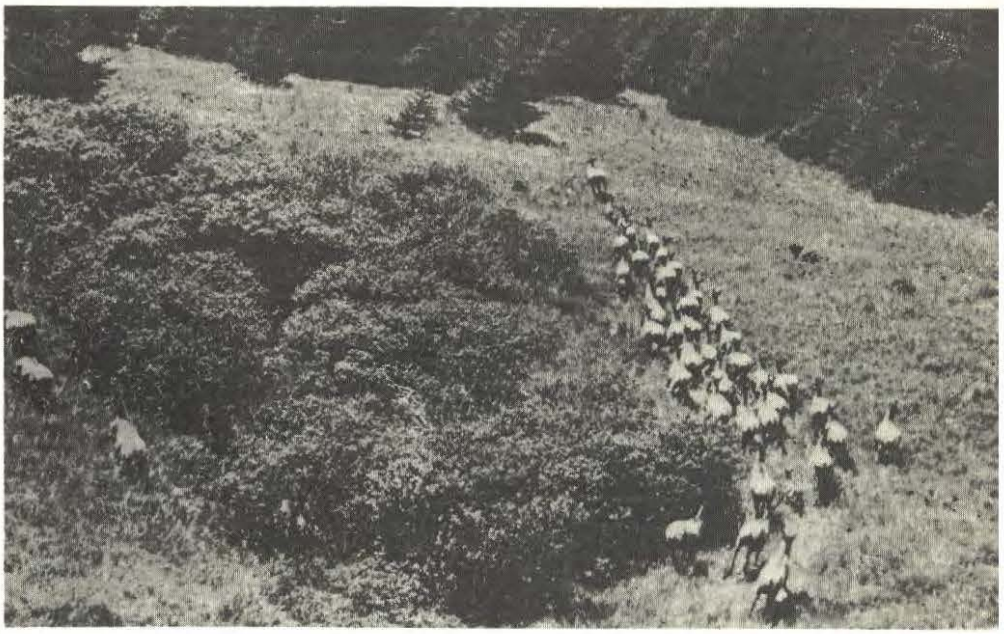
ALASKA DEPARTMENT OF FISH & GAME

1960-61 Pittman-Robertson Project Report

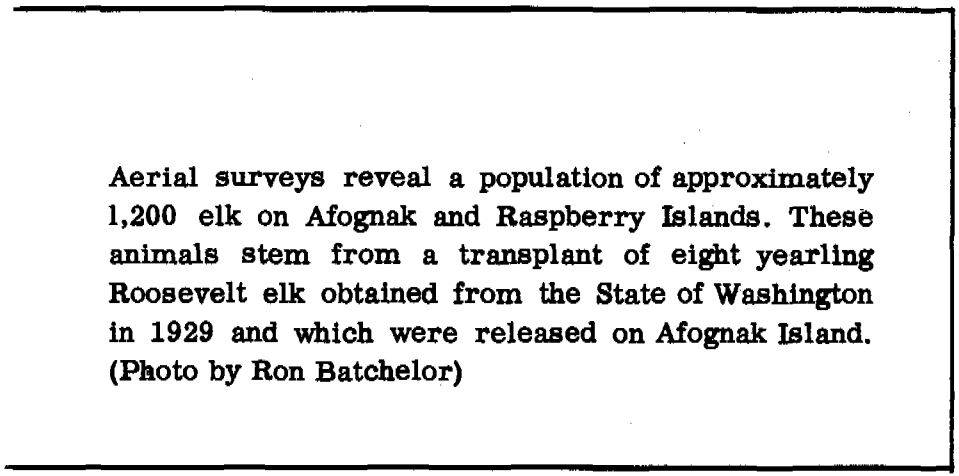
'ISION OF GAME VOLUME II, NO. 4

ELK AND BISON MANAGEMENT INVESTIGATIONS

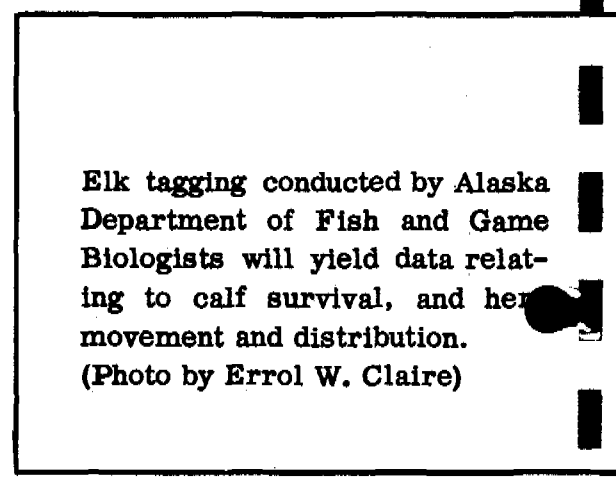
Work Plans D and L-2



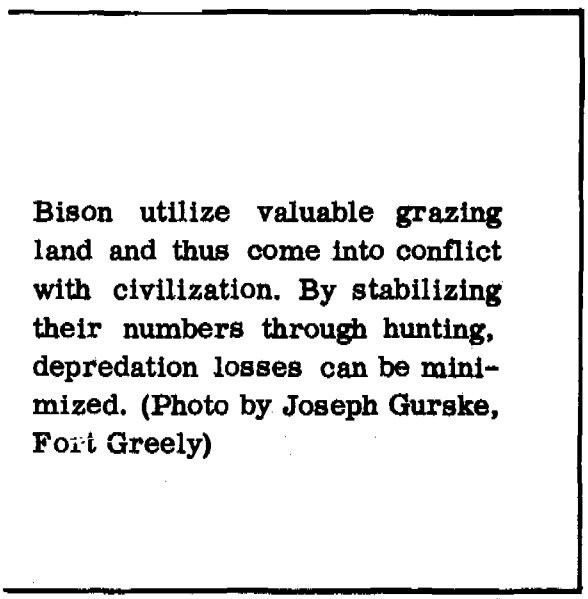
Juneau, Alaska



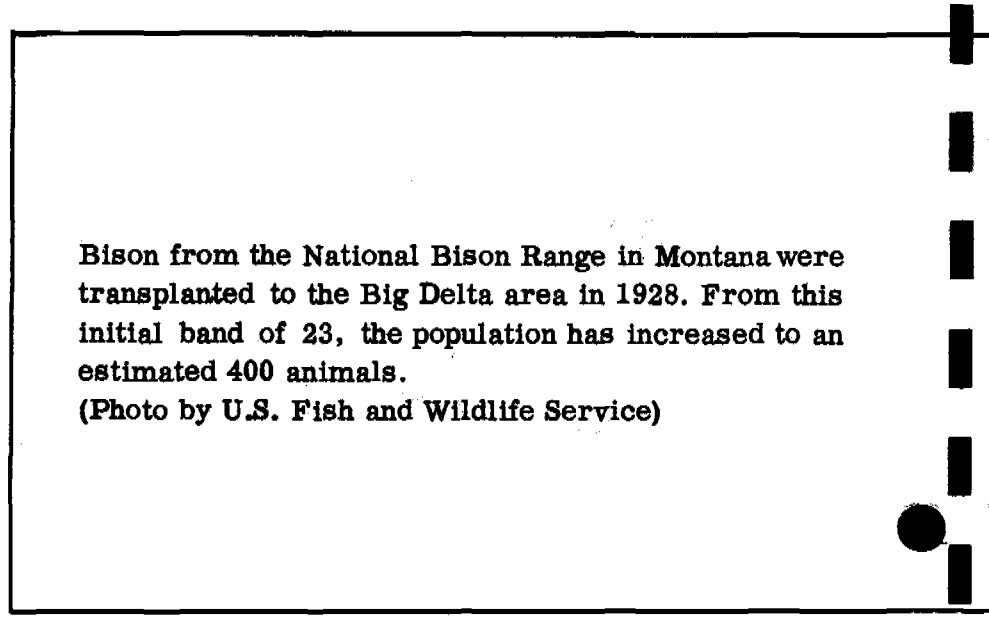
Aerial surveys reveal a population of approximately 1,200 elk on Afognak and Raspberry Islands. These animals stem from a transplant of eight yearling Roosevelt elk obtained from the State of Washington in 1929 and which were released on Afognak Island. (Photo by Ron Batchelor)



Elk tagging conducted by Alaska Department of Fish and Game Biologists will yield data relating to calf survival, and herd movement and distribution. (Photo by Errol W. Claire)



Bison utilize valuable grazing land and thus come into conflict with civilization. By stabilizing their numbers through hunting, depredation losses can be minimized. (Photo by Joseph Gurske, Fort Greely)



Bison from the National Bison Range in Montana were transplanted to the Big Delta area in 1928. From this initial band of 23, the population has increased to an estimated 400 animals.
(Photo by U.S. Fish and Wildlife Service)

Volume II, Number 4 1960-1961

ANNUAL REPORT OF PROGRESS, 1960-1961

FEDERAL AID IN WILDLIFE RESTORATION PROJECT W-6-R-2

GAME INVESTIGATIONS OF ALASKA

STATE OF ALASKA

William A. Egan, Governor

Alaska Department of Fish and Game

Clarance L. Anderson, Commissioner

Division of Game

James W. Brooks, Director
David R. Klein, P-R Coordinator

Personnel participating in project:

Ronald F. Batchelor
Robert A. Rausch
Joseph A. Nava, Jr.

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Reports of Investigations

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Volume 2 Report No. D-1a

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: D Roosevelt Elk Studies

Job No: 1-a Title: Herd Distribution and Abundance

PERIOD COVERED: February 1, 1961 to March 31, 1961

ABSTRACT:

During February and March aerial surveys of Afognak and Raspberry Islands were conducted as a means of evaluating winter distribution of elk herds inhabiting the two Islands. As a result of the survey 4 distinct wintering areas were observed and 720 elk were counted. Tracks and signs of unobserved animals suggest that many more elk than were observed winter in the four key winter ranges.

OBJECTIVES:

To determine the distinctness, size and seasonal distribution of recognizable herds of elk inhabiting Afognak and Raspberry Islands. To determine present herd status as a basis for harvest regulations.

TECHNIQUES:

Aerial surveys were conducted periodically through the winter for the purpose of ascertaining elk numbers and winter distribution. On-the-ground observations to obtain sex and age composition data were attempted but were found unsuccessful.

FINDINGS:

Winter Distribution and Status: During the months of February and March an aerial survey of Afognak and Raspberry Islands was conducted to ascertain elk numbers and patterns of winter distribution. At the time of the survey elk herds of the two islands were found to occupy four distinct winter ranges, Table 1 and Figure 1. Of these 4 ranges, the Afognak Lake area of southwestern Afognak Island was considered the major wintering area, supporting 338 or nearly 50 per cent of all elk recorded during the survey. In addition to the animals counted, numerous tracks and sign of unobserved elk noted in the heavily timbered southeastern portion of the Afognak Lake area suggested that many more elk than were sighted wintered in this region.

Frequent aerial surveys of southwestern Afognak made during the period the elk drift onto their winter range indicated that animals summering along the crest north of Raspberry Strait and in the Malina Lakes area winter in the vicinity of Afognak Lake.

An aerial count of the Tonki Cape region of northeastern Afognak revealed 171 elk wintering in the area. Like lower Afognak Lake, much of Tonki Cape is timbered making a total count impossible. As was observed in all wintering areas of Afognak, numerous tracks and signs indicated that many more elk than were counted inhabited the Tonki Cape area. A conservative estimate places the Tonki herd at approximately 225 head.

Throughout northcentral Afognak scattered bands of from 15 to 53 head were observed during the survey. As this portion of the island supports a dense Sitka spruce climax forest, figures obtained during the survey only suggest the status of elk in this region. Additional surveys will be required in order to evaluate populations wintering in this area of Afognak Island. Information gathered to date suggests that elk summering on the Paramanoff Peninsula of western Afognak move from that area into the heavily timbered north central region of Afognak during the winter.

A survey of Raspberry Island during February revealed that a herd of 115 animals wintered in the Onion Bay area of

Table 1. Roosevelt elk distribution on Afognak and Raspberry Islands, February, 1961.

WINTER RANGE	No. Elk Counted	% Total Elk Counted
Raspberry Island (Onion Bay area)	115	16
Afognak Lake	338	47
Northcentral Afognak Island	96	13
Tonki Cape	171	24
TOTAL	720	

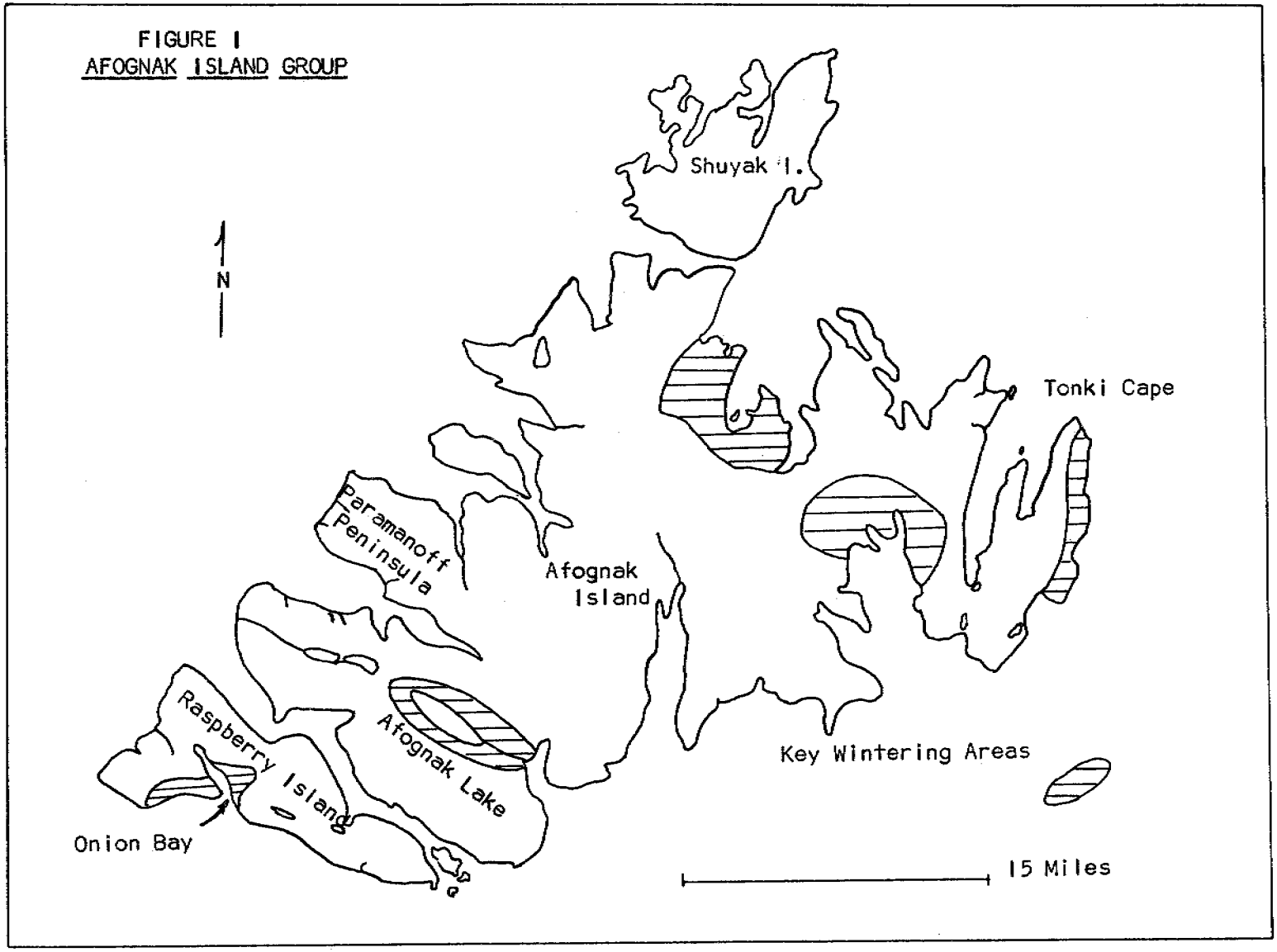


FIGURE 1
AFOGNAK ISLAND GROUP
Shuyak I.
N
Tonki Cape
Paramanoff Peninsula
Afognak Island
Raspberry Island
Afognak Lake
Key Wintering Areas
Onion Bay
15 Miles

the southwestern end of the island. This herd was frequently observed in this vicinity throughout the winter.

That the spruce climax plays an integral part in the ecology of the Roosevelt elk of the Afognak Island Group was demonstrated throughout the winter survey. Of the four above mentioned winter ranges, all are characterized by dense stands of Sitka spruce with adjacent Alnus-Sambucus and Calamagrostis-Salix associations. The later two associations supply the bulk of the available winter forage while the spruce association affords protection from severe winter weather. During periods of inclement winter weather elk were to be found almost entirely within the dense spruce forest, only to venture into the shrublands to feed for short periods of time.

Observations of key winter ranges made throughout the winter revealed that the distribution of elk is closely tied in with the spruce climax. It is very doubtful that an elk population of any magnitude will ever become established outside the forested areas of the Kodiak Archipelago. This same conclusion has been drawn regarding the distribution of the Sitka black-tailed deer of the Kodiak area.

At the conclusion of winter aerial surveys a total count of 720 elk was obtained from 4 distinct winter ranges of the Afognak - Raspberry Island Group. This figure, it is estimated, represents approximately 60 per cent of the total elk population of the Kodiak Archipelago.

Sex and Age Composition: Though it was hoped herd classification information could be obtained during the winter survey, it was found that conditions at this time of the year made it impossible to gather such data. Data concerning composition of Afognak and Raspberry elk herds will be presented in a later report.

RECOMMENDATIONS:

The collection of distribution and herd composition data on an annual basis is essential for the proper management of the Roosevelt elk.

SUBMITTED BY:

Ronald F. Batchelor
Game Biologist
June 30, 1961

APPROVED BY:

David R. Klein
P-R Coordinator

James W. Brooks, Director
Division of Game

Volume 2 Report No. D-1b

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: D Elk Management Investigation, Afognak Island

Job No: 1-b Title: Range Studies

PERIOD COVERED: July 1, 1960 to June 30, 1961

ABSTRACT:

This project was relatively inactive during the past year.

OBJECTIVES:

To delineate seasonal elk ranges, and determine their vegetative composition. To determine forage and browse production in relation to availability, utilization, and preference.

TECHNIQUES:

Elk surveys conducted in connection with Job No.D-1a served to delimit seasonal elk ranges. Plant composition, utilization and condition and trend are determined by standard range analysis methods.

FINDINGS:

Data regarding winter distribution and use of key winter ranges by elk were reported in Job No. D-1a. Range analysis, utilization and condition and trend data have not been gathered during this period. Initial investi-

gations regarding range use and range types were conducted during the period but are incomplete and will be reported at a later date.

RECOMMENDATIONS:

The evaluation of range condition and trend, utilization, and forage production is an integral segment in the management of the Roosevelt elk of the Afognak Island Group and should be continued.

SUBMITTED BY:

Ronald F. Batchelor
Game Biologist
June 30, 1961

APPROVED BY:

David R. Klein
P-R Coordinator

James W. Brooks, Director
Division of Game

Volume 2 Report No. D-1c

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: D Elk Management Investigations, Afognak Island

Job No: 1-c Title: Productivity Analysis

PERIOD COVERED: July 1, 1960 to December 31, 1960

ABSTRACT:

This phase of the project was inactive during the period.

OBJECTIVES:

To obtain data concerning elk breeding, fertility and parturition; to determine factors affecting these elements of productivity; and to apply this information to proper herd management.

TECHNIQUES:

Field observations of the timing, duration of the rut, and of the behavior of the elk during this period will be recorded. Fertility data will be gathered from observations made in the field, reproductive tracts, and measurement of survival of the calf crop to the period of legal hunting.

FINDINGS:

Only preliminary investigations have been conducted

regarding this phase and available data will be presented in a later report.

RECOMMENDATIONS:

The collection of data regarding current production should be gathered on an annual basis.

SUBMITTED BY:

Ronald F. Batchelor
Game Biologist
June 30, 1961

APPROVED BY:

David R. Klein
P-R Coordinator

James W. Brooks, Director
Division of Game

Volume 2 Report No. D-1d

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: D Elk Management Investigations, Afognak Island

Job No: 1-d Title: Mortality Studies

PERIOD COVERED: September 1, 1960 to June 20, 1961

ABSTRACT:

During the course of the investigation and in conjunction with other phases of the elk study no cases of mortality other than hunter harvest were recorded.

OBJECTIVES:

To obtain data relating to annual mortality sustained by Raspberry and Afognak Islands' elk herd; to identify and evaluate the degree to which individual mortality factors are acting; and to apply this information to proper herd management.

TECHNIQUES:

Field observations concurrent with other phases of the elk study were conducted to establish the degree and periods in which mortality is acting on both the total herd and individual elements.

FINDINGS:

During the course of the investigation, no cases of elk mortality were recorded from Raspberry and Afognak Islands. The terrain and vegetation of the elk range are such that carcasses of naturally dying animals cannot be readily located even though intensive searches are made.

RECOMMENDATIONS:

If the collection of mortality data cannot be accomplished through carcass counts, evaluation of natural mortality will have to be made from composition counts made throughout the year.

SUBMITTED BY:

Ronald F. Batchelor
Game Biologist
June 27, 1961

APPROVED BY:

David R. Klein
P-R Coordinator

James W. Brooks, Director
Division of Game

Volume 2 Report No. D-1e

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: D Elk Management Investigations

Job No: 1-e Title: Characteristics of the Hunter Harvest

PERIOD COVERED: August 20, 1960 to October 31, 1960

ABSTRACT:

The Roosevelt elk kill for 1960 was 127 animals harvested during a 57 day season. Of this figure, 68 animals were bulls, 43 were cows, 2 were calves, and 14 were unidentified as to sex. At the conclusion of the season seven more elk were harvested over the 1959 figure. A collection of 51 elk jaws revealed that 47 per cent of the female sample was represented by animals in the 4.5+ year class while 48 per cent of the male sample was composed of animals in the 1.5 year class. Available data indicate an existing differential age ratio between the male and female segments of the population. Hunter success for the 1960 season was 37 per cent. The desired harvest of 150 animals was not attained, even with a liberal 20 day either-sex season.

OBJECTIVES:

To secure information relative to the total kill of elk by hunters, area and chronological distribution of the kill, and hunter success.

To determine and evaluate the sex and age composition

of the kill and the physical characteristics of elk harvested.

TECHNIQUES:

Harvest information for the 1960 elk season was obtained in part through contact with hunters in the field. In addition, hunter-harvest forms were distributed to the military, local meat processors, and air lines in the Kodiak area. Throughout the season aerial surveys and hunting camp checks were conducted to determine the extent of the harvest. Hunters checked in the field were encouraged to report their kills and turn in elk jaws to the Department's office in Kodiak.

The 1960 hunting season opened on September 1 and extended through the 30th with the taking of either-sex animals permitted during the last five days (26-30). In addition, a 15 day extension during which either-sex animals could be taken was provided. In the Tonki Cape area the season extended from August 20 through October 15 with no sex restrictions. The bag limit was one elk.

Prior to the opening of the season, jaw collection posters were distributed locally for hunters to observe. In addition, several ads were run in the local Kodiak paper reminding hunters to turn in elk and deer jaws.

Lower jaws were collected and analysed to ascertain the age structure of the harvest and when practical, weights and measurements of elk carcasses were recorded.

FINDINGS:

Sex breakdown of the kill: The sex breakdown of the total legal elk harvest for 1960 was 54 per cent bulls as compared to 87 per cent in 1959. The cow kill increased from 13 per cent of the total harvest (limited cow season) in 1959 to 34 per cent of the 1960 kill. This large increase of cows in the kill can be attributed to the liberal 20 day either-sex period during this year's season.

Age distribution of the kill: The age distribution of a segment of the 1960 harvest is shown in Table 1. This

Table 1. Age distribution of Roosevelt elk kill - 1960.

Age	No. of Jaws Represented	Per Cent
0.5 years	2	4
1.5 years	20	39
2.5 years	10	20
3.5 years	6	12
4.5 years	1	2
Over 4.5 years	12	23
	51	

Table 2. Comparison of age distribution of female elk kills, 1959*- 1960.

Age	1959 Per Cent	1959 No. of Jaws Represented	1960 Per Cent	1960 No. of Jaws Represented
0.5 years			5	1
1.5 years	0	0	26	5
2.5 years	27	3	11	2
3.5 years	18	2	11	2
4.5+ years	55	6	47	9
		11		19

* Tonki Cape area only.

distribution is based on a sample of 51 elk jaws collected during the season for aging purposes. Of the 51 jaws collected, 19 were from females, 27 from males, and 5 from unidentified animals.

Female age distribution: A sample of 19 female elk jaws was collected during 1960. Age ratios of female elk represented in the kill are shown in Table 2.

Female age ratios were found to be unlike the male ratios in that 47 per cent of the female sample was represented by the 4.5+ year class while this same year class for the male segment was only 8 per cent of the total. In 1959, the first year female animals were legally harvested on a limited basis, the 4.5+ year class represented 55 per cent of the total for this sex and 34 per cent for males.

Although the jaw samples collected during 1959 and 1960 are small and the reliability of the samples may be questioned, all available data point to an existing differential age ratio between male and female segments of the population. A contributory factor has been the harvest of males for a period of nine years and females for only two years and one of these years on a limited basis only.

Further data will be needed before any elaboration on this point can be made.

Male age distribution: The age distribution of a sample of the male elk killed during the 1960 season is presented in Table 3. Of particular interest is the high percentage of 1.5 year class animals in the sample. The proportion of young males in the kill has shown a marked increase from the 1958 level while the percentage of old animals (4.5+ year class) has exhibited a marked decrease over the same period. This is evidenced by data presented in Table 4. Prior to 1958 few 1.5 year class males occurredin the harvest as the season was opened for forked-horned animals or better. The large percentage of 1.5 year class animals recorded in the kill since 1957 may reflect the following factors: (1) the presence of a large number of young animals in the population as a whole, (2) a high amount of selectivity of young animals on the part of local elk hunters, or (3) a combination of points 1 and 2. The high percentage of old females in the

Table 3. Distribution of 1960 elk harvest.

BULLS		COWS		CALVES		UNIDENTIFIED		TOTAL KILL
Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent	1960
68	54	43	34	2	2	14	11	127

Table 4. Comparison of age distribution of male elk kills, 1956 - 1960.

	1956		1957		1958		1959		1960	
Age	%	No. of Jaws Represented	%	No. of Jaws Represented	%	No. of Jaws Represented	%	No. of Jaws Represented	%	No. of Jaws Represented
0.5 years									4	1
1.5 years	3	1	27	10	43	19	30	14	48	13
2.5 years	28	8	11	4	23	10	19	9	30	8
3.5 years	14	4	19	7	16	7	17	8	11	3
4.5+ years	55	16	43	16	18	8	34	16	8	2
TOTALS		29		37		44		47		27

1959 and 1960 kills suggests that hunters preferring young animals have difficulty selecting young cows from old cows.

Distribution of kill by area: The distribution of the kill by area is shown in Table 5. The Lower Raspberry Straits and Afognak areas received the heaviest kill during the 1960 season. This was desirable as these two areas were lightly harvested in 1959. The Tonki Cape area which supports an estimated elk population of between 150 and 200 head accounted for only 14 per cent of the 1960 harvest. This area continues to be under-harvested even with a liberal either-sex season of 57 days. In 1959 the cow elk season on Tonki was a special incentive to hunters and of the 33 animals killed, 16 were cows. This year only 18 elk were harvested in this area, 12 of which were bulls, and 6 were cows.

Chronological distribution of the kill: The distribution of the kill by five day periods is shown in Figure 1. In previous years the heaviest hunting pressure occurred during the early portion of the season and then slacked off. During 1960 the greater portion of the total harvest (37 per cent of the total kill) occurred during the last 5 days of the general season. At this time animals of either sex were legal. During the 15-day extention to the either-sex season, 11 animals or 10 per cent of the total were added to the kill.

Hunter harvest - 1960: Approximately 345 hunters harvested 127 elk for a success ratio of 37 per cent. A number of hunters from Anchorage and other Alaskan points participated in the hunt.

It is evident in Table 6 that the number of hunters participating in the pursuit of elk has stabilized during the last three years. If this number does not increase within the near future it will be difficult to achieve adequate hunting pressure to properly harvest and control the elk populations of Raspberry and Afognak Islands.

Weather conditions this year were excellent for the hunter. Had there been some snow in the high areas to drive elk off the mountain tops, perhaps a greater harvest might have been accomplished.

Table 5. Distribution of elk kill by area, 1958 - 1960.

1958

Area Killed	Number Represented	Per Cent
Raspberry Island	44	44
Afognak Island		
Malina Area	14	14
Lower Raspberry Straits	31	31
Tonki Cape	10	10
Total	99	

1959

Area Killed	Number Represented	Per Cent
Raspberry Island	17	14
Afognak Island		
Malina Area	38	32
Upper Raspberry Straits	22	18
Lower Raspberry Straits	10	8
Tonki Cape	33	28
Total	120	

1960

Area Killed	Number Represented	Per Cent
Raspberry Island	23	18
Afognak Island		
Malina Area	24	19
Lower Raspberry Straits	34	27
Afognak Lake Area	28	22
Tonki Cape	18	14
Total	127	

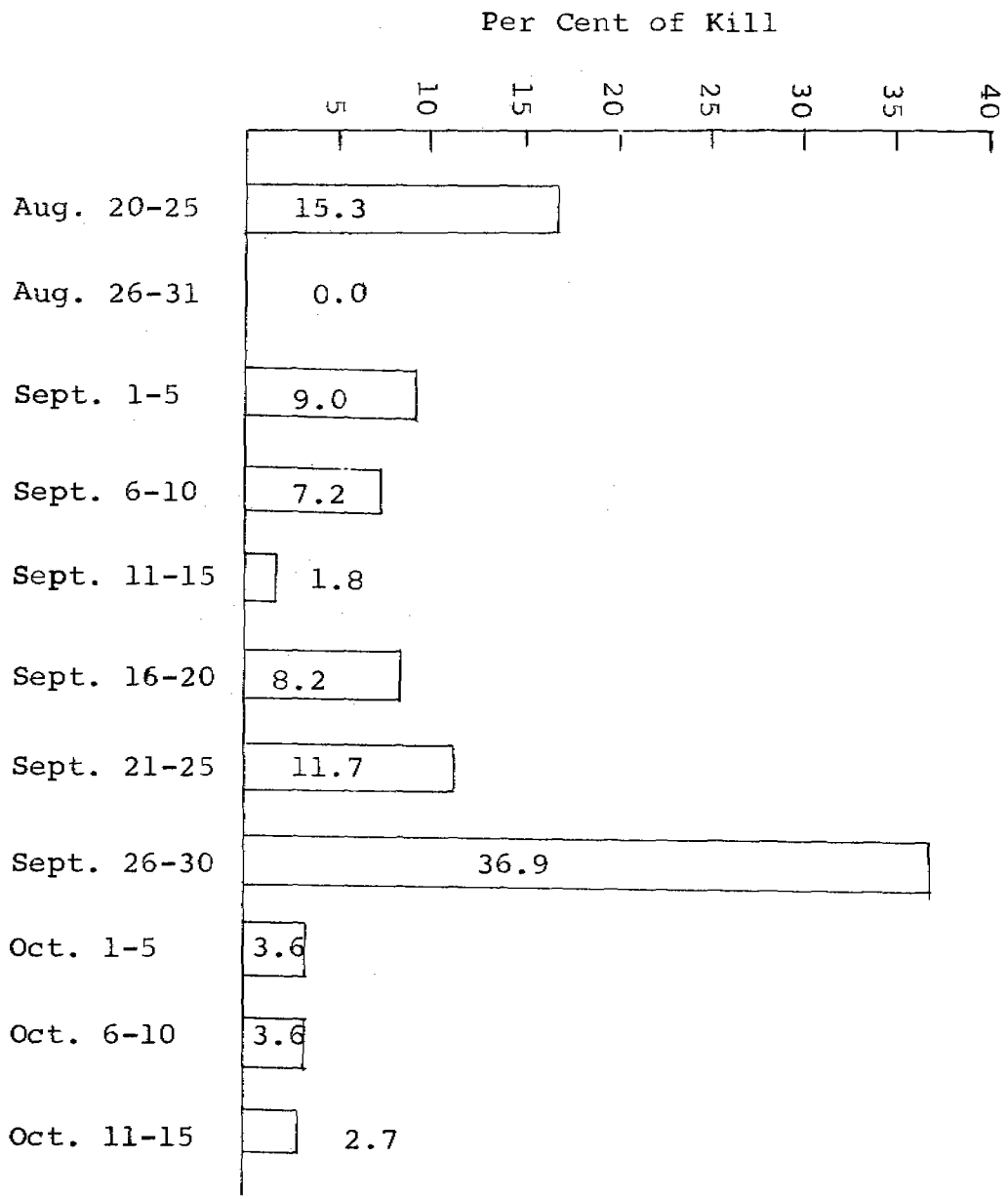


Figure 1. Chronological distribution of elk kill - 1960.

Table 6. Roosevelt elk kills, 1950 - 1960.

Year	Kill	Number of Hunters	Per Cent Hunter Success
1950*	27	50	54
1951	0	0	0
1952*	15	35	43
1953*	19	40	48
1954	0	0	0
1955	26	105	25
1956	40	135	30
1957	70	250	28
1958	111	345	32
1959	120	330	36
1960	127	345	37

* Hunting by permit only.

It had been hoped that the additional 15 day extension to the season would accomplish the desired harvest of 150 animals. This extension coupled with the regular season provided for the taking of animals of either sex over a 20 day period.

Physical condition of elk: Data concerning the physical condition, weights, and measurements of elk are incomplete, and will be presented in a later report.

RECOMMENDATIONS:

Every effort should be made to increase the hunter harvest of elk in order to maintain the present high degree of productivity and to insure a proper balance between populations and their available ranges. As has been true with other species of Alaska wildlife, sufficient numbers of hunters are not available to adequately harvest existing populations of elk on Afognak and Raspberry Islands. The continued liberalization of either-sex harvesting and the manipulation of seasons appear in the light of present management problems, to be the best techniques available to properly harvest existing herds.

PREPARED BY:

Ronald F. Batchelor
Game Biologist
November 23, 1960

APPROVED BY:

David R. Klein
P-R Coordinator

James W. Brooks, Director
Division of Game

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: L Wildlife Data Collections

Job No: 2 Title: Bison Management Investigations

PERIOD COVERED: November 1, 1960 to March 30, 1961

ABSTRACT:

An aerial census of the Big Delta bison herd conducted on November 16, 17 and 20, 1960 revealed 318 animals. The herd is estimated at 350 animals. Calves comprised 12 per cent of the herd. Approximately 85 per cent of the Delta herd frequent the Clearwater homestead area in the fall. Depredations by the Delta herd caused an estimated loss of $12,730 in 1960. The loss for the past 10 years is estimated at $33,480.

Twenty-nine bison were counted during the aerial census of the Nabesna herd. This herd is estimated to contain at least 50 animals. The Nabesna herd has moved from the original placement site near Nabesna to the Copper River between Copper Center and Chitina. There has been no property damage caused by the Nabesna herd.

OBJECTIVES:

To determine current size and population structure of the Big Delta and Nabesna herds. To determine herd distribution and movements during the year. To determine extent of property damage to homesteads, rural communities and govern-

ment agencies as a result of bison depredation. To develop a practical management plan for the Delta and Nabesna herds.

TECHNIQUES:

A total count of the Delta area bison herd was attempted. Early November was selected as the best time for the count because of the distribution of the bison, snow cover, and the desire to obtain information comparable to that obtained during the census conducted in November of 1955.

An area of approximately 3,000 square miles was selected as representing the total range of this herd. Six aircraft were used, each being assigned to a separate section. The aircraft used were two Department of Fish and Game 150 Supercubs, one chartered Cessna 180, two Army L-19's, and an H-13 helicopter. Personnel were from the Alaska Department of Fish and Game, U. S. Fish and Wildlife Service, Fort Greely, the Arctic Test Board, a representative of the Tanana Valley Sportsmen's Association, and a representative of the Delta Clearwater homesteaders. Inclement weather was encountered, consequently, a period of five days elapsed before the count was completed on one of the sections. The census of the Nabesna herd was conducted in March and consisted of two flights. One was made by Protection Officer William Sholes in a chartered Supercub, the other was made by Conservation Officer Buck Stewart and Game Biologist Joe Nava of Tok. A total count was undertaken but only the reported area of concentration could be flown due to the lack of time. Undoubtedly some bison in outlying areas were missed.

The distribution and movement of the Delta herd was determined mostly by observation. Observations were made from the ground and the air during a five-month period. It was necessary to rely on past observations of others to obtain information on year around movements. Difficulty was encountered in determining herd or band identity in the vicinity of Delta Junction. Tagging of some of these animals with colored, plastic ear-streamers revealed that the bison intermingled in a completely unpatterned manner. Tagging was accomplished by rendering the animals immobile with succinylcholine chloride. Palmer Cap-chur equipment was used to administer the drug.

The movement of the Nabesna herd was determined by interview since observation time in the area was limited.

The amount of property damage due to bison depredations was determined mostly by interview. One observation trip was made to the Clearwater homestead area by the Project Supervisor and Conseravtion Officer Buck Stewart in September of 1960. Agencies and individuals contacted concerning bison depredations are as follows: the U. S. Army post at Fort Greely, the Federal Aviation Agency at Delta Junction, Delta Junction residents, and Delta Clearwater homesteaders. In addition, a notice was run in the local newspaper requesting information regarding other possible bison depredations.

FINDINGS:

Census

Delta Herd

Data from the aerial census conducted on November 16 through 20, 1961, when combined with information on bison inhabiting adjoining areas not surveyed at that time revealed an estimated population of 352 bison (Table 1). The fresh blanket of snow created ideal conditions for the count. This snow greatly enhanced the success of the count, enabling observers to distinguish between fresh and old tracks and accentuated the contrast between the dark bison and the white background. Fresh bison tracks were seen and recorded in area six (Figure 1). The animals were in dense white spruce and were not sighted. I believe, when considering the sighting conditions and intensive coverage, that not more than five to ten per cent of the herd inhabiting the area surveyed could have been missed. Possibly a few lone animals or small bands resting in or traveling through spruce forest were missed.

Nabesna Herd

Twenty-nine bison were located in a partial survey of the Nabesna Herd. As this herd, which apparently winters on the northeast bank of the Copper River between the Dadina River and Chetaslina River, has scattered over many hundreds

TABLE 1. DELTA BISON CENSUS, 1960

AREA	DATE	PILOT AND OBSERVER	HOURS FLOWN	TOTAL BISON SEEN	CALVES SEEN
1	11-16-60	Grundman & Stewart	2.0	0	-
2	11-16-60	Norton & Nava	3.0	0	-
3	11-16-60	Lanni & Hortman	1.3	0	-
4*	11-16-60	Sherbert & Pinkham	4.5	42	?
5	11-16-60	Jones & Mathis	?	4	?
6**#	11-16-60	Bentley & Rausch	3.9	54	3
7	11-17-60	Lanni & Pinkham	?	6	?
9	11-17-60	Lanni & Pinkham	?	0	-
5	11-17-60	Jones & Nava	3.0	52	8
6	11-19-60	Bentley & Nava	.5	19	2
6	11-20-60	Bentley & Nava	1.1	78	15
8***	11-20-60	Bentley & Nava	1.1	0	-
		TOTALS	20.4+	255	28 or 12%

Actual observations from the air	255
Tracks estimated by Bentley & Rausch	15
Bison observed south of census area 4	4
Bison observed in area 4 by Bentley & Nava	44
Bison observed by sawmill workers	34

Total estimated population 352

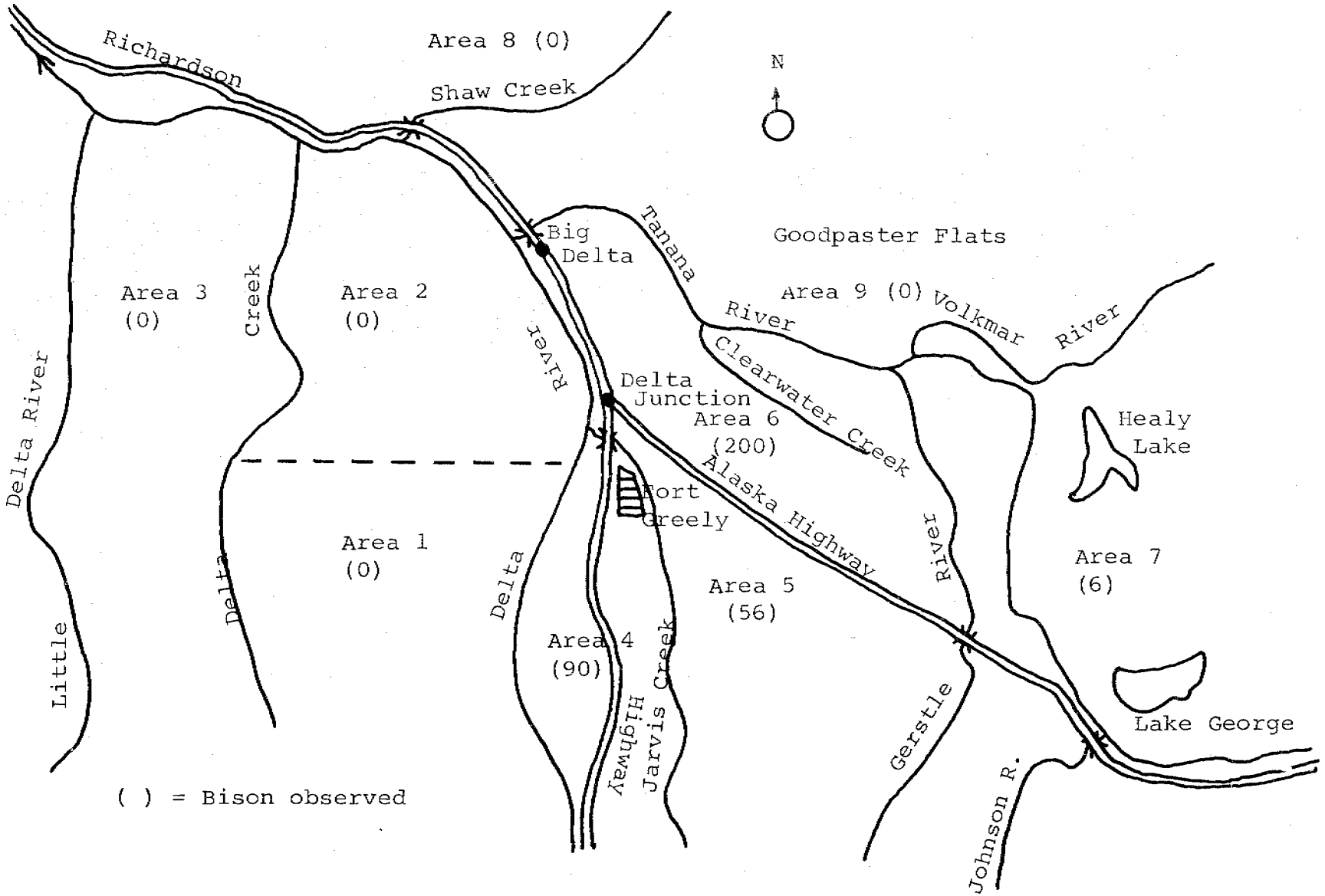
* Four bison seen south of the census area on this date.

** Tracks seen indicated about 15 additional bison.

*** Forty-four bison seen in area 4 on this date. These were counted as additional animals.

\# Thirty-four bison were seen by sawmill workers in a wooded section of this area where none had been seen from the air.

FIGURE 1. NOVEMBER 1960 BISON CENSUS -- DELTA HERD



of square miles it was not practical to attempt complete coverage of the entire potential range. Additional information regarding bison numbers was obtained from local pilots. One pilot reported seeing 36 at one time. This cannot be considered a complete count but it would appear that this herd consists of approximately 50 bison. Aerial census in the Copper River area is particularly difficult because of the mature spruce forest.

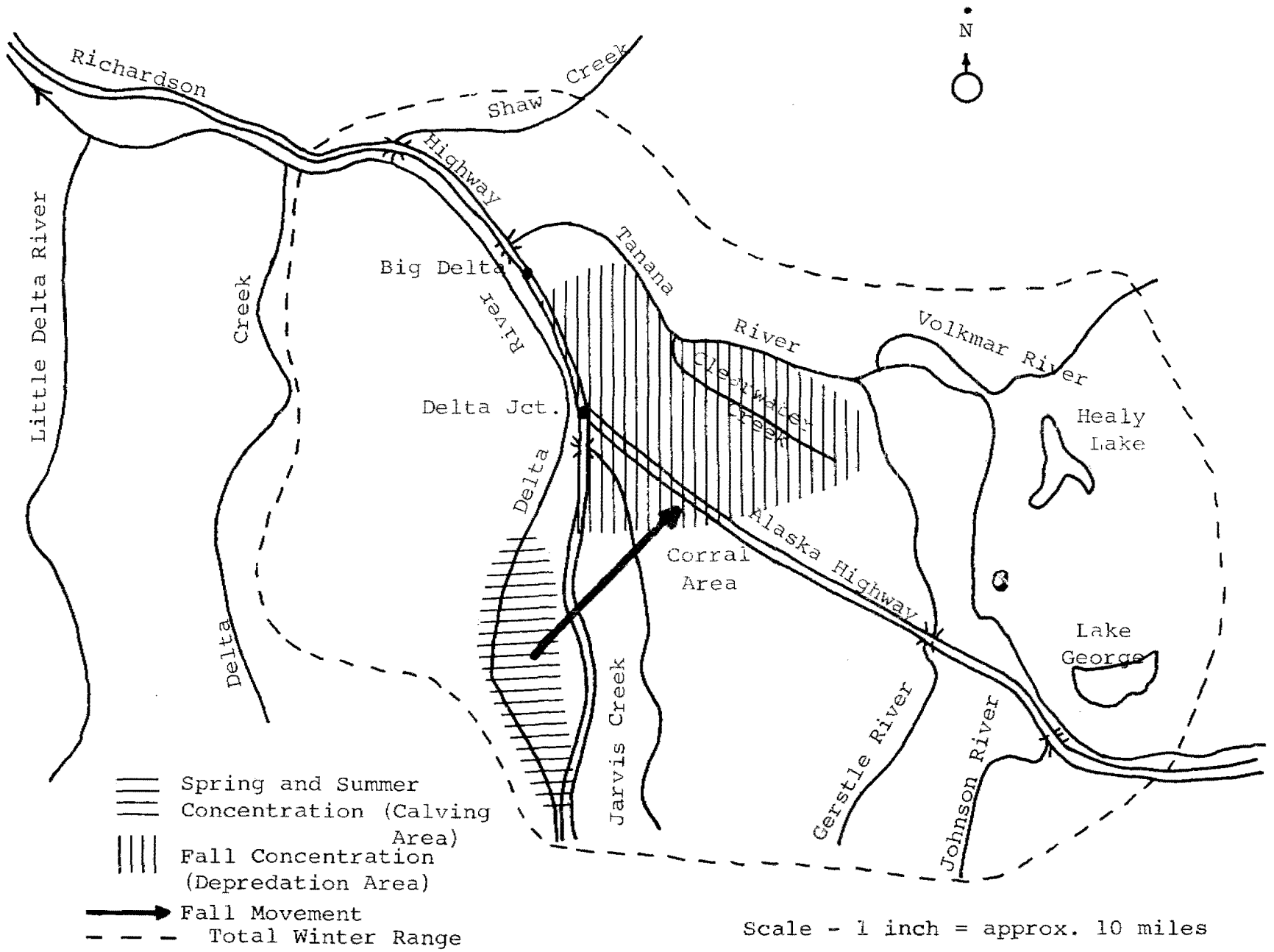
Movements

Delta Herd

The Delta herd exhibits definite seasonal movement patterns. The more purposeful movements include their annual trek to the calving grounds along the Delta River, their late summer-fall movement to the breeding grounds around the old corral, and their winter dispersal between the Big Delta and Gerstle Rivers (Figure 2). More detailed observations will perhaps reveal additional distributional characteristics of this herd. Of particular interest to the present study are the late summer-fall and winter movements for it is these movements that bring the bison into conflict with civilization.

Apparently the late summer movement signals the approaching breeding season, which is reported to take place in the vicinity of the old corral. This movement involves the entire herd with the exception of possible non-breeding (senile?) males, and the population segment inhabiting the Gerstle River-Healy Lake area. Concurrent with the rut and following it the bison forage in the adjoining grain and hay fields -- cleaning up both before and after harvest. This feeding activity continues into early winter. The November count and subsequent information revealed that 200 (55 per cent) of the herd was in area 6 in 1961 (Figure 1). Similar information for 1955 reveals only about 33 per cent of the total herd in this area. The significance, if any, of this change in distribution is not known but may reflect attraction to the additional food stuffs created by the homesteading activities.

FIGURE 2. ANNUAL MOVEMENT OF DELTA HERD OF BISON



Ear-tagging and marking were used in an attempt to determine the numbers of bison inhabiting the Delta Junction area during the winter. When approximately 2 per cent of the total estimated herd was marked, observations in March included 11 per cent marked animals. This possibly indicates that only 16 per cent of the herd frequented this area during March (Table 2). Most of these animals were cows and calves (Table 3). The remainder of the herd was spread out over the rest of the range, mostly to the east and south of Delta Junction. By late winter some of the animals had wandered south and east as far as Craig Lake near the Johnston River.

Nabesna Herd

Seasonal movement patterns, if any, of the Nabesna bison herd were not determined in this study. Past movements of this herd have been extensive. The herd has moved from the area in which it was released and now inhabits the Copper River valley between Copper Center and Chitina (Figure 3). This segment of the Nabesna herd grazes mainly on the northeast side of the river between the Dadina River and Lower Tonsina. Local residents report the calving grounds to be on the Copper River bar just northeast of Lower Tonsina (Figure 3). The bison of this herd seemingly dispersed quite widely and they have been reported from the following areas: Tazlina Lake, Tazlina Lodge, Hanagita River and Lake, Dadina-Chetaslina-East Fork and Cheshnina Rivers.

Depredations

Delta Herd

Total estimated losses through depredations of the Delta bison herd was $12,730 in 1960. The loss for the past 10 years is estimated at $33,480. This does not include $6,120 in damage to automobiles due to collision with bison. The total loss to homesteaders was estimated at $10,480, this constitutes the largest loss in the area. Their losses included hay, oats, peas, barley, and brome grass. The monetary figure was arrived at by the homesteaders and may be subject to some bias. The homesteaders crops were not fenced. Some

TABLE 2

GROUND OBSERVATIONS OF DELTA BISON HERD

AFTER SIX BISON HAD BEEN TAGGED

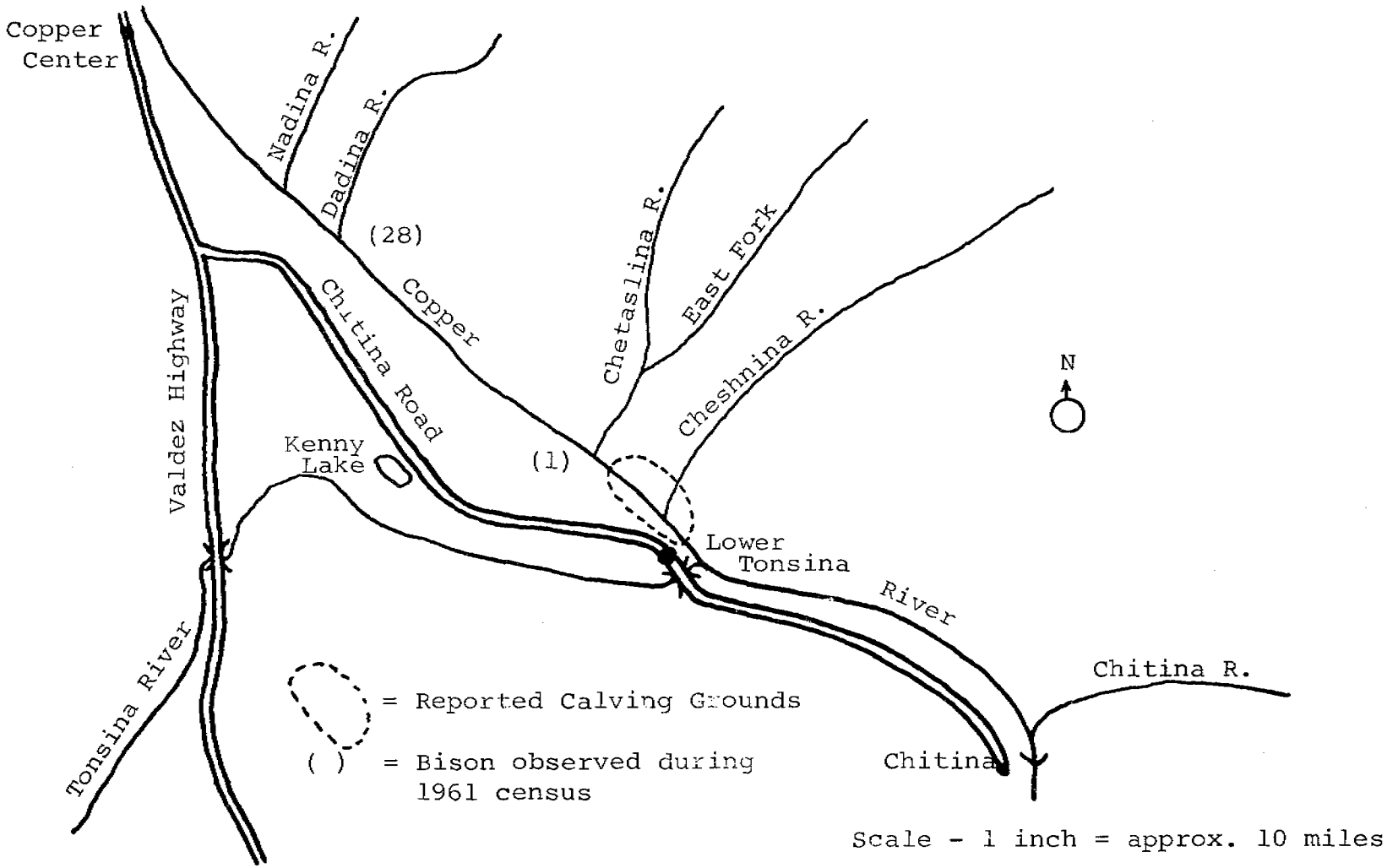
Date	Number of Bison	Location	Number of Marked Bison
3- 2-61	17	Delta Court	3
3- 3-61	16	Clearwater	0
3- 3-61	22	Clearwater	2
3- 3-61	18	Delta Dump	2
3- 4-61	37	Clearwater	2
3- 4-61	18	BLM Runway	2
3- 6-61	1	Delta Court	1
3-14-61	1	Noffke's Trading Post	1
3-15-61	13	Clearwater	1
3-15-61	3	Fort Greely	0
3-15-61	13	Diehl's Store	3
3-16-61	3	Fort Greely Dump	0
3-16-61	4	Clearwater	0
3-16-61	13	Delta School	3
Totals	179		20

TABLE 3

SEX AND AGE OF OBSERVED BISON OF THE DELTA HERD

Date	Number of Bison Seen	Number of Calves	Number of Adult Bulls
12- 6-60	17	2	1
12 -8-60	9	1	0
12-16-60	14	3	0
12-17-60	2	0	0
12-19-60	6	0	?
12-22-60	1	0	1
12-30-60	15	4	0
1- 3-61	20	1	0
1- 4-61	27	1	0
1- 5-61	30	2	0
1- 8-61	11	1	0
1-19-61	21	?	?
1-20-61	26	3	3
1-21-61	8	0	0
1-23-61	16	6	0
1-24-61	10	?	?
1-28-61	1	0	1
3- 2-61	17	4	0
3- 3-61	56	21	0
3- 4-61	55	21	0
3- 6-61	11	0	1
3-14-61	1	0	1
3-15-61	29	11	0
3-16-61	20	5	2
Totals	408	86 or 21%	10 or 2%= 504

FIGURE 3. CALVING LOCATION OF NABESNA HERD OF BISON



of the homesteaders plan to fence soon but most of them lack the time or money. The Federal Aviation Agency has erected a hurricane-type fence which successfully turns bison but improperly constructed cattle-guards were installed instead of gates and the bison still have free access to the area. Other monetary losses include $1,000 damage to lawns, shrubs and fences on Fort Greely; $1,000 damage to lawns, gardens and incinerators at the Federal Aviation Agency; $200 damage to lawns and garbage cans at the Delta Trailer Court; $50 damage to a trapper in the form of garden and trapline damage.

Nabesna Herd

No damage due to depredation by this herd could be found.

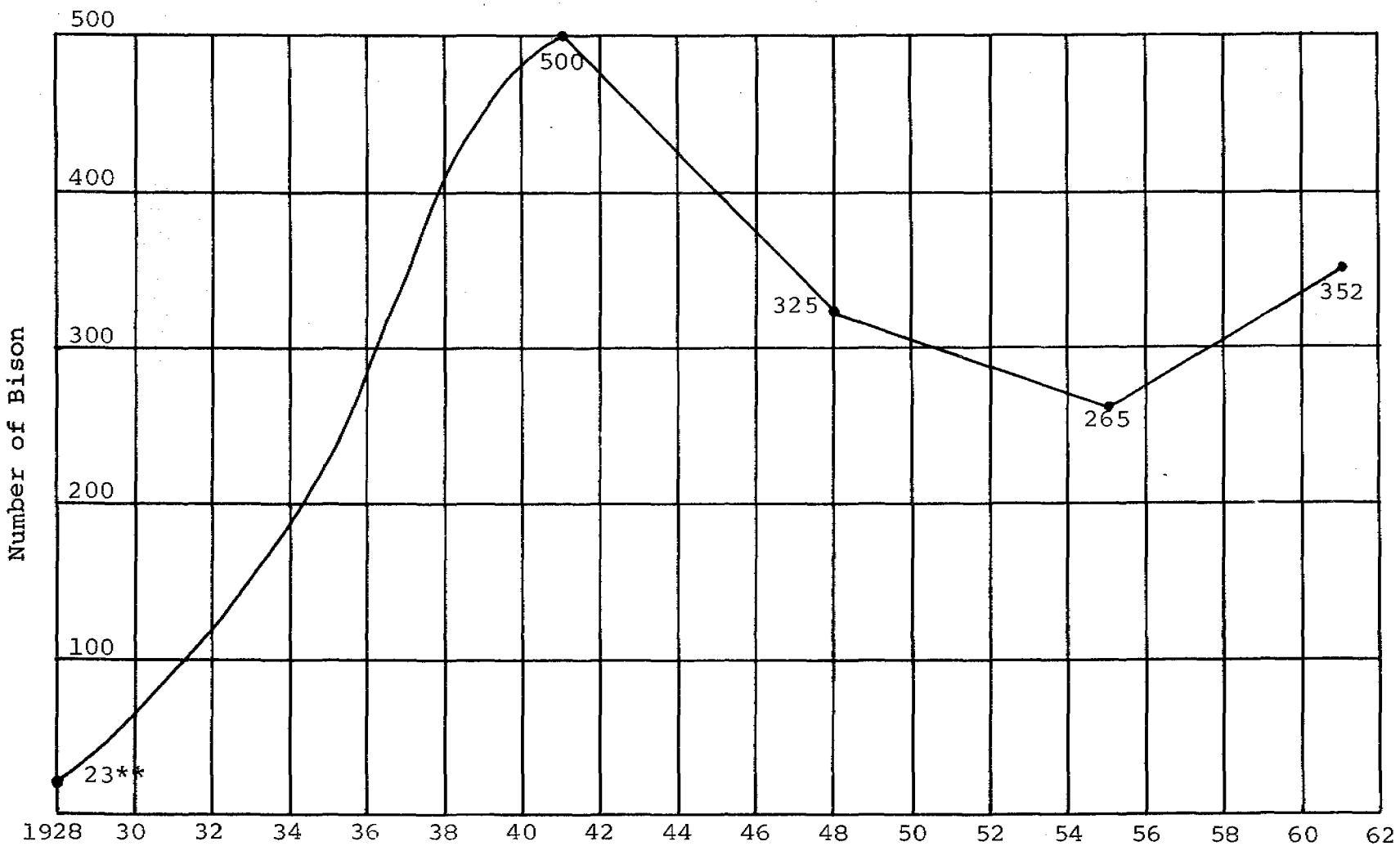
Management

Delta Herd

In 1928, 23 bison obtained from the National Bison Range, Moise, Montana, were released in the Big Delta area. Initially, from 1928 to the mid-1940's, they increased at an average annual rate of 20 per cent (Figure 4). By the mid-1940's the population is reported to have numbered in excess of 500 animals (records during the war years are absent). The next estimate, by U. S. Fish and Wildlife Service, was made in 1943 -- 325 animals were reported. This was a decrease of 35 per cent from the previous estimate. The first systematic aerial survey was conducted in November 1955, when the population was estimated to be 265± 10 (Table 4). And, as previously reported 318 - 352 were accounted for in November of 1960. In a period of 32 years this herd apparently has experienced a peak population, a decline and a subsequent population increase, although at the much reduced annual rate of 6 per cent.

Management of the herd through hunting or other recreational uses has been a minor factor in its history. Complete protection was afforded the herd from 1928 until 1950, probably well after it had exceeded the carrying capacity of the range. In 1950, 1951, and 1952 permit hunts were held for the purpose of removing (senile?) bulls. Twenty-five adult

FIGURE 4. CURVE OF DELTA BISON POPULATION



* 1950 - 45 removed by hunting and transplant
1951 - 31 removed by hunting and transplant
1952 - 25 removed by hunting

** Segment prior to 1941 is based on the 1941 estimate of 500 + animals and must be considered only approximate.

TABLE 4

BISON CENSUSES (BIG DELTA HERD)

Year	Total	Per cent Calves
1928	23	-
1940's	500*	-
1948	325**	-
1955	265± 10	11.4
1960	352	12.0

* Estimated at 539 by John Hajdukovich, of Big Delta.

** Fish and Wildlife Service estimate.

bulls were removed during each hunt. Examination of the testes suggests that perhaps some of the males were truely senescent as Chatelain (unpublished ms.) reports that the testes of 19 of the 25 killed in 1950 had atrophied. A detailed description of the reproductive tracts is not present and since the hunts were held in October, some six weeks to two months after the rut, it is not known whether his observations reflect true senescense of the older males or merely a quiescent period following the rut. Other legal removal of bison from this herd were for restocking efforts in Alaska and Yukon Territory (Table 5). A total of 102 animals were utilized in restocking and hunting from 1949 to 1952 -- certainly less than the probable annual increment. As previously mentioned, the census conducted in 1955 showed that the bison had not responded even to complete protection as there were only 265± 10 at that count. That winter, the winter of 1955-56, was unusually severe and it is probable that by spring there were not more than 225 bison remaining. Once again they were afforded complete protection and the 1960 count revealed that a slight annual increase has taken place since 1955. It should be noted, however, that this increase was during a period of normal to unusually mild winters. Other factors which may have influenced this increase include the clearing of considerable areas in the Delta Clearwater area, some clearing by the Military on the Delta Dry bar, and better protection through proper servicing of Military garbage dumps, thus reducing a hazard which contributed to the death of a number of bison annually.

Briefly then, the animals have generally not been managed at all. It is suggested that management practices be instituted. This suggestion is prompted by the population dynamics of the herd more than by the conflicts between human civilization and bison that are now in the public eye. The size of this herd should be reduced. When one considers that the natural succession of the vegetation in this area is toward a brush-timber situation, the growing civilization around Fort Greely and Delta Junction, and the budding potential of farming in the area it becomes clear that the future of this herd is not bright. Possibly a herd reduction to 200 to 250 animals would make it possible to retain a segment of this herd in the area for many years. If no active management

TABLE 5

BISON REMOVED FROM BIG DELTA HERD

Year	Males	Females	Total	Reasons
1949	1	-	1	Predator control bait
1950	5	12	17	Moved to Nabesna area
1950	1	-	1	Killed incidental to trapping
1950	25	2	27	Taken during the hunt
1951	2	3	5	Moved to Yukon Territory
1951	24	1	25	Taken during the hunt
1951	-	1	1	Killed incidental to trapping
1952	25	-	25	Taken during the hunt
Totals	83	19	102	

through recreational uses is instituted, bison will continue to be a controversial resource of unrealized potential value.

Nabesna Herd

In 1950, 5 males and 12 females were transplanted from the Delta herd to the Nabesna area. These animals moved south to the Copper River and established themselves there. The herd has been protected completely. The available records do not show analysis of the range before or after the bison settled themselves in the Copper River Valley. In the future it is recommended that some basic analysis of the range potential in this area be undertaken. It is also recommended that a limited harvest be implemented in the 1962-63 fiscal year.

RECOMMENDATIONS:

Productivity studies of the Delta and Nabesna herds should be continued. A permit hunt for 100 - 150 bison should be held in the Delta Junction area in the fall of 1961. An annual harvest from the Nabesna herd of from five to ten animals should be implemented in 1962. A preliminary survey of the potential range of both the Big Delta and Nabesna herds should be undertaken. The Department of Fish and Game should request results of bison studies conducted by graduate student John Hogben (1953-1956).

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