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A PLAN FOR THE MANAGEMENT OF BROWN BEAR

IN RELATION
TO OTHER RESOURCES ON
ADMIRALTY ISLAND, ALASKA

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A PLAN FOR THE MANAGEMENT OF BROWN BEAR IN RELATION TO OTHER RESOURCES ON ADMIRALTY ISLAND, ALASKA

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INTRODUCTION

The national forests contain a great variety of important natural resources of commercial, recreational, and aesthetic value that must be conserved. Frequently two or more of these occur in the same locality, and in order to insure well-rounded use, enjoyment, and perpetuation of the whole, closely coordinated land-use plans covering their management are necessary. The coordinated plans commonly deal with commercial utilization of timber, land occupancy, preservation of scenery, general recreation, and game hunting.

The plan herein described provides for the management of the brown bears of Admiralty Island, in the Tongass National Forest, Alaska. It coordinates the management of the bears with other present and prospective activities on the island and more specifically provides that all activities, including bear hunting, shall be so regulated as to insure the perpetuation of the animals in satisfactory numbers.

The management of the bears of Admiralty Island under this plan is a cooperative project between the Alaska Game Commission and the Alaska regional office of the Forest Service, both of

which function under the Department of Agriculture. The Commission is the agency established in Alaska by the Federal Government for the administration of the game and fur laws enacted by Congress and of regulations thereunder promulgated by the Secretary of Agriculture. The Forest Service has full responsibility for the administration of the resources of the national-forest lands, except the game and fur thereon, but cooperates with the Commission in the protection of those game and fur resources. The Territorial Government is not authorized to deal with game and fur matters.

DESCRIPTION OF THE ISLAND

Admiralty Island (fig. 1) is located in the northerly half of southeastern Alaska, that section of the Territory consisting of a narrow strip of mainland and a paralleling group of hundreds of islands that extend for 400 miles southerly from the main body of Alaska along the west side of British Columbia. The area of this section is about 35,500 square miles. Admiralty Island lies southwest of Juneau, the capital of the Territory, and the nearest point is within 12 miles of the capital. Its length is 100 miles, average width 20 miles, and the area is 1,664 square miles, or about 1,065,000 acres—21 percent greater than the total land surface of Long Island, in New York State. The narrow and almost detached Glass Peninsula parallels the east side of the main body of the island for 43 miles, and is separated from it by Seymour Canal, a natural waterway. The shore line, with the exception of a 38-mile section on the west coast, is deeply indented with numerous bays that provide good anchorage for vessels of all classes. Motor launches and motor cruisers from Juneau are usually employed in reaching the island, and the longest run to any point is 118 miles. Airplanes, equipped to land on water, now leave Juneau frequently for the coastal harbors and inland lakes.

The main steamer route through southeastern Alaska parallels the east side of the island for 45 miles and the north end for the same distance. The steamer channel lies for the most part 2 miles or more offshore.

Admiralty is the third largest island in southeastern Alaska, being exceeded in size by Prince of Wales and Chichagof Islands only. It is one of three large islands in this section of the Territory on which Alaska brown bears are found, the others being Chichagof and Baranof.

TOPOGRAPHY

The topography of Admiralty Island is extremely rough. The axis of a mountain range extends from south to north through the middle of the island, and for most of its length steep rugged slopes rise from the shore line to elevations between 2,000 and 3,000 feet. Many ridges and peaks reach heights between 3,500 and 4,500 feet. The Glass Peninsula is a steep ridge parallel to the main range.

About midway of the length of the island a break occurs in the mountain range, and a strip of rolling land with an average elevation of about 250 feet extends from the east to the west coast. Well inland on this strip are a group of four large lakes and a number of smaller ones. The western part of this rolling strip forms extensive lowlands

near Kootznahoo Inlet and Hood Bay, in the vicinity of the Indian village of Angoon.

Extensive tide flats occur at the mouths of the streams that empty into the heads of most of the larger bays, and level foreshores are

FIGURE 1.—Admiralty Island, Alaska (length, 100 miles; average width, 20 miles; area, 1,664 square miles), showing villages, homestead, mining, and salmon-canning centers, public-service sites, and other centers of human activity.

found along portions of the Kootznahoo lowlands. With these exceptions the shore line is steep and rocky and has deep water extending to the edge of the timbered slopes. Sandy and shingle beaches are rare.

The main drainage of the island is provided by 35 to 40 streams originating along the axis of the principal mountain range. These streams are 25 to 75 feet wide and 1 to 2 feet deep at their tidewater outlets. They range in length from about 4 to 12 miles. Innumerable smaller streams drain directly into tidewater.

CLIMATE

The average annual precipitation at Juneau is 83 inches, but on Admiralty Island fragmentary records indicate that at tidewater elevation it is probably about 50 to 55 inches. This is well distributed throughout the year. Overcast skies with mist or rain are usual, and as much as 2 weeks consecutively of clear weather is exceptional. May and June are normally the driest months. The prevailing winds are southerly, and the wide waterways surrounding the island are subject at all seasons to storms that drive large motor launches to shelter. Such storms, however, are not sufficiently frequent to interfere seriously with launch transportation.

Near tidewater the snow depth is 1 to 3 feet in a normal winter, but warm rains may melt off all the snow a number of times during the season. With progress inland from tidewater and increase in elevation, the depth increases rapidly, so that the greater part of the island is under a heavy blanket of snow from the middle of December to the first of May.

HUMAN POPULATION

The total year-long population of southeastern Alaska in 1930 was 19,304, of which 13,314 were whites and 5,990 Indians. The Indian village of Angoon, on the shores of Chatham Strait, with a population of 320, is the only town on Admiralty Island. Funtier Bay on the north end of the island is the next most important community center, with one gold-mining property employing 15 men, another smaller mine, a large cannery, and several individual homes. There are also some isolated residents, such as miners, homesteaders, home-site occupants, cannery watchmen, and lighthouse keepers. The total year-long population is approximately 365. In addition, about 10 persons occupy fur farms on small islands in the bays indenting the shore line. In the summer the population is materially greater because of the influx of salmon-cannery workers, fish trollers encamped on the beaches, fish seiners on boats using the bays for night anchorages, fish-trap watchmen, stream watchmen for the Bureau of Fisheries, sport fishermen, prospectors, miners, and others. This purely seasonal population is estimated at 600 at the peak of the cannery activities. During the middle of the summer, when the bears are on the salmon streams, the island population, including both year-long and seasonal residents, reaches 1,000. Figure 1 shows the principal centers of human activity. The amount of patented land on Admiralty Island is inconsequential.

ROADS AND TRAILS

The island has no roads. Not more than 10 miles of good trail have been constructed by mining companies on the Mansfield Peninsula section in the north, while 3 miles of fair trail lead out of

Angoon Village. Blazed and partially brushed lines of travel intended for temporary use and established over a long period by prospectors and hunting guides are found in many places. These lines are of considerable assistance in following routes to remote points, but they cannot be classed as satisfactory travel ways.

Construction was started in 1933 on a comprehensive system of trails, portages, and shelter cabins, which will open large portions of the island to foot and water travel.

VEGETATIVE COVER TYPES

The principal cover type is a virgin mixed forest of western hemlock and Sitka spruce of merchantable quality for timber products. This commercial type extends from tidewater to an altitudinal limit of about 1,500 feet and occupies a major part of the land area below that elevation. This same zone contains another extensive type consisting of "scrub" timber of the same species. The number of trees per acre is less than in the commercial stands and the trees are shorter and of poorer quality. This material is classed as unmerchantable, although portions well located for logging may sometimes be used. Other cover types found in this same zone include muskegs, composed of peat moss, shrubs, and isolated stunted trees; grass flats at the heads of bays and near the mouths of streams; and wet swamps. These three types are important as bear range but have no commercial value. They cover but a small percentage of the land area within the commercial-timber zone.

Above the commercial-timber zone is a narrow band of stunted trees clearly of no commercial value, designated as the "subalpine forest" type. This in turn gradually gives way at its upper limits to a very extensive type composed of dense thickets of alders and willows interspersed with areas of herbs and grass. Barren rock shows on the more rugged sites within all types above the commercial-timber zone.

The timber grows in fairly even-aged stands, and practically all age classes are represented. Overmature age classes, however, are by far the most abundant. The trees reach heights of 175 to 200 feet, averaging about 125 feet. Diameters of 6 feet are not uncommon, but the average is about $3\frac{1}{2}$ feet for spruce and between 2 and $2\frac{1}{2}$ feet for hemlock. The maximum volume per acre is in excess of 100,000 board feet, and the average of all the commercial-timber stands is 20,000 board feet. The total volume of commercial timber on the island, as determined by timber surveys, is 8,500,000,000 board feet.

Logging operations along the shores of this island have been carried on intermittently for at least 25 years to supply the local demand for saw logs and the long piling needed in the construction of salmon traps. The total quantity of material removed represents but a small fraction of that available, and the timber resources can be considered as still intact.

It is likely that timber for local use will continue to be taken from the island in small quantities, but the great bulk of the commercial forest is of outstanding value for the production of paper and will undoubtedly be used for this purpose. In that event the

manufacturing plants for paper production will probably be located in the vicinity of Juneau, however, to take advantage of town facilities and of large, nearby water-power sites.

The estimated acreage of each of the major cover types is as follows:

	<i>Acre</i> s
Commercial forest.....	460,000
Scrub forest.....	100,000
Subalpine.....	90,000
Brush, grass, barren.....	409,000
Lakes.....	6,000
Total.....	1,065,000

The estimates for areas of commercial and scrub-forest types are based on timber cruises and are fairly accurate. The estimates of the other types are only approximate.

DETAILED TIMBER DESCRIPTION

The commercial-forest stands are composed almost entirely of western hemlock and Sitka spruce, the former constituting about 80 percent and the latter 20 percent by volume. A few trees of Alaska cedar (yellow cedar) are scattered through the commercial forests. Other tree species are alder and cottonwood along the banks of the principal streams and scattered lodgepole pine on the muskegs.

FOREST MANAGEMENT

The extensive commercial forests of southeastern Alaska constitute one of its most valuable resources. They are destined to play a very important part in the economic development of that region and in providing the United States with a large, sustained supply of newsprint paper. This section of the Territory is largely unsuited to agriculture and needs some other industry based on a renewable resource to complement the fisheries in giving stability to its economic life. At the same time, the United States draws its supply of newsprint paper largely from foreign countries—a situation that is undesirable in many ways, including the large yearly loss of wages that otherwise would be paid to American workmen.

The Alaska forests can materially relieve both the local and general problems. They are owned by the Federal Government and have been included in the national-forest system, where they will be managed in accordance with the principles of forestry for the continuous production of timber crops. There is no possibility of forest devastation. The lands will not be alienated to the timber-using companies, and all cutting and other forest activities will be supervised by the Forest Service. Practices will be followed that insure successive crops of trees on the cut-over areas and provide for a continuous and regulated flow of wood material to the mills in quantities commensurate with the growing power of the forests. Studies of the local forests indicate that southeastern Alaska can supply 1,000,000 tons of newsprint yearly in perpetuity, which is more than one-fourth of the present yearly consumption of the United States. Paper manufacture has not yet started in Alaska,

and no commitments to establish plants for this purpose are now in effect, but it is expected that construction of at least one large mill will be started as soon as general business conditions improve materially. As not less than 3 years will be required to complete the plant after construction has begun, it will be seen that the beginning of pulp-timber logging on the island is not imminent.

Admiralty Island is highly important to this proposed paper-making development. Its 460,000 acres of commercial timberland, 8,500,000,000 board feet of standing timber, and exceptionally good tree-growing soils make it the keystone to paper-manufacturing projects in the Juneau section. It is capable of a sustained production of enough pulpwood to make 440 tons of newsprint paper daily, or 132,000 tons yearly. The full development of the island's commercial timber would require a capital investment of \$17,000,000 in paper mills, power plants, and logging equipment; produce paper valued at \$5,000,000 yearly at the plant, and give year-long employment to about 1,000 persons.

Management of the commercial-timber stands is not incompatible with the maintenance of a numerous bear population on the island. Possible points of conflict exist, but they are in the details of the actual day-to-day and year-to-year handling of the woods activities rather than in the general scheme. Moreover, there is ample opportunity for men who are interested in both timber and game to make adjustments that entail little sacrifice on the part of either.

Timber-management activities will be confined to the areas of commercial timber and some of the intermixed patches of scrub timber, less those portions of the well-timbered area that are found to be too rough and inaccessible to log economically. The area affected by the timber-management plans will not exceed 425,000 acres, or two-fifths of the total land area, and this workable section occupies the outer portions of the island nearest tidewater. Its inland limits, however, form a very irregular and somewhat indefinite line, so that the establishment of a practical boundary to limit the area to be worked is impossible. The location and area of the commercial timber leaves a vast interior region, comprising three-fifths of the total area, into which there is no necessity for the woods workers to penetrate. This is now the preferred habitat of the bear. The isolation, rough terrain, vegetation, and more especially the food supply, except in the salmon-spawning season, make this much better bear country than the dense forests at lower altitudes with their limited food supply.

The period necessary to grow trees to economical pulp-timber size in this region is not less than 75 years, and as the forests will be handled on the sustained-yield principle, the timber-management plan will provide in effect that not to exceed one seventy-fifth of the commercial area shall be logged in any 1 year. This is slightly more than 0.5 percent of the total area of the island. Clear-cutting, leaving large groups of seed trees intact, will be the logging method used, so that a tract once cut over will not be logged again for 75 years. The number of going logging operations at any one time on the island will probably be not more than six or eight. There is no apparent reason why the bears should necessarily be molested during logging operations. The animals naturally shun noisy, human activities, such

as steam-power logging, and can easily keep away from the small part of this large island to which the yearly cutting area will be confined.

The woods activities of timber purchasers and others will be under the close supervision of a Forest Service field officer, who will also be made a game warden of the Alaska Game Commission, specifically charged with the protection of brown bears on the section of the island near the logging camp to which he is assigned. This precludes wanton and illegal killing. In this connection it should be remembered that small and medium-sized logging camps have operated on Admiralty Island under Forest Service supervision for at least 25 years without seriously interfering with the bears.

Logging operations on Admiralty Island in the future, as in the past, will involve the hauling of logs from the stump by means of heavy logging engines and wire cables. In many cases railroads or tractor roads, usually less than 4 miles in length, will be needed for the final stage of the haul to the nearest bay, where the logs will be rafted for towing to the mills. Logging camps will continue to be largely of the floating type that can be moved along the sea channels from place to place and pulled on the tide flats or anchored in shallow water near the working areas, and few permanent or semipermanent camps will be established. The location of camps, regardless of type, can be controlled by the Forest Service. The number of men employed in logging operations on the island under a full utilization of the commercial-timber resources will not exceed 250.

Pulp and paper mills, including hydroelectric plants, to be established for the utilization of the island timber will probably be located on the mainland shore of Alaska in the vicinity of Juneau. Thus the work and residence of the paper-industry employees, aside from the loggers, will not be in the neighborhood of the bears.

Cutting operations increase the food supply for bears. Dense virgin timberland provides little food, while the luxuriant growth of shrubs, berry bushes, and annual plants that covers all cut-over areas in this region for the first few years after logging contributes abundantly both directly and indirectly to the food supply.

MINING

Mining on Admiralty Island has little effect on the bears. The northern end of the principal mountain chain is known to contain a belt of mineral-bearing rocks. Promising mines in the development stage are located on the part of this belt north of Hawk Inlet, including three active gold-mining properties on which heavy expenditures have been made. An asbestos mine is also being developed on Bear Creek.

Active mining operations are largely confined to the relatively small area between Funter Bay and Hawk Inlet. The work is concentrated in four properties, and most hard-rock miners are not of the woodsmen or hunting class.

The low-lying lands in the vicinity of Kootznahoo Inlet contain extensive deposits of bituminous coal. A small mining operation here produced coal commercially for a few years, but recently suspended operations. Smaller deposits occur farther south, particularly in the vicinity of Tyee post office at Murder Cove, near the southern point of the island.

FISHING INDUSTRY

Commercial fishing gives rise to more contacts between men and bears than any other local activity, especially in the salmon-spawning season, which is also the most active fishing period. Salmon start to enter the fresh-water streams on the island in the middle of July, and a great concentration of bears occurs on the lower sections of the streams near tidewater during the following 6 weeks or 2 months. According to the Bureau of Fisheries, 65 streams on the island are used by salmon.

Six salmon canneries, of which only three have been active in the past 3 years, are located along the coast. During the active fishing season 25 to 30 salmon traps, each in charge of a watchman, are placed along the shore line. At the same time not less than 25 seine boats, with crews of 4 to 5 men, fish for salmon in the waters adjoining the island and spend much time at anchor in the protected bays. The actual fishing and packing season of the canning plants covers about 6 weeks in midsummer. During this period the three canneries bring to the island approximately 500 men, of which one-fifth are orientals, principally Chinese and Filipinos. Exclusive of this short period of intense activity, the industry employs about 120 men on the island between April 1 and September 30, but during most of the remaining 6 months only one watchman for each cannery.

The herring-packing establishments on the east shore of Baranof Island frequently send boats across Chatham Strait to fish in the bays on the west side of Admiralty Island.

Trolling for king salmon, which are shipped fresh in ice from the Territory, is an important local industry. The fishing is done from small boats, each with a crew of 1 or 2 men, during 9 months of the year, but intermittently at any one place, depending on the movement of the fish. These fishermen use nearby protected bays as headquarters and frequently maintain tent camps ashore. The most active trolling grounds in the island waters are off Hood Bay and Point Gardner, and in Seymour Canal. Perhaps 40 boats fish at least 3 months of the season along the Admiralty coastline.

A small amount of halibut fishing, carried on in much the same way as salmon trolling, is done in waters adjacent to the island.

To provide the best possible protection against seining in the streams during the 6-week salmon-canning season, the Bureau of Fisheries maintains stream watchmen at the mouths of three important creeks. The taking of salmon for commercial use after they have entered any spawning stream is illegal.

AGRICULTURAL SETTLEMENT

The limited agricultural possibilities preclude any extensive demand for opening land to homestead entry. Only seven homesteaders (on either patented or unpatented claims) are now living on the island. The policy in effect is to discourage the settlement of any isolated tract too small for the development of a sufficient community to provide reasonable social and educational advantages. The extension of existing settlements, where soil and other conditions are satisfactory, is encouraged as being to the best interests of permanent

Territorial development. In such cases the plan is to grant home sites, which are limited to tracts of 5 acres, rather than homesteads of larger size, as the land is valuable for dwelling sites and home gardens primarily and not for extensive farming. The communities where expansion along this line is expected are Angoon, Tyee, and Funter Bay.

WATER POWER

There is little chance that the development and operation of power sites will conflict with bear and forest management. The lakes of the large group in the center of the island have little value as potential water-power sites, because of the high development costs and a lack of any demand that can be foreseen for the possible power output. Much better power sites are available on the mainland in the vicinity of Juneau and on Baranof Island. Lake Kathleen and a few small streams near the mineralized sections, however, are of possible future power value in connection with mining operations.

WILDLIFE AND RECREATIONAL FACILITIES

Five species of bears of the grizzly-big-brown group have been differentiated by C. Hart Merriam, a noted authority on these animals, among the collection made on Admiralty Island. No black bears occur on this island.

The small Sitka deer, a species of the black-tailed group, is numerous on all parts of the island, and the local fur bearers include the beaver, mink, land otter, muskrat, weasel, and marten. The beaver is especially abundant.

The upland game birds are ptarmigan and grouse. The waterfowl consist of various species of wild ducks and geese, which are largely migratory and very abundant in the fall in numerous places along the shores of the island. A small number nest in the lake country in the interior of the island or on tidewater sloughs, and apparently few of these migrate.

Most of the streams and lakes afford excellent trout fishing. At least three varieties of trout, the rainbow, cutthroat, and Dolly Varden, are found in abundance.

Recreational activities aside from hunting and trout fishing include canoeing and camping on the lake system in the interior of the island; hiking along the grass-covered slopes of the high ridges above timber line, and climbing the principal peaks; photographing scenery and wildlife; and cruising and camping along the coast, salt-water fishing, and taking trips inland.

THE ALASKA BROWN BEARS

The big-brown and grizzly bears are regarded by biologists as constituting a single group. Certain peculiarities of structure distinguish the grizzly and big-brown species, but they are of such nature as to be indistinguishable in the field. The unit in all game laws, regulations, and management plans must therefore be the entire group, though regulations could be made to apply, of course, to any well-marked geographic unit.

DISTRIBUTION OF SPECIES

Species with the characteristics of the grizzly type are found over practically the whole of Alaska, while those species regarded as brown bears are in general confined to the southern coastal areas. Further study is necessary to determine the exact limit of distribution of the coastal species toward the interior of the territory.

The range of the species of brown bears in Alaska extends along the southern coast of the Territory from Dixon Entrance, on the British Columbia line, to Unimak Island, at the tip of the Alaska Peninsula, a distance of 1,500 miles. While the extent to which they penetrate inland along the southern coastal strip is not definitely

Photo by Navy Department.

FIGURE 2.—South arm of Chaik Bay. A typical view of the west side of Admiralty Island.

known, the distance tentatively adopted by the Alaska Game Commission gives a total range of 96,000 square miles, an area more than twice the size of the State of Pennsylvania.

Southeastern Alaska has about 27,000 square miles of brown-bear range, or 28 percent of the total range in the Territory. Of this area, 2,100 square miles is included in Chichagof, 1,664 square miles in Admiralty, and 1,604 square miles in Baranof, the three large brown-bear islands of this section. The remainder is largely mainland.

Within the entire brown-bear range of 96,000 square miles, complete sanctuary is provided in national monuments, game refuges, and elsewhere, to a total area of 10,000 square miles, or 10 percent of the whole range. The sanctuaries in southeastern Alaska consist

of the Glacier Bay National Monument, an area of 1,820 square miles north of Icy Straits; Kruzof and Partofshikof Islands, 187 square miles near Sitka; and an area of 1,910 square miles adjoining the Glacier Bay National Monument. The last named was designated as a brown- and grizzly-bear refuge by the Secretary of Agriculture in March 1933.

Many Government field workers, hunters, and other outdoor men who visit parts of the brown-bear country are of the opinion that brown bears are well distributed over the range, that the stocking in most places is heavy, and that, with the exception of a few localities, the present bear population is in excess of that of 15 or 20 years ago, when the sale of pelts was permitted.

RELATIONSHIPS AND HABITS

Naturalists have differentiated many species and subspecies of brown bears throughout this wide range. Admiralty Island is well represented in the collections, and the following five species have been recognized, and listed by Merriam in his monograph:¹ *Ursus shirasi*, *U. insularis*, *U. mirabilis*, *U. neglectus*, and *U. eulophus*. Merriam stated that each of these has related species on the adjacent mainland.

The classification of the Admiralty Island bears was made largely on cranial character and measurements, and so far as known no satisfactory method exists of distinguishing the species in the field by general observation. The color differs among the various animals from a light to a deep chocolate brown, and there is likewise great variation in size of the head and of the whole animal. The Admiralty Island animals are apparently considerably smaller at maturity than many of those in more westerly parts of Alaska.

The animals spend at least 5 months in hibernation and generally emerge about May 1 in an average season, although some individuals may be seen early in April. During the first 2 weeks, or until the pads of the feet have become toughened, the animals do not travel extensively, and are frequently seen on the soft mud flats and grasslands at the heads of the bays.

The bears have no natural enemies.

After the winter hibernation, the food at first consists principally of winter-killed deer carcasses found on or near the beaches, and the roots of herbs and grass. As the spring advances and the snow retreats the animals drift to the slides and other openings above timber line. They spend the early summer largely in the high country, but by the middle of July or the first of August the great majority descend to the salmon-spawning streams to feed on fish. For a month or 6 weeks they bed on the lower timbered slopes and make frequent excursions to the nearby streams, largely at night or in the early morning. At intervals they become surfeited with fish and return for a few days to a vegetable diet, largely of skunk cabbage. Early in September they start drifting away from the streams to the blueberry patches in the scrub timber and muskeg areas and on the higher treeless slopes, where they remain until it is time to hibernate.

¹MERRIAM, C. H. REVIEW OF THE GRIZZLY AND BIG BROWN BEARS OF NORTH AMERICA. U.S. Dept. Agr., North Amer. Fauna no. 41, 136 pp., illus. 1918.

Apparently some bears do not visit the larger and more congested salmon streams. These include very old males too decrepit to defend themselves in the battles staged there, males that have been injured in previous fights and are recuperating in isolation, and females with cubs. The relatively small number of cubs on the salmon streams may be due to the mothers' desire to protect them from other bears. In the bear study of 1932 it was estimated that 10 percent of the bears on the island were not making use of the known salmon streams.

REPRODUCTION AND SURVIVAL

Females first give birth to cubs in the third year of life and thereafter at intervals of 2 years. The cubs are born in the den during the period of hibernation, and the number per litter is 1, 2, or 3, with a probable average, on a conservative basis, of $1\frac{1}{2}$. Apparently there is a high degree of cub mortality from a variety of causes, including perhaps killing by mature animals. Until better data are available the writers are of the opinion that the survival in the cub crop should be considered as not greater than between 50 and $66\frac{2}{3}$ percent.

The life span of the animal is unknown. Ages of 25 years or more are recorded for individuals in zoological parks, but under natural conditions on the range the average may be as low as 15 years. The bearing period in the life of the females is likewise unknown, but is probably at least 10 years.

ESTIMATED BEAR POPULATION

The Forest Service and the Alaska Game Commission made a detailed field estimate in the summer of 1932 of the number of bears on Admiralty Island. Four men well acquainted with brown-bear habits and with conditions on the island did the work between August 10 and September 10, when the bears were largely congregated along the salmon streams. Every stream of any importance was investigated from its mouth at tidewater to a point as far inland as spawning grounds occurred. The estimators covered 50 distinct areas in detail, and in addition made a few excursions into the interior region to determine the number and class of animals that had not come down to the large salmon streams.

The total estimate for the island was 900 animals. Of this number, 820 were ascribed to areas along the salmon streams and 80 to the vast sections not adjacent to these streams. While the estimate was conservative, no arbitrary reductions were made, and full weight was given to all evidence regarded as reasonably conclusive. It is thought that the total estimate given can be accepted as a basis for starting the game-management plan here presented. The number will be checked from time to time as conditions show the need.

Practically all brown-bear sections of southeastern Alaska are known to be satisfactorily stocked. Reliable information on this subject is available from forest rangers, game wardens, prospectors, trappers, and other outdoor men who work in this region constantly, and is confirmed by the number found in the detailed estimate on Admiralty Island. Applying the estimated average for the island—one animal on each 1.85 square miles—to the whole southeastern

Alaska bear range of 27,000 square miles, exclusive of permanent ice fields, roughly estimated at 7,000 square miles, would give a total brown-bear population for the region of 10,810 animals.

It is generally agreed that the number of brown bears in southeastern Alaska has been increasing materially in the past 15 to 20 years, or since the sale of pelts was stopped. A fur dealer in Juneau states that in the days when pelts could be taken commercially, his firm alone obtained between 25 and 50 skins yearly from the Indian village of Angoon on Admiralty, and that these came largely from the three important bear islands of Chichagof, Baranof, and Admiralty. Many other firms were buying at the same time from hunters in the same general field. The regulations and the check-up on the shipment of brown-bear pelts from the Territory are now so rigid that the sending out of contraband pelts is thought to be an immaterial factor.

PRESENT EXTENT OF KILLING

Most of the residents of southeastern Alaska are concentrated in the towns, and few follow occupations or engage in recreational activities that take them into the wilderness areas that constitute the bear habitat. They number, including both whites and Indians, only one person to 1.84 square miles. Jungle-like forests, rough topography, and a wet climate discourage frequent and long trips on the part of townspeople into the bear country.

Bear hunting as a sport has very few local followers. The number of bear hunters from outside the Territory, however, is increasing from year to year, but the kill from this source, which is accurately known, is still too small to jeopardize the bear population on any major subdivision of the range. Furthermore, it should be stated that a majority of the big-game hunters prefer to seek trophies at points farther north and west, where the animals attain a larger size than in southeastern Alaska.

The killing of brown bears by nonresident seasonal workers is still a considerable problem. Few of these men have any interest in game conservation, and many, especially orientals and other foreigners, seem inclined to kill every wild animal and bird they see. Moreover, cannery employees, who constitute the largest class of seasonal workers, are in the Territory during the period that the bears are most accessible. The game laws adequately cover this class of wanton killing, and the Alaska Game Commission is receiving excellent cooperation from the companies bringing such labor to the Territory. The matter is being brought under control, but increased protection by game wardens, forest rangers, and other Government field men is needed. Aliens are not allowed to possess firearms within the Territory, except under permit. This law is an effective game-protective measure, especially as related to alien cannery workers.

Although the practice is not general, the incidental shooting of brown bears by local residents whose occupations take them into the bear sections doubtless accounts for a considerable number of animals yearly. This casual killing is most frequently done by crews

of small boats, and especially in spring and midsummer when the bears are within easy reach of boat anchorages.

Nonresident hunters are required to report their kills to the Alaska Game Commission. The field men of the Commission were instructed, beginning with 1932, to seek information on and keep a record of the number of brown and grizzly bears killed in their respective districts by others than nonresident big-game hunters, the data to be obtained from every reliable source. In the calendar year 1932 the kill in southeastern Alaska was thus determined to be 75 animals, of which 15 were taken by nonresident licensed hunters and 60 by all others. The kill on Admiralty Island was 20 animals, of which 10 were taken by nonresident licensed hunters. Considering these figures and making generous allowance for possible killing not reported to the Commission, there can be no question that the total yearly kill in southeastern Alaska, and on Admiralty Island in particular, is at present well below the net increase.

LAWS AND REGULATIONS PROTECTING BROWN BEARS

The laws enacted by Congress for the protection of game in Alaska give the Secretary of Agriculture broad discretionary powers. Protective measures in force can be changed readily and promptly and kept up-to-date in meeting the demands of changing conditions. The Secretary appoints and acts through the Alaska Game Commission, which, created by the Alaska Game Laws of 1925, consists of five residents of the Territory. Four of these, one from each judicial division, serve without pay except on days when the Commission is in session and when the members are otherwise actively engaged in special game-administrative work. The fifth commissioner is the chief representative of the Bureau of Biological Survey resident in Alaska, and is executive officer and secretary of the Commission. The Commission makes recommendations through the Biological Survey to the Secretary of Agriculture in regard to changes in the laws and regulations, and exercises general direction of the work of the game-warden force. The Biological Survey conducts studies of wild-life problems and acts as technical advisor to the Secretary of Agriculture and to the Commission in its administration of the wild-life resources of the Territory.

The following are the principal provisions of the game laws and regulations of 1933 affecting brown and grizzly bears in southeastern Alaska:

1. Throughout this section of Alaska bear hunting by both residents and nonresidents is restricted to a season extending from September 1 to June 20 (during at least 5 months of which period bears are in hibernation) and to a seasonal bag limit of two animals. No hunting of any kind or at any season is permitted in sanctuaries. No hunting of bears is permitted in closed areas or in refuges established exclusively for bear protection.

2. Nonresidents of the Territory are required to obtain hunting licenses from the Alaska Game Commission at a substantial cost and to employ licensed guides.

3. Residents of the Territory are not required to obtain hunting licenses, pay any fees, or employ guides.

4. Aliens are not allowed to take any protected game animals or to possess firearms, except under an alien special license issued by the Commission and costing \$100.

5. The sale of pelts is prohibited.

6. The use of poison to kill bears or other fur or game animals is prohibited.

7. Dogs may not be used in taking any game animals, and shooting from power boats is not allowed.

8. A resident may kill a brown or a grizzly bear at any time or place when such animal is about to molest persons or property.

BEAR MANAGEMENT

In the sections that follow are presented the essential details of the bear-management plan for Admiralty Island, agreed upon between the Forest Service, the Bureau of Biological Survey, and the Alaska Game Commission.

OBJECTIVE

Every effort will be made to maintain the present bear population of the island. Other resources will be so managed as not to cause a diminution of the number of these animals.

An attempt to increase the bear population will be made if studies and experience show that a larger number can be maintained without undue interference with the use of other important resources of the island.

A number, subject to revision from time to time, will be set up as the maximum that can be taken yearly without jeopardizing the bear population desired. This number will be based on and not exceed the net increase, as determined by field studies at such intervals as appear necessary. Until better information is available on the life history of the brown bear and on mortality, population, and other important factors, the number set as the maximum permissible kill will be very conservative.

SEASONAL CLOSED AREAS AND BAG LIMITS

In case overhunting develops or becomes imminent, all or any portion of the island, as may be deemed necessary, will be closed to bear hunting for entire seasons or for parts of seasons until the deficiency, as far as can be determined, has been made up. As an alternative, the bag limit on the island will be reduced if this appears to be the more desirable conservation measure under the then-existing conditions.

SEMI-PERMANENT CLOSED AREAS

In addition to the seasonal closing of portions of the island to bear hunting because of overshooting, semipermanent closed areas will be established from time to time. Bear hunting and such other recreational or commercial activities as appear objectionable on any particular area will be forbidden there. Closed areas of this kind will be extended, vacated, or replaced by others as changing conditions warrant. This type of refuge will be extended particularly to such localities as the following:

1. Areas with an outstanding heavy stocking in the spring, when the cubs are small. Under this provision there is now withdrawn

an area of 60 square miles² covering the Thayer Mountains (fig. 3) and lying between Lake Hasselborg and Thayer Lake, as shown on the map (fig. 1). No logging will be permitted on this area.

2. Small heavily-stocked areas of ready accessibility where bears can be observed by naturalists, photographers, and the general public. The entire watershed of Pack Creek, 21 square miles, which empties into Seymour Canal near the north side of the entrance to Windfall Harbor, is now withdrawn for this purpose. No logging is to be done and no form of land use or occupancy is permitted in this watershed.

Photo by Navy Department.

FIGURE 3.—Portion of Thayer Mountain and lake system in the interior of Admiralty Island. All lands surrounding Thayer Mountain and the lakes are a part of the Thayer Mountain closed area.

3. Lands in the general vicinity of logging camps, trollers' camps, and other centers of seasonal occupancy, where this action may be advisable to assist in controlling casual or illegal killing.

4. General recreation areas, consisting of small tracts to be administered solely for recreational purposes. No hunting of any kind and no logging or any form of land use will be allowed on such areas.

²Thayer Mountain closed area on Admiralty Island is described as follows: Beginning at the foot of the waterfall at the mouth of Hasselborg River on Salt Lake, head of Mitchell Bay; thence along the easterly bank of the Hasselborg River to the outlet of Hasselborg Lake; thence along the west shore of said lake to the outlet of the creek flowing into the head of the lake; thence upstream along the east bank of said creek to the trail crossing; thence in a southwesterly direction along the trail to the head of Thayer Lake; thence along the easterly shore of said lake to the extreme southern end of the lake; thence southeasterly approximately 2 miles in a straight line to the west end of Salt Lake at the head of Mitchell Bay; thence along the line of mean high tide of Salt Lake to the foot of the waterfall on Hasselborg River, the place of beginning; as shown on the map (fig. 1). The total area is approximately 60 square miles.

RESTRICTIONS ON THE USE OF OTHER RESOURCES

Public-service sites are established as the need for anchorages, trail terminals, portages, and other public uses develops in connection with bear-management activities and general recreation. Such lands cannot be patented but are held for public use. The principal public-service sites so far established are (1) the head of Windfall Harbor as a harbor and trail terminal for ingress to the interior of the island, (2) portage between Young Bay and Hawk Inlet, and (3) portage between Oliver Inlet and Seymour Canal.

Logging camps will be so placed with reference to salmon streams as to interfere as little as possible with bears on such streams during the salmon-spawning season.

In acting on application for homesteads, home sites, hunting-lodge sites, and other forms of land occupancy or use at any point on the island, consideration will be given to possible conflict with bears, provided that no such application will be disapproved on this account for lands in the vicinity of towns and other centers of year-long human occupancy. Among such existing centers are Angoon, Tyee, and Funter Bay.

IMPROVEMENTS

A system of trails, portages, and shelter cabins is being constructed on areas of greatest recreational importance on the island as funds permit. The first trails contemplated are those from tidewater of Seymour Canal to the lakes in the interior of the island, short portages to connect these lakes, and trails from the lakes to Mitchell Bay and Chatham Strait. A trail is also proposed from the beach of Seymour Canal to a point on Pack Creek for the use of those wishing to observe the bears in this closed area. An observation blind will be constructed on this creek at the same time.

Shelter cabins, open on one side, are being constructed of logs at desirable places on the trail system. A more elaborate cabin is to be built on Hasselborg Lake at a point readily reached by airplane and accessible to the trails in that locality.

COOPERATION

Special efforts will be made to obtain the cooperation of other Federal and Territorial agencies, national and local game-protective organizations, and the local general public in the protection of the bears and other game animals of the island.

PROTECTIVE LIMIT ON YEARLY KILL

The bear-management plan contemplates that a good stocking of the island shall be maintained indefinitely and, more particularly at this time, that the present bear population, which was estimated in 1932 at 900 animals, shall not be reduced. The most important action to insure this result is to limit the yearly kill to a number that does not exceed the yearly net increase. There are a number of imperfectly known factors, especially in the life history of the brown bear, that must be taken into account in determining the number of births yearly in a given bear population. The proportion of the cubs that survive and reach maturity is still also an open

question. On the basis of the available knowledge it is conservatively estimated that in a population of 900 animals the net increase after all losses are taken into consideration should be at least 100.

In view of a number of assumptions that had to be made in estimating the net increase, based on the surviving cub crop, and in order to operate on the side of safety, the allowable yearly kill at the beginning of the management plan is placed at 35 animals.

The allowable kill is subject to increase or reduction from time to time, changes being dependent especially on the availability of better scientific data on the life history of the bears, and an increased knowledge of the local situation affecting the animals. In addition to holding the existing bear population intact, the regulation of the kill may be used as a means of increasing the population, if experience gained in the coordinated management of the various resources of the island shows that an increase is possible and advisable.

RESPONSIBILITY AND FUNCTIONS OF COOPERATING OFFICIALS

The carrying out of the provisions of this working plan will be a joint project of the Alaska Game Commission and the Alaska Region of the Forest Service. The Bureau of Biological Survey will cooperate so far as is possible in scientific studies of game problems that cannot be handled by the commission alone or with the assistance of the Forest Service.

The Alaska Game Commission will be responsible for making field studies on the island to obtain information as a basis for maintaining the desired bear population; for ascertaining the number of animals taken yearly; for the establishment of desirable regulations relative to the taking of bears, including length of hunting season, bag limits, methods of taking game, seasonal closing of portions of the island to hunting when deemed advisable, and such other matters as refer solely to game regulations. The regional forester will be offered opportunity to present his views to the commission on any proposed change in the game regulations.

The commission will be primarily responsible for affording protection against violations of the hunting regulations, and substantial cooperation in the field will be furnished by the Forest Service.

The Biological Survey will make such game studies as it may find desirable.

The commission will take the lead in seeking cooperation from Federal and Territorial agencies, game-protective organizations, and the local public for bear protection on the island.

As administrator of national-forest lands and their resources, the Forest Service will have the responsibility of coordinating the use of game with that of all other resources, commercial and recreational. In projects and plans involving use of land and resources, the Forest Service will give careful consideration to the possible effect on the bears and will make such adjustments as may be deemed necessary. The commission is free at all times to present its views to the Forest Service on any feature of administration of the land and its resources that affect the bear resource.

Semipermanent closed areas will be established and vacated by the commission with the approval of the Forest Service, with the excep-

tion that general recreational areas will be wholly the responsibility of the Forest Service.

The withdrawal and vacation of public-service sites will be a function of the Forest Service.

The Forest Service will be responsible for the location and construction of trails, portages, shelter cabins, and other improvements of value for the hunting, protection, or observation of bears.

During the active salmon-spawning period, when the bears are congregated on the salmon streams, the commission will maintain a launch patrol around the island to afford extra protection to the animals. The Forest Service will make a special effort to supplement this intensive protective work of the commission. Forest Service launches will patrol the shore line in connection with their regular work, and forest officers in their capacity of game wardens will enforce the regulations. If circumstances cause an unavoidable interruption in the commission's patrol work at this period the Forest Service will endeavor to carry it on until the interruption is terminated. All Forest Service officers working in the brown-bear region will hold appointments as game wardens of the Alaska Game Commission.