*Acer pennsylvanica*)
	Yellow birch
	Holly (*Ilex opaca*)
	Shrubs
	Dog hobble (*Leocothe editorum*)
	Rhododendron (*Rhododendron maximum* and *R. catawbiense*)
Northern hardwood	Beech
	Yellow birch
	Yellow buckeye
Spruce-fir	Canopy Trees
	Frasier fir (*Abies fraseri*)
	Red spruce (*Picea rubens*)
	Yellow birch
	Mountain ash (*Sorbus americana*)
	Small Trees
	Mountain maple (*Acer spicatum*)
	Dogwood (*Cornus alternifolia*)
	Shrubs
	Rhododendron (*Rhododendron catawbiense* and *R. carolina*)
	Mountain cranberry (*Vaccinium erythrocarpum*)
	Mountain blueberry (*V. pallidum*)
	Witch-hobble (*Viburnum alnifolium*)

TABLE 1 (continued)

Vegetation Type	Important Species
Closed oak	Canopy Trees
	Red maple (Acer rubrum)
	Pignut hickory (Carya glabra)
	Mockernut hickory (C. tomentosa)
	Tulip tree
	Black gum (Nyassa sylvatica)
	Northern red oak
	White oak (Quercus alba)
	Chestnut oak (Q. prinus)
	Black oak (Q. velutina)
	Black locust (Robinia pseudoacacia)
	Small Trees
	Red maple
	Flowering dogwood (Cornus florida)
	Sourwood (Oxydendrum arboreum)
	Shrubs
	Bear huckleberry (Gaylussacia ursina)
	Mountain laurel (Kalmia latifolia)
	Buffalo nut (Pyrularia pubera)
	Flame azalea (Rhododendron calendulaceum)
	Rhododendron
Open oak and pine	Pitch pine (Pinus rigida)
	White pine (P. strobus)
	Table mountain pine (P. pungens)
	Virginia pine (P. virginiana)
	White oak
	Chestnut oak
	Black oak
	Scarlet oak (Quercus coccinea)
	Mountain laurel
Heath balds	Mountain laurel
	Rhododendron
	Blueberries
	Flame azalea
Grass balds	Service berry (Amelanchier laevis)
	Blueberries
	Mountain oatgrass (Danthonia compressa)
	Blackberries (Rubus sp.)
	Common cinquefoil (Potentilla canadensis var. caroliniana)

Sources: Shanks, 1954b; Whittaker, 1956.

the cove and sheltered slope sites up to about 4500 feet (1372 meters). On the North Carolina side the cove hardwoods occupy only narrow bands up each drainage because of mostly southern exposures which are typically warm and dry. On the Tennessee side, which is characterized by cooler and damper conditions, the cove hardwoods cover a broader area and extend higher in elevation. Major tree species are listed in Table 1. The herb stratum coverage is high at 80 percent with over 100 species represented in the spring and summer. There are no dominant shrubs (Shanks, 1954b; Whittaker, 1956; National Park Service, 1969).

The 7696 acres (3115 hectares) of hemlock forest are usually found on sheltered topography along streams up to 3000 feet (915 meters), but can occur on exposed slopes and lead ridges from 3000 to 4500 feet (915 to 1327 meters). The sites are generally drier than those of the cove hardwood forests with a corresponding increase in subcanopy heath species. Whittaker (1956) states that ". . . the hemlock forest type is most distinctive with heaviest hemlock dominance (70-80 percent), densest heath growth, and most impoverished herb stratum on steep slopes at high elevations. At lower elevations, stands are more mixed with hardwood, with less heath and more herbs. Below 2500 feet (762 meters) the hemlock forest gradually merges with the cove forest, and hemlock becomes only one of the dominants." There is either a well-developed small tree layer or a layer of rhododendron on higher, steeper sites. The herb layer coverage varies from zero up and is related to the proportion of hardwoods and development of the heath (Shanks, 1954b; Whittaker, 1956; National Park Service, 1969).

The 70,921 acres (28,693 hectares) of northern hardwood forests

begin at 4500 feet (1372 meters) and continue over mesic sites such as at the heads of coves and in gaps. The canopy is dominated by beech and yellow birch (Table 1). The northern hardwoods are closely related to upper cove forests, but with a larger number of stems, a limited tree size, and a subalpine cast of flora. The herb coverage, mostly sedges, varies from 40-60 percent. Small trees and shrubs are absent or unimportant (2-10 percent) (Shanks, 1954b; Whittaker, 1956; National Park Service, 1969).

The 35,491 acres (14,363 hectars) of spruce-fir forest are characteristic of the Canadian Zone. Red spruce dominates the lower limits of this association at 4500 to 5400 feet (1372 to 1650 meters) (Jennison, 1939). Frasier fir (Abies fraseri) becomes a codominant at 5500 to 6100 feet (1677 to 1860 meters) and dominates in the upper elevations above 6200 feet (1890 meters). There is a trend of decreasing importance on non-evergreen elements in all strata toward higher elevations, and a corresponding increase in more xeric sites. Herb coverages and species diversity decrease along the moisture gradient (Shanks, 1954b; Whittaker, 1956; Stupka, 1960b; National Park Service, 1969).

The closed oak forest occupies the intermediate and dry slopes at low and middle elevations where the moisture is sufficient to maintain a high and continuous forest canopy. Shrubs cover 20-50 percent below 2500 feet (762 meters), 50-80 percent at middle elevations up to 4500 feet (1372 meters), and not more than 20 percent above 4500 feet (1372 meters). Heaths are usually present in the shrub layer 5-50 percent

but do not form a continuous layer. Herb coverage is up to 40 percent at lower elevations, and up to 60 percent at higher elevations (Shanks, 1954b; Whittaker, 1956).

Shanks classifies open oak and pine stands and heath balds together because neither has a stratum which forms a closed canopy, although these two associations could easily be considered separately. The open oak and pine stands are found on dry exposed slopes and ridges, often rocky. They are characterized by short, scrubby trees scattered through a continuous tall layer of mountain laurel. Virginia pine is found below 2000 feet (762 meters), pitch pine from 2000 to 3000 feet (600 to 975 meters), and table-mountain pine above 3200 feet (975 meters). The oak distribution is determined mainly by the moisture gradient (Shanks, 1954b; Whittaker, 1956).

The heath balds occur throughout the elevations down to 4000 feet (1220 meters) and show considerable variation with differences in altitude. Throughout their range, they are dominated by evergreen ericacious shrubs which approach not only full coverage but complete impenetrability in their dense thickets of tough stems. The shrub canopy may be 10 feet high, but on ridges and summits it is more frequently three or four feet. Mountain laurel is most important at lower elevations. The high elevation balds, where purple rhododendron, Carolina rhododendron, and mountain blueberry dominate, are somewhat lower in canopy height and are more open. The herb stratum of the balds is limited with coverage below 5 percent and in denser stands approaching zero (Shanks, 1954b; Whittaker, 1956).

Two types which Shanks (1954a, 1954b) does not mention are the

grassy balds and the fields and pastures - both types manmade (Gershmehl, 1970). The change from the forest to the grassy bald is abrupt. The balds are dominated by mountain oat grass (Danthonia compressa) and common cinquefoil (Potentilla canadensis var. carolinana). They are currently being invaded by service berry, blueberries, and blackberries (Whittaker, 1956; National Park Service, 1969). In order to maintain demonstration areas of early pioneer settlements and mountain culture, the National Park Service has leased out small areas to be kept in pastures and fields by allowing the leasees to raise cattle and hay crops in accordance with good management practices. These areas are among the centers for human activity in the Park (National Park Service, 1969).

CHAPTER III

MATERIALS AND METHODS

Interviews

Since most conventional methods of biological investigation were not applicable to the present study, the Department of History at The University of Tennessee was consulted and a variation of their research methods was adopted. On the recommendation of the History Department, persons contacted for information on bear were asked to let their responses to questions regarding historical aspects of black bear be taped. Fifty percent of the persons interviewed cooperated willingly, another 40 percent agreed after being assured that their names would not be used in the report, and the remainder preferred that no permanent record of their answers be made, although most did not mind if notes were taken. All interviewees were allowed to censor their responses concerning man-bear relations within reasonable limits, since many of the people named in various questionable actions, such as illegal hunting, still live in the area. For the above reason, few names of living people other than recognized authorities, including interviewees, are mentioned in this study. However, no information concerning the biology of the black bear or other species was censored. Small portable recorders with outside microphones were used during the interviews. Interviewees were less likely to feel constraint if the tape recorder was kept out of sight. This made it necessary to keep the recorder with only the outside microphone exposed.

All persons interviewed had lived and/or worked in and around the perimeter of the Great Smoky Mountains National Park. Most people surveyed had outdoor interests in hunting, fishing, or hiking. Others were persons who had worked either for one of the lumber companies operating in the Smokies prior to the Park's establishment, one of the railroads servicing the lumber companies, for the National Park Service, or were men or women who had lived in the communities that existed in and around the Park prior to its establishment. It was difficult to judge the reliability of the information received from these people. Unless otherwise stated, all information presented in this study was reported by a minimum of three separate sources, While the above criterion does not eliminate the possibility of widespread folktales, it does prevent the use of personal fancies due to various factors. The interviews did not follow any given format, although the same basic information was sought from each person. The following are the approximate preliminary questions asked each interviewee, although no specific order was maintained.

1. Personal history.

   When did your family first settle in the area?

   Place and date of birth.

   Where brought up?

   How many in the family?

   How many are still living and where are they (possible future interviewees)?

   Have you ever worked in the Park area? Doing what?

2. Personal hunting experience (if applicable).

   When, what, and where did you first hunt?

   Have you always hunted in that area? If not, where else?

   When did you first hunt bear?

   Where, specifically, did you find bear (for various years)?

   When did the chestnut blight hit the area you hunted?

   Did you hunt before and/or after the chestnut blight?

   Did you hunt before and/or after the Park came into existence (about 1930)?

   After 1930, did the numbers of bear change noticeably? Was there any change in the locations where bear were found, in feeding (and other) habits, behavior or anything else?

   Did you hunt with other people? How many?

   Did you hunt with dogs?

      How many and what kind?

      Did you raise your own?

      How much do you think a good bear dog is worth?

   What kind of gun did you use?

   What was the average weight/sex of the bear you shot?

   What season(s) did you hunt?

   How many did you kill per year (specific years)? Total?

   Do you remember years when bears were particularly scarce?

      Abundant?

3. Second-hand information.

   How many bear hunters did you know? Who? Are they still alive?

Where, specifically, did they hunt?

What methods did they use?

How many bears did they kill? Years?

Do you remember them ever having trouble finding bear?

How big were the bears on the average? Sex?

4. Trapping.

What kind of trap was used in your area?

Was it homemade?

How successful was it?

Why were bear traps used?

Did you ever trap bear? Why?

What was the size/sex of bears trapped?

Where were the traps located? When?

5. Other.

a. Stock-killers, raiding.

How often did stock-killers or field raiders bother you?

How much damage was done?

What time of year did it occur?

What were the size, sex, and age of such bears?

Why do you think these bears became troublesome?

b. Chestnut blight.

When did the blight first hit your area?

How long did it take for the chestnut to be eliminated?

How good a mast[1] producer was the chestnut?

How did its extermination affect bear?

---

[1]Mast is taken to mean nuts and fruit from trees, produced in the fall.

c. Logging.

How extensively was your area logged?

By whom?

What methods did they use?

When was it logged and exactly where?

Did fires follow logging in your area? Exactly when and where?

What was the effect of logging and fires (if any) on bear?

What was the attitude of loggers towards bears?

Were there any established practices concerning bears?

d. CCC camps.

Did you work in the CCC's or any of the other organizations working in the Park?

What was the policy towards bears, particularly around the camp area?

Did this have any effect on bears?

During this time (1930's) did you notice any changes in bear population or anything else?

e. Food habits.

What do (did) bears eat? Seasonally (specific names and seasons)?

Do bears show preference for certain kinds of foods?

For certain species?

What was the abundance of these foods in your area?

What effects did mast failures have on bears?

What effects did seasons of particular abundance have on bears?

f. Hibernation.

Do all the bears in the Park hibernate in the winter?

Have you noticed bears roaming during the period from November to April? Could you be specific?

When do they go into hibernation? Come out? Is it the same each year?

Where do they hibernate (location and type of site)?

What kind of preparation do bears make before denning?

What is their behavior when they come out?

g. Life history questions.

(This section was aimed at discovering how much each person actually knew about well-known facts about black bear.) Included such questions as:

How much do black bear weigh at birth?

What is maximum and average size of females? Males?

When do they mate? How often?

How many cubs do they have?

6. Poaching.

(This section was omitted with some people.)

How much poaching has occurred in the Park in the past? Where? When?

Has it increased, decreased, or stayed the same? Recently?

How many of the people you know have poached bear in the past?

How many are presently poaching bear?

What percentage use traps? Firearms?

Why do people poach?

7. Park policy.

   How familiar are you with the present Park policy towards the black bear?

   What do you think of it and how would you change it if you had the chance?

   How effective do you think bear-proof garbage cans have been?

   Several of the garbage dumps?

   What should be done with the remaining dumps?

8. Do you have other comments?

Information other than responses to the above questions was usually related in the course of the interview. Pictures and diaries were often brought out of dusty corners. Personal bear stories, those of relatives, and those handed down from generation to generation were recounted and often took up most of the interview. These stories were only marginally useful as there was no way to verify the authenticity of many of them. Interviewees often became so excited that they volunteered to return to the Park area and find the spot where they hunted, lived, or where they had observed bear.

The answers to each of these verbal interviews were reviewed at a later date and if there were questions on the information related or if it seemed that this person could give additional information, she/he was contacted as many as six times. Many of the older people (over 80 years old) who were difficult to obtain information from at the first or second interviews, were much more relaxed later. Each person who could not be verbally interviewed was contacted by mail and was informally asked for any information she/he could offer on black

bears. The specific questions sent in the second letter were based upon the reply to the first.

Written Material

Old records of the National Park Service were incomplete with the bulk in storage in Kansas City. However, notes by Park naturalists, memos to all Park personnel, typed reports to the Park Superintendent, and reports of previous research studies were still available in Park files. To provide supplementary information, written documents from other sources were used. Diaries, travel logs, biographical sketches, memoirs, and magazine and newspaper articles were searched and some information used. However, much of what was found in magazines and newspapers was believed inaccurate and therefore not useful. In addition, histories, photographs, and records of defunct companies from the area of the Great Smoky Mountains National Park and other historical articles were located in libraries in East Tennessee and North Carolina and contributed from private sources. Many of these written sources were of limited value as many were not concerned with wildlife.

Most of the Indian legends and mythology were not considered a valid source of information because the Indian mythology was developed at a time when the Cherokees had no written language. Mooney (1898) felt that the impact of settlers from the time of the Revolutionary War all but erased most mythology from the tribal memory and what remains is distorted to such a degree that it is unrecognizable. However, Gershmehl (1970) was able to verify some aspects of Indian lore by confirming former disturbances to certain areas.

Analysis of Data

One hundred and thirty-three verbal interviews were recorded, and another 53 persons replied by mail. Since much of the material gathered was repetitious, only 14 representative interviews are used for most of the opinions presented. In several places where it was necessary to weigh opposing information, the total number of the 133 interviewees giving one answer is summed and is given as a percentage in the text. When there was a general consensus of opinion among the interviewees, there are no references listed in the text because it was felt that this would be redundant. Where written material was available, the interviews were used only to add details.

In order that a thought may be maintained, references are often placed at the end of a sentence or paragraph. Information gathered in an interview is indicated by "p.c." for "personal communication." Interviewees quoted are listed at the end under "List of References." Material used from interviewees who did not wish to be identified is cited as "unnamed interviewee."

For this study, the GSMNP was divided into 19 sections (Figure 1, page 5) for easy identification of the watersheds. These sections were then enlarged to more easily identify locations (Figures 3, 4, 5, and 6).

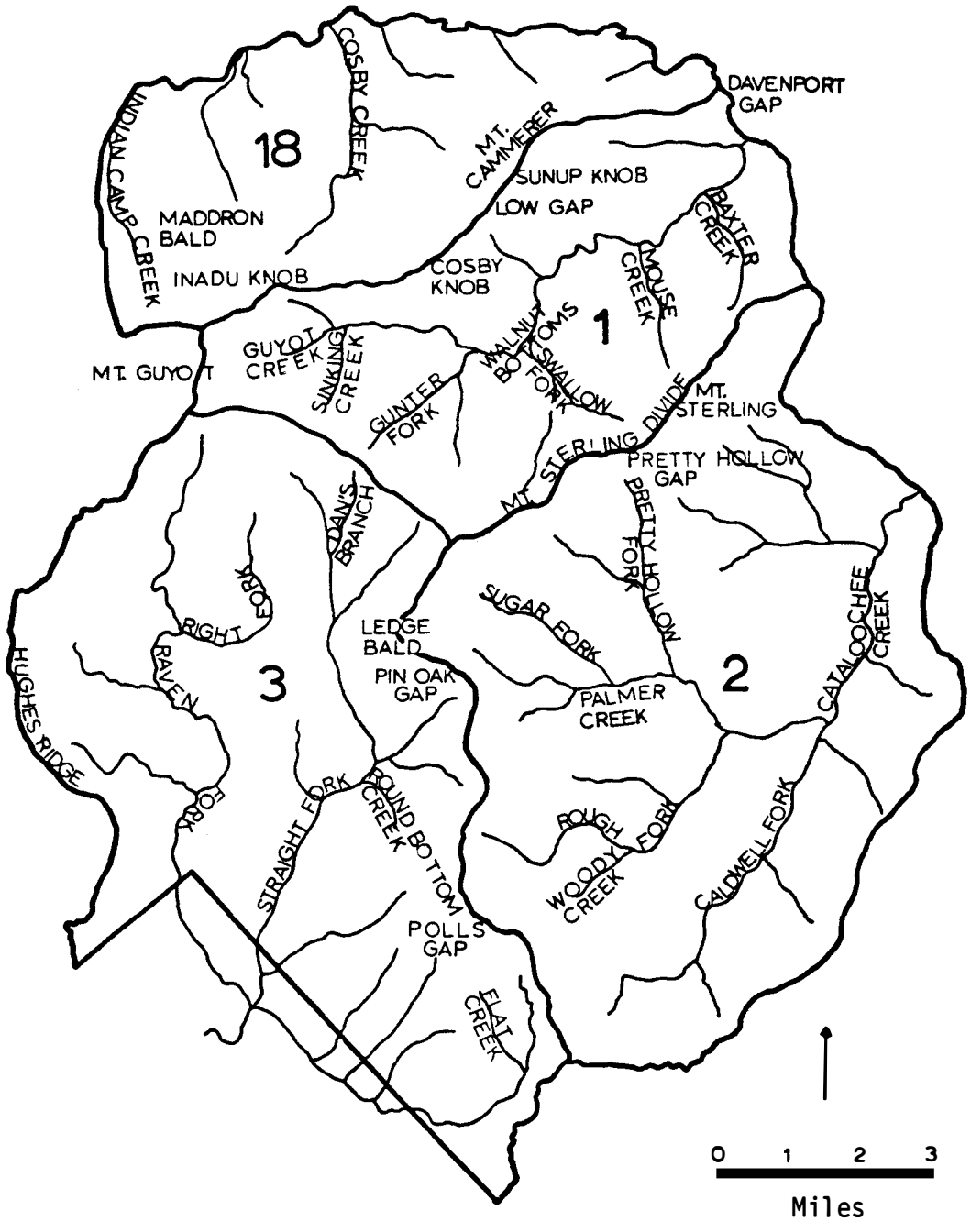


Figure 3. Watershed boundaries, major streams, and other geographic locations of watersheds of Big Creek (1), Cataloochee (2), Raven Fork (3), and Cosby (18) in the Great Smoky Mountains National Park.

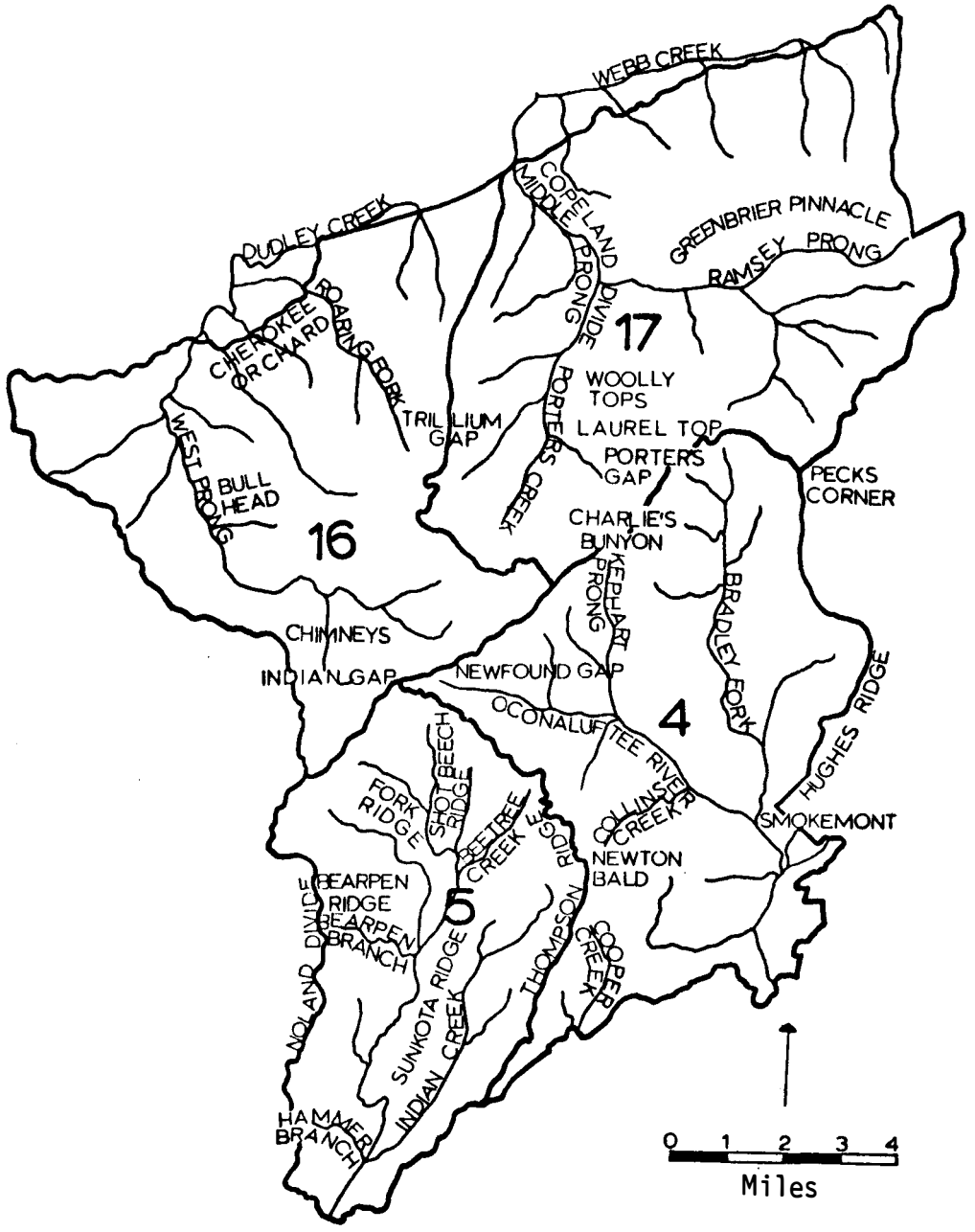


Figure 4. Watershed boundaries, major streams, and other geographic locations of watersheds of the Oconaluftee River (4), Deep Creek (5), East Prong (16), and Middle Prong (17) of the Little Pigeon River in the Great Smoky Mountains National Park.

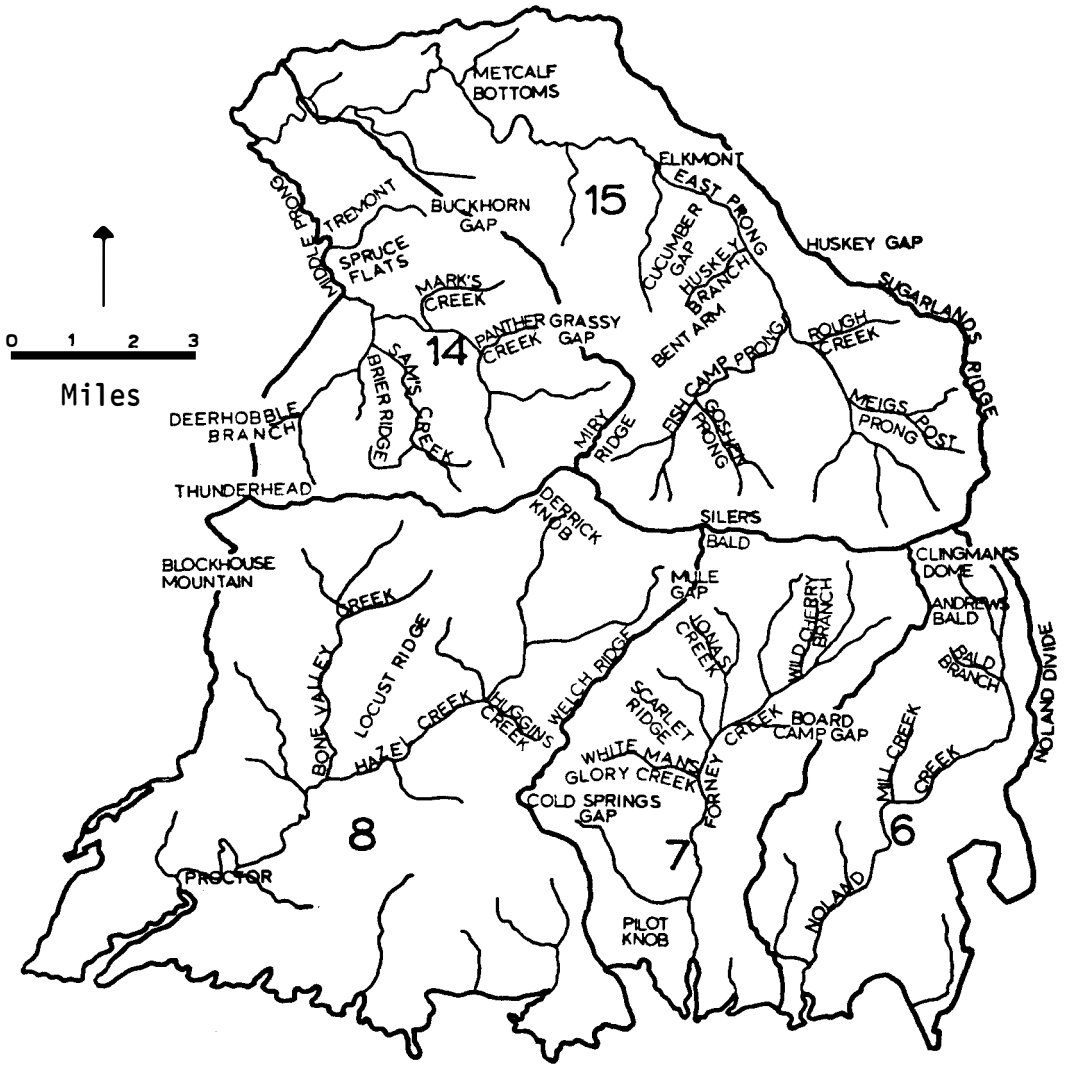


Figure 5. Watershed boundaries, major streams, and other geographic locations of watersheds of Noland Creek (6), Forney Creek (7), Hazel Creek (8), Middle Prong (14), and East Prong (15) of the Little River in the Great Smoky Mountains National Park.

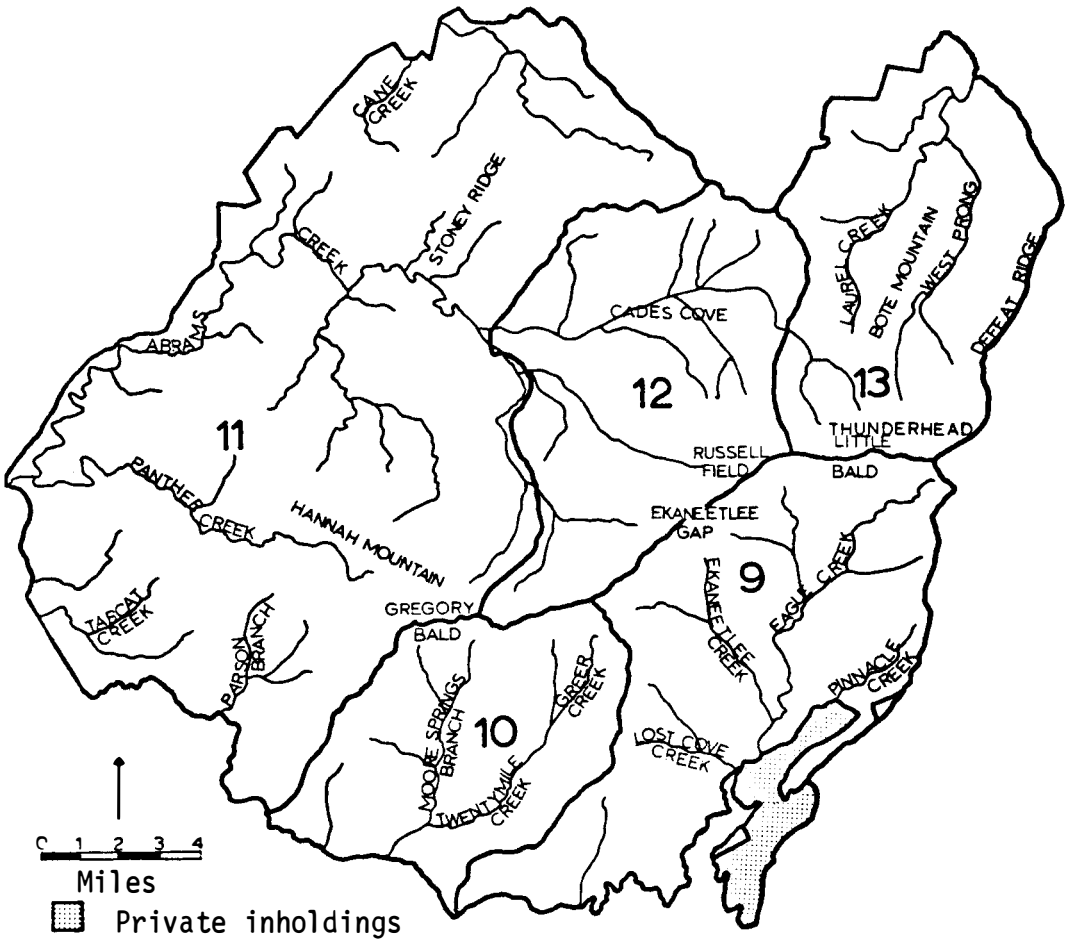


Figure 6. Watershed boundaries, major streams, and other geographic locations of watersheds of Eagle Creek (9), Twentymile (10), Abrams Creek (11), Cades Cove (12), and West Prong of the Little River and Laurel Creek (13) in the Great Smoky Mountains National Park.

CHAPTER IV

RESULTS AND DISCUSSION

A. INTRODUCTION

There are no specific data on the primitive black bear populations in the Great Smoky Mountains (GSM or Smokies) area prior to settlement. However, information from a number of sources cited later provides enough data to at least hypothesize general fluctuations of the population (Figure 7).

The area around the GSMNP was not settled until the late 1700's and early 1800's, but prior to that a number of explorers, adventurers, and occasionally scientists came into the region and left written records. There is some doubt whether many of these actually accomplished the rugged trip to the mountains or whether they copied the material from an earlier author. Lefler (1967) found that many of the early descriptions of North Carolina were identical, word for word. Authors quoted in this paper are those whose material Lefler felt was original.

There can be no doubt that bears were plentiful in the GSM. All authors mentioned the numerous bears that they saw and how much the Indians depended on them for meat, fur, and particularly oil, because it was so easily attainable. Gabriel Arthur, who explored western North Carolina with James Needham from about 1670 to 1680, commented on the great store of game all along and mentioned "beare" as being one of the most common animals seen when they were being led over the mountains by the Indians (Arthur, 1914). Timberlake, who traveled through the area

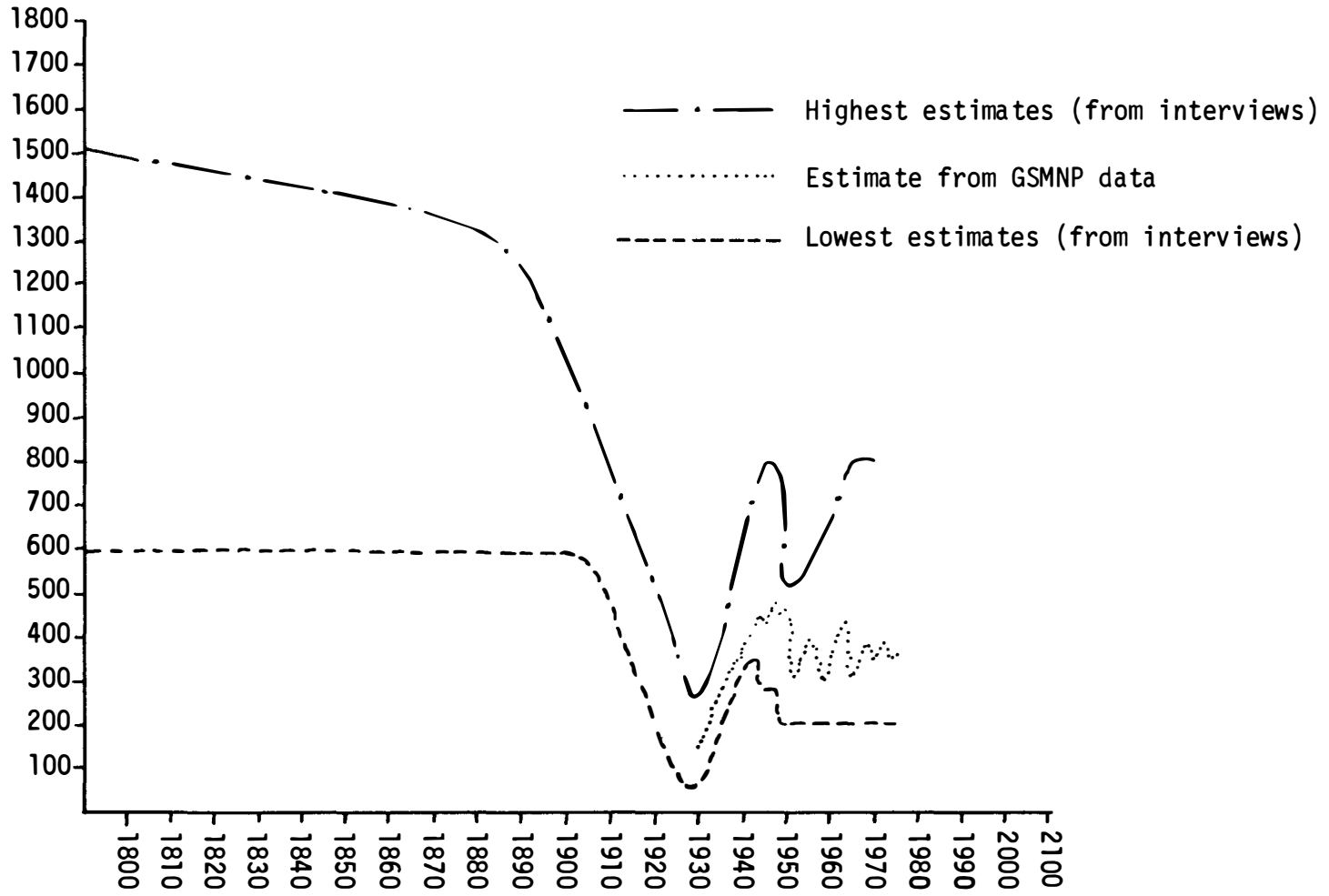


Figure 7. Black bear population trend estimates in the Great Smoky Mountains National Park.

and was held hostage by the Cherokee Indians in 1756, saw "incredible numbers of bear" and other game. He reported that when they made a fire in camp "several large bears came in, within reach of a tomahawk." He estimated that largest bear to weigh about 400 pounds (Timberlake, 1765).

Three current black bear research projects reported an approximate density of one bear per square mile (Jonkel and Cowan, 1971; Poelker and Hartwell, 1973; Marcum, 1974). Using this density as a guide, and assuming virgin forest conditions, the bear population of the 300 square miles (2072 square kilometers) in the GSMNP area may have exceeded 800 bears before human settlement. The values shown in Figure 7 include the perimeter of the area, and therefore, some bears from the surrounding forests. Interviewees gave estimates ranging from 600 bears (Cable, p.c.) to 1500 bears (Alexander, p.c.).

Until the formal settlement of the GSM the Indians were the only human users of the wild animal populations of the Park area. Even though the first settlers came into the mountains in the 1790's (Lambert, 1957; Burns, 1952), there seems to have been no major change in the population size of the black bears in the GSM until the middle 1850's when all of the major valley bottoms were settled (Lambert, 1957). Kent (p.c.) produced records kept by his great-great grandfather which showed that the residents of Greenbrier killed and smoked very large quantities of bear and deer. These records seem to indicate that land usage around settlements could have affected local bear populations and movement through hunting pressure, by habituating bear to avoid these small areas. Guyot (1863) found that the eastern

slopes of the State-line Ridge above Cades Cove were partially cleared and had numerous man-made paths. The area from Big Stone Mountain (Siler's Bald) to Great (Gregory) Bald was used by both residents of Tennessee and North Carolina to graze their livestock (Ayres and Ashe, 1905). Although there is no documentation, the same conditions probably existed around Oconaluftee. The rest of the GSM, for the most part, was still wilderness. Guyot (1863) found that the only way through many of the areas of dense undergrowth was on hand and knees along the bear paths. King (1874) had the same experience, as did Zeigler and Grosscup (1883) who wrote of the extreme wilderness conditions in the eastern section of what is now the GSMNP.

During the last 20 years of the nineteenth century, small logging firms began to invade the GSM. None of these operations logged large areas, and those areas cut were high-graded for cherry, yellow poplar, and ash, leaving cover and a substantial number of mast trees (Lambert, 1957). The large-scale logging, which began about 1900, not only destroyed large areas of habitat, but also contributed greatly to the growth of the human population in new and already existing communities. (Ayres and Ashe, 1905; Lambert, 1957). Until this massive change took place, it seems that only the bear populations immediately around the scattered communities (Appendix A) underwent any change. With extensive land clearing and with increased hunting pressure, particularly with the use of dogs, the bear population began to decline sharply. Every interviewee who was living in the 1920's stated that bear were rare, even non-existent at lower elevations. Information from the more ardent hunters seems to indicate that bear populations were driven

further up the mountains by human activities and were not observed by anyone not looking for them (Ledbetter, p.c.; St. Owenby, p.c.). Available information suggests that the total bear population was low. Major sections of most mountain ridges were cleared up to 4000 feet (1220 meters) eliminating food and cover and making bears much more susceptible to hunting in those areas. Dogs, which had had only local popularity, were becoming much more widely used. Many natives were finding it profitable to conduct large party hunts where as many as eight bears were killed over a two-week period (Ledbetter, p.c.). In addition, the chestnut blight invaded the area in 1925 affecting the most stable mast producer in the mountains (Gravett and Marshall, 1926; Baxter and Gill, 1931). The first die-outs of chestnut occurred at lower elevations making available food more scarce than it already was (Frothingham, 1930). Old bear hunters indicate that they had to climb over 4000 feet (1220 meters), usually into areas of thick undergrowth or rocks, to find bear (Cable, p.c.; Calhoun, p.c.; Ledbetter, p.c.; McCaughley, p.c.; Sparks, p.c.). Figure 8 shows the general location of these areas. Estimates of the bear population in the 1920's range from 50 bears (Leonard, p.c.) to over 200 bears (unnamed interviewee, p.c.).

Complete protection of the wildlife of the GSMNP from hunting and molesting was begun in 1934 (Komarek and Komarek, 1938), although hunting had been restricted since 1930 (Lex, 1958). Bear were immediately seen more frequently at higher elevations (King, 1934a). In 1931, J. R. Eakin, Acting Superintendent, was quoted as saying "there are more bear and turkey each month in the Park." By the fall of 1931,

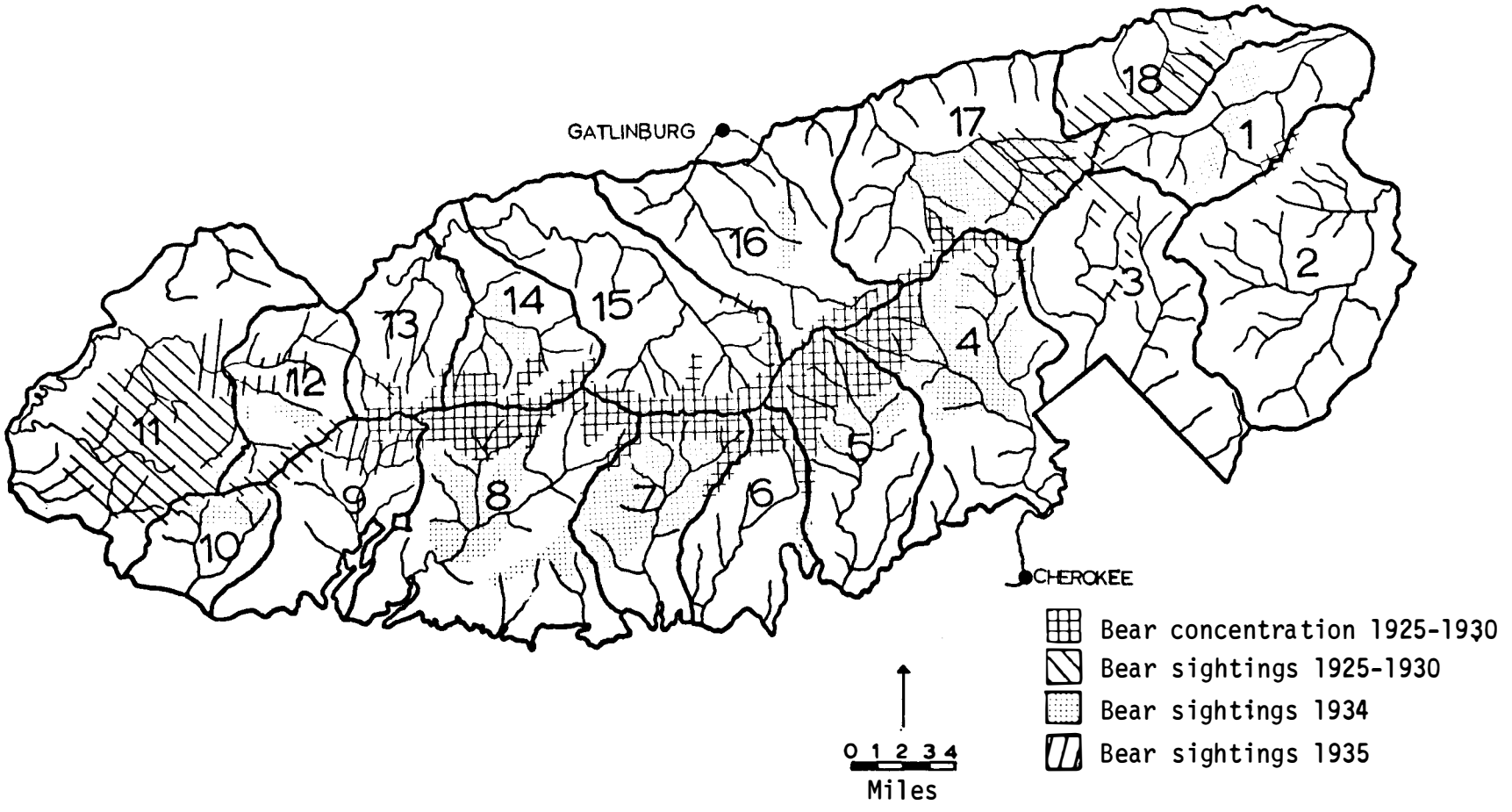


Figure 8. Range and sightings of black bear in the Great Smoky Mountains National Park 1925-1935.

bears were being seen at lower elevations (Sharp, p.c.; Whaley, p.c.) where land had been cleared (Sneddon, p.c.). In September, three separate bears were seen and killed at the Little River Lumber Company Camp in Tremont (Lex, 1958). Almost as soon as the government work program camps were established, bears became a nuisance. By 1935, they had become a serious problem at the mess tents and garbage pits, particularly at the camps on Miry Ridge and Sugarland Ridge (King, 1935b). In 1935, King (1935a) cited numerous reports of bears on Hazel, Forney, and Sam's Creeks, which may indicate an expansion of the population centers from the pre-Park logging period (Figure 8). Willis King, then a Park Naturalist, wrote, "Ten years ago, before protection was given the animal life of the Park area, bears were much depleted in numbers and rarely seen. During the recent years they have reproduced to the extent of becoming fairly common. They inhabit the high mountains and ridges and the more inaccessible stretches where their signs are usually seen in from five to ten places in a ten-mile hike. Occasionally one wanders down to an elevation of 2000 feet (610 meters), but generally they stay in higher country. . . . I believe bears are approaching the numbers which they normally should have" (King, 1935c). Dr. A. J. Sharp wrote in 1937 that "bears are not scarce and are rapidly increasing in numbers." In 1940, Arthur Stupka, Park Naturalist, estimated the population at about 300 bears (Stupka, 1950b). About this same time heavy depredations began to occur outside the Park during years of mast failure and the first visitor-bear conflicts became apparent (Stupka, 1941). The unofficial estimate of the black bear population was 350 to 400 bears in 1942 (Thornburg,

1962). In 1943, Eakin released an official statement verifying this and added ". . . it is possible that Park could support twice this number, but certain sections appear to be saturated. Bears are going outside the Park boundaries to raid hog and poultry pens, as well as cattle and sheep" (Eakin, 1943). Morrell (p.c.), then a Park ranger, also felt that the side effects of World War II were very helpful in protecting the bear population in the Park. Many potential visitors were either overseas or working in war industries. Those that remained had to contend with gasoline rationing. Morrell felt that these restrictions on people all but eliminated poaching from 1942 to 1945. During 1949, after people returned to their normal way of life and visitations to the Park increased, the Park experienced a massive mast scarcity and bear began to turn to maurauding outside the Park (Stupka, 1950a). Lex (1958) and Stupka (1950b) reported that 81 bears were shot by hunters above Fontana Lake that year. Stupka also believed that many more had been eliminated by poachers and farmers sending the bear population into a serious decline. "In spite of the present record-breaking mild winter, we have had no reports of these animals in the past three months. Whereas it was quite usual for the Park visitor to see no more than three or four bears in driving to Clingman's Dome in 1949, as many as ten or twelve were commonly observed in 1943 and again in 1947. In 1944,[2] 1945, 1946,[2] 1948, and 1949[2] the animals were noticeably scarce. Within the Park, bears are less plentiful today than they were ten years ago. The cessation of legal hunting on what has now become Park land, north of Fontana Reservoir, should serve to

[2]Years of documented mast scarcity.

increase the Park's bear population" (Stupka, 1950b). King and Stupka (1950) stated that before the 1949 mast failure black bears might have been as prevalent as they were when the country was first settled.

In spite of Stupka's reservations, Pyle (1951) was told by the National Park Service that there were 600 bears in the GSMNP. In 1952, Hart wrote of the "hundreds of black bear" that he thought were in the Smokies, an impression he received from the large numbers of bears and signs he saw while on a pack trip through the mountains. He saw "bear sign everywhere" while riding in the Shallow Fork, Mt. Sterling, and Rough Fork areas (Figure 3, page 23). Gilbert (1954) met bear frequently wandering about the balds "leaving a network of paths and occasional wallows." Stupka still felt that the bear population was suffering; he gave an unofficial estimate of 200 bears, even though he admitted that this was probably conservative (Calloway, 1955). There was poor mast production again in 1958 and the bear population again declined by as much as 100 bears (Kulesza, 1959a; Wingieir, 1959). Since 1949, Stupka, Morrell, Whaley, and other Park employees felt that poaching has increased and become a serious problem. Whether for sport, profit, or revenge, the above-mentioned interviewees claimed that bears of all age classes were being eliminated from the population by both hunters and dogs.

Population estimates by interviewees seem to reflect one extreme or the other, indicating the inaccuracies involved. Notes on bears were not kept until the 1920's when groups such as the Smoky Mountain Hiking Club started yearly journals. Also in the late 1920's, land evaluation for condemnation suits was begun by state officials.

Estimates from either of these sources were based entirely on on-the-spot observations along trails and depended much on chance. If an observer did not recognize bear sign, or did not happen to be in an area where food was available at the time, he might easily conclude that there were no bears in the Smokies. The low estimates of bear populations - as low as 50 individuals - are probably due to these sorts of observations. Not many people penetrated ridges and slicks (laurel thickets) where bear were concentrated in the 1920's (Cable, p.c.; McCaughley, p.c.). The few people who did, mostly bear hunters, found bear without difficulty (Ledbetter, p.c.; McCaughley, p.c.). Although the population was undoubtedly low, there were enough bears to increase the population to the point where bears were becoming troublesome in the CCC camps by 1934 (King, 1934a). It would seem that 50 bears would not have the capabilities (using 20 percent as the annual rate of growth) to withstand the constant poaching which has occurred since 1930, and still produce the numbers observed. In the early 1930's estimates were as high as 300 bears. These high estimates, and others later on, may partially be explained by the frequency with which (the same) bears were seen in garbage cans and along highways, and later in the campgrounds and picnic areas. Beeman (p.c.) reported 100 bear observations in one campground in 1973. All were of four bears, and 80 were of one bear. Marcum (1974) found "from the observational data collected for 1972 and 1973, it appeared that observations along roadsides and near shelters and campgrounds do not provide an adequate index to population density. The number of bears observed near these

areas appeared to be related primarily to food availability and only secondarily to density."

The pattern previously described for the years of 1949 to 1958 seems to be a predictable phenomenon. After each mast failure, there is an apparent decrease in the number of bears remaining in the Park. The population density appears to increase before the next mast failure. It is possible that the density of the bear population will periodically fluctuate according to mast scarcity or abundance.

Even if complete protection of the black bear were maintained, it is unlikely that they would reach the population levels of the early 1800's. The loss of the chestnut as a stable mast producer has definitely lowered the carrying capacity of the Park for any mast-dependent species.

B. HUNTING

History

Indians valued bear as a staple in their daily life and were the first recorded hunters of the black bear in the North Carolina-Tennessee area. Lawson (1709) and Brickell (1739) were the only two writers who described early bear hunting by the Indians in the 1700's, although Timberlake (1765) mentioned that he saw an Indian kill a bear with a tomahawk. Both writers stated that the Indians would not hunt bears in the spring, apparently because the Indians believed that the fish the bears sometimes included in their diet made the flesh distasteful. According to Brickell (1739), the Indians had no knowledge of hibernation and did not connect the poor condition of black bears

to anything other than fish. Lawson (1709) remarked that all bears killed in the winter were either males or females without cubs, but he had no explanation. The Cherokees regarded the bear as the noblest object of the chase, as a brother of man, and as having a common ancestor with man (Godman, 1826). From this sprang their belief that the bear that they killed would spring from the earth again if the spot where the bear had been slain was covered with leaves. Thus the bear was continually giving to man with no damage to itself (Mooney, 1898).

The Cherokee Indians did hunt extensively and for profit. Rothrock (1929) referred to the number of skins coming from the Overhill Cherokees in the mid-1700's. Mooney (1898) mentioned four places where Indians hunted bears. Yấ nû - din ě hûñ yǐ, or "where the bear live," was an area on the Oconaluftee River about one mile above the junction with the Tuckaseegee. Yânû - ú - nătawastí Yǐ or "where the bears wash" was a prominent bear wallow at the extreme head of Raven Fork. Four mountains, Tsistú yǐ (Gregory Bald), Kwấ hǐ (Clingman's Dome), Uyá hye (Mt. Guyot), and Gâté gwâ (unknown) were particularly good hunting spots in the fall and winter (Mason, 1927). In lore, Atagahi also existed, the enchanted lake where bears wounded in hunting could be healed by contact with the waters. Dried up now, it was supposedly located near Clingman's Dome (Mooney, 1898). Stupka (p.c.) said that he met a mountaineer whose grandfather was told by an Indian that Mt. Sterling Bald and the bald between Clingman's Dome and Siler's Bald were made as game lures. Lanman (1869) on his trip into

the Smokies commented that the Indians had an active hunting camp very near Alum Cave.

The first residents of North Carolina had already experienced bear hunting in Europe and had bred dogs for that specific purpose. Many of these dogs were brought over, the use of dogs picked up by the Indians, and, according to Brickell (1737), the black bear was virtually killed out of the eastern section of North Carolina by 1737. He did not note, though, how much habitat had been destroyed by this time.

The first pioneer settlers of the Smokies found the rough terrain too discouraging to conduct the extensive bear hunts that occurred in the flat lands of North Carolina. Baiting and trapping bears, particularly by deadfalls, was popular. Hunts were small, usually limited to one or two men with the family dog, and were kept close to home. Due to the lack of methods of preservation, the meat was usually divided among the relatives of the hunter. At least one member of each family probably attempted to get a bear each year, but few men hunted with enough regularity and success to make a name for themselves. Fonce Cable hunted out of Cades Cove and over to Thunderhead and Bote Mountain, occasionally into Bone Valley, as did John Stinnett and John McCaughley. "Black" Bill Walker hunted Meigs Mountain up to Devil's Courthouse. Ben Parton, Steve Owenby, Levi Trentham, and "Uncle" Bill Cove stayed around Jake's Creek and Sugarlands Mountain. J. W. Whaley hunted extensively on Porter's Flats, and Turkey George Palmer was famous in Cataloochee. In spite of the legends that grew around these men and others during their lifetimes, they were not

professionals. Ben Parton claimed that none ever killed more than they could use (Buckley, 1857; Mason, 1927; Cable, p.c.; Ledbetter, p.c.; McCaughley, p.c.; L. Owenby, p.c.; St. Owenby, p.c.; Sw. Owenby, p.c.; Shields, p.c.; Sparks, p.c.; Thompson, p.c.; Webb, p.c.; Whaley, p.c.).

Originally, bears and bear hunting occurred all over the Park area (Kephart, 1922). Later, with gradual community and logging development, bears were either forced out or otherwise eliminated from easily accessible areas, and hunting, of necessity, became much more stylized. Hunters such as Levi Trentham, Fonce Cable, and John McCaughley lived during the period when this change was taking place, and although they resisted, their pattern of hunting was altered (Cable, p.c.; McCaughley, p.c.; Sparks, p.c.; Thompson, p.c.). Originally, in the late 1800's, they hunted alone as was the custom. By 1910, bears were limited to areas of very difficult terrain and vegetation, and it was necessary to form a drive to hunt them.

Methods

Bears were hunted all year in the Smokies (Campbell, p.c.), but other than hunting stock killers, the most popular time was in the fall, particularly after the leaves had fallen and several rains had wet and packed them (Ledbetter, p.c.; Webb, p.c.). A few hunters would go out again in the early spring when bears were first coming out of hibernation (Hannah, p.c.). In late October or November either local people or sports hunters with a guide would gather at a camp, usually with dogs, for a one- to four-week hunt. The two most famous hunting camps in the Smokies were Tar Paper Camp, now Tremont, and the

Hall's Cabin at Derrick Knob. There were as few as three people to a hunting party or as many as 15; five was the average number[3] (Campbell, p.c.; Ledbetter, p.c.; McCaughley, p.c.).

In the fall, bears were located by the presence of mast trees. Thompson (p.c.) and L. Owenby (p.c.) observed that bears could be found anywhere there were mast and chestnuts. Griffin (p.c.) looked for areas where acorns, chestnuts, grapes, and hickory nuts were plentiful. Some of the more devoted bear hunters walked the ridges and coves looking for areas of abundant fresh bear sign, but most were unable to take the time required (Webb, p.c.). Baiting, or hanging sacks of food to lure a bear to a particular area, was commonly practiced by trappers, but was used only by those hunters who hunted all year. This was later adopted by hunters along the Park periphery who tried to lure bears out of the Park (Hannah, p.c.).

Usually, all but two hunters were placed in gaps where bears were known to cross the mountains (called stands). The two "drive" hunters took the dogs to another ridge and turned them loose in an area where they were likely to pick up the scent of a bear. It later became standard not to release the dogs until they picked up a fresh trail. Any bear that jumped in front of the dogs generally headed in the direction of one of the stands. All hunters then divided the meat equally. The success of these hunts varied. McCaughley (p.c.) said that many bears headed into laurel thickets from which it was almost impossible to drive them. "Rough areas alway had bears, but they were

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[3]Collins (1970) found that presently, hunters in North Carolina hunt with an average of 11.5 other hunters each hunt and use an average of 13 dogs per chase (Table 2).

TABLE 2

SOME RECENT CHARACTERISTICS OF BEAR HUNTERS IN NORTH CAROLINA AS COMPARED TO CHARACTERISTICS OF FORMER HUNTERS OF THE GREAT SMOKY MOUNTAINS

Category	Collins (1970)	Present Study
Number of hunters interviewed	64	117
Number still hunters	12	6
Number dog hunters	41	71
Number unspecified hunters	11	40
Average number dogs owned	12.3	6
Average value	$401	$450
Range	$100-$2000	$0-$5000
Average per chase	13	3-5
Range	5-52	1-12
Average number hunters per hunt	12.5	5
Range	5-30	3-15
Average distance from road	1.36	
Range	0-5 miles	

so hard to take (there) that few were ever killed." In addition, young hunters and occasionally old, experienced hunters, had an attack of buckfever and completely missed a good shot. On the other hand, Ledbetter (p.c.) and Webb (p.c.) shot nine bears in 14 days on one hunt in Bone Valley. They gave credit to the unusually good crop of grapes that year. Due to the unpredicability of dogs, bears, men, and terrain, normally only two or three bears were shot during a two-week hunt (Cable, p.c.; Ledbetter, p.c.; McCaughley, p.c.; Sparks, p.c.; Webb, p.c.).

Sports hunters came into the Smokies occasionally and hired a local resident as guide. These hunts were, in general, reported to be similar to the party hunts in wildlife management areas today. McCaughley (p.c.) commented that sport hunters camped out for about a week and tried to kill everything in sight; however, they were usually in no condition to do so.

Dogs

Originally, the use of dogs in hunting was limited, but it gradually spread in popularity.[4] Although Godman (1826) mentions dogging as a common practice, several of the older people interviewed swore that dogs were not used a great deal because the meat was inedible after the bear had been run. The first recognized breed, the Plott hound, was brought over from Germany by Jonathan Plott in the 1700's. By 1850 their viciousness, strength, and stamina had become legendary (Gasque, 1948; Plott, p.c.). Some interviewees contended

[4]Conley (p.c.) showed that dog hunting was two to three times as efficient as still hunting.

that the Plott is still the best bear dog available today; many more felt that both inbreeding and strain-crossing have left them inferior. Various other hounds, part-hounds, and "fice" dogs were and still are used. Black-and-tans, red-bones, and bluetick hounds are among the most popular.

Many bear hunters prefer to breed their own bear dogs and consider them one of their most valuable pieces of property. One hunter recently bought a stud for $5000.00 (Frye, p.c.). Collins (1970) showed that the average successful hunter owned 12.3 dogs at an average value of $401.00 each. The present study found that former dog hunters had owned about six dogs each which they valued at an average of $450.00 each, by current standards (Table 2, page 42). Not all pups from a litter were suitable. Webb (p.c.) had an average of only one or two from each litter that eventually qualified. He claimed that it was possible, through their behavior, to tell them from birth. After some obedience training, new dogs are put on the scent of a bear. Most hunters agreed that the basic skills needed to make a good bear dog are instinctive and cannot be learned. Any dog which consistently chased game other than bear or boar or gave any indication of cowardice was immediately eliminated.

Single hunters used three to five dogs, although Fonce Cable usually used only one dog and Griffin as many as 10 or 12. A group of hunters usually used three to six dogs. Occasionally parties ran into each other so that as many as 15 dogs ran in a pack (Buchanan, p.c.; Campbell, p.c.; Cooper, p.c.; Whaley, p.c.). Dogs can usually track well only if the ground is damp, although a few can "twig" (pick up a

scent from twigs, rocks, etc.). When a bear was cornered the chance of losing a dog was very high. It was important, if possible, to kill the bear immediately and to pull the dogs off to prevent them from fighting among themselves (Ledbetter, p.c.; Webb, p.c.).

Weapons

The weapons used for hunting were as varied as the hunters. Indians used tomahawks and knives (Lawson, 1709; Timberlake, 1765). Early settlers depended on knives and muskets (L. Owenby, p.c.; Webb, p.c.). Ben Parton has been given credit for killing a bear by driving a ramrod through its head (L. Owenby, p.c.). Later, shotguns were very popular and used as frequently as rifles (Hannah, p.c.). The 12 most common rifles used among 117 hunters were: 32-20 Winchester, 25-20 Winchester, 38-40 Winchester, 44-40 Winchester, 25-35 Winchester, 32 Remington, 303 Savage, 30-30 Winchester, 35 Remington, 32 Winchester Special, 300 Savage, and 30-06 Springfield. The first few are no longer commonly used, having less knock-down power than most rifles available today, but the last five are still recommended for big game (Remington-Peters, 1968). A powerful rifle was not needed in the Smokies because dense underbrush demanded that hunting be at close range. For the same reason, many had short barrels on their firearms. It was not uncommon for the sole weapon to be a pistol. Turkey George Palmer usually hunted with a 38-40 Winchester pistol (Hannah, p.c.; Plott, p.c.). Campbell (p.c.) killed his biggest bear with a 22 pistol.

C. TRAPPING

Godman (1826) mentions that the Indians used traps for bear. Buckley (1859) and Zeigler and Grosscup (1883) verified this as well as describing one popular deadfall. Rocks and heavy timbers were rested on a log placed over a baited trip set in a pen two feet deep. When the bear pulled the bait, he was crushed.

Trapping was popular with the early settlers and was frequently the method employed to get meat as hunting was often too time-consuming (L. Owenby, p.c.). Gradually, trapping lost favor as firearms became more sophisticated and as better access was provided by the development of trails. Trapping remained a commonly used technique among older hunters who formerly depended on it. Steve Owenby claimed that trapping bear on Blanket Mountain was a favorite pasttime (Bowman, 1938; St. Owenby, p.c.). Both John McCaughley and Fonce Cable were reported to have used traps extensively (Cable, p.c.; McCaughley, p.c.). About 75 percent of the 117 hunters interviewed had known someone who had trapped, while about 40 percent of these had actually used traps themselves.

Home-made traps were of many kinds. Both L. Owenby and McCarter made trip-pens out of chestnut logs (L. Owenby, p.c.; McCaughley, p.c.). Thompson (p.c.) said that in addition to the pen described above that the Cherokees showed him a unique trap. A cylindrical hole was cut from an old log. Horseshoe nails were then pounded in all the way around, tilted in towards the bottom of the hole. When a fat animal, such as a bear, put its head in to reach for the bait in the bottom of

hole, the animal was not able to withdraw it easily, giving the trapper time to kill it. This trap was said to be successful with raccoons as well. Drum-type barrel traps were also used (Griffin, p.c.). Buckley (1859) mentioned that in the mid-1800's steel traps were infrequently used, but it was easy for a blacksmith to construct one out of wagon or car springs. The biggest trap ever found in the Park (58 inches) was of this type (Stupka, 1960b; Whaley, p.c.). By the early 1900's, large, mail-order steel traps (Newhouse traps) became the most commonly used trap. These traps were heavy - from 35 to 100 pounds (Ledbetter, p.c.; McCaughley, p.c.; Webb, p.c.) - and were difficult for one man to set. It was necessary to pry one side down with a pole, peg it, and then pry down the other side (Thompson, p.c.).

Traps were set either in an active trail, in an area which had previously been baited, or in an area in which there was fresh bear sign. The traps were checked at least every two or three days. Size usually determined the fate of the captured bear. Large bears (over 300 pounds) were more likely to either avoid or break out of the trap, but those that were caught were too heavy to be carried alive and were dispatched immediately. Smaller bears could be spread with a logging chain and carried alive off the mountain to be fattened in a log crib (Thompson, p.c.). Although trapping was conducted all year (Cable, p.c.), late summer and early fall were the most popular times. Shields mentioned that more males were caught than females, possibly due either to a behavioral characteristic or to a difference in moving habits. Today, some traps are used around farmsteads near the Park when occasional bears become a nuisance (Cooper, p.c.; Shields, p.c.).

Snares did not enjoy much popularity. Cooper (p.c.) commented that bears often got out of snares. McCaughley (p.c.) used a snare made out of locust poles and ropes; Thompson (p.c.) used wire snares.

D. USES

The Indians of North Carolina found the black bear a useful source of meat and oil. Black bears were widely utilized by early settlers for their flesh, fat, and skin, and next to deer, were more commonly killed by pioneers and early travelers than any other large mammal (McKinley, 1962).

Bear meat was a staple for the Cherokees (unnamed interviewee, p.c.). Even though deer meat was preferred, bear meat was regarded with favor, and forepaws were considered a delicacy (Lawson, 1709; Byrd, 1728). Byrd (1728) reported that a fat two-year-old cub tasted like pork. The Cherokees must have found bear difficult to hunt, for every pound of meat was highly valued. Many tribes singed the hair off in order not to damage the meat by skinning (Godman, 1826). The only skins saved were those needed as rugs or blankets. After contact with larger settlements, a few tribes, including the Overhill Cherokees, began to market hides rather than burn them off (Rothrock, 1929; Peattie, 1943). Even after the Cherokees were forced to live on the reservation, which now borders on the southern edge of the Park, they hunted bears extensively. They continue to hunt currently and claim to enjoy bear meat as much as their ancestors (three unnamed interviewees, p.c.).

The Cherokees had many uses for bear oil. It was used as a hair

dressing, in birth and death ceremonies, in cooking other foods (Lawson, 1709), to mix powder for paint, as a body grease to ward off weather and insects (Brickell, 1739), and as a cure for baldness and rheumatism (Godman, 1826). The Indians also hung bear claws on deer sinews and wore them as ornaments (Brickell, 1739).

Settlers also turned to the bear as a plentiful source of meat. Because of the lack of effective methods of preservation, a hunter often divided the meat among his relatives or neighbors. After smoke houses became more common, large pieces of meat became a medium of exchange in trading (Sparks, p.c.) and a point of contention in hunting (Kephart, 1922). "Stoking" the meat, or dividing it up by chance, became the method most commonly employed to insure that no participating hunter would have reason to complain. After the carcass was butchered and the meat divided into the appropriate number of piles as equally as possible, one man called out a hunter's name from behind a tree as another stood next to each pile. Each hunter then took his randomly designated pile (Kephart, 1922; Gasque, 1948; Cable, p.c.; Calhoun, p.c.; McCaughley, p.c.).

Because of the seasonal variation in the taste of bear meat, most of the hunting by settlers and their descendants was done in the fall (Ledbetter, p.c.; Webb, p.c.). The flavor of the meat is apparently controlled by diet and age. The meat from a young bear is far less stringy and "gamey" than that from an old bear (Cooper, p.c.; Thompson, p.c.). Fish, garbage, and vegetative parts of plants were said to make "bear meat taste like an old wet dog smells" (Campbell, p.c.). Mast, particularly chestnuts and grapes, gave bear meat a sweeter flavor

(Griffin, p.c.). Many of the older bear hunters claimed that they lost interest in eating bear when the chestnuts died out because the meat was not as good (Cooper, p.c.; McCarter, p.c.). Some interviewees also claimed that bear meat tasted much better if the bear had not been dogged and run before it was killed (Ledbetter, p.c.; Webb, p.c.).

Bear meat was considered an exotic meat outside the mountains. It was occasionally sold for a dollar a pound in Knoxville, but there was never much of a market for it (McCaughley, p.c.).

Mountaineers found many uses for bear hides. Brickell (1739) mentioned that the belly fur was good for making hats; occasionally hunters did so, but it was not a common practice. Most of the people interviewed had at least one bear skin rug. Several used skins as blanket robes in the past, but discarded them in favor of lighter weight materials. John McCaughley, owner of one of the first cars in Cades Cove in the mid-1920's, had his car paneled, upholstered, and rugged in bear hides (McCaughley, p.c.). Campbell (p.c.) said that he had heard of sacks being made from bear skins, but he had never seen one.

Bear grease and oil were used by the mountaineers as a lubricant, as a waterproofing and a lamp fuel, and in cooking.

E. VEGETATION AND BEAR HABITAT CHANGES

Human Occupation

Vegetation changes brought about by human occupation of the Smokies was likely a major factor affecting the bear population in the area. Clearing and logging activities eliminated over half of the

bear's natural habitat by 1930 (Lambert, 1957). As vegetation was eliminated, bears were forced into nondisturbed regions (Figure 8, page 32).

Settlement of the GSM apparently occurred in the 1790's. By 1825 almost every watershed was occupied by a few families and several large communities (Appendix A) were scattered throughout the Park area (Lambert, 1957; Lex, 1958). Cultural activities reached their greatest intensity during the half century between 1880 and 1930, and left only bare vestiges of past vegetation on higher, more inaccessible peaks (Komarek and Komarek, 1938).

Other than the initial land-clearing activities in valleys and up the mountainsides in later generations, upland grazing occupance was a prevalent feature of early land-use patterns and probably reached its peak in the last decades of the nineteenth century (Buckley, 1859; Gershmehl, 1970). Gershmehl (1970) found that "the long-term grazing and burning are capable of deforesting large areas and exposing the remaining trees to artificially severe conditions." By 1902, eight percent of the land on the Tennessee side of the GSM had been cleared and seven percent of that in North Carolina (Ayres and Ashe, 1905). By 1926, when land buying for the Park began, there were 1200 farms and about 7300 people within the current Park boundary (Whittle, 1934; Lex, 1958; Campbell, 1960).

Logging changed the vegetation of the Smokies far more than did the activities of the settlers. By 1887, cherry, walnut, and ash were disappearing from the lower streams and were found in quantity only in upper watersheds (Anonymous, 1887; Lambert, 1961). In 1902, Ayres and

Ashe (1905) estimated that of the timber remaining, less than one percent was cherry, one of the bear's highly preferred foods (Beeman, 1971). By 1923, 85 percent of the land contained in the GSMNP was owned by 18 timber and pulpwood companies which cut at least 65 percent of the area by the time logging was halted in 1939 (Lambert, 1958). Chestnuts comprised 18.7 percent of all hardwoods removed and recorded and oaks 8.7 percent (Lambert, 1961). In 1909, oak and chestnut accounted for about 50 percent of the lumber produced in Swain County, North Carolina, and for 27.4 percent of the lumber of the Little River Lumber Company of Tennessee (Lambert, 1958, 1961).

Methods used by logging companies caused heavy damage to the land. Typically, railroad tracks were laid up a stream as logging progressed. Clearing of the way for these tracks, inclines, overhead skidders, and Sarah Parkers (a winch-pulled railroad car used to haul logs on the steepest slopes) laid bare large areas which encouraged massive erosion on hillsides (Lambert, 1958; Cady, p.c.; Thompson, p.c.). Even more destructive were the frequent and extensive fires, an occupational hazard of logging (Stupka, 1960b; Frothingham, 1931). One series of fires was reported to have burned continuously for nearly two months (Lambert, 1958).

By the time the National Park Service was ready to oversee the area, bear populations were apparently concentrated in the thin stands of timber left on rocky slopes (Figure 8, page 32).

Big Creek Watershed

The first recorded settlement in the Big Creek watershed (Figure 3, page 23) was in 1862 (Lambert, 1957; Lex, 1958). There was little

disturbance before the 1880's, when the Scottish Carolina Timber Company began highgrading the area (Lambert, 1958). Zeigler and Grosscup (1883) mentioned that this area was then excellent for bear-hunting. When Ayres and Ashe (1905) examined the area in 1902, the lower part of the forest had been heavily culled, with widespread evidence of fires. Good timber remained only in remote coves and on steep mountain slopes. By 1917, Baxter Creek, Swallow Fork to Mt, Sterling Divide, Mouse Creek, Gunter Fork, Campbell's Camp Branch, Yellow Creek, and Deer Creek up to Mt. Guyot had been stripped of all salable timber. In 1916, the area along Sinking Creek burned for three days. In 1917, the head of Yellow Creek to the head of Guyot Creek was leveled by fire. In 1925, Swallow Fork west to the top of Mt. Guyot and the area around Inadu Knob were both burned (Lambert, 1958; Lex, 1958). Since 1900, the only reported hunting in this watershed occurred along the ridge from Mt. Sterling to Mt. Guyot (Campbell, p.c.; Griffin, p.c.; Hannah, p.c.; Plott, p.c.). This area was forested until 1925 when a hot fire occurred on Mt. Sterling, burning even the organic matter in the soil (Campbell, 1934). Hannah (p.c.) observed that berry-bearing bushes are just now coming back. In 1934, Campbell reported bears in the vicinity of Sunup Knob because of blackberries. He referred to the badly burned area from Cosby Knob to Inadu Knob as "Hell Ridge" because of the lack of vegetation and water; he reported seeing no bears.

Cataloochee Watershed

The Cataloochee section of the Park (Figure 3, page 23) was more extensively settled, but less heavily cut than most (King, 1935a). The

first recorded settlement was in 1830 (Lex, 1958); much of the watershed was left relatively undisturbed. In the 1880's, as in Big Creek, some of the lower sections were highgraded. Ayres and Ashe (1905) commented only that they found large areas heavily burned to make pastures. In the 1920's, Parson's Pulp and Paper Company, which was logging Straight Fork, came through Poll's Gap and Pin Oak Gap and began to cut down Woody Creek and Sugar Fork. At the same time Suncrest Lumber Company moved in from Big Creek and cut 7500 acres (3035 hectares) north of Palmer and Cataloochee Creeks, 1000 acres (405 hectars) of which later burned (Lambert, 1958). With small tracts of settled land scattered throughout much of the watershed, access was not as limited as in many of the other watersheds. There does seem to have been a substantial bear population as this area was continuously hunted (Campbell, p.c.; Griffin, p.c.). By 1925, the size of the bear population must have dwindled, for although an occasional bear was killed, the area was not considered one of the prime areas by bear hunters, many of whom preferred to go to Pisgah National Forest (Griffin, p.c.).

Raven Fork Watershed

Until 1910, there was little activity in the Raven Fork watershed (Figure 3, page 23). Ayres and Ashe (1905) mentioned that there had been some cutting, but gave no location. At that time there were about 60 residents in the watershed, mainly from the Indian settlement. By 1919, much of Straight Fork had been extensively cut to the head of Dan's Branch. Flat Creek was only selectively cut for cherry and Raven's Fork up to the head of Right Fork was virtual wilderness (Hart,

1952; Lambert, 1958). Alexander (p.c.) reported hunting in the area as did several of the Cherokees, who claimed to have hunted the area extensively. It is probable that after 1919 only a small bear population remained at the head of Raven's Fork, for several Indians reported having difficulty finding bears in the 1920's (three unnamed interviewees, p.c.).

Oconaluftee Watershed

Oconaluftee (Figure 4, page 24) was first settled between 1795 and 1797. By 1800, five families began what were to be the largest farms in the Smokies (Lambert, 1957). When Ayres and Ashe (1905) examined the area it had been highgraded. Bradley Fork was cut and burned for over four miles (six kilometers) above Smokemont, up to an elevation of about 5000 feet (1525 meters). By 1925, the Oconaluftee valley had been logged almost up to Newfound Gap, then extensively burned over into Tennessee. Several years later torrential rains washed away most of the soil exposing bare rock (Lambert, 1958). The area around Charlie's Bunyon fared the worst (Mason, 1927; Adams, 1966). When Campbell hiked through the area in 1934 he found it still almost completely denuded. The lower part of Collins Creek was also extensively cut and burned (Lambert, 1958). There is one reference to some hunting in this area by the Cherokees before the logging companies began to remove the timber (Lanman, 1869), but otherwise the only hunting referred to was by Tennesseans who had come up to Porter's Gap (Cooper, p.c.; St. Owenby, p.c.). There was no hunting reported from this area after the fires in 1925.

Deep Creek Watershed

Deep Creek (Figure 4, page 24) was first settled around 1830. By 1902, 30 families were living there (Lambert, 1957). Only selective cutting was reported along Deep Creek in the 1890's (Ayres and Ashe, 1905) and along Cooper's Creek and Lands Creek in 1908 (Lambert, 1958). There is no record of fires in the Deep Creek drainage (Lambert, 1958). The upper half of Deep Creek was well-known bear territory and the area from Beetree Ridge, across Shot Beech Ridge and Fork Ridge, to Bearpen Ridge was considered particularly excellent (Hunnicutt, 1926; "Bear," p.c.' Calhoun, p.c.).

Noland Creek Watershed

Noland Creek watershed (Figure 5, page 25) was selectively cut in sections from the 1880's until 1908. In 1905, Ayres and Ashe wrote that the lower basin had already been highgraded and that the logging company had moved several miles in to the upper basin. In 1905, the Harris-Woodbury Lumber Company began again to log the area and removed mainly poplar, white oak, and chestnut up to Bald Branch. There is no evidence of fire in the Noland Creek watershed (Lambert, 1958). The removal of mast trees and underbrush made the lower part of the drainage less desirable bear habitat than Deep Creek. Bear hunters, though, were successful along the ridge running from Andrews Bald to Clingman's Dome, an area which had been left undisturbed other than the grazing on Andrew's Bald (Calhoun, p.d.; Ledbetter, p.c.).

Forney Creek Watershed

There is no record of the original settlers of Forney Creek (Figure 5, page 25), but by 1900 there was a small town at the foot of the watershed and a good road for several miles up the creek (Lambert, 1957). As early as 1863, Siler's Bald was being used to graze cattle (Guyot, 1863). By 1900, the best timber had been culled (Ayres and Ashe, 1905; Lambert, 1958). Logging continued rapidly and by the early 1920's the Norwood Lumber Company had logged Forney Creek extensively all the way to the foot of Clingman's Dome and Siler's Bald (Lambert, 1958; State of Tennessee, 1930). There were several large fires. One in 1912 burned all of Scarlet Ridge Branch. In 1920, the watersheds of Board Camp Creek and White Man's Glory Creek were completely burned as well as from the head of Forney Creek all the way to Clingman's Dome (Lambert, 1958). In 1925, a third fire burned almost the entire watershed. The only hunting reported was around Siler's Bald (Ledbetter, p.c.; Webb, p.c.).

Hazel Creek Watershed

Guyot (1863) refers to "Hazelnut" Creek (Figure 5) as complete wilderness, with no settlers and abundant bear trails which were the only routes through the laurels on the top of the ridge. By 1902, the Hazel Creek watershed had been selectively cut for oaks to within five miles (eight kilometers) of the head of the stream (Ayres and Ashe, 1905). By 1926, with a total of 1000 residents living in Proctor, all of the drainage had been stripped of all salable, accessible timber, with concentration on chestnut, hemlock, poplar, cucumber magnolia,

ash, and oak. Timber had been cut to the foot of Siler's Bald, and to within a mile of the State Line Ridge on Proctor's Creek. There was no cutting above the head of Hazel Creek or on the State Line Ridge because the timber was of poor quality (Lambert, 1958). Proctor Creek was completely burned in the early 1920's with the fire burning over the State Line Ridge into Tennessee (Lambert, 1958). Most of Bone Valley had been selectively cut, but no extensive logging occurred above Sugar Fork and mast trees other than chestnuts and white oaks were left intact. Bone Valley was one of the finest hunting areas in the GSM. All of the bear hunters contacted who had hunted in the western half of the GSM agreed that they and their relatives had considered Bone Valley and the area from Defeat Ridge to Bote Mountain the two best bear-hunting territories now enclosed in the Park. King (1935a) comments that small fires occurred yearly along the ridges of the watershed, giving berry-bearing bushes a good foothold. Blockhouse Mountain was a very good place to hunt bears as bears often crossed there (Calhoun, p.c.). Gasque (1948) mentions that on one trip he guided 22 hunters into Hazel Creek; 15 to 20 bears were jumped and eight were slain in three days. He does not mention the year.

Eagle Creek Watershed

Guyot (1863), Ayres and Ashe (1905), and Kephart (1922) found the Eagle Creek drainage (Figure 6, page 26) undisturbed as late as the early 1900's. Logging began in 1910. By 1919, most of Eagle Creek, Pinnacle Creek, Ekaneetlee Creek, and Lost Cove Creek were heavily cut and burned. Lost Cove Creek had been burned over so many times that

when condemnation proceedings were filed in 1926 by the State of Tennessee, it was feared tree reproduction was severely endangered (Lambert, 1958). Serious fires occurred at the head of Ekaneetlee Creek and Eagle Creek was burned to Little Bald (Lambert, 1958; Lex, 1958). Other than the area at the southeast corner of the watershed owned by a private hunting club, the only good hunting was found along the State Line Ridge from Russell Field to the Hall's Cabin (Derrick Knob). Much of the area had been cleared for pasture as had Russell Field (Cable, p.c.; Ledbetter, p.c.; McCaughley, p.c.).

Twentymile Creek Watershed

As with Hazel and Eagle Creeks, Twentymile Creek (Figure 6, page 26) remained undisturbed long after the other watersheds now included in the Park area were settled. Although Ayres and Ashe (1905) found very good timber, with oak, chestnut, and hickory the most common trees, when they examined the watershed in 1902, they reported that no logging had occurred because the terrain was too rough. Later, the Kitchen Lumber Company installed a railroad bed for 15 miles (24 kilometers) up Twentymile Creek and selectively cut along the main stream (Lambert, 1958). This area was excellent bear territory, but due to the rough terrain and thick underbrush, many local residents hunted in Bone Valley instead (Calhoun, p.c.; Frye, p.c.). Only the Sparks and the Roses hunted the Twentymile watershed with regularity. They found bear mainly at the heads of Twentymile and Greer Creeks (Sparks, p.c.).

Abrams Creek Watershed

Much of the Abrams Creek watershed (Figure 6, page 26) lies below 3000 feet (915 meters) and was described as "hilly" by Ayres and Ashe (1905) rather than "mountainous." This is most likely the reason that there were more scattered farms and access dirt roads in the Abrams drainage than in any other watershed. Since Gregory Bald was used extensively to graze as many as 1000 head of cattle, sheep, and hogs at one time, the path up to it was well cleared (McCaughley, p.c.). Ayres and Ashe (1905) found that the lower portion of the watershed had been selectively cut, with numerous small burned-over areas from land-clearing methods. Lambert (1958) judged that these fires were numerous enough to have killed or injured many trees as well as eliminate undergrowth. The Morton Butler Timber Company of Chicago owned most of the middle of the watershed and left it in virgin condition. The Aluminum Company of America, which owned most of the western third of the watershed, allowed some logging (Preston, 1966). About 1920, extensive cutting occurred above Parson's Branch Road. Hannah Mountain was not cut, being considered too difficult. King (1935a) reported that all trees of value were being cut in the Tabcat Creek drainage. The northern corner, from Cove Creek east, was obtained by the Little River Lumber Company which logged part of the Cane Creek drainage (Preston, 1966). This watershed was not considered good bear country, perhaps due to the logging, but more likely due to the scattered developments keeping bears from coming into the watershed. The Tiptons, Roses, and Sparks hunted from Hannah Mountain to Parson's and Gregory Balds (Ledbetter, p.c.; Sparks, p.c.). By 1925, they apparently had managed

to extirpate most of the game in this region and were successful in keeping it killed back (Ledbetter, p.c.; Webb, p.c.).

Cades Cove Watershed

The first settlers recorded in Cades Cove (Figure 6, page 26) came in 1794 (Burns, 1952). The first legal settlers, after the Indian Treaty of 1819, came in 1820 (Lex, 1958). By 1902 Cades Cove was occupied by 140 families (Ayres and Ashe, 1905).

The balds were apparently man-made. Old Man Sparks, Tom Sparks, cleared scattered beech trees from Spence Field (Little Bald) before the Civil War (Calhoun, p.c.; Sparks, p.c.). Russell and Spence Fields, Ekaneetlee Gap, and Thunderhead were cleared for grazing around 1880 and reburned every year or two (Carpenter, 1891; Gilbert, 1954; Ledbetter, p.c.; McCaughley, p.c.; Oliver, p.c.; Webb, p.c.). There was little logging, but trees were extensively girdled and burned to clear land. As early as 1863, Guyot noticed that the Tennessee side of the State Line Ridge above Cades Cove was much "tamer" than that of North Carolina, with numerous paths and fields. By 1920, the area from the valley up most of the way to the ridge was cleared with cabins and gant pens scattered throughout (from pictures in the possession of Kent and Webb). King (1934b) reported that Thunderhead, Spence Field, and Russell Field were still heavily pastured with cattle in 1934. He also noted that Russell Field was eroding heavily. Grazing on Gregory Bald was not stopped until 1936 (Stupka, 1960b). Since most of the Cades Cove area has been at least partially developed since the 1850's, little bear hunting occurred here other than the

routine dispatching of stock-killers. Most bear hunters went to Thunderhead, Defeat Ridge, Bote Mountain, or Bone Valley. A few hunted in Tellico (Hunnicutt, 1926; Calhoun, p.c.; Cooper, p.c.; Ledbetter, p.c.; Sparks, p.c.; Thompson, p.c.; Webb, p.c.). Harvey Broome, though, on a hike in 1928 found bears on Mollie's Ridge (Broome, 1970).

West Prong and Laurel Creek Watersheds

The West Prong and Laurel Creek watersheds (Figure 6, page 26) were the first areas in the Smokies to be extensively logged (Lambert, 1961; Mason, 1927). By 1908, most of West Prong was well cut-over using highly destructive and primitive logging methods. Later, a railroad was built most of the way up Laurel Creek but only the lower reaches were selectively cut (Ayres and Ashe, 1905; Lambert, 1957). This area - from Bote Mountain east to Defeat Ridge - was one of the best bear-hunting areas of the GSM. Several hunters claimed that the north side of Thunderhead was the most heavily hunted area now enclosed within the Park (McCaughley, p.c.; Sparks, p.c.; Thompson, p.c.). Some hunting occurred on Anthony Creek, but only one party hunted it extensively (Ledbetter, p.c.; Webb, p.c.). Two gaps on Defeat Ridge were regularly used by bears and these were known to local hunters as the Snag stand and, just above, the White Rock stand.

Middle Prong, Little River Watershed

Except for a small amount of selective cutting for yellow poplar in the early 1900's, the Middle Prong drainage of the Little River (Figure 5, page 25) remained undisturbed until 1925 (Ayres and Ashe, 1905; Lambert, 1958). This watershed was said to contain a good

population of black bears. Tar Paper Camp, now Tremont, was originally a hunting camp, with one stand located close by on Spruce Flats. Other well-known stands in the watershed were at the gap on Mark's Creek, at Bee Gap, and one by the big oak by Starkey Prong on Sam's Creek (Ledbetter, p.c.; Thompson, p.c.; Webb, p.c.). John McCaughley and Fonce Cable often found bears on Deerhobble Branch and Deerhobble Ridge, Thunderhead Mountain, Blow-Down (Brier Ridge), along Sam's Creek, and in Devil's Courthouse (Cable, p.c.; McCaughley, p.c.). The area from Spence Field to the Hall's Cabin (Derrick Knob), which was often used as headquarters for hunting parties from both North Carolina and Tennessee, was considered prime bear country during late summer and early fall. Beginning in 1925, the Little River Lumber Company cut every piece of salable timber from this watershed, with the last cutting on Spruce Flats Branch in 1938 (Lambert, 1958; Campbell, 1960, Tipton, n.d.). Several fires followed logging in many places (King, 1934a; Lambert, 1958).

East Prong, Little River Watershed

The East Prong drainage of the Little River (Figure 5, page 25) watershed was extensively logged and/or burned over in stages from 1901 to 1925 (Tipton, n.d.). This included Blanket Creek to Blanket Mountain, Long Arm (Bent Arm), Miry Ridge, Jakes Creek, Fish Camp Prong, Goshen Prong, Meig's Post Prong, Rough Creek, and around Little Greenbrier, now Metcalf Bottoms (Lambert, 1957; Lex, 1958). The area was abandoned in 1925 and no further hunting was reported except along some sections of Sugarland Mountain and the State Line Ridge (L. Owenby,

p.c.). L. Owenby stated that he and his brother occasionally trapped a bear in Grassy Gap (Jakes Gap) behind Elkmont. Before the complete devastation of the watershed, the area was reported to have a fairly good population of bear. "Uncle" Levi Trentham and Steve Owenby hunted Sugarland's Mountain, Jake's Creek, Huskey Branch, and Long Arm into Grassy Gap. L. Owenby (p.c.) reported that he could also find bear in Cucumber Gap. Other places mentioned included Goshen Ridge and Meig's Post Prong (L. Owenby, p.c.; St. Owenby, p.c.; Sw. Owenby, p.c.).

West and Middle Prongs, Little Pigeon River Watershed

Much of the West and Middle Prongs of the Little Pigeon watershed (Figure 4, page 24) was privately owned in small tracts (National Park Service, n.d.). Remaining land areas were eventually bought by the Champion Fibre Company and held in reserve. Small areas such as some parts of Sugarlands Mountain, the watersheds of Roaring Fork and Little Dudley Creek, parts of Ramsey Creek, Webb and Dunn Creeks, Porters Creek and its tributaries, Pinnacle Mountain, and Trillium Gap were selectively cut. As mentioned earlier, much of the State Line Ridge above these two watersheds was burned. There was also serious fire damage on Brushy Mountain (Mason, 1927) and around Brier (Greenbrier) and Sugarville (Sugarlands) (Lambert, 1957). The bear population does not seem to be as dense as it was in the western half of the Park. (Shields, p.c.; Whaley, p.c.). However, reaches of the Sugarlands Mountain were apparently good areas for hunting. Bears were also reported to be taken from Porter's Mountain and Woolley Tops, and were occasionally seen from Texas Creek east to Indian Camp Creek (Thompson, p.c.; Whaley, p.c.).

Cosby Creek Watershed

The upper part of the Cosby drainage (Figure 3, page 23) was owned by Chilhowee Extract, while the lower reaches were in private ownership (National Park Service, n.d.). There was selective cutting over the entire watershed, with the exclusion of Davenport Gap and Indian Camp Creek; no area was heavily cut. The timber available was difficult to reach, thin, and of poor quality. While this prevented massive cutting, it also did not support a good bear population (Lambert, 1958; Lex, 1958). Favorite hunting areas included the upper reaches of Indian Camp Creek, around Maddron Bald, and along the headwaters of Cosby Creek and its tributaries (Blanchard, p.c.; Large, p.c.).

Summary

Vegetation destruction from settling and logging practices reached its peak in the late 1920's in the GSM, with over 60 percent of the land at least partially cleared. With food and cover gone from the lower, more accessible slopes, bears moved to the high remote and undisturbed areas of the Smokies.

F. CHESTNUT BLIGHT AND ITS EFFECTS

The loss of the American chestnut (Castanea dentata) is the only introduced change to the area that apparently can never be completely rectified. Much blame for the decline of bears in recent years has been placed on extensive hunting practiced in pre-Park days and on the current poaching situation. A more likely source of the problem lies in the demise of the chestnut and its replacement by less dependable mast-producing species.

There is no way to prove the true value of the chestnut, but certain conclusions can be drawn from related data. In the 1930's there was an attempt by the National Park Service to evaluate the value of the chestnut, but the results are not available (King, 1938). Chestnuts definitely seemed to be a highly preferred food of black bear. William Byrd (1728) wrote that bears climbed out the limbs of chestnut trees as far as they were able, then either bit or broke off the rest and finished it on the ground. Many of the people interviewed had also noticed this habit. Several of these interviewees felt that the chestnut was so superior that they will no longer eat bear meat because without the chestnut, the meat lacked the sweet taste it used to have (Cooper, p.c.; McCaughley, p.c.).

The chestnut was found throughout the Park below 2000 feet (600 meters) to above 5000 feet (1500 meters) but most commonly around 3000 feet (900 meters) on dry, north-facing slopes and on south-facing slopes (Ashe, 1911; Cain, 1930; Woods, 1957). It once covered the lower coves and broad open valleys away from stream banks. In more submesic and subxeric stands, chestnuts formed 30-70 percent of the canopy (Whittaker, 1956). Woods (p.c.) found the chestnut most prevalent in the eastern end of the Park with the largest stand between Indian Camp Creek and Texas Creek. Kendeigh (1942) also found "the largest stand of dead mature chestnut in the Park between Indian Camp Creek, Texas Creek, the Pinnacle Lead, and the Park line" - a total of about 3800 acres (1540 hectares). These trees were 80 to 100 feet (25 to 30 meters) tall and about 3 to 4 feet (1 meter) in diameter at breast height (MacDonald, 1963).

The information given in the interviews definitely implied that there was not a region now in the Park which did not depend on chestnut as a major contributor of fall mast. Such names as Chestnut Flats, Chestnut Branch, Chestnut Ridge, and Chestnut Gap were common throughout the Smokies before the blight. Since establishment of the Park, many of these names have been changed.

The chestnut blight was first introduced into the northeast corner of the Smokies around 1925 (Gravatt and Marshall, 1926). Hannah (p.c.) said that in 1925 some sort of disease showed up in the chestnut, but that little attention was paid to it because "no one knew what it was." The blight was slow in spreading. Frothingham (1931) claimed that around 1930 "chestnut is still the most abundant timber tree in the Southern Appalachian Mountains in spite of the blight," estimating chestnut to comprise 13 percent of all trees. During July, 1935, Jennison reported that chestnuts at elevations from 3500 feet (1100 meters) to 5000 feet (500 meters) were not yet striken by the blight. In 1938, Stupka reported that chestnuts were abundant on Thomas Ridge around 5000 feet (1500 meters). As late as 1952, Stupka mentions that chestnuts were blooming at Soco Gap, about 4500 feet (1400 meters). By 1940 it had spread southwest and killed at least half of the Park's chestnuts (MacDonald, 1963).

The death of the blight-stricken chestnut was slow, from two to 10 years, depending on the altitude. Chestnut sprouts bearing fruit are still occasionally found over 4500 feet (1400 meters). This slow death favors replacement of the chestnut by adjacent trees which adjust gradually to the new conditions and occupy much of the space left

vacant. Woods (1957) and Woods and Shanks (1959) found that the chestnut was replaced through this method primarily by chestnut oak, northern red oak, red maple, hemlock, and silverbell (Table 3). Keever (1953) working in North Carolina, found that northern red oak, chestnut oak, pignut hickory, white oak, and scarlet oak, in that order, were the main replacement species. In Woods' (1957) study, 47 percent of the replacement species were mast species, while in Keever's study 75 percent were mast species. Oaks alone accounted for 41 percent of the replacement species in Tennessee and 57 percent in North Carolina. In both studies replacement to 3500 feet (1100 meters) was good, but very slow at higher altitudes.

Oaks do not produce a good crop of nuts each year. Baker (1950) found a good crop of nuts about every three years over a 20-year period, approximately the same periodicity found by Sharp and Sprague (1967). Gysel (1956) and Reid and Goodrum (1957) found no definite periodicity. Genetics and weather are the two factors that work to control mast production. Matthews (1963), Sharp and Sprague (1967), and Farmer (n.d.) all found that if oak trees produced a good crop one year, the next year's production was light or non-existent. Temperature during blooming and pollination seems to be a critical factor in mast production. Baker (1950), Sharp and Chisman (1961), and Goodrum, Reid, and Boyd (1971) definitely correlated early spring freezes where temperature falls below 29 degrees Fahrenheit (-1.7 degrees Centigrade) during pollinating and fertilization with heavy crop losses and found that the red oaks were more susceptible to damage than white oaks. Sharp and Sprague (1967) showed that a freeze is not necessarily the

only spring weather factor responsible for poor oak crops. They suggested that a 10-day warm period is necessary for pollen maturation and dissemination, followed by a 13-20 day cooler period needed to insure proper fertilization. In their 14-year study, Sharp and Sprague (1967) found that only one mast failure was caused by a late freeze while they attributed eight to the lack of cool weather in May. Other early bloomers which might be susceptible to the same conditions are hickories, cherries, buckeye, beech, ash, and sassafras (Fowells, 1965; Taylor, 1972; Reader, 1973; Farmer, p.c.). Table 4 gives the known frequency of good mast crops of some mast species found in the GSMNP.

During a good mast year, the nut production is probably many times greater than the consumption; therefore, years of poor production determine carrying capacity. Weather records from the GSMNP Headquarters and TVA show that late freezes, which cause heavy crop loss in early blooming trees, can occur as often as every two years and no less often than every seven years. The evidence presented by Sharp and Sprague (1967) concerning the relationship between warm periods in May and mast failures is inconclusive, and therefore, cannot be applied. Table 5 presents an evaluation of the total mast crops in the GSMNP. Chestnuts, on the other hand, bloom in the first two weeks of June (Rink, p.c.; Thor, p.c.) and are not usually susceptible to late frosts. Drying winds and heavy rains can reduce the crop size, but the chances of a total crop failure are slim (Thor, p.c.). While chestnut was the preferred mast species, it was more importantly a stable mast producer and capable of carrying the animal population through a season when other species had failed. The last good crop of

TABLE 3

REPLACEMENT SPECIES OF AMERICAN CHESTNUT IN THE GREAT SMOKY MOUNTAINS NATIONAL PARK

Species	Percent Replacement Species	
	Woods (1957)	Keever (1953)
Chestnut oak	17	22.2
Northern red oak	16	24.4
Red maple	13	2.5
Hemlock	6	
Scarlet oak	4	1.2
White oak	2	9.2
Black oak	2	
Beech	2	
Pignut hickory	1.5	16.6
Mockernut hickory	1.5	
Sourwood	4	1.3
Tulip tree	4	4.9
White pine		0.43
Silverbell	5	0.14
Sassafras (*Sassafras albidum*)	1	0.02
Sweet birch (*Betula lenta*)	3	5.7
Black gum	1	1.8
Black locust	4	1.3
Dogwood	2	
Pitch pine	2	
Table mountain pine	1	
Yellow birch	1	
Sugar maple	1	
Striped maple	1	
Shortleaf pine (*Pinus echinata*)		

TABLE 4

FREQUENCY OF GOOD MAST CROPS OF SOME MAST SPECIES WHICH OCCUR IN THE GREAT SMOKY MOUNTAINS NATIONAL PARK

Species	Percent Composition of Stands[a]	Month of Blooming	Years Between Good Crops	Source in Addition to Fowells, 1965
Oaks	20			
Black oak		April	2-3	Gall, p.c.
Chestnut oak		Early April	4-7	Reader, 1973
Northern red oak		April	2-5	Reader, 1973
White oak		April	4-10	Reader, 1973
Hickories	1			
Mockernut hickory		Early to late April	2-3	Reader, 1973
Pignut hickory		Early to late April	1-2	Reader, 1973
Cherry	1	Mid to late April	2-3	Farmer and Barnett, 1972
Buckeye	6	End March to end April		
Beech	Less than 1	April	3-5	King, 1934b Gysel, 1956
Ash (green and white)	2	Mid to late April	3-5	
Sassafras	Less than 1	March to early April	1-2	
Chestnut	12	June	1	Thor, p.c. Rink, p.c.

Sources: Keever, 1953; Woods, 1957.

TABLE 5

AN EVALUATION OF THE PRODUCTION OF MAST IN THE GREAT SMOKY MOUNTAINS 1917-1960

Year	Mast Production	Notes and Sources
1917	Fair[a]	Frost killing early-blooming trees (Burchfield, 1941)
1925	Poor[b]	Excessive drought, extensive fires (Campbell, 1934)
1934	Good[c]	Heavy berries and mast (Fleetwood, 1934; King, 1934a)
1936	Fair	Oaks, cherries damaged by early spring freezes, good chestnuts (Jennison, 1936a)
1937	Good	Heavy berries and mast (Stupka, 1937)
1938	Good	Heavy mast including chestnut-last time this species mentioned as major contributor (Stupka, 1938)
1940	Fair	Good berries, fair acorns (Stupka, 1940)
1941	Fair to poor	Early killing frost, first heavy depredations (Burchfield, 1941)
1942	Fair	Poor berries, "average" mast (Broome, 1949-1950)
1943	Good	Good berries and mast (Stupka, 1943)
1944	Poor	Excessive drought, berry and mast failure, depredations (Stupka, 1944, 1950b)
1945	Good	Berries and furit abundant (Stupka, 1945)
1946	Poor	Good berries and mast except for oaks (Stupka, 1946, 1950b; Hannah, p.c.)
1947	Fair	Good grapes (Stupka, 1947, 1950b)
1948	Fair	Berries good, mast fair (Stupka, 1950b)
1949	Poor	Only berries and beechnuts good, oaks failed (Stupka, 1949, 1950b)
1950	Good	Beech particularly abundant (Stupka, 1950a)
1951	Good	Beech "average" (Stupka, 1951)
1953	Fair	Spring freeze (Stupka, 1953)
1954	Good	(Stupka, 1954)
1955	Good	(Stupka, 1955)
1957	Fair	Spring freeze (Stupka, 1957)
1958	Poor	Acorn failure (Kulesza, 1959b; Thomson, 1959)
1959	Good	(Thomson, 1959)
1960	Fair	Spring freeze (Stupka, 1960a)

[a]Fair - acorns not abundant, one other mast species failed.

[b]Poor - mast not available.

[c]Good - mast abundant.

chestnuts in the Park was reported in 1938 (Stupka, 1938). In 1941 there was an early killing frost (Stupka, 1941), a partial mast failure, and the first significant crop and stock losses to bears were reported outside the Park. Depredations increased in 1942, 1944, 1946, and 1949, which also were years of mast failure (Stupka, 1941, 1942, 1944, 1946, 1949; Hannah, p.c.). Several of the people interviewed noted that stock raidings and crop losses did not occur widely until the chestnuts died, then bears became a problem (Hannah, p.c.; Cooper, p.c.).

Oaks comprise 41 percent of the fall diet of the black bear (Beeman, 1971). When failures occur, they can have wide-ranging effects. Not only do they cause bears to move over larger areas, making them more susceptible to both legal and illegal hunting, but also reproduction of black bears is apparently inhibited during these years. After the mast failure in 1968 only one cub was observed in 1969 (Beeman, 1971).

Although Park protection halted the deterioration of the area caused by logging and settlement and brought the opportunity for a gradual reversion to more natural conditions for both vegetation and wildlife, the death of the American chestnut is apparently permanent. There seems to be no reliable mast producer capable of replacing the chestnut. The oaks, hickories, and beeches fail periodically, keeping wildlife populations at lower numbers than probably were maintained when chestnuts were a major mast-producing species. Although the pattern of mast failures will probably continue, there is a possibility that the total amount of mast produced will be greater as the forest

reaches a climax stage in several hundred years (Komarek and Komarek, 1938; Buckner, p.c.), with a corresponding increase in wildlife. Some sort of index of annual mast production is needed to follow (understand) these production patterns.

G. DEPREDATIONS

Bears enjoy many of the same foodstuffs of man and seem to find them either "unbearably" tantalizing or much easier to obtain than wild foods, particularly during mast failures. This problem is not new, although it has greatly increased recently.

In the 1700's both Indians and settlers had difficulty with bears. Lawson (1709) reported that bears occasionally raided maize fields planted by Indians, destroying 10 times what they ate. Settlers were reported to have lost potatoes, cabbage, green corn, calves, swine, and sheep to marauding bears (Lawson, 1709; Godman, 1826; Van Doren, 1928; Gasque, 1948). These sources also include carrion as a food item and Lawson recognized that this could lead to a belief that bear depredations were greater than actually occurred.

During pre-Park days, there was occasional crop damage and stock-killing, but it was never extensive. Shields (p.c.) said that raccoons and deer did more damage to corn than did bears. King (1874) wrote that hard times brought bears in to raid cabins, but this was not reported by any other source. Kephart (1922) said that in the early 1900's bears sometimes raided fields of the upper settlements of Hazel Creek or Little Fork of Sugar Fork. Ledbetter (p.c.) and Campbell (p.c.) never observed bears in their crops before they moved

from the Park area. L. Owenby (p.c.) had trouble with bears killing his chickens as did Hannah (p.c.). He claimed that one bear even piled them up under his apple tree. McCaughley (p.c.) remembered when Gregory Bald was used as a livestock pen. He estimated that there were 700 to 900 head of cattle, 300 to 400 sheep, and 50 mules on Gregory Bald during the summer and that only one or two cattle every four or five years were lost. He mentioned that they also occasionally lost chickens and hogs. Whaley (p.c.) commented that bears prefer hogs and sheep to cattle, but he claimed that not many of either were killed. He mentioned, however, that once a bear acquired the killing habit it had to be destroyed because it could never be stopped. Thompson (p.c.) lived in Blow-Down in the early 1930's and maintained hogs and cattle near his community. He said that the entire community lost several hogs and only one calf. Calhoun (p.c.) mentioned that he had sheep and goats killed by bears.

Commonly, stock-killers has some peculiarity that made them turn to killing cattle. Whaley (p.c.) commented that all stock killers he had examined were old males, as did Buchanan (p.c.). Griffin (p.c.) noted that all stock killers he observed were older animals. Hannah (p.c.) also found stock killers to be old males. He also noted that they usually had some physical defect such as no teeth or a malformity; one had only three feet.

Most stock-killings occurred in late spring and in early to mid-summer (Campbell, p.c.; Ledbetter, p.c.; Thompson, p.c.; Webb, p.c.). No one remembered having any stock killed by bears in the fall. Certain bears became well-enough known through their habits that they

earned names. Old Kettlefoot, so named because it was said that a kitchen kettle would not cover his footprints, killed cattle over a wide area. Honest John killed only what he could eat and returned to the kill to finish it (Gasque, 1948). Old Reelfoot had a twisted hind foot and teeth worn to the gums (Kephart, 1922).

Davenport (1953) conducted an extensive study of agricultural depredations in Virginia. He found that corn was the only field crop to suffer appreciable damage. Livestock loss usually began around the middle of March to the beginning of April and ceased about the first of November. Sheep were the most frequently killed animals, followed by hogs, goats, calves, and cattle.

Although the numbers and extent of depredations in pre-Park days did not reach the levels reported by Davenport (1953), by 1941 reports of marauding bears were becoming frequent. The first written record of bear depredations was found in a 1936 Knoxville News-Sentinel article concerning Jim Sanders who shot a bear in Townsend that had been killing his hogs (Anonymous, 1939). However, several of the interviewees who lived in the communities surrounding the Park reported that they had never had trouble with bears until the early 1940's (Cooper, p.c.; Griffin, p.c.; Hannah, p.c.; Whaley, p.c.). Whaley (p.c.) reported that several cows were killed in Cosby in the mid-1940's, but he never knew of much trouble with bears outside the Park. A bear was shot near the edge of Gatlinburg after it had killed a hog (Stupka, 1943). In these same notes, Stupka reported that one resident outside the Park near Little Bald claimed to have had 31 sheep killed by bears during the previous year. During that year, Eakin wrote, "Bears are going

outside the Park boundaries to raid hog and poultry pens as well as cattle and sheep. In such instances they are occasionally shot (and are causing) ill will with certain people who live in close proximity (to the Park)" (Eakin, 1943).

In 1944, the berries dried up and the mediocre mast year came very late (Stupka, 1944). Twenty chickens, four calves, two cows, and a hog were killed by bears between Roaring Fork and Townsend from July through September that year (Stupka, 1944). A poor year for acorns occurred in 1946 (Hannah, p.c.). Stupka (1946, 1950a, 1960b) again noted the increase in depredations reported outside the Park and estimated that as much as half the Park's bear population had roamed outside the Park and been shot in 1946. In 1947, five bears were killed in Gatlinburg, apparently attracted by garbage (Anonymous, 1947). In 1949, the first very poor mast year occurred. Stupka (1950b) felt that the bear population had been decreasing through poaching and the killing of marauders in the 1940's; however, he gave no figures. Stupka judged that the numbers of roadside bears could be used as an indicator of bear populations. During the 1949 failure, he again was concerned by the number of depredations reported to him, but he made no listing. He did report that 81 bears were taken in the legal hunting area near Fontana. He estimated that at least that many again were shot as marauders and poachers, and that as much as half of the Park's bear population had been eliminated. He gave no estimate of the remaining population at the end of the season, but he did say that only three or four bears had been reported on Highway 441, where 10 to 12 had been

reported in 1943 and 1947. Shields (p.c.) said that at least 200 bears were lost along the Park's periphery in 1949.

Through the 1950's scattered damage by bears was reported. Alexander (p.c.) claimed to have lost sheep and cattle each year. Cooper (p.c.), Webb (p.c.), and Thomson (p.c.), who all lived along the northern edge of the Park, reported that they had heard of crop damage and stock losses, but could not remember details.

In 1958, another mast failure occurred. There is no record of the number of complaints received by the Park. Thompson (1959) mentioned that there was definitely an increase in depredations, but states that the National Park Service was much more concerned with the complaints of visitors not seeing bears the following year.

Local residents of the area around the periphery of the Park still believe that the establishment of the Park and an ensuing Park policy (undefined by the interviewees and apparently nonexistent) other than protection and maintenance of a bear population, have caused the marauding bears to leave the GSMNP. Only four of those who had experienced bear damage - Hannah, Griffin, Whaley, and Cooper - felt that the demise of the chestnut and the inevitable mast failures were the cause of the bear problem outside the Park. In addition, according to Hannah (p.c.), the common practice of hanging beef bones along the periphery of the Park to lure out bears has helped caused some of the problem.

The National Park Service does not reimburse those who are victims of maraudings outside the Park, nor are they responsible for programs to help them. A cooperative program, though, with the Tennessee

Wildlife Resources Agency, perhaps through prepared presentations to various local community groups, could prove an excellent public relations venture. By taking a more active role in communicating with natives concerning the problems which seem to be Park-related, better understanding could be established.

H. PARK PROBLEMS AND POLICY

Bear Incidents

The Park provides a large protected area for bears. It also provides conditions which bring bears and people in close contact. Visitor curiosity and disregard for the wild nature of the black bear have done a great deal to habituate the bears to humans and unnatural foods. No permanent record of bear incidents is available prior to 1959. However, notes made by Park personnel proved to be an adequate source of information.

In the early 1930's, when those working for government work programs were the primary source of contact with the black bear, the bears were regarded as a curiosity by the workers and officials alike, and were treated as such. Although the feeding of bears was never a recognized policy in the GSMNP, the practice became a regular routine in many CCC camps (Calloway, 1955). By 1934 and 1935, King (1934b, 1935b) reported problems with bears at garbage cans and mess tents on Rough Creek, Sugarlands, and Miry Ridge Camps. In July, 1935, Cammerer and Eakin released a statement ordering that there be absolutely no feeding of bears; however, this was not enforced (Cammerer, 1935). In 1936, the Knoxville News-Sentinel published

photographs of bears being fed at unnamed CCC camps as an attraction of the Smokies. As the camps were closed and their garbage pits cleaned, the "garbage" bears began to appear along the roads and in the picnic grounds (King, 1937).

The first recorded injury to a Park visitor occurred on June 28, 1930, at the Cherokee entrance (Bear file N 1427). During the 1930's, while Park visitations were low and the bear population was still growing, bear incidents such as snatched food, damage to the property of Park visitors, and injuries were not considered a serious problem. Enforcement was not strict; a program of visitor education had not been established and little cooperation was received from the news media (Cady, p.c.; Sharp, p.c.; Whaley, p.c.). In 1938 and 1939, Eakin, through the press, asked visitors not to feed the bears while in the Park (Eakin, 1938, 1939). At the same time, these same newspapers were publishing pictures of visitors feeding bears or posing with them with no mention of Park regulations (East Tennessee Automobile Club, n.d.). With the beginning of World War II, American tourist trade was banned from Europe and the number of visitors to the GSMNP jumped from 91,342 in June of 1939 to 128,533 in June of 1940 (GSMNP Headquarters records). In 1941, the number of visitors climbed another 37 percent and bears began to become a serious problem (GSMNP Headquarters records; Whaley, p.c.). In an effort to control the skyrocketing number of injuries, the National Park Service began to send short, terse public accounts with photographs to the newspapers (Anonymous, 1940). This was continued through 1941. All incidents reported to the newspapers included some action of illegal

feeding. In 1942, the Naturalist Program published the bulletin "Do Not Feed The Bears," and naturalists began to emphasize in the evening campfire programs that bears were dangerous and wild animals. No evidence was located as to whether the above policy was effective or not. Stupka (1943, 1944, 1945) and Shields (p.c,) noted that there was a sharp drop in the number of bear incidents in 1943, 1944, and 1945, but this was more likely due to World War II than to National Park Service policy. With fuel rationing and the country in a continuous state of emergency, former visitors no longer had the time or the energy for pleasurable excursions (Morrell, p.c.).

In the late 1940's and early 1950's, after the end of the war, the use of the Park by visitors increased. In 1951 there were 1,945,100 visitors in the GSMNP (GSMNP Headquarters records). Shields (p.c.) and Whaley (p.c.) felt that the number of bear incidents increased accordingly. Until it became evident that the growing familiarity between bears and humans was leading to serious consequences, the GSMNP had not considered the control of bear-human interactions a major concern. In July, 1955, the GSMNP had 46 injuries caused by bears (Wingeier, 1959). The following year, rangers were given orders to cite bear feeders, and a great deal of publicity was given in the newspapers and over the local radio stations regarding arrests. The number of injuries was reduced to 18 in 1956, 5 in 1958, and 3 in 1959 (Thomson, 1959; Wingeier, 1959). These results are shown in Table 6. In 1959, the total number of incidents jumped to 1343 for the year (Table 6). The previous year had been a particularly poor mast year, and it may be that bears had not

TABLE 6

REPORTED BEAR INCIDENTS IN THE GREAT SMOKY MOUNTAINS NATIONAL PARK 1955-1973

Year	Mast	Injuries	Incidents Directly Related to Food[a]	Total Incidents	Comments
1955	Good	46			
1956		18			Began strict law enforcement on highways
1957	Fair	5			
1958	Poor	5			
1959	Good	3	1259	1343	
1960	Fair	16	110	148	Began strict law enforcement in campgrounds and picnic areas
1961	Fair	10	78	147	
1962	Fair	8	115	131	
1963	Good	7	44	84	
1964	Fair	4	52	94	
1965	Good	3	8	16	
1966	Poor	23	50	142	First bear-proof garbage cans installed
1967	Fair	12	29	65	
1968	Poor	7	49	135	
1969	Good	1	6	14	
1970	Fair	4	26	65	
1971	Good	7	11	51	
1972	Poor	15	15	117	
1973	Good	3	3	18	

[a]Food and picnic lunches taken; coolers damaged.

[b]Includes damage to automobiles, trailers, campers, tents, and miscellaneous damage.

Sources: Stupka, 1955-1959, 1960a, 1961-1963, 1964, 1965-1968; Kulesza, 1959b; Beeman, p.c.; Bear File N 1427.

accumulated a thick fat layer to carry them through the lean period the following spring and summer. The high number of incidents, including 604 instances of food stolen and 655 coolers damaged, may indicate that bears were supplementing their low fat layer with unnatural foods. However, data in the later years indicate bear-person incidents decrease after years of poor mast. A strict enforcement program was begun in the campgrounds. Warning signs were placed where campers were likely to see them and small printed forms explaining safe food storage were handed out with each Park folder. Garbage was collected several times a day to keep garbage cans empty (Kerr, 1959). After the mast failures in 1966, 1968, and 1972, there was a low corresponding rise in bear incidents (Table 6). While it is possible that the number of incidents recorded during a particular year reflects the number of bears present and the mast production in the Park, it also may indicate to some degree the amount of law enforcement and visitor cooperation during that year. Temporary, scattered attempts to control bears were made by Park employees. In 1937, Park officials attempted to remove troublesome bears by trapping, first in wooden crates (Cady, p.c.) and later in oil drums (Hannah, p.c.). Cady reported (p.c.) that the wooden crates were unsuccessful. The first official trap, a modified culvert, was received by the Park in 1941 and located in the Chimney's Campground. During the 1940's it was felt that this trap was all that was needed. As early as 1938, various Park personnel had adopted temporary methods to deter bears. Clubbing and the use of shotguns loaded with small shot were the two most popular (King, 1937b; Whaley, p.c.). Suggestions of bear-proofing garbage cans, regular clean-ups,

and a public education system were frequently made (Bear file N 1427). In 1943 a bear-proof garbage container was developed, but it proved to be unsuccessful. An effective bear-proof design was not introduced until 1966 (Myers, p.c.). In 1943, Swede Owenby successfully protected his beehives in Elkmont by means of an electric fence, but this method was too expensive for the National Park Service. Nothing further was done until the late 1950's when it became evident that while Park visitors traveled many miles to see a bear on the highway or trails, they did not want bears in the campgrounds.

In 1959, trapping became an official policy. By the early 1960's each campground was supplied with at least one culvert trap (Shields, p.c.). Once trapped, nuisance bears were moved to remote areas. If they returned to the capture area, the National Park Service allowed rangers the option of disposing of them permanently.

In spite of this liberal policy, by 1960 rangers were finding it difficult to adequately maintain all their duties and control bears as well. The Park's staff had not been increased enough to handle the number of visitors entering the Park each year. Bear-visitor conflicts, particularly in the campgrounds and along the highways, began to take up a large amount of each ranger's time. There are indications that several Park rangers felt inclined to unofficially lower the bear population or to look the other way when confronted with poaching (unnamed interviewee, p.c.). Although bear-proofing garbage cans has presently helped to alleviate the problems in picnic areas and campgrounds, intentional and unintentional law-breakers continue to be a headache. The written warning originally was effective (Wingeier,

1959). An onlooker had no idea that this was not a citation. It has since become better known and publicized that these written warnings are not penalties and are no longer a deterrent (East Tennessee Automobile Club, n.d.; Ogle, p.c.). The visitor who derives a great amount of satisfaction and excitement from feeding wild animals is willing to take the risk if he knows that he will not be fined. If, instead, a fine of five or 10 dollars is issued for a first offense, the reputation for more strict control will likely follow with a subsequent decrease in the number of offenses.

The area of visitor education apparently has been neglected. Campfire programs and occasional road signs do not seem to be effective. A survey of the visitors to the GSMNP (Burghardt, Hietala, and Pelton, 1972) indicated that less than half had attended one of the naturalist talks. "Talking boxes" and other visual aids, such as used in zoos, could be utilized in picnic grounds, along nature trails, and at the beginning of the more heavily used trails, such as Laurel Falls. Information included should show not only the destructive powers of black bears, but also many aspects of their life history. The above-mentioned survey also indicated that Park literature and the exhibit at Sugarlands Visitor Center were five times as effective as the Park naturalist talks as a source of information.

While incidents occurring along the highway are duly noted, many of the back-country occurrences are not reported and are not easily controlled. Hikers have been increasing at an exponential rate, from 8000 in 1970 to 80,000 in 1973. Bear-man contact was held to a

minimum in Glacier National Park from 1968 to 1972 by limiting back-country access (Martinka, 1974). This method was attempted in the GSMNP in 1973, by means of the permit system. Due to lack of enforcement this system was apparently not as effective as expected. It was the author's experience that as many as 30 people were at a trail shelter for which only 12 permits were issued. In spite of literature handed out with the permit, the feeding of bears through the protective screening at the shelter was also observed. Since it is not feasible to set up education centers in the back country, more strict enforcement of back-country regulations is necessary. The "if you carry it in full, you can carry it out empty" policy seems to be working better, although visitors continue to dispose of their garbage in other ways.

Poaching

Poaching, or illegal hunting, began as soon as the Park was established. In 1934, King reported finding three deer hunters on the ridge running to Parson's High Top (King, 1934b). In 1935, Jennison mentioned that there were bears killed on the lower reaches of Walker and Proctor Creeks.(Jennison, 1935). Stupka reported the catching of one party which had slaughtered eight bears in two days inside the Park (Stupka, 1935). Willis King, during the period from 1934 to 1937, reported numerous bear hunts in the Hazel Creek area, with as many as five bears reported killed in one month (King, 1934a to 1937a, 1934b to 1936b). He and Stupka (1950b) both felt that much of this was due to the influence of a private hunting club and other individuals who owned land along the southwest border of the Park. Throughout his notes from

1935 on, Stupka mentions that bears were found shot or that poachers had been sighted or caught, but the first official report of a bear shot within the Park was not until 1943 (Anonymous, 1943). Shields (p.c.) mentioned that officers in North Carolina were frequently running into illegal bear traps that two or three trapped bears were found dead. Many of the traps in the Park set in trails were not marked. Sw. Owenby stepped in the middle of one that was frozen to the ground and did not spring (Whaley, p.c.). One old hunter claimed that Cataloochee is still trapped frequently (unnamed interviewee, p.c.). Two hundred and thirty-one steel traps were confiscated by the National Park Service between 1932 and 1952 (GSMNP Headquarters records). Six more were taken in 1952 (Lex, 1958). Shields (p.c.) comments that big steel traps were regularly used during the 1940's.

Other than these few records and those of poachers actually caught, there is no official record of the extent of poaching within the Park. Interviews indicated that it is much more extensive than the Park records show. One privately owned hunting club which claimed to hunt only 1900 acres north of Fontana Lake (Figure 7, page 28) conducted hunts into the Smokies. There is some evidence that this club still does, as do several of the professional guides (six unnamed interviewees, p.c.). One professional guide from North Carolina made a great deal of money taking parties into the Smokies before the Park was established and was caught at the same occupation several times after the Park protection began (unnamed interviewee, p.c.). This guide still hunts along the boundary and swore that he knew several other guides who are not adverse to leading parties into the Park for an extra fee.

Since the founding of the Park, hunting has always been active along the Park boundary. There is no doubt that some bears which wandered outside the Park were killed (Stupka, 1942-1949; Campbell, p.c.; Cooper, p.c.; Hannah, p.c.), but there were large numbers of questionable bears killed right at the Park boundary (Alexander, p.c.; Morrell, p.c.). Hannah (p.c,) mentioned that it was a common practice to hang beef bones near the periphery to lure bears near enough to kill. If the carcass was not outside the Park boundary it was then so placed. Tom Alexander, a former wealthy land owner who claimed to have lost a large number of sheep and cattle to Park bears, is reported to have made a profit from bears obtained by the above method (three unnamed interviewees, p.c.). These above interviewees also indicated that there has been an increase in poaching since the middle 1940's. Arthur Stupka had no direct evidence, but he felt that in addition to the 81 bears taken near the private hunting club grounds in 1949, at least that many bears from the Park were also taken "in other ways" (Stupka, 1950b). Prior to the 1949 season there was an average of six hunting violations (does not include trapping) each year in the Park (Park records). During the 1949 to 1950 season there were 15 arrests for hunting within the Park (Lex, 1958).

In 1950, Stupka indicated that he felt the heavy poaching during mast failures might change. "Within the Park, bears are less plentiful today than they were 10 years ago. The cessation of legal hunting on what has now become Park land, north of Fontana Reservoir, should serve to increase the Park's population" (Stupka, 1950b). Later data showed this not to be the case. Kulesza (1959) reported that 86 bears killed

in 1958 in the strip of land from Bryson City to Fontana between Highway U.S. 19 and N.C. 28 and Fontana Lake. This kill was reported for just the first two months of bear season. Wingeier (1959) estimates that at least 100 bears were lost from the population. Poaching from this area seems to continue today. As recently as 1972, one unnamed interviewee (p.c.) has noticed that 28 bears were supposedly removed from the 1900-acre private inholding near Fontana Lake (Figure 7, page 28) during two weeks of the legal hunting season in North Carolina. Even allowing for a relatively high bear density of over one per square mile, three is the maximum number of bears which might be maintained on 1900 acres.

Before the Park was established, bear hunting was considered an honorable occupation as well as an inalienable right. After condemnation proceedings claimed land for the GSMNP it was very difficult for many to leave the areas with which they were familiar. The old hunters felt that they still owned the land and were willing to risk the $25.00 fine for hunting in the Park each fall. One old timer said that he was born and raised on the land and that he would hunt it as long as he lived. One former poacher did not consider that he or his friends poached. As far as he was concerned the land was still his, but it did not belong to the other Park poachers. He contended that the laws should be stiffer for everyone else.

Hunting in the 1930's and 1940's was not extensive and tended to be concentrated during the fall of the year (Morrell, p.c.; Whaley, p.c.). In addition, many former poachers claimed that they had hunted only during the Depression to help provide food. Everyone agreed that

currently poaching is a year-round problem and a much more dangerous one due to the change in attitudes among the younger hunters. The beginning of this change seems to have taken place in the late 1940's. World War II ended in the mid-1940's and the economics of the area were substantially improved. Not only were men returning home, but it was not long before they found that they had much more leisure time than had enjoyed during the Depression and post-Depression period. In addition, the number of bears which left the Park during the 1949 to 1950 years of poor mast production led to a belief among local people that there were too many bears in the Park. These two factors apparently were the primary reasons for the sharp increase in poaching. Campbell (p.c.) felt that there was another reason for the increase in poaching. He contended that the increase in the number of useable roads giving access to the further reaches of the Park led to much of the increased poaching. Collins (1970) found, in fact, that the "average" bear in North Carolina was killed only 1.36 miles from the nearest road (Table 2, page 42). One current poacher admitted to staying within a mile of a gravel road, because he finds it difficult to drag bear out of the woods. He preferred to shoot bears along the roadsides and had shot bears that were frequenting dumps and garbage cans (unnamed interviewee, p.c.).

Whittle (1934) interviewed many of the Tennessee families who moved from the Park. At that time he was able to correlate the unrest and vindictive attitudes towards the Park with their current standard of living. This still seems to be apparent today. The majority of those contacted who still displayed open hostility towards the National

Park Service and who were proud of breaking Park regulations, seemed to be from a lower economic class and seemed to be, in general, more dissatisfied with their surroundings than other people interviewed. Six of the nine poachers contacted were of this description. The other three were older hunters who still came in for their "fall bear" when there was not a legal hunting season in their area. One of the six younger poachers said that he hunted for sport - it was "fun" to outwit the government. Another claimed that he was "picking up" where his father left off. The other four poached because they "felt like it."

Poachers today seem to know "how to take advantage of an overworked ranger" (Whaley, p.c.). One poacher indicated that when he was in the Park he always knew where the rangers were. He felt that the only way that he could be caught was either at his camp inside the Park or at his normal entrance route into the Park, but he did not think that this was likely. Another stated that it was easy to hunt in Cades Cove without being caught. He said there were many places to hide if anyone saw him. Poachers interviewed admitted to hunting in Cataloochee, near Laurel Creek Road, Bote Mountain, above Elkmont (Grassy Gap), above Tremont (Bear Den Ridge, Glow-Down), West Prong, Sam's Creek, Copeland Mountain, Cooper Creek Road, Hazel Creek, Bone Valley, and north of the Indian Reservation. These poachers felt that they were not doing extensive damage to the bear population, because since they had to be careful of their position, their hunting success was low. One hunter claimed that he had shot only two bear in 1972. Not one poacher admitted to baiting bear into an area, although they said that other poachers did. Only the three older poachers used all the meat from

the bear that they shot. The others often left the bears, cutting off either the hide or choicest parts. During the summer, very little of the bear was utilized. The poachers hunted all year when they had time. Four of the poachers said that there is a good market for good bear hides. Only one of the poachers said that he used traps in the Park, but he would not say whether he marked them or not.

There are other forms of poaching. The taking of cubs became a profitable business after World War II, when the tourist industry began to boom and bear exhibitions became popular. Several of the restaurants in the Park area also included bear meat as an attraction on their menu. Hannah (p.c.) stated that before the law was passed that a possessor of a cub must show where the cub came from, the Cherokees alone were taking 30 to 50 cubs worth $100.00 apiece from the Park each year. An unofficial estimate went as high as 100 cubs per year being taken from the Park, when available (unnamed interviewee, p.c.). Often, to get these cubs, the sow would have to be killed. This practice undoubtedly hurt the population. Currently, there is a very active market for cubs. One poacher said that he could get as much as $400.00 for one cub. He did not feel that cub poaching was as extensive as it used to be (unnamed interviewee, p.c.).

Illegal hunting is one of the most difficult problems confronting Park personnel. Poachers consider Park hunting their inalienable right and pay little attention to Park policy, aims, and regulations. They are generally more familiar with Park terrain than most of the Park rangers. In addition, several Park employees are acquainted with or related to persons hunting in the Park and are unwilling to give any

information concerning these individuals to the authorities. There are indications that a few Park employees are allowing them access to gravel roads leading to more remote areas of the Park as well as discretely giving them pertinent and helpful information. Since the GSMNP is presently understaffed, it is not likely that poaching can be adequately controlled by law enforcement. The catching of known, "hardcore" poachers does make others more wary, but it apparently does not deter them for more than a year or two (unnamed interviewee, p.c.).

A program where personnel of the National Park Service would speak with local community clubs on a regular basis should be established. Garden clubs, schools, meetings such as that of the Annual Beekeeping Association, and particularly hunting clubs should be targets of this campaign. Although hunters and potential poachers must be the prime targets, the community attitude must change if poaching is to be stopped. Again, a cooperative community education program with the Tennessee Wildlife Resources Agency might be helpful. Many of the local people have inherited the attitude that the bear is a pest species and do not realize that it is one of the main reasons for the heavy visitations to the Smokies, nor do they understand the research being carried out in the Park. This lack of understanding is more evident among older people. One interviewee said, "I feel like an intruder in my own backyard" (Mrs. Cooper, p.c.). One major problem related to this is the high turnover in Park personnel. In recent years many top administrators and rangers have not remained at the GSMNP long enough to become acquainted with either the local people or many of the problems of the GSMNP. There can be very little

communications between the Park and local communities if Park personnel do not remain long enough to establish proper rapport.

Road access seems to be one of the most important factors in poaching. By permanently limiting access to many of the Park's gravel roads, much of the poaching in more remote areas (above Elkmont, Bote Mountain, Eagle Creek) could be eliminated. As already mentioned, Defeat Ridge and Bone Valley have traditionally held good bear populations. The proposed Transmountain Road from Tremont to Bryson City would give almost complete access to both of these areas of prime bear habitat. Also the alternative North Shore Drive, extending the length of the north side of Fontana Lake, would open up the Hazel Creek, Eagle Creek, and Twentymile Creek watersheds and would likely cause increased poaching there. There can be no doubt that any further road development would be detrimental to the GSMNP and its bear population.

Many of the local people allow their dogs to run game in the Park. Although this is more likely to be detrimental to deer than to bear, there have been occasional incidents of bear being mauled. Until free-running dogs are eliminated from the Park, and those found dispatched on sight, this will continue to be a problem.

Poaching does definitely have a detrimental effect on the GSMNP's bear population, but the extent is impossible to ascertain. Park employees, on the whole, felt that poaching kept bear far below their potential, as did 37 of those interviewed from the Park periphery. Forty-three interviewees felt that poaching did not have much effect. Three of the above mentioned that they felt that Park employees were

eliminating as many bears as were being taken by poachers, even though evidence does not support this belief.

Depredations and Park Policy

Officially, the National Park Service is not responsible for the actions of any bears, but these actions can still cause a problem between the Park and the surrounding communities.

During the 1940's and 1950's, depredations increased alarmingly. Taylor (1949) noted that the depredations, which had been non-existent in 1939, reached serious proportions during 1944 to 1949. He reported that the popular belief was that the maraudings were caused by an increase in the bear population, not a decrease in mast, and that the problem would increase at an astronomical rate with continued bear reproduction.

The extensive mast failure of 1949 was previously discussed, as were the effects on the Park's bear population. The result was a further straining of relations between the National Park Service and the peripheral communities. Since these communities contained many families who had lived on Park land, the local feeling towards the National Park Service was already hostile. As previously mentioned, Stupka (1950b) verified that legal and illegal hunting of Park bear had significantly increased during the years of mast failures. The opening of a bear season in 1951 in Blount, Serier, and Cocke Counties did little to pacify the local people (Cooper, p.c.; Thompson, p.c.). The year of 1951 was a fairly productive mast year (Stupka, 1951) and bear movements were decreased. The expected kill from observations of

the two previous years were not reached and many disgruntled hunters entered the Park to find bear (Cooper, p.c.; unnamed interviewee, p.c.). Many others felt that little had been done to alleviate the problem. Although electric fences have eliminated a large number of the depredations, there is still a great deal of hostility towards the Park. In 1972, several bee keepers around Cosby reported losses in their apiaries. One interviewee reported that he killed seven bears which were bothering his hives (unnamed interviewee, p.c.).

A cooperative community action program with the Tennessee Wildlife Resources Agency aimed at helping those possible victims of bear maraudings, perhaps by bringing out the newest methods of repelling bears, would do a great deal to better relations between the local people and the Park.

I. BIOLOGY

Food Habits

In a two-year food habits study conducted in the GSMNP, Beeman (1971) found that plant material made up 84 percent of the black bears' total diet. During the spring, leaves and stems comprised 75 percent of the total intake. Fruits and seeds were the most important food item in the summer, forming 62 percent of the total diet. In the fall, Beeman (1971) found fruits and seeds were about 76 percent of the bears' total intake. Squawroot (*Conopholis americanus*) was a major food item in the spring and summer. In the summer, blueberries, huckleberries, and blackberries were favored. The diet in the early

fall of one year included mostly beechnuts, and black cherries during another year. In late fall, acorns were almost the entire diet.

The current research agrees with Beeman's (1971) findings, and adds certain other possible food items to his list. The information presented here is indicative of what bears were observed feeding upon by interviewees, not of stomach contents or scat analysis.

Matson (1967) reported that the stomach of the black bear in hibernation shrinks to a solid ball the size of a man's fist, making the bear physically incapable of ingesting or digesting food. He concluded that this forces the bear to wander in the spring with a little appetite. Calhoun (p.c.) said that in the spring, bears can be found at all elevations, with no particular food favored. He thought that the wandering was due to a lack of food rather than a lack of appetite. Bear potatoes, or squawroot, were reported as a common food, as were grass and green plants. No interviewee could remember an instance of a bear eating meat before mid-April. It was noticed by a number of interviewees that bears do not use their fat reserve during dormancy, but appear to be in good condition in the spring (Campbell, p.c.; Griffin, p.c.; Thompson, p.c.). The main function of the stored fat appears to be to sustain the animal through the spring and early summer. Buckley (1859) was told by mountaineers that bear become very thin during the late spring and early summer. Cooper (p.c.) commented that by the time the berries were ripe in mid-summer there was little or no fat on the bear.

Early summer, before the berries ripen, coincides with a period of food scarcity. Excluding years of mast failures, 80 percent of the

livestock killings reported by Stupka (1941-1943, 1945, 1947, 1948, 1950a, 1950b, 1951-1957, 1959, 1960a) were reported in May, June, and July. By August, if the berry crop was good, depredations seemed to decrease, either because bears were returning to natural foods or because the majority of those causing the damage were eliminated. Among the late spring and early summer food items mentioned by interviewees were grass, weeds, ramps, raspberries, strawberries, gooseberries, roots, grubs, insects - particularly yellow jacket nests, ants and larvae, fish, frogs, turtles, bird eggs, mice, and moles (Lawson, 1709; Godman, 1826; DeKay, 1842; Hunnicutt, 1926; Stupka, 1938-1943; Morrell, 1944; Stupka, 1944-1949, 1950a; Broome, 1951; Stupka, 1951-1959; Calloway, 1955; Stupka, 1960a; Broome, 1970; Buchanan, p.c.; Calhoun, p.c.; Cooper, p.c.; Griffin, p.c.; Hannah, p.c.; Ledbetter, p.c.; Sparks, p.c.; Thompson, p.c.).

While acorns definitely are now the bear's main food item during the critical period of weight gain before winter dormancy, several old hunters claimed that acorns were eaten only when beechnuts and chestnuts were not available (Campbell, p.c.; Cooper, p.c.; Griffin, p.c.). Martin, Zim, and Nelson (1951) stated that "acorns rate at a position at or very near the top of the wildlife food list, not so much because they are a preferred food item, but because they constitute a good and abundantly available staple." On the other hand, Bacon (1973) found that two penned female black bears preferred acorns over all other natural foods tested, and preferred hickory nuts and blackberries over beechnuts in all seasons. Chestnuts were not tested. Chestnuts were mentioned by all hunters as being the main fall food of the black bear

before the blight. Many hunters also indicated that in the fall they located bears by finding good stands of chestnuts (Calhoun, p.c.; Griffin, p.c.; Ledbetter, p.c.; L. Owenby, p.c.; Thompson, p.c.; Webb, p.c.). Byrd (1728) commented that bears would break the limbs from trees trying to get chestnuts. McCaughley (p.c.) saw trees in Bone Valley which had all the limbs broken out by feeding bears. He commented that bears will occasionally do the same thing to white oaks. He claimed that he had heard that several bears were killed by crawling too far out on limbs and falling. Fall food items other than black cherries, acorns, and beechnuts included grapes, hickory nuts, fire cherries, apples, black gum berries, mountain ash, sassafras, buckeyes, persimmons, plums, peaches, and paw paws (King, 1934b; Stupka, 1937, 1940; Stephens, 1947; Stupka, 1947, 1949, 1951; Calloway, 1955; Stupka, 1955, 1960a; Broome, 1970; Calhoun, p.c.; Cooper, p.c.; Griffin, p.c.; Ledbetter, p.c.; McCaughley, p.c.; Sparks, p.c.; Thompson, p.c.).

Cannibalism is not unknown in the black bear. Although no interviewee knew of any instance of cannibalism, both Stupka (1960b) and Beeman (1971) reported it.

When natural foods are scarce or when a black bear has some peculiarity which makes natural foods more difficult to obtain, bears will often kill and eat livestock - sheep, swine, cattle, calves, chickens, bees, and goats (Stupka, 1944; Gasque, 1948; Stupka, 1949; Calhoun, p.c.; Hannah, p.c.; L. Owenby, p.c.; Whaley, p.c.); crops - maize, corn, cabbage, potatoes, honey, fruit trees; picnic supplies; and garbage (Byrd, 1728; Gasque, 1948; Davenport, 1953; Calloway, 1955;

Cooper, p.c.; Ledbetter, p.c.; McCaughley, p.c.; L. Owenby, p.c.; Whaley, p.c.). Both DeKay (1842) and Schorger (1949) claim that if natural foods, particularly fruits, are abundant, bear will pass by available meat.

Denning

There is very little information about denning habits of black bears in the GSMNP. Lawson (1709), who was familiar with the habits of the European brown bear (Ursus actos), noticed that the Indians had no knowledge of denning or hibernation in black bears, but believed that pregnant sows or those with cubs went to another land, accompanied by a few males and barren females.

Black bears were reported by the majority of interviewees to begin denning in late December and to come out of hibernation in March, although this varied. In certain years bears began denning in November or emerged as early as January and February or as late as April. In other years, there seemed to be very little denning activity. This variation in denning habits was attributed to existing weather conditions (89 of 133 interviewees). Only a few (Hannah, p.c.; Morrell, p.c.; Thompson, p.c.; Whaley, p.c.) believed that the build-up of fat in bears seemed to control the tendency to hibernate. The above interviewees had no records, but they felt that denning activity was less after mast failures. Forty-eight interviewees observed that sows with cubs or pregnant sows went into hibernation early. They determined pregnancy by whether they saw cubs the following year. However, no evidence was presented that indicated any interviewee could identify

individual bears. Sixty-three interviewees claimed to have seen males (based on the size of the bear) active in the winter. Thompson (p.c.) mentioned that he observed "pre-hibernation" attempts. He claimed that several bears 'hibernated' for only a few days at a time in late fall, either returning to the old den or to a new one after roaming aimlessly. Since these observations were made while Thompson worked for the Little River Lumber Company, these animals may have been disturbed by logging activities.

Suitable den sites were reported to be any sheltered location. Tree den sites were the most frequently reported, with the dens located anywhere from under the roots to the "top of the trees" - about 50 feet from the ground. This does not mean that bears den most frequently in trees. Many of these dens were discovered as trees were logged in the 1920's. Den sites noticed by bear hunters who had not worked for the logging companies were also usually above ground. Favorite den sites appear to be in standing or hollow trees (46 reported), rock clefts (20), caves (4), beneath windfalls (15), at the base of uprotted trees (12), or in depressions of any kind. The bears found by Thompson (p.c.) denned primarily on the north or south exposures, while Kephart (1922) said that bears seemed to den more on the Tennessee side where it (the topography) was steep and "laurely." Most of the bear dens mentioned were located near ridge tops. Very few were below 4500 feet (1370 meters). The above is possibly because the bear populations with which the majority of the hunters were familiar were confined to the ridge tops before the Park was established. More recent observations by Park employees have shown dens scattered at all elevations in any

suitable habitat (Beeman, p.c.; Morrell, p.c.). Bears do not seem to return to the same den site each year, although they do seem to return to the same location (Buckley, 1859; Stupka, 1939, 1947; Schorger, 1949; Matson, 1967; Thornburg, 1968; Campbell, p.c.; Griffin, p.c.).

There are several questionable, but very popular, beliefs about hibernation. One is that bears shed the soles of their feet during hibernation so that they have trouble walking in the spring. Another is that bears will eat up to a gallon of acorns, then pine needles and cones to plug up the alimentary canal so that the acorns will stay in place and be digested through the winter (Cooper, p.c.; Webb, p.c.).

Size

Most hunters tended to overestimate size or did not have any idea of the weight of a black bear. However, they tended to answer more accurately than the general public (Table 7). When asked for an estimate of the average weight of a bear, only 15 hunters answered between 200 and 300 pounds. Fifty-eight estimated between 300 and 400 pounds and 44 between 400 and 500 pounds (Table 7). The largest bear ever seen was always at least 500 pounds, while 26 said 600 to 700 pounds (Table 7). Only one hunter said that the largest bear he ever killed was about 300 pounds (Campbell, p.c.). Skins can be stretched in the tanning process and in the memory. These same record bears were reported to have "squared 9 to 12 feet." The present researcher did not personally see a hide close to that size, though nearly every hunter had saved a skin from what he considered a large bear. Sixty-three percent of all interviewees said that males and females were the

TABLE 7

A COMPARISON OF THE KNOWLEDGE OF VISITORS AND HUNTERS ABOUT BLACK BEARS IN THE GREAT SMOKY MOUNTAINS NATIONAL PARK

Subject	Park Visitors[a] (Percent)	Hunters[b] (Percent)
Percent hunters	26.0[c]	100
Diet		
Mostly plant matter	67.2	100.0
Weight newborn cub (pounds)		
<1[d]	9.2	18.8
1-4	11.6	34.2
5-8	11.8	28.2
9-15	20.2	12.8
16-25	17.6	6.0
>25	25.8	0.0
Average weight of adult (pounds)		
0-199	5.0	0.0
200-299[d]	12.4	12.8
300-399	24.8	49.6
400-499	13.4	37.6
>500	39.6	0.0
Largest bear killed (pounds)		
300-400		0.9
400-500		11.1
500-600		65.8
600-700		22.2
Longevity (years)		
<5	0.2	0.0
5-10	15.6	18.0
11-15	20.2	29.1
16-20	27.0	32.5
21-30	17.4	3.4
>30	20.4	2.6

[a]From Burghardt, Hietala, and Pelton, 1972 (500 interviews).

[b]From present research (117 interviews).

[c]Bacon, p.c. (700 interviews).

[d]Correct answer (longevity as yet undetermined).

same size, while the rest said females were 50 to 200 pounds lighter. The average weight of cubs at birth was about five pounds, with a range of "a couple of ounces" to over 10 pounds (Table 7). Estimates of cubs averaged 20 pounds at one year and 50 to 75 pounds at two years. Approximately 25 percent (31) of the interviewees felt that bears reached their full size before the fifth year. Another 20 percent (27) believed that black bears kept growing their entire life and the remainder thought that they reached their full size between five and eight years.

General

Most people interviewed recognized that cubs were generally born in mid-winter, during hibernation, but it was not well known that they are born naked, helpless, and weigh less than one pound. Other than those who had had personal experience, the general belief was that they were born small editions of their mother. Several people reported that they believed that a sow disturbed near the time of birth would expel the cubs and/or desert them (Calhoun, p.c.; Griffin, p.c.). The sow was reported to most commonly have two cubs, often three, sometimes four, and occasionally one in each litter.

Mating season takes place in early summer. Most interviewees reported that a sow kept her cubs two years and did not mate the first summer, but several insisted that they had known cases where the sow ran off first-year cubs (McCaughley, p.c.; Sparks, p.c.). These incidents could have been small second-year cubs. Very little was generally known about the reproductive rate of black bears. Many

felt that if most of the population could be killed out, it would increase rapidly in a short time, and must be controlled. It was usually those interviewees who did not hunt who believed that bears have a low reproductive potential (Morrell, p.c.; Whaley, p.c.; Hannah, p.c.). Fourteen of all the interviewees recognized a correlation between reproduction and the previous mast crop. Two commented that "there ain't no cubs if there ain't no acorns" (Cooper, p.c.) or that "you generally see three or four cubs only if the nuts were real good the year before" (Griffin, p.c.). Many other interviewees had noticed a low cub populations in 1950, but attributed it to poaching (Calhoun, p.c.; Kent, p.c.; L. Owenby, p.c.).

The average life expectancy was said to be about 15 years, with a range of eight years to "very old." Numerical estimates were as high as 35 to 50 years (Table 7).

Only the black phase of the black bear were reported in the GSMNP, although Griffin (p.c.) said that several lighter bears had been released in hunting areas of North Carolina. Several interviewees mentioned that they had seen cubs with brown behind the ears and brown bellies, or occasionally with a small white chest blaze, but they had never seen this in an adult ("Bear," p.c.; Calhoun, p.c.; Sparks, p.c.).

All interviewees reported that young and/or small bears were good tree climbers. Forty-three of the interviewees reported that all bears were good tree climbers, while 34 stated that larger bears, particularly males, almost never climbed trees.

Not much was known about competition between black bear and other

species. Many interviewees felt that the European wild boar (Sus scrofa) somehow hurt the bear, but they were not certain just how. Shields (p.c.) and Scott (1973) both felt that the wild hog and the black bear probably compete for food during years of low mast, while McCaughley (p.c.) believed that the wild turkey would compete.

Movements

Since black bears are apparently adapted to a seasonal diet (Beeman, 1971), food appears to be one of the main factors influencing movement. An apparent local abundance of bears appears to be due to the temporary occurrence of food within a limited area. When a bear resumes traveling in mid-March, it is reported that it will first wander aimlessly, but not in any apparent search for food (Calhoun, p.c.). Until the berries ripen, bears are reported to be at all elevations of the Park (Stupka, 1941, 1943, 1945, 1946, 1948). King (1934a, 1934b, 1935a, 1935b) noted that bears were often found on the balds and ridge tops in the spring. However, L. Owenby (p.c.) stated that bears usually came down the mountain in the spring. All evidence seems to indicate that bears do move to wherever food is available in the spring and early summer. They seem to cover a greater distance at this time of year than at other times. Between late July and early September, bears seem to concentrate in berry patches along ridgetops and balds (Hannah, p.c.). Both Fleetwood (1934) and Stupka (1936, 1938, 1940, 1943, 1945-1949) noticed that blackberry canes and blueberry and huckleberry plants became trampled by feeding bears at this time of year. They also reported piles of runny scat all around these

patches. Stupka (1944) mentioned that in 1944, when the berries dried up, there was a corresponding increase in bear wanderings and depredations. In the fall, cherries are among the first crops to ripen. Cherry trees - black, pin, or choke - are found up to about 5300 feet (1615 meters), and it is likely that bears are found among them at this time of year. Beeman (1971) found black cherries to be a major food item in early fall. Oaks and hickories occur abundantly up to about 3500 feet (1100 meters) and beeches thrive up to 5500 feet (1677 meters). In late fall, bears will move to locations of heavy mast crops and stay in those areas until they are ready to go into hibernation. Many hunters commented that bears were easy to find in areas of abundant mast (Cable, p.c.; Calhoun, p.c.; Campbell, p.c.; Cooper, p.c.; Griffin, p.c.; Ledbetter, p.c.; McCaughley, p.c.; St. Owenby, p.c.; Sparks, p.c.; Webb, p.c.). From the locations of den sites given by hunters, it seems that bears move back up the ridge for the winter. As mentioned previously, this information could be misleading, since later data indicates that bears den at all elevations.

Variations in movements described above may be caused by the visitors to the GSMNP. With the introduction of new sources of food (picnic lunches and garbage), some bears stay near the major roads, picnic areas, and campgrounds (Hannah, p.c.; Morrell, p.c.; Whaley, p.c.), leaving only during mating season. Panhandling bears also maintain seasonal movements for these bears appear to move in and out with the visitor load.

Permanent bear trails are numerous in the Park. Since there is no recorded evidence of movement characteristics of bears when the Park

was an undisturbed area, it is difficult to say whether bears have changed their movement patterns since the influence of man. Bears seem to frequently use existing open trails (often man-made), ridge tops, and gaps. All hunting stands mentioned in previous sections were in gaps placed along well-used bear trails. Thompson (p.c.) said that bears never travel straight down or across a mountain but always zig-zag through the gaps. Bear paths were also located on the State Line Ridge near Laurel Top, up Bullhead Mountain near Cherokee Orchard, from Indian Gap to Clingman's Dome down to Forney Creek, from Bear Creek Road to Poplar Flats, from Three Forks to Clingman's Dome, up the Walker Creek Trail, from Blockhouse Mountain to Thunderhead, along the Rough Creek Trail . . . (Hunnicutt, 1926; King, 1934a, 1934b; Stupka, 1938-1949, 1950a, 1951-1958; Calhoun, p.c.; Campbell, p.c.; Griffin, p.c.). The above is a very small listing of the bear paths mentioned (Appendix D). Many of these paths led through heavy patches of mountain laurel and rhododendron where bear would lie during the day. McCaughley (p.c.) and Ledbetter (p.c.) claimed that not even dogs could get bears out of the laurel thickets. Other bear trails led to areas of high usage, such as the wallow on Hughes Ridge. This wallow was well-known to bear hunters before the Park was established (Hunnicutt, 1926) and was still there in 1934. King (1934a) found three trails leading into it. The spring under Bee Knob was reported to be frequently used by bear (Calhoun, p.c.).

Changes in actual areas of movement seem to be due to vegetation destruction and human occupance. Certainly when the GSM were heavily logged and the lower portion of major watersheds destroyed, bear

movements were restricted to the upper ridges. When the Park was established and vegetation recovered, bear movements seemed to cover the entire Park (Stupka, 1937-1941). McCaughley (p.c.) commented that when the Abrams Creek watershed was being logged, bear from the area appeared to be moving into Tellico, west of the Park. He said the best bear concentrations were on Jeffries Mountain, Hooper's Bald, and Stratton Meadows. Griffin (p.c.) felt that bear movements between Pisgah National Forest in North Carolina and the GSMNP were constant.

Very little was known by the bear hunters about the territory of black bears in the Smokies. Hunters indicated that a bear would "use" an area for a while, then move on. Griffin (p.c.) indicated that a bear's home range could change from year to year depending on the food availability. When available food was low, a bear's home range would expand to include everything needed for maintenance; Matson (1967) seemed to agree. "It would appear that only with relation to the varying seasonal food supply can the presumed 'home range' of the individual black bear be indicated in terms of space or distance." When interviewees were asked if there was a difference in the size of the "home range" of a male and female black bear, the answer was always negative. Other factors brought out in the interviews indicate the opposite. More males than females were killed during hunts. Stock-raiders were always males. Well-recognized males with deformities covered a large area while females did not. The first statement indicates only that males are more susceptible to hunting pressure than females. This could be due to some behavioral characteristic, but it could also be due to males having a larger home range.

Mast failures appear to alter a bear's movement pattern. Griffin (p.c.) and Whaley (p.c.) both associated the movements of bears off the mountains with mast failures. Shields (p.c.) noticed a tremendous bear kill (estimated 200) along the Park boundary during the 1949 mast failure. Stupka's comments verifying this have previously been discussed. There is definitely an increase in depredations, and therefore, movements off the mountain during years of mast failures (Stupka, 1944, 1949, 1950). Dean (1970) noticed that the legal bear kill in North Carolina was four times greater in 1968, during a poor mast year, than it was in 1969. Beeman (1971) concluded that "acorns are the only plentiful food available during the time of the bear's greatest food demand... . . A failure of oaks to produce acorns apparently causes bears to move more than during a year of good mast crop." Griffin (p.c.) gave an interesting variation of the above. He mentioned that mast failures occur more often outside the Park - in the Pisgah National Forest - which frequently causes bears to move into the Park.

Behavior

There are many aspects of behavior in bears that have already been mentioned under other headings. This section will attempt to concentrate on man-bear relationships, one of the more important aspects to consider when managing an area that is subject to public pressure.

Before the Park was established bears were shy, wary, elusive, and difficult to get near (Whaley, p.c.). Kephart (1922), Ledbetter (p.c.), and Webb (p.c.) commented that before the Park existed you could be in the center of bear country and never see a bear. The Park protection

has created a situation in which bear gradually became more intimate with man. As late as 1935, Jennison (1935a) and Sharp (p.c.) reported that although bear were not scarce, it was difficult to see one because they fled. McCoy (1935) indicated that the forthcoming change in bear-man interactions was considered desirable. "The bear is the only prominent large animal now found in the Park. Park officials predict he will become tame and will be often seen after the Park's protection policy has been in effect a short time." In 1935, Eakin felt that after four years of protection, the bears, attracted by food, were already too tame (Eakin, 1935). Cahalane (1938) made the following comments about the situation: "The primary consideration throughout most of a bear's waking moments is food. The supply determines the animals whereabouts, his daily schedule and many of his habits. Feeding an animal along the roadside induces him to abandon the natural mode of living to take up instead a life of racketeering. Constant close association with people causes bears to lose the fear that is the basis of respect. It is a logical consequence that he will attack people and tear open locked automobiles and cabins to satisfy his new appetite." By 1938, it appears that some bears had lost their fear of man. They paid little or no attention to the visitors in close proximity while they (bears) were eating (Morrell, p.c.; Sharp, p.c.; Whaley, p.c.).

Craighead and Craighead (1971) found that grizzlies in Yellowstone developed into two types of bears - those which lost their fear of man only with one-half mile of a customary feeding place and those which had learned to associate food-getting and man under a variety of situations

and had become thoroughly conditioned to man wherever encountered. The above seems to be the same general trend in the GSMNP. There are a number of bears seen primarily in the campgrounds, picnic areas, and along the highways (Morrell, p.c.; Whaley, p.c.). These bears are thoroughly conditioned to man. There are bears which panhandle along the Appalachian Trail and wilderness camping areas. These bears exhibit a marked wariness around man and do not associate with him other than in these areas. In addition, Marcum (1974) also indicated that a subpopulation of "backwoods" bears which never panhandle or associate with man exists in the Park. Accumulating evidence indicates that less than five or 10 percent of the bears in the Park account for over 95 percent of the sightings and incidents and that these are typically males (Pelton, p.c.).

Loss of the natural fear of man has directly affected local residents. Two current poachers noticed that bears are much easier to kill now. One stated that "before the Park a bear would run his legs off getting away from you. Now they'll walk all around you." The other commented that even in prime bear country, that without dogs "you hardly ever saw a bear before the Park took this (land) and now they walk right out in your face." When asked if they felt that this was due to an increase in population, they both gave negative replies and asserted that the areas they had hunted previously had had an abundance of fresh bear sign.

CHAPTER V

SUMMARY AND CONCLUSIONS

This study was conducted to assess the factors which have affected the black bear in the GSM from earliest recorded history until 1960. It was believed that this information might be useful in setting up a long-range black bear management plan in the GSMNP. Research into some aspects of National Park Service policy was carried further in order that future recommendations might be made.

Historical data were gathered primarily from written sources. State histories from both North Carolina and Tennessee, diaries, travel logs, biographical sketches, records of defunct companies from the area, and available National Park Service records were used extensively. These were supplemented with photographs, magazine and newspaper articles. Many of the articles found in magazines and newspapers proved to be inaccurate and were not used.

Interviews of 186 present and former residents of the area were taken - 133 verbal and 53 written. Many of these people had hunted black bear in the mountains and/or worked for one of the logging or railroad companies which operated in the district before 1930. No particular format was adhered to when conducting an interview, but many of the same questions were asked each interviewee. Fourteen representative interviews were selected and used as examples through most of the thesis. Other interviewees were quoted only when necessary.

Results were sorted into six major categories - hunting, trapping, uses, vegetation changes, depredations, Park policy and problems, and biology. Each category was analyzed separately. Within each section, the data were presented chronologically.

It was found that prior to the settlement of the Smokies, there were few limiting factors controlling the GSM bear population. By 1825 to 1850, the density of sub-populations of bear around scattered settlements had decreased through movement from areas of human occupation, from related vegetation changes, and from hunting. On the whole, the bear population in the GSM remained unchanged. From 1900 to 1930, over 60 percent of the area now enclosed in the GSMNP was logged, much of it extensively. With this large-scale habitat destruction, the bear population underwent a serious decline. Hunting and trapping further decreased the population. By the late 1920's, bears were found only in the more inaccessible areas.

With the establishment of the GSMNP in 1930, and the ensuing wildlife protection in 1934, it appeared that the black bear would eventually return to its original numbers as the vegetation began to mature. However, the chestnut blight, infecting the area since 1925, apparently had a dramatic effect on the bear population. The last good crop of chestnuts in the GSMNP was reported in 1938. By 1940, 50 percent of the chestnuts were dead and another 35 percent were dying. The 1940's were marked by mast failures within the Park, increased bear depredations on the surrounding areas, and a corresponding decrease in the bear population. Data indicate that the bear population continues to fluctuate irregularly due to periodic years of

poor mast production. This is also related to increased movements of bears and a concomitant increase in the legal and illegal kill in and around the periphery of the Park.

Major problems within the GSMNP today are poaching and bear-person interactions. It was found that attitudes among native people living around the Park and limited law enforcement within the Park are the primary causes of current poaching. Within the Park, ignorance and disregard of regulations by the Park visitor, as well as the leniency practiced by rangers towards those guilty of minor infractions, eventually has led to conflicts at roadsides, picnic grounds, camp-groupds, and trail shelters. A program of education and more strict law enforcement should be initiated for a more successful plan for black bear. The following might be included in such a program.

1. Regular contact with local communities through hunters organizations, garden clubs, farm groups, and schools. Information disseminated might include familiarizing the people with the research, routine work, and goals of the GSMNP.

2. Periodic meetings with the National Beekeeping Association, the Tennessee State Beekeepers Association, or the various regional and county affiliates would do much to relieve current misunderstandings. Current methods of prevention of hive raiding and other depredation controls could be discussed.

3. Establishment of a cooperative community program with the Tennessee Wildlife Resources Agency. This program might include (1) and (2) above.

4. Additional displays within the Park similar to that at the

Sugarlands Visitor Center depicting different aspects of the black bear's life history and behavior. Additional visual aids and "talking boxes" would be useful at centers of visitor-bear conflicts.

5. Strict law enforcement for both poachers and visitors. It is very difficult for an already busy ranger to spend the time in the backcountry necessary to control poaching. Good relations with local people might lead to information that would aid in the capture of illegal hunters. Park visitors, if aware that citations, rather than warnings, were issued for a first offense, might be more observant of Park regulations.

6. A system of annual mast indices in order to predict fluctuations in mast and wildlife populations.

7. Attempting to maintain stability in Park personnel. The rapid turnover rate tends to make natives feel that they are dealing with "outsiders."

8. Eliminating private inholdings which apparently play a role in giving access to poachers.

9. Eliminating public access to all non-paved roads leading to remote areas in order to help contain poaching.

10. Prevention of construction of new roads, paved or unpaved.

LIST OF REFERENCES

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Adams, P. J. 1966. Mt. LeConte. Holston Printing Co., Knoxville, Tennessee. 63 pp.

Anonymous. 1887. Logging the Southern Appalachians. Northwestern Lumberman, April 2. 4 pp.

Anonymous. 1936. Hogs killed by bear. Knoxville News-Sentinel, August 20. Copy in Bear File, Great Smoky Mountains National Park Library, Gatlinburg.

Anonymous. 1940. Bear feeding policy. Memo from March 20. Bear File, Great Smoky Mountains National Park Library, Gatlinburg.

Anonymous. 1943. Memo report to Naturalist, June 14. Bear File, Great Smoky Mountains National Park Library, Gatlinburg.

Anonymous. 1947. Five bears killed. Knoxville News-Sentinel, June 26. Copy in Bear File, Great Smoky Mountains National Park Library, Gatlinburg.

Arthur, J. P. 1914. Western North Carolina. Edward Broughton Printing Co., Raleigh, North Carolina. 710 pp.

Ashe, W. W. 1911. Chestnut in Tennessee. Tenn. Geol. Surv. Bull. 10-B. 35 pp.

Ayres, H. B., and W. W. Ashe. 1905. The Southern Appalachian Forest. U.S.G.S. For. Ser. Prof. Pap. 37. 291 pp.

Baker, F. S. 1950. Principles of Silviculture. McGraw-Hill, New York. 414 pp.

Bacon, E. S. 1973. Investigation on perception and behavior of the American black bear (Ursus americanus). Unpublished Ph.D. Thesis, The University of Tennessee, Knoxville. 161 pp.

Baxter, D. V., and L. S. Gill. 1931. Deterioration of chestnut in the Southern Appalachians. U.S.D.A. Tech. Bull. 257. 21 pp.

Bear File. (n.d.). Miscellaneous articles on black bear in the Great Smoky Mountains National Park. Great Smoky Mountains National Park Library, Gatlinburg.

Bear File N 1427. (n.d.). Miscellaneous reports on black bear in the Great Smoky Mountains, 1940 to present. Records File, Great Smoky Mountains National Park Headquarters, Gatlinburg.

Beeman, L. E. 1971. Seasonal food habits of the black bear (Ursus americanus) in the Great Smoky Mountains of Tennessee and North Carolina. Unpublished M.S. Thesis, The University of Tennessee, Knoxville. 61 pp.

Bowman, E. S. 1938. Land of High Horizons. Southern Publishing, Inc., Kingsport, Tennessee. 212 pp.

Brickell, J. 1739. The Natural History of North Carolina. Republ. in 1968. Johnson Publishing Co., Murfreesboro, North Carolina. 424 pp.

Broome, H. 1949-1950. Mountain notebook . . . 1942 . . . The Living Wilderness 14(31): 17+.

Broome, H. 1951. 1943 . . . Mountain notebook . . . 1944. The Living Wilderness 16(38): 1-9.

Broome, H. 1970. Harvey Broome: Earth Man - Some Miscellaneous Writings. The Greenbrier Press, Knoxville, Tennessee. 127 pp.

Buckley, S. B. 1859. Mountains of North Carolina and Tennessee. Am. J. Sci. and Arts 27: 286-294.

Burchfield, W. W., Jr. 1941. The Unaka Mountains. Unpublished M.S. Thesis, The University of Tennessee, Knoxville. 128 pp.

Burghardt, G. M., R. O. Hietala, and M. R. Pelton. 1972. Knowledge and attitudes concerning black bear by users of the Great Smoky Mountains National Park. Pp. 255-273 in S. Herrero, ed. Bears--Their Biology and Management. Papers and Proc. of the Int. Conf. on Bear Res. and Manage. Calgary, Alberta. IUNC. Publ. 23. 371 pp.

Burns, I. 1952. Settlement and early history of the coves of Blount County, Tennessee. East Tenn. Hist. Soc. Publ. 24: 44-64.

Byrd, W. 1728. Histories of the Dividing Line Betwixt Virginia and North Carolina. Republ. in 1967. Dover Publishing, Inc., New York. 340 pp.

Cahalane, V. H. 1938. National Park Service bear problem. Planning and Civic Comment 1938: 32.

Cain, S. A. 1930. The vegetation of the Great Smoky Mountains: an ecological study. Unpublished Ph.D. Thesis, University of Chicago, Chicago. 145 pp.

Cain, S. A. 1931. Ecological studies of the vegetation of North Carolina and Tennessee. I. Soil reaction and plant distribution. Bot. Gaz. 91: 22-41.

Calloway, C. C. 1955. Bear of the Great Smokies. Brazos Printing Co., Gatlinburg. 26 pp.

Cammerer, A. B. 1935. Memo to all Park personnel. Bear File, Great Smoky Mountains National Park Library, Gatlinburg.

Campbell, C. C. 1934. A wilderness hike in the Smokies. Typed manuscript. 33 pp.

Campbell, C. C. 1938. Wildlife in the Great Smoky Mountains National Park. Knoxville News-Sentinel, September 4. Copy in Bear File, Great Smoky Mountains National Park Library, Gatlinburg.

Campbell, C. C. 1960. Birth of a National Park. University of Tennessee Press, Knoxville. 155 pp.

Carpenter, F. O. 1891. The Great Smoky Mountains and Thunderhead Peak. Appalachia VI 1890-1892: 138-146.

Caton, J. L. 1928. The Great Smoky Mountains National Park, Tennessee and North Carolina. Great Smoky Mountains Publishing Co., Knoxville. 38 pp.

Collins, J. M. 1970. Hunter interview and data collection - black bear. North Carolina Wildl. Res. Comm. Annu. Job Prog. Rep., Vol. 23, Proj. W - 25.22, job III - D, July 1, 1969-June 30, 1970.

Craighead, J. J., and F. C. Craighead, Jr. 1971. Grizzley bear-man relationships in Yellowstone National Park. Bioscience 21(6): 845-857.

Davenport, L. B., Jr. 1953. Agricultural depredations by the black bear in Virginia. J. Wildl. Manage. 17(3): 331-340.

Dean, J. 1970. The plight of North Carolina's bears. Wildife Afield Newsletter. 2 pp.

DeKay, J. E. 1942. Natural History of New York. Vol. I, Part I - Mammalia. D. Appleton and Co., New York. 146 pp.

Eakin, J. R. 1931. Report on the Great Smoky Mountains National Park. Asheville Citizen-Times. Copy in Bear File, Great Smoky Mountains National Park Library, Gatlinburg.

Eakin, J. R. 1935. Memo to National Park Service, June 26. Bear File, Great Smoky Mountains National Park Library, Gatlinburg.

Eakin, J. R. 1938. Memorandum to the press from U.S.D.I., N.P.S. and G.S.M.N.P., August 10. Bear File, Great Smoky Mountains National Park Library, Gatlinburg.

Eakin, J. R. 1939. Tourists are asked not to feed bear in Smoky Mountains. Knoxville News-Sentinel, June 11. Copy in Bear File, Great Smoky Mountains National Park Library, Gatlinburg.

Eakin, J. R. 1943. Personal communication to Regional Director #2, November 24. Bear File, Great Smoky Mountains National Park Library, Gatlinburg.

East Tennessee Automobile Club, (n.d.), Scrapbook of history of the Great Smoky Mountains National Park. Great Smoky Mountains National Park Archives, Gatlinburg.

Farmer, R. E., Jr. (n.d.), Problems and analysis: flowering research in Tennessee Valley hardwoods, Typed manuscript, 32 pp.

Farmer, R. E., Jr., and P. E. Barnett. 1972. Precocious flowering of black cherry related to attitudinal source, Can. J. For. 2(1): 57-58.

Fleetwood, R. J. 1934-1935. Annual field notes. Files of Great Smoky Mountains National Park Library, Gatlinburg.

Fowells, H. A. 1965. Silvics of Forest Trees of the United States. Agri. Hdbk. 271. U. S. Government Printing Office, Washington. 762 pp.

Frothingham, E. H. 1931. Timber growing and logging practice in the Southern Appalachian region. U.S.D.A. Tech. Bull. 250. 92 pp.

Gasque, J. 1948. Hunting and Fishing in the Great Smokies. Alfred A. Knoff, New York, 210 pp.

Gerschmehl, P. J. 1970. A geographic approach to a vegetation problem: the case of the Southern Appalachian grassy balds. Unpublished Ph.D. Thesis, University of Georgia, Athens. 463 pp.

Gilbert, D. L. 1951. Economics and related biology of the black bear in Colorado. Unpublished M.S. Thesis, Colorado A & M College, Fort Collins. 164 pp.

Gilbert, W. H., Jr. 1943. The Eastern Cherokee. Bureau of American Ethnology Bull. 133: 169-413.

Gilbert, V. C. 1954. Vegetation of the grassy balds of the Great Smoky Mountains National Park. Unpublished M.S. Thesis, The University of Tennessee, Knoxville. 73 pp.

Godman, J. D. 1826. American Natural History: Mastology. Carey and I. Lea Co., Philadelphia. 121 pp.

Goodrum, P. D., V. H. Reid, and C. E. Boyd. 1971. Acorn yields, characteristics and management criteria of oaks for wildlife. J. Wildl. Manage. 35(3): 520-532.

Gravett, G. F., and R. P. Marshall. 1926. Chestnut blight in the Southern Appalachians. U.S.D.A. Circ. 370. 11 pp.

Great Smoky Mountains National Park Headquarters Records. (n.d.). Miscellaneous records in files of Main Office, Great Smoky Mountains National Park, Gatlinburg.

Guyot, A. 1863. Notes on the geography of the mountain districts of North Carolina. Typed manuscript, Coast and Geodetic Survey Library, Washington, D. C. 62 pp.

Gysel, L. W. 1956. Measurements of acorn crops. For. Sci. 2: 305-313.

Hart, V. 1952. Pack trip through the Smokies. Nat. Geogr. Mag. 102: 473-502.

Huheey, J. E., and A. Stupka. 1967. Amphibians and Reptiles of the Great Smoky Mountains National Park. University of Tennessee Press, Knoxville. 98 pp.

Hunnicutt, S. J. 1926. Twenty Years of Hunting and Fishing in the Great Smoky Mountains. S. B. Newman and Co., Knoxville, Tennessee. 216 pp.

Jennison, H. M. 1935-1937. Complete set of monthly reports on wildlife activities - Great Smoky Mountains National Park. University of Tennessee Library Archives, Knoxville.

Jennison, H. M. 1939. Flora of the Great Smokies. Tenn. Acad. Sci. 14(3): 266-298.

Jones, J. K., D. C. Carter, and H. H. Genoways. 1973. Checklist of North American mammals, north of Mexico. Occas. Pap. Mus. Texas Tech. Univ. 12: 1-14.

Jonkel, C. J., and I. McT. Cowan. 1971. The black bear in the spruce-fir forest. Wildl. Monogr. No. 27. 57 pp.

Keever, C. 1953. Present composition of some stands of the former oak-chestnut forest in the Southern Blue Ridge Mountains. Ecology 34: 44-54.

Kendeigh, S. C. 1942. Research areas in the National Parks. Ecology 23: 236-238.

Kephart, H. 1922. Our Southern Highlanders. MacMillan Co., New York. 469 pp.

Kerr, R. I. 1959. Memorandum to Chief Ranger: bear incidents. Bear File N 1427, Great Smoky Mountains National Park Headquarters, Gatlinburg.

King, E. 1874. Among the mountains of Western North Carolina. Scribners Monthly VII: 513-544.

King, P. B., and A. Stupka. 1950. The Great Smoky Mountains: their geology and natural history. Sci. Monthly 71(1): 31-43.

King, W. 1934a-1937a, 1938. Reports on Technician activities. Files of Great Smoky Mountain National Park Library, Gatlinburg.

King, W. 1934b-1936a. Annual summary of field notes. Files of Great Smoky Mountains National Park Library, Gatlinburg.

King, W. 1935c. Personal communication to V. H. Chalane, July 24. Bear File, Great Smoky Mountains National Park Library, Gatlinburg.

King, W. 1937b. Personal communication to Lorna Thornburg, January 21. In King, 1937. Wildlife Technician Reports. Files of Great Smoky Mountains National Park Library, Gatlinburg.

Komarek, E. V., and E. Komarek. 1938. Mammals of the Great Smoky Mountains. Bull. Chic. Acad. Sci. 5(6): 137-162.

Kulesza, J. 1959a. Memorandum to Chief Ranger re: John Parris. Bear File N 1427, Great Smoky Mountains National Park Headquarters, Gatlinburg.

Kulesza, J. 1959b. District Ranger Annual Reports. Great Smoky Mountains National Park Headquarters, Gatlinburg.

Lambert, R. 1957. Pioneer history of the Great Smoky Mountains National Park. Report to the Superintendent. Great Smoky Mountains National Park, Gatlinburg.

Lambert, R. 1958. Logging in the Great Smoky Mountains. Report to the Superintendent. Great Smoky Mountains National Park, Gatlinburg.

Lambert, R. 1961. Logging on the Little River, 1890-1940. East Tenn. Hist. Soc. Publ. 33: 2-12

Lanman, C. 1869. Letters from the Alleghany Mountains. George P. Putnam, New York. 198 pp.

Lawson, J. 1709. A New Voyage to Carolina. Republ. in 1967. University of North Carolina Press, Chapel Hill. 305 pp.

Lefler, H. T. 1967. Introduction to Lawson, J. A New Voyage to Carolina. University of North Carolina Press, Chapel Hill. Pp. xi-liv.

Lex, H. W. 1958. Short history of the Great Smoky Mountains National Park. Typed manuscript. Great Smoky Mountains National Park Headquarters, Gatlinburg. 126 pp.

MacDonald, R. D. 1963. The character of surviving American chestnuts in the Southern Appalachians. Typed manuscript. 22 pp.

Marcum, L. C. 1974. An evaluation of radioactive feces tagging as a technique for determining population densities of black bear (Ursus americanus) in the Great Smoky Mountains National Park. Unpublished M.S. Thesis, The University of Tennessee, Knoxville. 95 pp.

Martin, A. C., H. S. Zim, and A. L. Nelson. 1961. American Wildlife and Plants. McGraw-Hill, New York. 500 pp.

Martinka, C. J. 1974. Preserving the natural status of grizzlies in Glacier National Park. Wildl. Soc. Bull. 2(1): 13-17.

Mason, L. M. 1927. The Lure of the Great Smokies. Houghton Mifflin Co., New York. 320 pp.

Matson, J. R. 1967. The Adaptable Black Bear. Dorrance and Co., Philadelphia. 147 pp.

Matthews, J. D. 1963. Factors affecting the production of seed by forest trees. For. Abstr. 24: 1-13.

McCoy, G. W. 1935. Guide to the Great Smoky Mountains National Park. Inland Press, Asheville. 161 pp.

McKinley, D. 1962. The history of the black bear in Missouri. The Bluebird 29(3): 1-16.

Moment, G. B. 1968. Bears: the need for a new sanity in wildlife conservation. Bioscience 18: 1105-1108.

Mooney, J. 1898. Myths of the Cherokees. Bureau of American Ethnology. 19th Annu. Rep. 576 pp.

National Park Service. (n.d.). Park Land Map (Mercurichrome Map). Great Smoky Mountains National Park Headquarters, Gatlinburg.

National Park Service. 1969. Resource management plan for the Great Smoky Mountains National Park. Great Smoky Mountains National Park Headquarters, Gatlinburg. 186 pp.

Peattie, R. 1943. The Great Smoky Mountains and the Blue Ridge. Vanguard Press, New York. 372 pp.

Poelker, R. J., and H. D. Hartwell. 1973. Black bear in Washington. Wash. State Game Dept. Biol. Bull. 14: 127-128.

Preston, J. C., Presiding Officer. 1966. Wilderness Hearing on the Great Smoky Mountains National Park. U. S. Government Printing Office, Washington. 465 pp.

Pyle, E. T. 1951. Gatlinburg and the Great Smokies. Mountain Press, Gatlinburg. 27 pp.

Reader, R. 1973. A phenological approach to the estimation of photosynthetic period and primary productivity at the macroregion and biome levels in the Eastern Deciduous Forest Biome. EDFB Memo Rep. 73-2. 39 pp.

Reid, V. H., and P. D. Goodrum. 1957. Factors influencing the yield and wildlife use of acorns. Proc. Annu. Louisiana State Univ. For. Symp. 6: 46-79.

Remington-Peters. 1968. 1968 Sporting Firearms and Ammunition. Dupont Press. 39 pp.

Rights, D. L. 1947. The American Indian in North America. Duke University Press, Durham, North Carolina. 296 pp.

Rothrock, M. U. 1929. Carolina traders among the Overhill Cherokees, 1690-1760. East Tenn. Hist. Soc. Publ. 1: 3-18.

Schorger, A. W. 1949. The black bear in early Wisconsin. Trans. of the Wisconsin Acad. 39: 151-194.

Scott, C. D. 1973. Seasonal food habits of European wild hogs (Sus scrofa) in the Great Smoky Mountains National Park. Unpublished M.S. Thesis, The University of Tennessee, Knoxville. 54 pp.

Shanks, R. E. 1954a. Climates of the Great Smoky Mountains. Ecology 35: 354-361.

Shanks, R. E. 1954b. Reference list of native plants of the Great Smoky Mountains. Botany Dept., The University of Tennessee. 14 pp. Mimeo.

Sharp, A. J. 1937. Special Report. Typed manuscript. Files of Great Smoky Mountains National Park Library, Gatlinburg.

Sharp, W. M., and H. H. Chisman. 1961. Flowering and fruiting in the white oaks. I. Staminate flowering through pollen dispersal. Ecology 42(2): 365-372.

Sharp, W. M., and V. G. Sprague. 1967. Flowering and fruiting in the white oaks. II. Pistillate flowering, acorn development, weather and yields. Ecology 48(2): 243-251.

State of Tennessee. 1930. Committee for Smoky Mountain National Park vs. Champion Fibre, et al. Condemnation Proceedings. Sevier County Circuit Court Records, Sevierville, Tennessee.

Stephens, G. M. 1947. The Smokies Guide. The Stephens Press, Asheville, North Carolina. 64 pp.

Stupka, A. 1935-1949, 1950a, 1951-1959, 1960a, 1961-1963, 1964a, 1965-1968. Annual Summary of Naturalist Notes. Files of Great Smoky Mountains National Park Library, Gatlinburg.

Stupka, A. 1950b. Bears in the Great Smoky Mountains National Park. Typed memorandum. Bear File N 1427, Great Smoky Mountains National Park Headquarters, Gatlinburg.

Stupka, A. 1960b. Great Smoky Mountains National Park, Natural History Handbook Number 5. U. S. Government Printing Office, Washington. 75 pp.

Stupka, A. 1964b. Trees, Shrubs and Woody Vines of the Great Smoky Mountains National Park. University of Tennessee Press, Knoxville. 185 pp.

Taylor, F. G. 1972. Phenodynamics of production in a mesic deciduous forest. EDFB Rep. 72-8. 44 pp.

Taylor, O. B. 1949. Bears in the Great Smoky Mountains National Park. Typed manuscript. Bear File N 1427, Great Smoky Mountains National Park Headquarters, Gatlinburg.

Thomson, J. M. 1959. Memorandum to Chief Ranger: bear incidents. Bear File N 1427, Great Smoky Mountains National Park Headquarters, Gatlinburg.

Thornburg, L. 1962. The Great Smoky Mountains. University of Tennessee Press, Knoxville. 180 pp.

Timberlake, H. 1765. Lieut. Henry Timberlake's Memoirs. Republ. in 1948. Continental Book Co., Marietta, Georgia. 197 pp.

Tipton, D. H. (n.d.). Records of the last president and general superintendent of the Little River Logging Company. Private collection of Mrs. Tipton.

U.S.G.S. 1926. Proposed Great Smoky Mountains National Park (map). Great Smoky Mountains National Park Archives, Gatlinburg.

Van Doren, M. (ed.). 1928. Travels of William Bartram. Dover Publishing, New York. 414 pp.

Whittaker, R. H. 1956. Vegetation of the Great Smoky Mountains. Ecol. Monogr. 26: 1-80.

Whittle, W. 1934. Movement of populations from the Smoky Mountains area. Univ. of Tennessee Agric. Exp. Sta. Pam. 33. 40 pp.

Wingeier, F. A. 1959. Memorandum to Chief Ranger: bear incidents. Bear File N 1427, Great Smoky Mountains National Park Headquarters, Gatlinburg.

Woods, F. W. 1957. Natural replacement of chestnut by other species in the Great Smoky Mountains. Unpublished Ph.D. Thesis, The University of Tennessee, Knoxville. 50 pp.

Woods, F. W., and R. E. Shanks. 1959. Natural replacement of chestnut by other species in the Great Smoky Mountains National Park. Ecology 40(3): 349-361.

Zeigler, W. G., and B. S. Grosscup. 1883. The Heart of the Alleghanies or Western North Carolina. Alfred Williams and Co., Raleigh, North Carolina. 468 pp.

PERSONAL COMMUNICATIONS

Interviews

Alexander, Thomas	Cataloochee Ranch, North Carolina
"Bear"[5]	Bryson City, North Carolina
Blanchard, Charles	Newport, Tennessee
Buchanan, J. R.	Happy Valley, Tennessee
Cable, Jessie	Maryville, Tennessee
Cady, Earl	Knoxville, Tennessee
Calhoun, Granville	Bryson City, North Carolina
Campbell, Glenn	Maggie Valley, North Carolina
Cooper, Frank	Wears Valley, Tennessee
Frye[5]	Robbinsville, North Carolina
Griffin, Glenn	Canton, North Carolina
Hannah, Mark	Maggie Valley, North Carolina
Kent, Sydney	Knoxville, Tennessee
Large, Bernard	Miller's Cove, Tennessee
Ledbetter, Maynard	Townsend, Tennessee
Leonard, Arnold	Knoxville, Tennessee
McCarter[5]	Seymour, Tennessee
McCaughley, Millard	Walland, Tennessee
Morrell, John	Gatlinburg, Tennessee
Oliver, John	Knoxville, Tennessee
Owenby, Lem	Elkmont, Tennessee
Owenby, Steve	Miller's Cove, Tennessee
Owenby, Swede	Gatlinburg, Tennessee

[5]Complete name unavailable.

Plott, George and Vaugh	Waynesville, North Carolina
Sharp, Aaron	Knoxville, Tennessee
Shields, Randolph	Maryville, Tennessee
Sparks, Asa	Townsend, Tennessee
Thompson, Arnold	Townsend, Tennessee
Webb, Preston	Townsend, Tennessee
Whaley, Audley	Wear's Valley, Tennessee

Short Communications

Bacon, P. C.	Clarion State College, Clarion, Pennsylvania
Beeman, L. E.	University of Tennessee, Knoxville
Buckner, E. R.	University of Tennessee, Knoxville
Conley, R.	Tellico Wildlife Management Area
Farmer, R. E.	Tennessee Valley Authority, Norris, Tennessee
Myers, M.	Great Smoky Mountains National Park
Ogle, G.	Gatlinburg, Tennessee
Pelton, M. R.	University of Tennessee, Knoxville
Rink, G.	University of Tennessee, Knoxville
Sneddon, L.	Great Smoky Mountains National Park
Thor, I.	University of Tennessee, Knoxville
Woods, F. W.	University of Tennessee, Knoxville

APPENDIXES

APPENDIX A

LARGER COMMUNITIES IN AND AROUND THE GREAT SMOKY MOUNTAINS PRIOR TO 1930

Communities in the Great Smoky Mountains were very local and tended to vary in size. Proctor varied from a few families in the early 1900's to over 1000 people when the Hazel Creek watershed was being logged in 1926 (Ayres and Ashe, 1905; Lambert, 1958). Almost all population centers were spread up streams. Information for the following map (Figure 9) was taken from both written sources or interviews. All sources are cited in the List of References. Those settled areas for which there was no common well-known name are marked by diagonal lines.

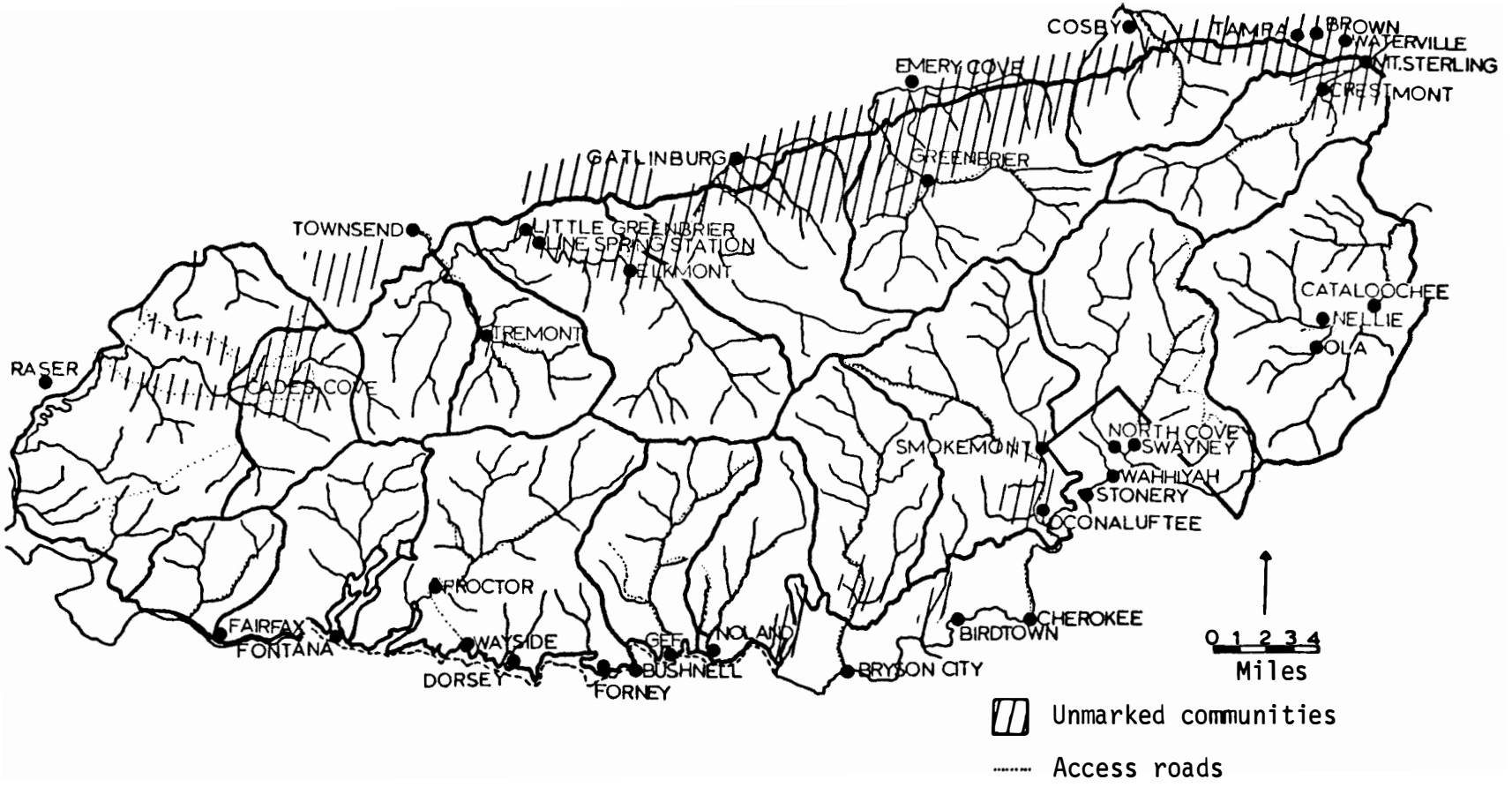


Figure 9. Larger communities in and around the Great Smoky Mountains prior to 1930.

APPENDIX B

INFORMATION ON OTHER WILDLIFE IN THE GREAT SMOKY MOUNTAINS NATIONAL PARK

I. MAMMALS

Order Marsupialia

Family Didelphidae

Didelphis virginiana

Oppossums have apparently always been abundant in the GSM. Gilbert (1943) and Rights (1943) both commented on the numbers of oppossum eaten by the Indians. Timberlake (1765), too, mentioned the incredible number of oppossums he saw. "Possum" meat was not generally a favorite among mountain people, but it was eaten when nothing else was available (Calhoun, p.c.; Campbell, p.c.; McCarter, p.c.). There is no record of oppossums during the 1920's, but by 1934, King was seeing an average of 33 per month while hiking in the GSMNP (King, 1935).

Family Leporidae

Sylvilagus transitionalis

Rabbits were not often mentioned, either in the literature or the interviews. Both Lawson (1709) and Rights (1943) listed rabbits as pre-settler dwellers of the Smokies. Timberlake (1765) commented on the vast numbers of rabbits he saw when traveling to the Cherokee nation. Mooney (1898) found rabbits prominent in Indian mythology.

Family Sciuridae

Marmota monax

There was no mention of the woodchuck before the Park was established. In April, 1934, though, King saw 305 woodchucks along trails. Currently, woodchucks are common in the grassy strips along roadsides and in Cades Cove. One interviewee said that he used them for target practice (unnamed interviewee, p.c.).

Castor canadensis

There are no recent references to beaver in the GSM. Rothrock (1929) commented on the large number of beaver skins coming from the Overhill Cherokees in the mid-1700's, and Peattie (1943) added that each skin was worth five times its weight in deer skins. Timberlake (1765) briefly mentioned the amazing numbers of beaver that he saw.

Family Cricetidae

Ondatra zibethicus

The muskrat was mentioned by Lawson (1709) as occurring on the southern edge of the GSM. There is no further report of muskrats until King (1934) saw 15 while hiking trails in the GSMNP. By 1960, muskrats were becoming common in the low places near the Park boundary (Stupka, 1960).

Order Carnivora

Family Canidae

Canis lupis

The gray wolf seems to have been common in the GSM before

settlement. Timberlake (1765) and Arthur (1914) who rode through the mountains about 1675, found "incredible" numbers of wolves. Mooney (1898) found wolves prominent in Cherokee mythology. Wolves seem to have diminished in numbers with the settling of the Smokies; by the late 1800's they were rare. Dave Ogle was reported to have caught a wolf in his bear trap at the head of Ramp Hollow on Big Branch in the 1890's (Stupka, 1940). John Stinnett told Mason (1927) that he ran a wolf out of Devil's Courthouse in the early 1900's. Adams (1966) reported seeing a large wolf on Mt. LeConte in 1925, 1926, and 1929, but this was not verified by anyone else.

Vulpes vulpes

Urocyon cinereoargenteus

As with squirrels, species of fox are often not distinguished. Lawson (1709) and Timberlake (1765) both noticed that foxes were very abundant. Hunnicutt (1926) found foxes common on the North Carolina side of the mountains. King (1934, 1935) found foxes very abundant when he walked trails in the GSMNP. He reported seeing 10 red foxes and 15 gray foxes in one month. By 1950, Stupka felt that "red and gray foxes may be as prevalent today as when the country was first settled" (King and Stupka, 1950). Black foxes were mentioned several times and this was taken to be the black phase of the red fox. Mooney (1898) mentioned that the Cherokees had a special name for black foxes. John Stinnett said that he had caught black foxes on Blanket Mountain (Mason, 1927).

Family Procyonidae

Procyon lotor

Raccoons were reported to be very common in the GSM in the 1700's (Lawson, 1709; Timberlake, 1765; Rights, 1943). "Coon" hunting was a popular sport among settlers (Ledbetter, p.c.; Webb, p.c.). King (1935) saw only five raccoons in 1934. By the late 1930's, some CCC camps had problems with raccoons in their garbage and mess tents, indicating a population increase (Burchfield, 1941). The poaching of raccoons from the Park is apparently common. According to one poacher, there are few raccoons in Cosby, Greenbrier, Elkmont, Cataloochee, or Deep Creek (unnamed interviewee, p.c.).

Family Mustelidae

Martes pennanti

The only available information on fishers in the GSM is from Stupka (1960). He mentioned that fishers originally existed in the Smokies.

Mustela nivalis

Weasels were not commonly noticed in the GSM, probably because of their secretive nature. King (1935) reported that he found them fairly common inside the Park.

Mustela vison

Lawson (1709) listed the "minx" as one of the species he found in the Smokies. Mink were not popular targets, although Hunnicutt (1926) mentioned that he occasionally shot them. He also said that he never noticed any particular change in their numbers.

Spilogale putoris

Mephitis mephitis

Skunks, or "polecats," have apparently always been common in the GSM. Lawson (1709) found them abundant. All trappers interviewed had had at least one confrontation with an angry skunk (Campbell, p.c.; Griffin, p.c.).

Lontra canadensis

The otter appeared to be fairly common in the Smokies (Lawson, 1709; Stupka, 1960). The last reported otters were taken near Mt. Sterling Creek and Pigeon River in 1930, and near the mouth of Cataloochee Creek in 1933 (King, 1935).

Family Felidae

Felis concolor

Lawson (1709) and Timberlake (1765) both found the mountain lion abundant in the GSM. As with the wolf, the mountain lion's numbers appear to have decreased with the settlement of the GSM. Lanman (1869) reported that an Indian and her three children were chased by a "panther." John Stinnett claims to have caught a "painter" on Blanket Mountain in the late 1890's. King (1937b) wrote that the last mountain lion was killed on Spence Field by Sheridan Wear's grandfather in 1916. Stupka (1938) reported that a photographer mistook a dog for a mountain lion in 1938, and that a scare was started in 1940 when bear prints were mistaken for those of a mountain lion; both were very common mistakes (Stupka, 1940). Many of the interviewees claimed that they

usually see or hear of someone seeing a "painter" every few years (Campbell, p.c.; Cooper, p.c.; Thompson, p.c.).

Lynx canadensis

Lynx rufus

It has never been determined whether the lynx ever occurred in the Smokies (King, 1937). Some oldtimers could accurately describe it (Sparks, p.c.). Bobcat have always been reported from the more remote sections of the GSM (King, 1935; Stupka, 1938; King and Stupka, 1950). Most interviewees referred to the "wildcats," but never took much interest in them.

Order Artiodactyla

Family Suidae

Sus scrofa

No one is certain how or when the European wild hog was introduced into the Smokies. The Plotts (p.c.) believed, as did Gasque (1948), that hogs have been in the Smokies since the early 1900's, but others (Morrell, p.c.; Whaley, p.c.) said that the hogs which started the current population were not introduced until after the Park was established. One hunter (unnamed interviewee, p.c.) claimed that the hog was released in the Park by avid bear and boar hunters. Others said that perhaps the original hogs swam the Little Tennessee River when the water was low (Ledbetter, p.c.; Thompson, p.c.). Shields (p.c.), Morrell (p.c.), and Thompson (p.c.) all noticed that the wild hog has increased in numbers over the last 30 years. Shields (p.c.) said

that by 1945 to 1950 hogs were being seen on the balds. They appear to have moved slowly across the Park from west to east; they currently have moved at least as far east as Cherokee Orchard.

Family Cervidae

Cervus elaphus

The elk was a pre-settlement resident of the GSM (Byrd, 1728; Arthur, 1914; Peattie, 1943; Stupka, 1960). There are no other written reports of elk, nor did any interviewees remember hearing of them in the mountains.

Odocoilus virginianus

Arthur (1914) wrote of the "great store of deere" he saw in the lower reaches of the GSM about 1675. Byrd (1728) also saw "innumerable deer" as did Timberlake (1765). Rothrock (1929) and Peattie (1943) both refer to the large numbers of deer skins coming from the Overhill Cherokees in the early to mid-1700's. By 1920, deer were not often seen anywhere in the mountains. Even deer tracks were rare (Campbell, p.c.; Kent, p.c.; Whaley, p.c.). Hikers in the 1920's seldom saw deer; Campbell (1938) said that this was due as much to the fact that they were shy as to their low numbers. Dave Ogle contended the deer decreased after the shotgun came into use (Stupka, 1940). Campbell (1938) estimated that the deer population had fallen as low as 30 individuals, all located at the southwest end, by the time the Park was established. The deer population did not seem to respond to protection as did other wildlife populations. King (1935) reported seeing no deer on the GSMNP trails from April to October, 1934.

Komarek and Komarek (1938) reported occasional tracks in Cades Cove and Cosby. They mentioned that several deer were taken each year from the Morton Butler tract in the Abrams watershed (not yet Park property). They also mentioned that a disease had been reported among the deer. By 1942, the deer seemed to be increasing. Stupka estimated that there were about 50 deer in the Park (Thornburg, 1962).

Bison bison

As with the elk, only the earliest writers were familiar with the buffalo. Both Byrd (1728) and Timberlake (1765) were amazed at the numbers of bison which occurred in the Smokies. William (1928) reported that early explorers followed buffalo trails through the Smokies. There is no record of when the bison disappeared from the area, but indications are that it was before settlement of the GSM.

II. BIRDS

Family Accipitridae

Aquila chrysaetos

Only one report of eagles in the GSM was found. Caton (1928) found a golden eagle's nest on the side of Mt. LeConte.

Falco peregrinus

Duck hawks, or peregrine falcons, used to nest in the GSM. In 1949, Broome reported that they were on the increase, but by 1960, Stupka found only deserted nests near Alum Cave Bluffs.

Family Tetraonidae

Bonasa umbellus

The ruffed grouse, or mountain pheasant, was often hunted before the Park was founded (Hunnicutt, 1926: Campbell, p.c.). Hunnicutt (1926) found no shortage of grouse in the Deep Creek watershed, but Webb (p.c.) said that he rarely heard a grouse drum before the Park was established. After 1930, grouse multiplied rapidly. By 1934, King found grouse common in all watersheds he hiked.

Family Meleagrididae

Meleagris gallopavo

Arthur (1914) observed an abundance of turkeys in the GSM around 1675, as did Timberlake in 1765. Rights (1943) said that turkeys were plentiful before settlers came to the Smokies. Turkeys were commonly hunted before the Park was established and did not seem to be as susceptible to hunting pressure as bear and deer. Griffin (1930) said that there were many turkeys when the Park was founded. King (1935) found a good turkey population in the high elevations, but he also felt that the turkey population was declining because of the chestnut blight; apparently, this was not the case. Stupka estimated that by 1950, the turkey was almost as common as it had been before the Park had been settled.

APPENDIX C

BLACK BEAR SIGHTINGS IN THE GREAT SMOKY MOUNTAINS 1925-1935[1]

1925 to 1930

Thunderhead to Clingman's Dome
Head of Little River
Russell Field
Above Miry Ridge
Brier Ridge
Laurel Gap
Blanket Mountain
Sugarlands Ridge
Grassy Gap
Curry He Mountain
Buckhorn Gap
Copperhead Branch
Deer Bed Camp Branch
Mollie's Butt
Bone Valley (Hazel Creek)
Upper Raven Fork
Shot Beech Ridge
Long Branch
Pull Back Branch
Bear Creek
Firescald
Hannah Mountain
Polecat Ridge
Woolly Tops
Cold Spring Knob (Bote Mountain)
Siler's Bald
Up Thunderhead
Mark's Cove
Jake's Creek
Sam's Creek
Devil's Courthouse
Above Elkmont
Meigs Mountain
Low Gap
Spruce Flats
Shut-in Creek

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[1]Figure 8, page 32.

Defeat Ridge
Above Porter's Flats
Below Siler's Bald
Three Forks
Upper Deep Creek Road
Fork Ridge
Board Camp Branch
Head of Oconaluftee Creek to Mt. Guyot
Bear Pen Branch
Tabcat Creek
Inadu Mountain
Greenbrier Pinnacle

Extension of Range, 1934

Pinnacle to Mt. Guyot
Bullhead Mountain
Mt. Cammerer
Walnut Bottoms
Ramsey Prong
Lumber Ridge
Gregory Ridge
Moore Springs Branch
Pinnacle up Locust Ridge
Proctor Creek
Mule Gap
Cold Spring Gap
Welch Ridge
Forney Ridge
Sunkota Ridge
Mingus Creek
Pin Oak Gap
Baxter Creek
Three Forks to Clingman's Dome
Mt. Sterling
Sunup Knob
Gunter Creek
Above Greenbrier
Mill Creek
Spruce Flats
Greer Creek
Blockhouse Mountain
Huggins Creek
Pullback Ridge
Bee Knob
Bear Wallow Knob
Noland Divide
Newton Bald
Upper Collins Creek
Ledge Bald
Thomas Ridge

Extension of Range, 1935

Lower Sugarlands Mountain
Rough Creek
Anthony Creek
Hyatt Lane
Lower Bote Mountain
Jake's Gap
Ridges around Cades Cove
Eagle Creek west of Blockhouse

APPENDIX D

KNOWN BEAR TRAILS IN THE GREAT SMOKY MOUNTAINS NATIONAL PARK

Big Creek (Watershed 1, Figure 3, Page 23)

Trail to Sterling Gap Tower
Baxter Creek
Mt. Sterling
Mt. Guyot
Low Gap to Stony Gap
Gunther Creek to Big Creek
Big Creek to Low Gap
Walnut Bottoms

Cataloochee (Watershed 2, Figure 3, Page 23)

Pretty Hollow Gap

Ravens Fork (Watershed 3, Figure 3, Page 23)

Pin Oak Gap to Ledge Bald
Upper half Hugh's Ridge
Round Bottom
Three Forks to Clingman's Dome

Ocanoluftee (Watershed 4, Figure 4, Page 24)

Newton Bald
Upper end of Collins Creek
Kephart Prong
Newfound Gap
Bradly Fork to Peck's Corner
Indian Gap Trail
Hugh's Ridge

Deep Creek (Watershed 5, Figure 4, Page 24)

Thomas Ridge
Three Forks to Clingman's Dome
Fork Ridge to Hericon Ridge to Cherry Creek
Shot Beech Ridge
Noland Ridge Trail

Sunkota Ridge
Cathy Ridge to Hammer Branch to Deep Creek Road
Woolly Head Branch
Beetree Creek
Bear Pen Branch
Nettle Creek Bald

Noland Creek (Watershed 6, Figure 5, Page 25)

Headwaters of Mill Creek
Indian Gap to Cades Cove
Andrews Bald

Forney Creek (Watershed 7, Figure 6, page 26)

Mule Gap
Jonas Creek
Pilot Knob Trail
Forney Creek
Wild Cherry Branch
Cades Cove to Forney Creek

Hazel Creek (Watershed 8, Figure 5, Page 25)

Blockhouse Mountain to Thunderhead Mountain
Siler's Bald
Mule Gap
Welch Ridge
Huggins Creek
Procter Creek
Locust Ridge

Abrams Creek (Watershed 11, Figure 6, Page 26)

Panther Creek
Cane Gap
Cooper Road
Russell Field
Gregory Ridge

Cades Cove (Watershed 12, Figure 6, Page 26)

Gregory Ridge
Anthony Creek
Ridges surrounding Cades Cove

West Prong Little River (Watershed 13, Figure 6, Page 26)

Little Bald
Anthony Creek
Bote Mountain Road
Beech Gap
Turkey Pen Ridge

Middle Prong Little River (Watershed 14, Figure 5, Page 25)

Mark's Creek
Bee Gap
Starkey Prong
Deerhobble Branch
Buckhorn Gap
Miry Ridge
Spruce Flats
Thunderhead Prong to Thunderhead
Panther Creek
Brier Ridge to Little Courthouse Knob

East Fork Little River (Watershed 15, Figure 5, Page 25)

Huskey Gap
Jakes Creek
Sugarlands Ridge
Top of Cove Mountain

West Prong Pigeon River (Watershed 16, Figure 4, Page 24)

Newfound Gap
Cherokee Orchard up Bullhead Mountain
Top of Cove Mountain
Indian Gap Trail
Little River truck trail to Cades Cove

Middle Fork Pigeon River (Watershed 17, Figure 4, Page 24)

Pinnacle to Mt. Guyot
Porter's Creek
Ramsey Prong
Trillium Gap
Sawteeth to Mt. Guyot
Greenbrier to Mt. Guyot
Pinnacle to Ramsey Prong

Cosby (Watershed 18, Figure 3, Page 23)

County line to Cosby
Mt. Cammerer trail

VITA

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