5120

SANGRE De CRISTO

BIGHORN SHEEP PLAN

for

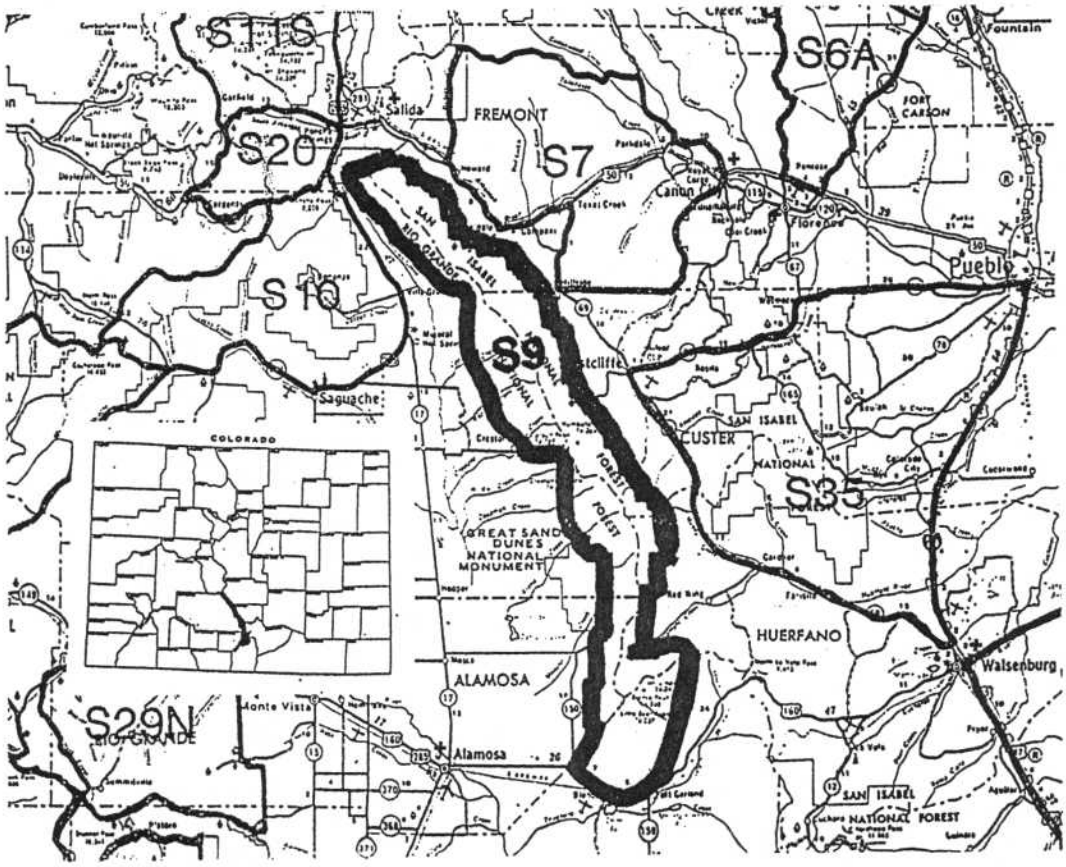
SHEEP UNIT S-9

1987 - 1998

Introduction

The Sangre de Cristo mountain range in south-central Colorado is a long, narrow chain of rugged peaks and steep rocky slopes. Within Colorado, the Sangre de Cristo range is over 100 miles long and rarely more than twelve miles wide. Eight of Colorado's 54 mountains over 14,000 feet in elevation are within this range. Geologically, most of the range is sedimentary in origin and not highly mineralized. Thus the Sangre's have escaped the impact of mining. Due to the steep slopes and lack of mining, very few roads exist and with the exception of U.S. Highway 160, most are primitive. Alpine habitat starts at about 11,500 feet elevation, and below the alpine area the slopes are mostly heavily timbered.

Figure 1: Bighorn sheep unit S-9 is in the Sangre de Cristo Range in south-central Colorado



Bighorn sheep Unit S-9 lies within the boundaries of the Rio Grande and San Isabel National Forests south of U.S. Highway 50, west of Co. Highway 69, north of U.S. Highway 160 and east of Co. Highway 17 (Figure 1). At one time sheep were found the entire length of the Sangre de Cristo Range (Woodard et al., 1972) but are now limited to the southern portion of S-9 roughly from Hermit Pass south to Blanca Peak.

Population Dynamics

Bighorn sheep were documented by the earliest explorers in the Sangre de Cristo range and is the location of one of the major bighorn sheep populations in Colorado. During the early 1900's bighorns could be found the entire length of the Sangre de Cristo range but by the 1950's bighorns were concentrated south of Horn Peak (Moser, 1962) and numbered about 135 animals. During the early 1960's lamb survival reached very low levels. Three aerial counts made in 1967 gave a total of 67 sheep - 9 rams, 56 ewes, and 2 lambs (Hibbs & Woodard, 1967). The very low lamb/ewe ratio prompted a study to determine the cause of low lamb survival. Woodard et. al. (1974) determined that disease, probably a verminous pneumonia enhanced by inclement weather was the cause of lamb mortality. During the study, fall lamb:ewe ratios were 17:100 in 1969 and 22:100 in 1970. Between 1965 and 1971 the Sand Creek sheep herd was estimated at 17-38 animals (fall counts). By 1975 the S-9 sheep population was estimated at a maximum of 150 animals. In the following years (Figure 2) populations estimates dropped to a low of 60 in 1980, up to 200 in 1981-82 and 500 in 1984. The rapid increase in the estimate was

due to two years of work by student interns who located and classified 349 sheep (52 rams, 230 ewes, 67 lambs = 23:100:29) during the summer of 1984. An aerial count[1] the following winter found 105 sheep (35 rams, 42 ewes, 28 lambs) with a ratio of 83:100:67. During the summer of 1985 student interns searched additional areas for sheep and located 184 animals (25 rams, 101 ewes, 36 lambs, 22 unidentified). The winter aerial count[1] flown on March 6, 1986 totaled 214 sheep with a (37:100:61) ratio. During Autust, 1986 an aerial count[1] found 216 sheep (26:100:53) and the winter aerial count[1] was 224 sheep with a (65:100:57) ratio. Sheep are still concentrated north of Madeno Pass to the Venable Pass area. The current best estimate is 600 plus animals with a minimum of 65-70 rams per 100 ewes and it may be much higher. Bighorn sheep researchers believe most sheep populations which are not heavily hunted maintain a sex ratio very close to 1:1. A current population model generated with a POP 2 program is Appendix A.

Hunting and Harvest

Details of hunting and harvest are not known before 1885 and in 1887 the season on bighorn sheep was closed until 1953. From 1953 to 1966 the bighorn sheep license cost $25.00, $40.00 from 1967 through 1975 and $75.00 from 1976 until 1983. Starting in 1984 the cost of a bighorn sheep license increased to $100.00 for residents and for the first time non-residents could apply for a sheep license which costs $500.00.

License numbers have varied greatly in the past from a low of 6 in 1985 to a high of 55 in 1986 and 1987 (Table 1). Hunter success has averaged about 30% through the years (Table 1). Horn restrictions have

[1] Counts were made from a Bell Saloy helicopter.

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License numbers have varied greatly in the past from a low of 6 in 1958 to a high of 55 in 1986 and 1987 (Table 1). Hunter success has averaged about 30% through the years (Table 1). Horn restrictions have

ranged from 1/2 to 3/4 curl. Ewe hunts were started in 1985 and continue in 1987. Ewe harvest is low, as 5 were taken in 1985 and 3 in 1986. S-9 ewe licenses were left over in 1986.

Bighorn sheep permits will probably stay near the same numbers as they are in 1987, 20 archery (all rams), 35 rifle (20 rams, 15 ewes) in the future. Additional hunters will decrease the quality aspect of the hunt. There is some competition for space as a "timberline" deer season is held during the bighorn sheep season. Additional licenses may be issued as the Mt. Blanca herd increases and if sheep are introduced on the north end of S-9.

Management Schemes

Very little has been done to manage the sheep in S-9 other than aerial and ground counts and setting seasons before 1984. One research project to determine the cause of poor lamb recruitment was completed (Woodard et. al., 1974) and salt and mineral blocks had been distributed in the late 1960's and early 1970's.

A much more intensive inventory effort was started in 1984 with two interns who spent three months searching for sheep and mapping their distribution. This program was continued in 1985. After many years of no aerial counts, winter counts took place in 1985, 1986 and 1987 are scheduled to continue. Attempts at baiting sheep with salt, alfalfa hay and apple pulp were made in 1985-86 and 1986-87. Due to deep snows and high winds, these attempts were not as successful as planned but the 1986-87 effort will start early in the fall, with the goal of trapping

and marking ewes for movement studies and possible removal of sheep for transplants.

On February 20, 1987, 20 sheep (7 rams, 13 ewes) were released on Cottonwood Creek at the base of Mt. Blanca. The only other bighorn sheep transplant into the Sangre de Cristo range occurred on March 15, 1945 when fourteen sheep (1 ram, 7 ewes, 6 lambs) were released east of Villa Grove.

Baiting operations were conducted during the winter of 1986-87. Sheep did not come to the bait in sufficient numbers and consistent enough to trap the animals. Fecal samples (n=8) were analyzed for Protostrongylus larvae with 1 to 268 larvae found in 5 gr. (dried weight) of fecal material. These numbers are not high enough to have concern about lungworm problems at this time.

The Future

The primary goal is to increase the number and distribution of bighorn sheep in S-9 until the majority of suitable habitat is occupied. A population of 900 - 1,000 bighorns with a ram:ewe ratio of 60-70:100 by 1997 is our objective.

As the majority of S-9 within a wilderness study area, the options are limited as to what can be done with habitat management. Several controlled burns are planned, but these may not be done as long as the area has a wilderness study designation. The same ruling applies to fertilization projects. If the wilderness designation is removed these types of projects will again be examined (Table 2).

Hunting opportunity will be offered at the same rate it is now, 20 archery ram licenses, 20 rifle ram licenses and 15 rifle ewe licenses. It is believed more hunters will diminish the quality (defined as seeing few other hunters and have a good chance to harvest a sheep) aspects of the hunt and 75 deer hunters will be in the area at the same time. Sheep permits may be increased if population densities get too high. Additional permits will be given when the Mt. Blanca transplant reached 75-100 animals. S-9 sheep hunts will be managed for a quality hunt in late August and September. Later hunts would cause conflict with big game hunters and hunts during the breeding season (November) are not feasible due to snow depths which limit access. Ewe permits will serve as a means to control the herd size while providing a sheep hunting experience to those who wish to hunt ewes. There is a problem with not enough people applying for ewe licenses in S-9. In 1985 six applicants applied for fifteen licenses and three people applied for fifteen licenses in 1986 (an additional six licenses were issued to second choice applicants). To change this situation it will be recommended that ewe licenses be removed from the preference point system. If this does not alleviate the problem it will be recommended to offer ewe licenses for one-half the price of a ram license.

During 1987 the area around Brush Creek will be surveyed as to habitat suitability for bighorns. If it looks feasible a sheep transplant into this area will be planned. Once the transplant is established, these animals will also be hunted (Table 2).

Establishment of a bait station on Music Pass will be attempted in 1987 starting immediately after the third combined deer and elk season.

This bait station needs to be established and trapping, marking and releasing or removing sheep for transplants must be completed before winter snows become too deep.

Aerial counts will be continued as long as funds are available. The existing system of a summer count by the Southwest Region and a winter count by the Southeast Region should be continued. Ground counts will be made anytime D.O.W. personnel are in the sheep range.

Starting in 1988 and continuing every other year, two temporary employees (preferred) or interns will spend the summer months (June, July and August) searching for sheep, monitoring transplants and mapping sheep distribution. These people will also note the location of any marked sheep (from the Music Pass bait site) and pick up bighorn sheep fecal pellets.

Lungworm (Protostrongylus spp) can be a limiting factor in bighorn sheep population and has been documented as causing lamb mortality in the Sand Creek area during 1969 and 1970 (Woodard et. al. 1974. J Wildl. Manage. 38 (4):771-774). Known bighorn sheep fecal samples will be picked up by temporaries or interns and D.O.W. personnel during the summer months and off bait sites by the baiter. Fecal samples will be examined by the Baermann technique for first stage larvae (L_1). If lungworm larvae counts are high, over 500 L_1/gram of feces, a treatment program may be initiated. Treatment may consist of increasing the number of ewe permits or trapping sheep to reduce the population, or use of chemotherapuetic drugs in apple pulp.

LITERATURE CITED

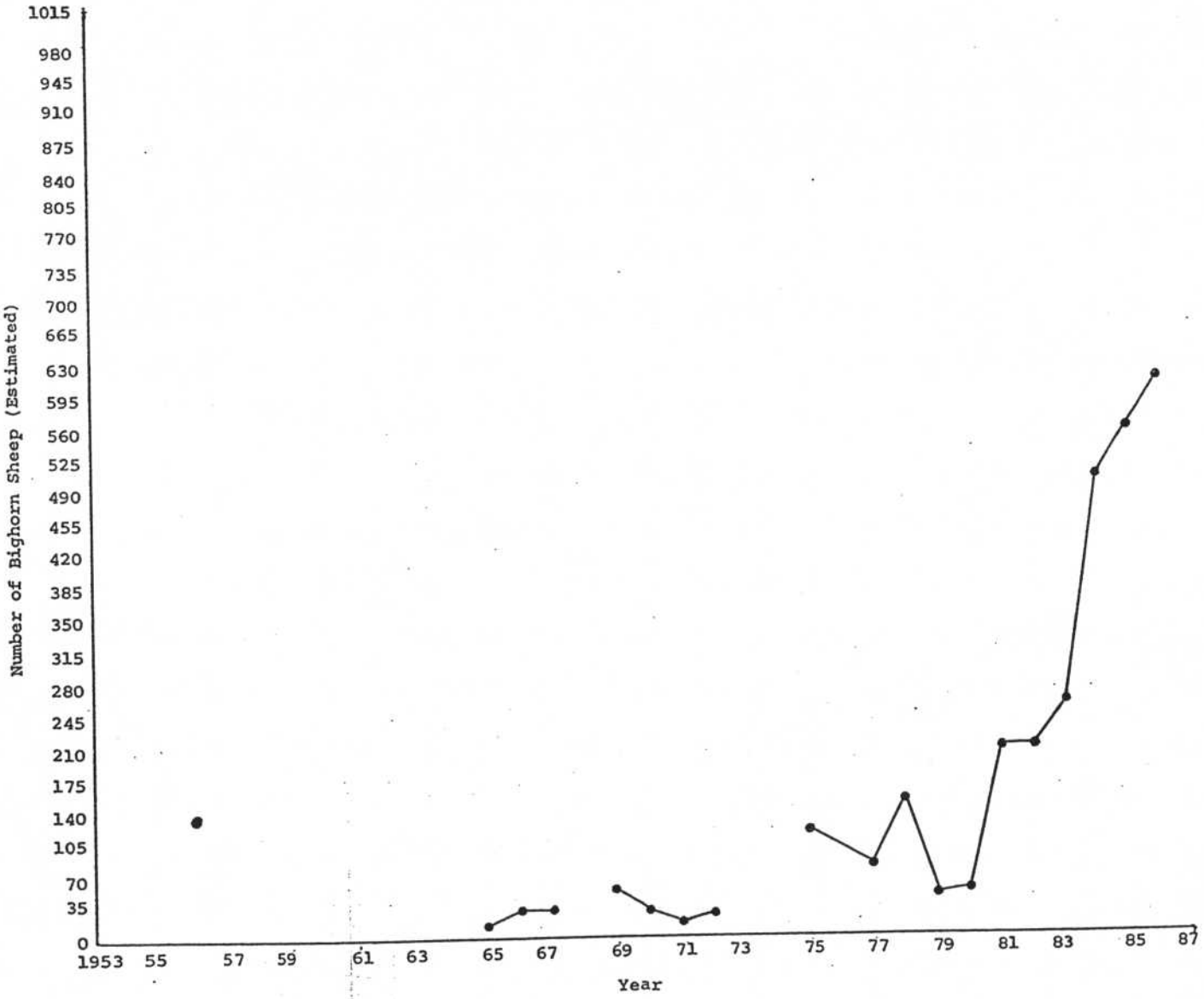
Hibbs, D.L. and T. Woodard 1967. Job Progress Report W-41-R-18 Work Plan 1. Job No. 12.

Moser, C.A. 1962. The bighorn sheep of Colorado Game and Fish Dept. Tech. Publ. #10. 49pp.

Woodard, T.N., R.J. Gutierrez and W.H. Rutherford. 1967. Bighorn lamb production, survival, and mortality in south-central Colorado. J.Wildl. Manage. 38 (4): 771-774.

Woodard, T., C. Hibler and B. Rutherford, 1972. Bighorn lamb mortality investigations in Colorado. Transactions of the Northern Wild Sheep Council. Symposium proceedings.

Figure 2: Estimated bighorn sheep population between 1953 and 1986 in Unit S-9.



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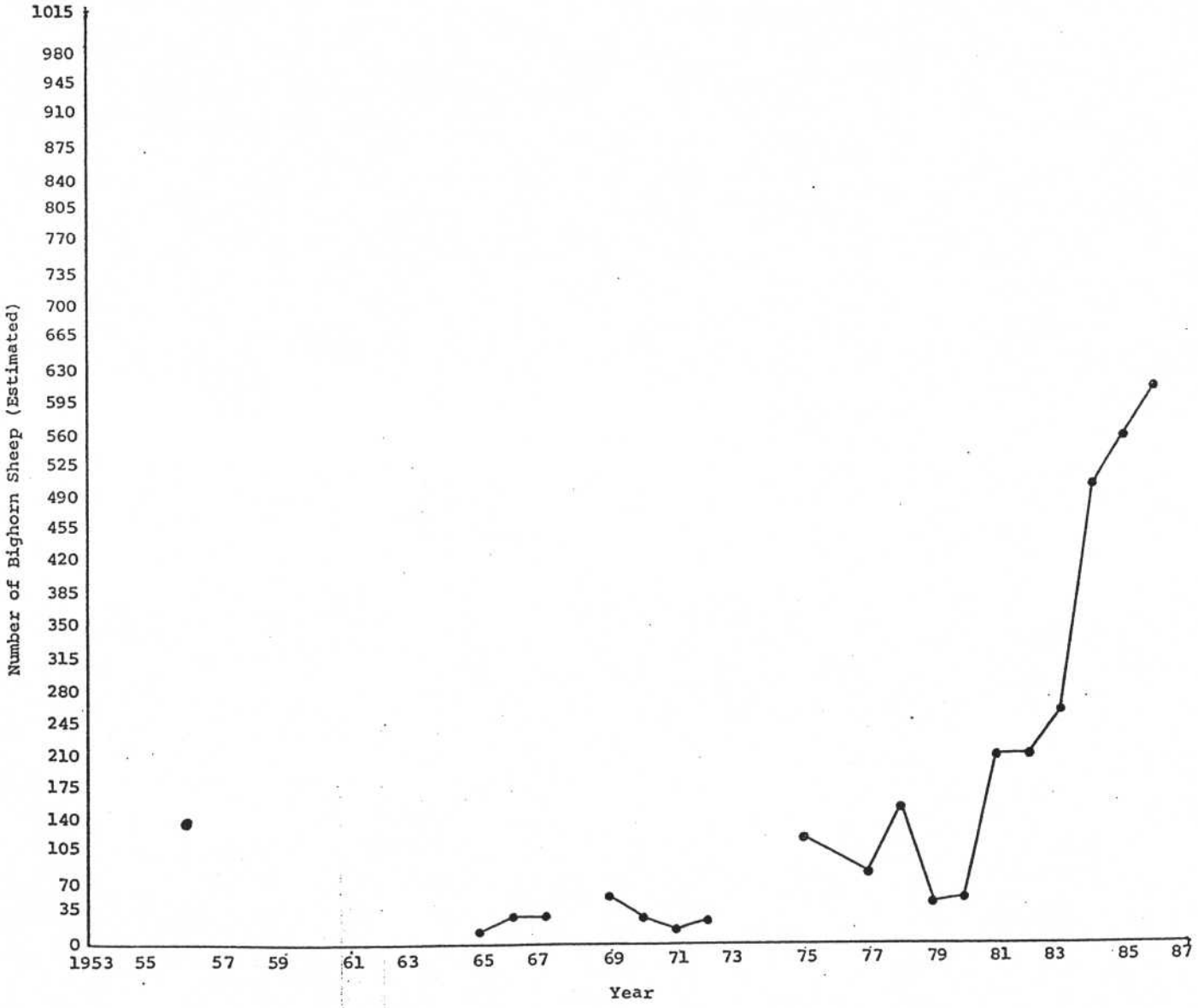

TABLE 1: Bighorn Sheep Licenses, Hunters and Success 1953 - 1986 in Unit S-9

YEAR	# of License	# Applications	Curl Regulation	Harvest	% Success	Population Est.
1953	10	a	1/2	5	50	a
1954	10	a	1/2	7	70	a
1955	20	a	1/2	4	20	a
1956	13	a	1/2	1	8	135
1957	10	14	1/2	2	20	a
1958	6	a	1/2	0	0	a
1959	Season Closed					a
1960	12	23	1/2	3	25	a
1961	12	22	1/2	4	33	a
1962	14	42	1/2	4	28	a
1963	20	71	1/2	8	40	a
1964	18	64	1/2	9	50	a
1965	16	77	1/2	2	12	a
1966	20	85	3/4	1		34[b]
1967	20	90	3/4	4		67[b]
1968	10	47	3/4	1		a
1969	53	10	1/2	2		a
1970	Season Closed					18[b]
1971	Season Closed					21[b]
1972	Season Closed					a
1973	20(10 issued)[1]	a	3/4	0	0	a
1974	25(20 issued)[1]	a	1/2	0	0	a
1975	25(11 issued)[1]	a	1/2	0	0	110
1976	25(11 issued)[1]	11	1/2	0	0	a
1977	25(18 issued)[1]	15	1/2	1	6	75
1978	25[2]	20	1/2	2	8	150
1979	35[2]	75	1/2	5	14	40[c]
1980	35[2]	82	1/2	2	6	45[c]
1981	41[2]	103	1/2	3	7	200
1982	40[2]	116	1/2	9	22	200
1983	40[2]	151	1/2	3	8	250
1984	40[2]	72	1/2	4	10	500
1985	55[2]	142	1/2	7M 5F	22	550
1986	55[2]	170	1/2	12M 3F	27	600+

1-archery only
2-archery & rifle combined

a-No Data
b-Number Counted
c-S.E. Region Only

ACTIVITY	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Aerial Counts	Summer and winter ----------											→
Summer Survey		Yes		Yes		Yes		Yes		Yes		Yes
Baiting Trapping & Marking	Start early November ----------											→
Controlled Burns	All projects on hold due to wilderness study classification ----------											→
Fertilization	All projects on hold due to wilderness study classification ----------											→
Habitat Survey	Brush Creek Area											
Transplants	None	Brush Creek ?		Brush Creek ?								
Lungworm Treatment	As needed ----------											→

TABLE 2

PROJECT ACTIVITIES 1987 - 1998

A:BHS-S9.GN1 09-29-1987 16:48:43 PAGE 1
SANGRE DE CRISTO BIGHORN SHEEP
DATA FROM 1987 TO 2011 SIMULATION FROM 1987 TO 2011

AGE CLASS	INIT POP. MALE	PROP. FEMALE	PRESN MALE	MORT. FEMALE	POSTSN MALE	MORT. FEMALE	EFFORT SET 1 MALE	EFFORT SET 1 FEMALE	EFFORT SET MALE	EFFORT SET FEMAL
1	83.0	84.0	25.0	25.0	10.0	10.0	0.3	0.0	1.0	1.
2	56.0	60.0	10.0	10.0	10.0	10.0	0.3	0.0	1.0	1.
3	45.0	42.0	10.0	10.0	5.0	5.0	1.0	1.0	1.0	1.
4	31.0	34.0	5.0	5.0	5.0	5.0	1.0	1.0	1.0	1.
5	26.0	29.0	5.0	5.0	5.0	5.0	1.0	1.0	1.0	1.
6	22.0	25.0	5.0	5.0	5.0	5.0	1.0	1.0	1.0	1.
7	18.0	22.0	5.0	5.0	5.0	5.0	1.0	1.0	1.0	1.
8	15.0	19.0	5.0	5.0	5.0	5.0	1.0	1.0	1.0	1.
9	13.0	15.0	5.0	5.0	5.0	5.0	1.0	1.0	1.0	1.
10	11.0	13.0	5.0	5.0	100.0	100.0	1.0	1.0	1.0	1.

SUM = 663 ESTIMATED SUM = 663

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BIO-YEAR	PRESEASON SEVERITY	HARVEST // SUBADULTS	DES. POP SIZE IN 9999 MALES	FEMALES	POSTSEASON SEVERITY	EFFORT SET USED
1987	0.0	0	10	4	0.0	1
1988	0.0	0	10	4	0.0	1
1989	0.0	0	10	4	0.0	1
1990	0.0	0	10	4	0.0	1
1991	0.0	0	10	4	0.0	1
1992	0.0	0	10	4	0.0	1
1993	0.0	0	10	4	0.0	1
1994	0.0	0	10	4	0.0	1
1995	0.0	0	10	4	0.0	1
1996	0.0	0	10	4	0.0	1
1997	0.0	0	10	4	0.0	1
1998	0.0	0	10	4	0.0	1
1999	0.0	0	10	4	0.0	1
2000	0.0	0	10	4	0.0	1
2001	0.0	0	10	4	0.0	1
2002	0.0	0	10	4	0.0	1
2003	0.0	0	10	4	0.0	1

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BIO-YEAR	PRESEASON SEVERITY	HARVEST // DES. POP SIZE IN 9999 SUBADULTS	MALES	FEMALES	POSTSEASON SEVERITY	EFFORT SET USED
2004	0.0	0	10	4	0.0	1
2005	0.0	0	10	4	0.0	1
2006	0.0	0	10	4	0.0	1
2007	0.0	0	10	4	0.0	1
2008	0.0	0	10	4	0.0	1
2009	0.0	0	10	4	0.0	1
2010	0.0	0	10	4	0.0	1
2011	0.0	0	10	4	0.0	1
	WOUNDING LOSS	0 %	2 %	1 %	SUBADLTS AGES 1 TO 1	

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BIO-YEAR	YOUNG:100 FEMS AGE 1 - 1	YOUNG:100 FEMS AGE 2 - 9	YOUNG:100 FEMS AGE 10 - 0	SEX RATIO: 50 : 50
1987	66.0	66.0	0.0	
1988	66.0	66.0	0.0	
1989	66.0	66.0	0.0	
1990	66.0	66.0	0.0	
1991	66.0	66.0	0.0	
1992	66.0	66.0	0.0	
1993	66.0	66.0	0.0	
1994	66.0	66.0	0.0	
1995	66.0	66.0	0.0	
1996	66.0	66.0	0.0	
1997	66.0	66.0	0.0	
1998	66.0	66.0	0.0	
1999	66.0	66.0	0.0	
2000	66.0	66.0	0.0	
2001	66.0	66.0	0.0	
2002	66.0	66.0	0.0	
2003	66.0	66.0	0.0	

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BIO-YEAR	YOUNG:100 FEMS AGE 1 - 1	YOUNG:100 FEMS AGE 2 - 9	YOUNG:100 FEMS AGE 10 - O	SEX RATIO: 50 : 50
2004	66.0	66.0	0.0	
2005	66.0	66.0	0.0	
2006	66.0	66.0	0.0	
2007	66.0	66.0	0.0	
2008	66.0	66.0	0.0	
2009	66.0	66.0	0.0	
2010	66.0	66.0	0.0	
2011	66.0	66.0	0.0	

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TABLE 1 - POPULATION SIZES DURING BIO-YEAR A:BHS-S9.GN1 09-29-1987 16:48:43

BIO-YEAR	START	PRE-HARVEST	POST HARVEST	END	% GROWTH
1987	663	586	572	511	3.7
1988	688	608	594	531	3.9
1989	714	632	617	552	3.8
1990	742	656	642	574	3.9
1991	771	682	667	597	4.1
1992	802	709	695	623	4.2
1993	836	739	725	649	4.3
1994	871	771	756	676	4.1
1995	907	802	788	703	3.9
1996	943	834	820	733	4.2
1997	983	869	855	764	4.2
1998	1024	906	891	797	4.2
1999	1067	944	930	831	4.2
2000	1112	984	970	866	4.3
2001	1160	1026	1012	904	4.3
2002	1209	1070	1056	943	4.3
2003	1261	1116	1102	984	4.3
2004	1316	1165	1150	1027	4.3

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TABLE 1 - POPULATION SIZES DURING BIO-YEAR A:BHS-S9.GN1 09-29-1987 16:48:43

BIO-YEAR	START	PRE-HARVEST	POST HARVEST	END	% GROWTH
2005	1373	1215	1201	1072	4.4
2006	1433	1269	1254	1119	4.4
2007	1496	1324	1310	1169	4.4
2008	1562	1383	1369	1221	4.4
2009	1632	1444	1430	1276	4.5
2010	1704	1509	1495	1333	4.5
2011	1781	1576	1562	1393	4.5

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TABLE 6 - PRE & POSTSEASON RATIOS A:BHS-S9.GN1 09-29-1987 16:48:43

BIO-YEAR	PRESEASON SUB-ADULTS/ 100 2+F	PRESEASON ADULT MALES/ 100 2+F	POSTSEASON SUB-ADULTS/ 100 2+F	POSTSEASON ADULT MALES/ 100 2+F
1987	52.0	91.3	52.9	88.6
1988	53.2	90.9	54.1	88.3
1989	53.2	90.9	54.0	88.3
1990	53.2	91.3	54.0	88.9
1991	53.2	91.8	54.0	89.4
1992	53.2	92.1	53.9	89.8
1993	53.2	92.5	53.9	90.3
1994	53.2	92.9	53.9	90.8
1995	53.2	92.9	53.8	90.9
1996	53.2	93.5	53.8	91.6
1997	53.2	93.8	53.8	92.0
1998	53.2	94.1	53.8	92.3
1999	53.2	94.4	53.7	92.7
2000	53.2	94.6	53.7	93.0
2001	53.2	94.8	53.7	93.3
2002	53.2	95.0	53.7	93.6

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TABLE 6 - PRE & POSTSEASON RATIOS A:BHS-S9.GN1 09-29-1987 16:48:43

BIO-YEAR	PRESEASON SUB-ADULTS/ 100 2+F	PRESEASON ADULT MALES/ 100 2+F	POSTSEASON SUB-ADULTS/ 100 2+F	POSTSEASON ADULT MALES/ 100 2+F
2003	53.2	95.3	53.7	93.8
2004	53.2	95.5	53.6	94.1
2005	53.2	95.7	53.6	94.3
2006	53.2	95.8	53.6	94.6
2007	53.2	96.0	53.6	94.8
2008	53.2	96.2	53.6	95.0
2009	53.2	96.4	53.5	95.3
2010	53.2	96.5	53.5	95.5
2011	53.2	96.7	53.5	95.7

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