

IDAHO DEPARTMENT OF FISH AND GAME

Ed Schriever, Director

Surveys and Inventories

FY2019 Statewide Report



MOOSE

July 1, 2018 to June 30, 2019

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2019
Boise, Idaho

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STATEWIDE REPORT SURVEYS AND INVENTORY

JOB TITLE: Moose Surveys and Inventories

STUDY NAME: Big Game Population Status, Trends, Use, and Associated Habitat Studies

PERIOD COVERED: July 1, 2018 to June 30, 2019

STATEWIDE

Moose have expanded their range and numbers in parts of Idaho over the past few decades, moving westward into Washington and northeastern Oregon. Harvest records, field staff and hunter reports indicate however, that many moose populations in Idaho are stable or declining. A variety of reasons are being investigated to identify the causes. Also, across the state moose tag allocations have been reduced in response to reduced success rate, reduced antler size, and reduced numbers of animals seen by hunters. Interestingly, moose range has increased in some areas of the state that were previously thought to be less optimal habitat, but at the same time numbers have declined in parts of the state that used to be considered optimal moose habitat. Statewide harvest has declined about 20% since the peak in the mid 2000's.

More than 10,000 moose hunters that harvested moose between 1990 and 2012 were asked via letter to provide a sample of moose hair from their tanned hides or heads. More than 1,400 samples were returned of which 989 were of adequate quantity and quality to be analyzed for mineral content. More than 200 untreated hair, blood and liver samples were collected from individual moose in 2014. Of these, 115 paired samples were adequate for testing. We found strong correlations between selenium levels in hair and levels in liver and blood serum in the 2014 samples. There were not significant relationships between levels of copper, manganese, or zinc between hair and liver or blood serum. These results indicate that untreated hair samples reflected selenium in a moose's body but they shouldn't be used to quantify levels of copper, manganese, or zinc in a moose's body at a given time. To accurately examine the effect of taxidermy treatments on trace mineral levels in hair, we would need to have both raw and taxidermy samples of hair from the same individual moose specimen. Unfortunately, we did not have untreated samples from the historic specimens. In the absence of that direct comparison, we graphically examined the extent to which the distributions of untreated hair sample values from the samples collected in 2014 and taxidermy hair sample values from samples collected in 2012 overlapped for each mineral. Average levels of copper, manganese, and zinc were significantly different (all t-test p-values <0.001) between untreated and taxidermy hair samples, suggesting taxidermy hair and untreated hair should not be treated as equivalent. Selenium levels between untreated and taxidermy hair were similar, suggesting taxidermy hair could be used to represent selenium levels in live moose. IDFG internal report, January 2019.

Moose continue to be one of Idaho's most desirable trophy species among resident hunters. Hunters may harvest only 1 antlered and 1 antlerless moose in their lifetime (except for those tags left over after the initial drawing, which do not apply to the lifetime limit). A total of 4,826 first-choice applications were received for the 669 tags available for antlered moose in the fall

2018 hunting season, yielding overall drawing success of 14%. Two antlered tags were available after the first drawing. Most applicants for antlered moose tags were resident Idahoans (3,963 or 82% of the total); 816 non-residents applied. Non-residents are able to draw up to 10% of the total number of tags offered.

Of the 639 applicants for 136 antlerless moose tags, 632 (99%) were from residents. One antlerless tag was available after the first drawing.

For the 2018 season, a total of 494 antlered moose were harvested (Table 1). The average antler spread of harvested moose was 39 inches, based on animals measured during the mandatory check conducted at Regional Offices, taxidermists, and contracted checkpoints around the state. Based on completed hunter harvest reports, success was over 74% for antlered moose harvest statewide.

In addition, 101 antlerless moose were harvested by the 136 tag holders in fall 2018 (Table 1). The hunter success rate for antlerless moose was 74%.

Four additional tags were issued in conjunction with the Department's "Super Hunt" drawings. Four antlered moose (100%) were reported harvested, in GMU 54. These 4 moose had an average antler spread of 48 inches.

Table 1. Statewide Moose hunter participation and harvest between July 1, 2018 and June 30, 2019.

Year	Hunters	Hunter Days	Total Harvest	Males	Females	% Change in Total Harvest from Previous Year
2018 ^a	809	4,634	599 ^a	498	101	+6%

^a Includes Super Hunt tags

Table 2. Statewide Moose population surveys between July 1, 2018 and June 30, 2019.

Season	Females captured, radio-marked, and/or Monitored	Males captured, radio-marked, and/or Monitored	Calves captured, radio-marked, and/or Monitored	GMUs Surveyed
2018	0	0	0	2

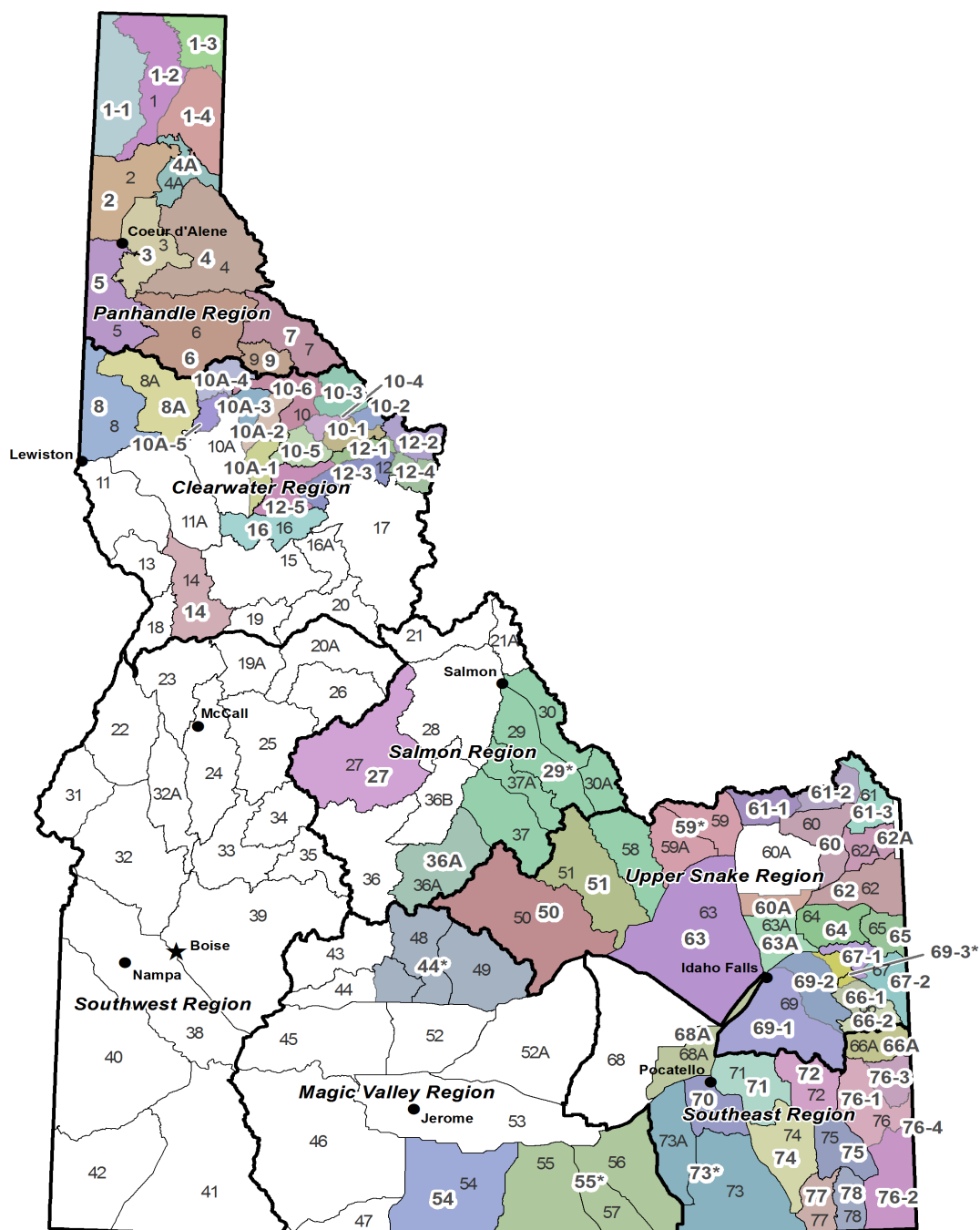


Figure 1. Statewide moose Controlled Hunt Areas.

PANHANDLE REGION

GMUs 1, 2, 3, 4, 4A, 5, 6, 7, 9

Historical Background

Open areas and extensive riparian areas that typify moose habitat elsewhere are not widespread in the Panhandle Region. Moose in this region often utilize closed-canopy timber stands with interspersed shrub fields and creek bottoms. Presently, moose populations appear to be declining to stable in most Hunt Areas of the Panhandle (Figure 2).

Historically, moose have been managed in Idaho for long hunts with high success rates and a good opportunity to harvest a large-antlered bull. This conservative approach, coupled with a high demand for moose hunting, led to poor odds for drawing a moose tag. In response, short, 7-day hunts were initiated during the fall of 2005 to; a) provide hunters a choice for better drawing odds at the expense of season length and; b) provide data on how success rates change with a short season. Further modifications to the moose hunting season structure were initiated for the 2007 and 2008 seasons. The 86-day hunts in Game Management Units (GMUs) 1 and 2 were eliminated and replaced with a series of 14-day hunts.

Starting with the 2009-2010 seasons, both long and short hunts were offered. Long seasons (77 days) offered more opportunity but lower drawing odds while short hunts resulted in better drawing odds. Hunters applying for the short hunts were over twice as likely to successfully draw a tag (Table 4).

Management Objectives

1. Develop an index to moose population trends that does not rely solely on aerial surveys, such as the use of game cameras.
2. Develop and implement moose survival and cause-specific mortality research.
3. Place enforcement emphasis on known problem areas of illegal moose kills. Publicize moose poaching arrests and the statewide reward system (Citizens Against Poaching) in the media.
4. Develop a program for warning deer and elk hunters that moose are in an area to reduce accidental kills of moose.
5. Examine present Controlled Hunt boundaries and permit levels and adjust as necessary to provide quality hunts and distribute moose hunters more evenly. Coordinate moose management and tag levels along the Idaho/Washington border with the Washington Department of Fish and Wildlife.
6. Continue collecting information on moose distribution and mortality from Department and other agency personnel and the hunting public.
7. Collect biological samples from hunter harvested moose to be used for disease monitoring.

Habitat Management and Monitoring

There has been no specific habitat management or monitoring for moose in the Panhandle Region during 2018. Varying landownerships and uses between federal, state and corporate timberlands has produced a mixed landscape between heavily logged and mature forests. Lack of timber harvest and wildfire in specific GMUs within the Panhandle region is a habitat concern. Additionally, the use of herbicide spraying by private timber companies may result in a loss of useable habitat and forage for moose.

Biological Objectives

There is little known about moose population dynamics in the Panhandle Region. Population trends are monitored using hunter harvest information and anecdotal information. Declining hunting success and anecdotal information points towards declining moose population throughout the Panhandle. The department plans to initiate a moose research project in select GMUs in the region that will help identify survival rates and cause-specific mortality.

Capture, Radio-mark, and/or Telemetry

No moose have been captured and radio-marked in recent years throughout the Panhandle Region.

Population Surveys

In December of 2010, an aerial helicopter survey was flown in the northern part of GMU 5, including the Mica Peak area from the Spokane River south to Windy Bay. In 18 search GMUs, 68 total moose were observed (23 bulls, 26 cows, 15 calves, 4 un-classified). The moose sightability data were run through several models. Quayle et al. (2001) developed a sightability model for moose in south-central British Columbia, which estimated the Mica Peak population to be 72. Anderson and Lindzey's (1996) sightability model developed for moose in Wyoming estimated the total to be 82 moose. The Hiller sightability model, developed for elk, produced an estimate of 100 moose. The Bell helicopter model, developed for elk, estimated the total number of moose in the Mica Peak area to be 115.

An aerial thermal infrared survey was conducted by Vision Air Research, Boise, ID at the end of March in the same section of GMU 5. Transects were flown 800 ft. apart at 1,500 ft. above ground in a fixed wing aircraft. An infrared sensor was mounted on the wing of the aircraft and operated by a wildlife biologist. Moose were located by observing their level of emitted infrared energy versus Historical Perspective levels. A total of 112 moose were observed. Some moose may have been missed if they were obscured by vegetation.

The infrared survey technique yielded an estimate for the number of moose that fell within the range of the elk sightability model estimates. Thermal infrared surveys should be further explored as a way to estimate moose populations.

Game cameras were used in 2016-2017 to monitor moose metrics, incidental to wolf monitoring throughout GMU 4. Although it was a small sample size, the average number of individuals and

calves did decrease from 2016 to 2017. The department is exploring the use of game cameras as a new way to monitor moose metrics throughout the Panhandle Region.

Hunting and Harvest Characteristics

Moose hunting was authorized in all Panhandle GMUs for the first time in 2007 (Table 2). In 2007, 5 antlered moose tags each were issued in GMU 4A and GMU 5. The Department issued 320 moose tags for the 2018 season: 165 tags for antlered moose with a 77-day season (15 Sept – 1 Dec), 125 tags for antlered moose with 2 different 14-day seasons (1 Oct – 14 Oct; 1 Nov – 14 Nov), and 30 tags for antlerless moose with a 48-day season (15 Oct – 1 Dec).

Hunters reported harvesting 234 moose with the 320 available tags for an overall success rate of 73% (Table 1). This is lower than the average success rate of 81% over the past 8 years of moose harvest throughout the Panhandle. Success rates in individual GMUs varied from 40% to 100%, but small sample sizes in some of these GMUs make success rates volatile. A hunt within the northeast corner of the panhandle was closed in 2017, due to continuous low success rates and anecdotal information pointing towards a declining population.

Of the 206 antlered moose for which we have antler spread measurements, 1 exceeded 50 inches (0.5%) in 2018. This is lower than data for the previous 6 years and is as follows: 2017: 1.5%, 2016: 1.9%, 2015: 0.8%, 2014: 1.2%, 2013: 4.2%, and 2012: 3.1%.

Controlled Hunt Odds

Most areas of Idaho have tags available for a variety of big game species. By forcing a choice between moose and other big game tags, the Department has been successful in substantially improving drawing odds across most of the state. Moose hunting is a once in a lifetime draw and statewide the drawing odds are about 12% - similar to the Panhandle in 2018 (15.3%) with Hunt Areas ranging from a low of 9% to a high of 60% (Table 1).

In a further attempt to address the complaint of hunters that it was too difficult to draw a moose tag, the Department conducted a trial 7-day hunt for 2005 and 2006 to provide an avenue for improving drawing odds. It was believed that relatively few hunters would opt for the shorter season, thus greatly improving drawing odds for those hunters who were interested in choosing better drawing odds at the expense of a shorter hunting season. It was also believed that success rates would diminish slightly with the shorter season, allowing the moose herd to support additional tags to be issued, which would further improve drawing odds.

Over the past 29 years, the number of moose applicants in the Panhandle Region has steadily risen, but the number of tags being offered has increased at a faster rate, resulting in significantly better drawing odds (Table 1, Figures 3 & 4). Further, antlered moose hunts with short seasons had much better drawing odds than longer seasons (Table 3).

Another modification of the shorter hunts was offered in 2007-2008. A series of 6 14-day hunts were offered in GMUs 1 and 2 with the first hunt starting on 30 August and the last hunt starting on 15 November. This was another attempt to provide hunter opportunity and improve drawing odds. Drawing odds were significantly better for these 14-day hunts as compared to the

traditional 86-day hunts, however, hunters were disappointed that no long hunt was offered in these GMUs.

Starting with the 2009-2010 season, both long and short hunts were offered in most Panhandle GMUs. Drawing odds were better for the shorter hunts (Table 3) and hunters seemed happy that they had the choice of the long or short hunts.

Capture and Translocation

Nuisance moose are not a prevalent issue within the Panhandle region. Occasionally some moose need translocated outside of town, one moose was captured and translocated during 2018 while another was removed from a window well and released on site.

Disease Monitoring

All moose harvested within the Panhandle region have a DNA tissue sample collected. Samples may be used for disease monitoring in the future.

Management Discussion

An attempt was made beginning in 2001 to become less conservative in many of our moose hunts, particularly in Hunt Areas 1-1, 1-3, and 2. The overall drawing odds have improved to the point that an applicant now has a 15.3% chance of drawing a moose tag in the Panhandle Region. GMU hunt areas range from as low as 10.5% to a high of 33.3% (Table 2). Success rates have remained relatively high and the mean antler spread has remained stable across years. Average antler spread for moose for which we have measurements (in inches) across the last 5 years is as follows: 2018: 35.3, 2017: 35.1, 2016: 36.6, 2015: 36.3 and 2014: 35.9.

The lack of moose population surveys is a serious handicap to moose management in Idaho. For the most part, tag levels continue to be set conservatively, based on field observation, public input, and the perception of what is socially acceptable. This conservative approach has produced poor drawing odds, the major complaint regarding moose management in Idaho, although recent changes in the Panhandle Region have improved the situation. However, the lack of surveys and low permit levels makes it difficult to determine the impact season changes have had to the moose populations in the Panhandle. Therefore combining information gathered by other state agencies and field observations is one way to adjust tag levels. Anecdotal information and low hunting success in some hunt areas suggest that moose populations within the Panhandle are decreasing. Therefore a hunt in the northeast corner of the panhandle was closed in 2017 due to continuously low success rates (20-40%).

Drawing odds are typically better for the 14-day hunts than the 77-day hunts, providing an avenue for hunters willing to trade season length for improved odds (Table 4). Hunters with the shorter hunts reported high satisfaction with the hunts during animal check-ins. It was hypothesized that the success rates for the shorter hunts would be lower than the longer hunts, allowing more hunters afield. The difference, however, was relatively minor. The success rates during the different time periods of these short hunts will be used to evaluate the practicality of continuing to offer these hunts and the possibility of adjusting tag levels based on success rates.

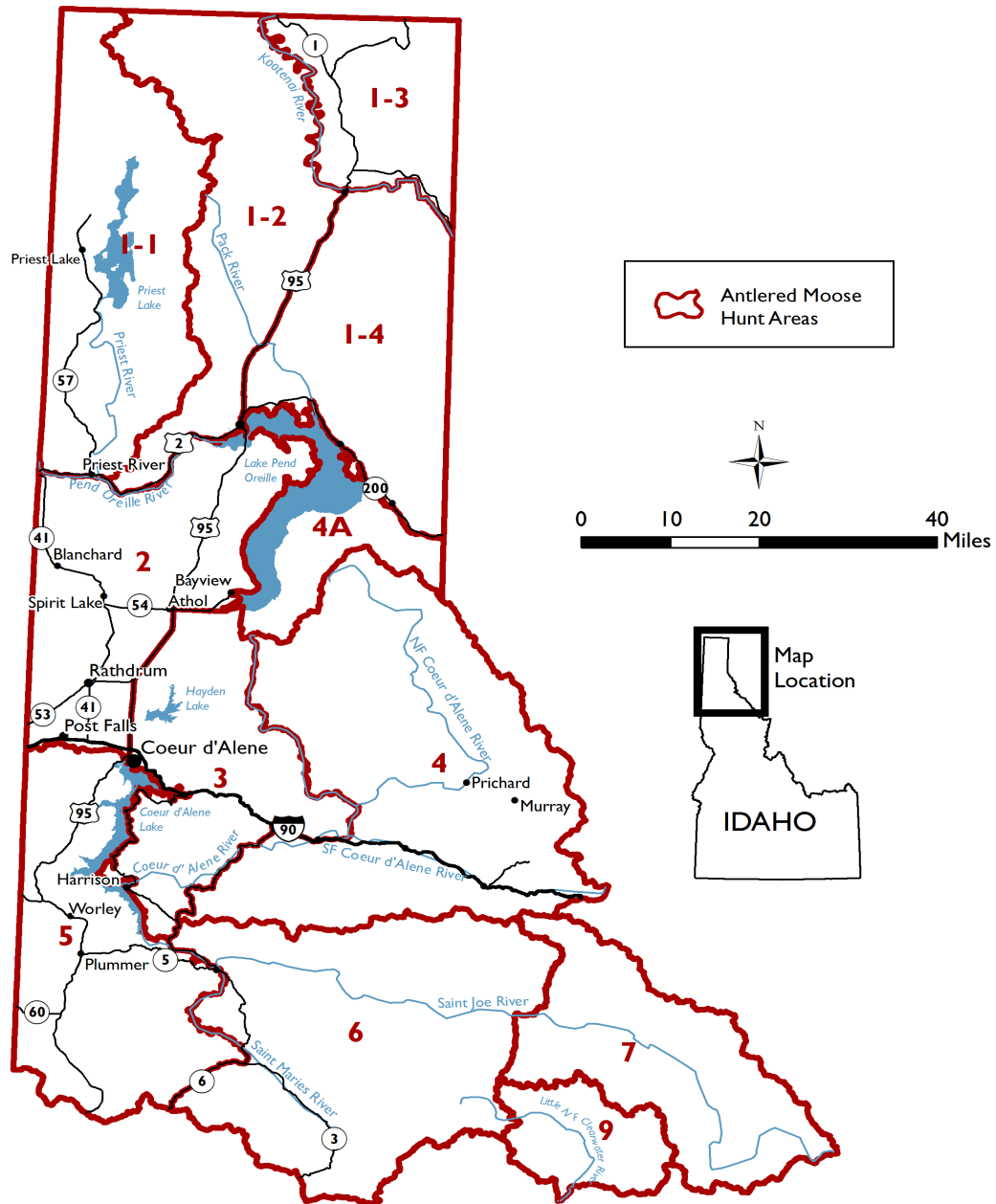


Figure 2. Panhandle Antlered Moose Hunt Areas.

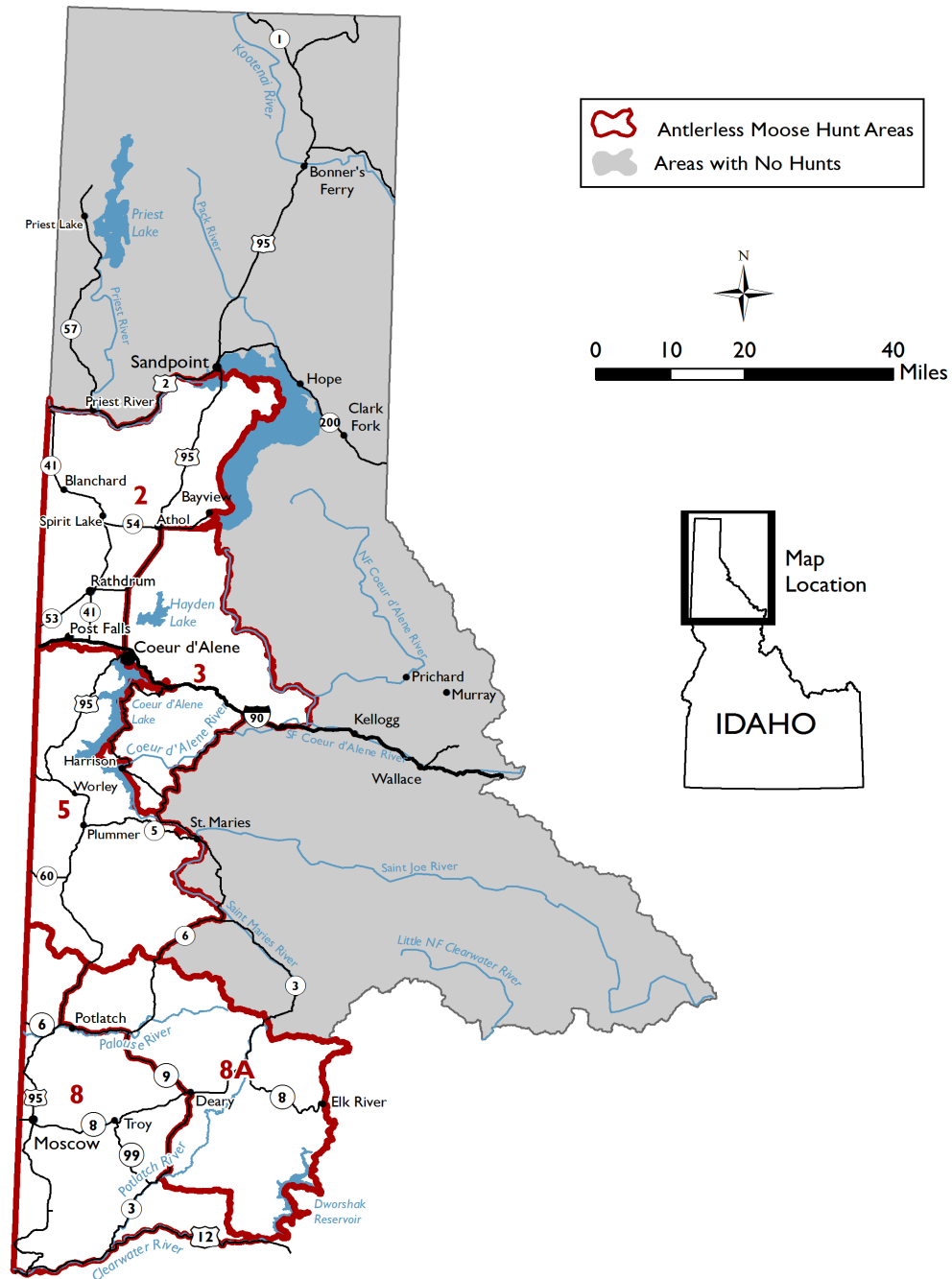


Figure 3. Panhandle and Clearwater Antlerless Moose Hunt Areas.

Table 1. Moose harvest and overall drawing odds, Panhandle Region, 2008-present.

Year	Tags	Harvest			Hunter success (%)	First-choice applicants	Drawing Odds %
		M	F	Total			
2008	352	235	36	271	77	2,352	15.0
2009	386	298	48	346	90	2,763	14.0
2010	386	283	50	333	86	2,814	13.7
2011	388	277	46	323	83	3,136	12.4
2012	373 ^a	263	42	305	85	2,880	13.0
2013	367 ^b	272	43	315	86	3,148	11.5
2014	366 ^b	262 ^b	40	302	83	2,964	12.3
2015	388 ^b	258 ^b	41	299	77	2,927	13.3
2016	388 ^b	264 ^b	39	303	78	2,549	15.1
2017	320 ^b	200	24	224	70	2,611	12.3
2018	320	206	28	234	73	2,093	15.3

^a No tags (15) were sold in hunt numbers 3009 and 3095 in 2012.

^b Includes Super Hunt tag.

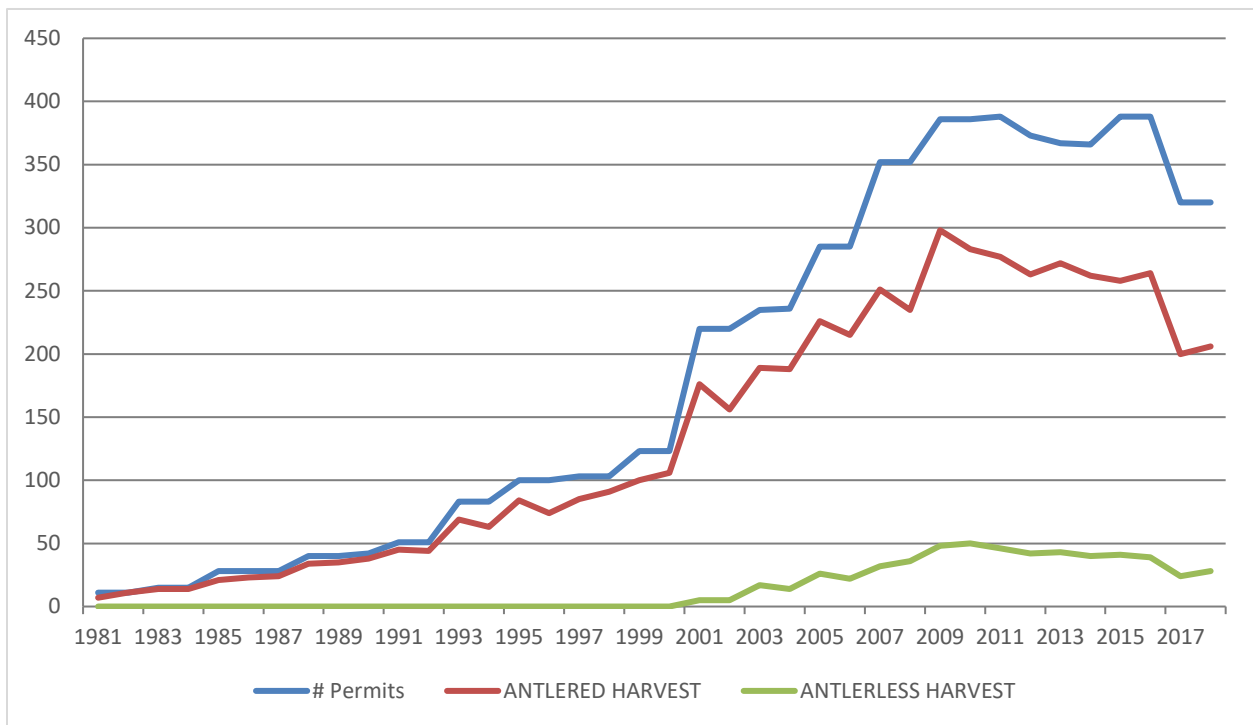


Figure 4. Total number of tags, antlered harvest, and antlerless harvest, Panhandle Region, 1981-present.

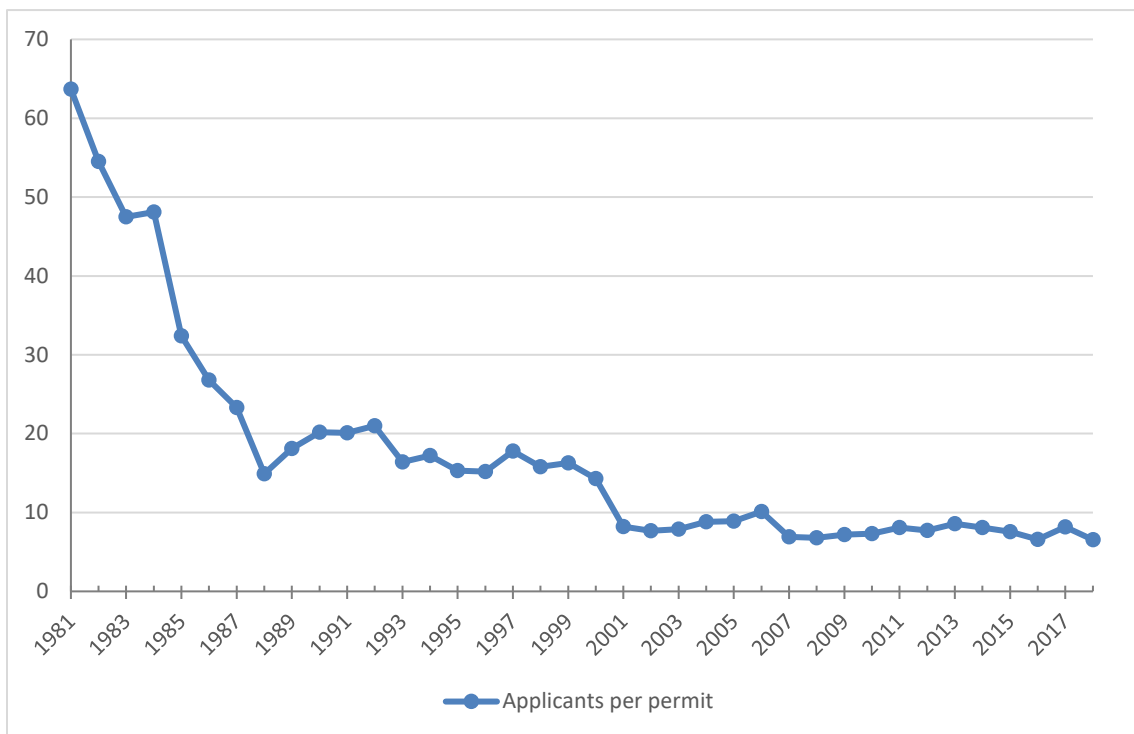


Figure 5. Number of applicants per tag, Panhandle Region, 1981-present.

Table 2. Moose harvest and drawing odds by GMU, Panhandle Region, 2008-present.

GMU	Year	Tags	Harvest		Hunter success (%)	Days/ hunter	First-choice applicants	Drawing Odds (%)
			M	F				
1	2008	219 ^b	136 ^b	18	71	5.6	917	23.8
	2009	207 ^b	160 ^b	15	85	7.0	1,112	18.5
	2010	206	154	20	84	5.7	1,071	19.2
	2011	180	131	7	77	7.9	1,056	17.0
	2012 ^a	165 ^b	119	1	79	8.1	809	20.4
	2013	142 ^b	108 ^b	0	77	9.2	929	15.3
	2014	143 ^{b,c}	109 ^{b,c}	0	76	9.2	845	16.6
	2015	146 ^{b,c}	87 ^{b,c}	0	60	8.7	850	16.5
	2016	144 ^{b,c}	91 ^{b,c}	0	63	9.7	706	19.8
	2017	95	48	0	50	10.8	563	16.9
	2018	95	55	0	58	12.4	462	20.6
2	2008	44	22	18	91	2.8	496	8.9
	2009	65	35	28	97	5.6	526	12.4
	2010	65	31	25	86	7.5	506	12.8
	2011	75	39	29	91	4.8	673	11.1
	2012	75	36	33	92	4.4	746	10.1
	2013	91 ^b	50 ^b	34	92	3.7	872	10.4
	2014	92 ^{b,c}	46 ^{b,c}	31	84	6.45	790	8.7
	2015	91 ^c	49 ^c	32	90	5.2	719	12.5
	2016	90	48	31	88	5.0	623	14.4
	2017	70	40	15	55	7.3	664	10.5
	2018	70	45	18	90	5.8	514	13.6
3	2008	20	18	0	90	5.9	165	12.1
	2009	30	24	5	97	5.6	192	15.6
	2010	30	20	5	83	6.2	227	13.2
	2011	33	25	4	88	5.2	230	14.3
	2012	33	26	4	94	5.0	259	12.7
	2013	35	24	4	80	8.3	221	15.8
	2014	35	24	5	83	7.6	234	15.0
	2015	35	21	5	74	7.6	207	16.9
	2016	35	22	3	71	6.6	172	20.3
	2017	35	20	5	71	8.2	160	21.9
	2018	35	17	5	63	7.9	149	23.5
4	2008	20	19	0	95	4.4	364	5.5
	2009	25	22	0	88	9.7	358	7.0
	2010	25	25	0	100	5.0	398	6.3
	2011	30	28	0	93	7.0	471	6.4
	2012	30	28	0	93	6.9	386	7.8
	2013	30	29	0	97	6.3	430	7.0
	2014	30	30	0	100	6.9	415	7.2
	2015	35	30	0	86	7.4	410	8.5
	2016	35	32	0	91	6.9	352	9.9
	2017	35	26	0	74	8.8	436	8.0
	2018	35	27	0	77	5.6	331	10.5
4A	2008	5	2	0	40	12.5	24	20.8

Table 2 Continued

GMU	Year	Tags	Harvest		Hunter success (%)	Days/ hunter	First-choice applicants	Drawing Odds (%)
			M	F				
	2009	5	4	0	80	3.0	8	62.5
	2010	5	4	0	80	3.0	17	29.4
	2011	5	2	0	40	12.5	13	38.5
	2012	5	2	0	40	16.5	14	35.7
	2013	5	4	0	80	6.7	13	38.5
	2014	5	3	0	60	7.3	25	20.0
	2015	5	3	0	60	8.3	18	27.8
	2016	5	3	0	60	17.0	19	26.3
	2017	5	5	0	100	18.6	27	18.5
	2018	5	2	0	40	14.5	15	33.3
5	2008	5	4	0	80	9.3	149	3.4
	2009	11 ^b	11 ^b	0	100	6.8	175	5.7
	2010	10	10	0	100	11.9	193	5.2
	2011	20	12	5	85	5.9	217	9.2
	2012	20	14	4	90	5.3	249	8.0
	2013	20	15	5	100	9.8	272	7.4
	2014	20	12	3	75	9.9	220	9.1
	2015	30	24	4	93	6.7	313	11.2
	2016	30	24	5	97	10.0	199	15.0
	2017	30 ^b	23	4	90	6.6	240	12.5
	2018	30	22	5	90	5.8	173	17.3
6	2008	21 ^b	20 ^b	0	100	5.8	338	5.9
	2009	26 ^b	26 ^b	0	100	6.7	294	8.5
	2010	25	24	0	96	7.1	280	8.9
	2011	25	23	0	92	6.1	321	7.8
	2012	25	23	0	92	6.6	289	8.7
	2013	25	26	0	100	6.0	318	7.9
	2014	25	23	0	92	8.1	319	7.8
	2015	30	27	0	87	7.2	286	10.5
	2016	30	29	0	97	7.6	326	9.2
	2017	30	22	0	73	7.5	381	7.9
	2018	30	28		85	9.6	319	10.6
7	2008	10	5	0	50	6.8	68	14.7
	2009	10	9	0	90	4.4	36	27.8
	2010	10	8	0	80	4.9	68	14.7
	2011	10	8	0	80	6.0	51	19.6
	2012	10	7	0	70	4.0	51	19.6
	2013	10	6	0	60	8.6	50	20.0
	2014	11 ^c	8	0	80	5.1	48	16.7
	2015	10	8	0	80	7.5	82	12.2
	2016	10	9	0	90	7.9	78	12.8
	2017	10	6	0	60	4.7	52	19.2
	2018	10	5	0	50	3.6	57	17.5
9	2008	10	9	0	90	6.4	78	12.8
	2009	10	9	0	90	4.1	62	16.1
	2010	10	10	0	100	4.9	54	18.5
	2011	10	8	0	80	5.3	56	17.9
	2012	10	8	0	80	4.2	48	20.8

Table 2 Continued

GMU	Year	Tags	Harvest		Hunter success (%)	Days/ hunter	First-choice applicants	Drawing Odds (%)
			M	F				
	2013	10	10	0	100	2.0	43	23.3
	2014	10	8	0	80	1.6	68	14.7
	2015	10	9	0	90	3.4	65	15.4
	2016	10	10	0	100	5.6	74	13.5
	2017	10	10	0	100	6.6	88	11.4
	2018	10	4	0	40	3.9	73	13.7

^a No tags (15) were sold in hunt numbers 3009 and 3095 in 2012.

^b Includes Super Hunt.

^c Includes rainchecks.

Table 3. Comparison of moose harvest success rates and mean antler spread with 77-day and 14-day seasons, Panhandle Region, 2018.

Season	Season length	Season Dates	Tags issued	Number harvest ^a	Success rate ^a (%)	Mean antler spread ^b
2017	77 days	15 Sep-1 Dec	165	119	72	34.9
	14 days	1 Oct-14 Oct	60	45	75	34.8
	14 days	1 Nov-14 Nov	65	42	64	34.7

^a Hunter harvest success.

^b Does not include bulls with 0.0 spreads

Table 4. Drawing odds by hunt type and season length for moose, Panhandle Region, 2008-present.

Year	Hunt type	Season length (days)	Tags	Drawing Odds (%)
2009	Antlered	77	210	9.4
	Antlered	14	121	3.3
	Antlerless	49	55	7.3
2010	Antlered	77	210	9.2
	Antlered	14	121	4.0
	Antlerless	49	55	7.3
2011	Antlered	77	205	10.5
	Antlered	14	128	4.0
	Antlerless	48	55	9.2
2012	Antlered	77	195	9.7
	Antlered	14	118	4.7
	Antlerless	48	45	7.7
2013	Antlered	77	185	8.7
	Antlered	14	130	4.8
	Antlerless	48	50	9.1
2014	Antlered	77	185	9.2
	Antlered	14	150	23.6
	Antlerless	48	50	12.0
2015	Antlered	77	195	11.9
	Antlered	14	140	15.4
	Antlerless	48	50	14.0
2016	Antlered	77	195	13.5
	Antlered	14	140	17.9
	Antlerless	48	50	15.4
2017	Antlered	77	165	8.9
	Antlered	14	125	28.2
	Antlerless	48	30	9.6
2018	Antlered	77	165	8.1
	Antlered	14	125	4.1
	Antlerless	48	30	7.8

CLEARWATER REGION

GMUs 8, 8A, 10, 10A, 12, 14, 16

Historical Background

Few records of moose in northern Idaho exist prior to 1900. Early seral habitats created through forest fire and timber harvest activity, in combination with restricted hunting, allowed moose populations to expand through the latter half of the 20th century. Although early seral habitats 10 to 30 years of age are important for moose, some moose populations in the Clearwater Region are found in climax vegetative cover. Summer feeding habits tend to be nocturnal in open habitats with abundant forage, such as wet meadows, riparian areas, and shrub fields, while diurnal activity is limited to adjacent forested areas. Logging and fire might improve foraging conditions and reduce thermal cover in areas of closed canopy forests. Winter habitat use varies based on availability and includes shrub fields in low snow areas, young subalpine fir forests, and mature grand fir forests with Pacific yew understories. Creating openings in these timber stands through logging may impact moose by eliminating yew-wood thickets. Effects of the recent expansion of wolves on moose populations within the Region are as yet largely undetermined. Disease, parasite, and nutritional data are also being evaluated across the state and southern distribution of moose range in North America.

Moose have declined precipitously in some portions of the Clearwater Region (southern) over the past 15-20 years. Reasons for these declines are poorly understood, but have also been documented elsewhere in other northwestern states, as well as the Great Lakes states and in the northeastern/New England states. Idaho has been participating in a collaborative research effort with neighboring states to investigate possible causes for these declines. Corresponding to population declines, permits offered in the Clearwater Region have declined as well. The 106 moose permits currently offered represents a 63% reduction from the high of 290 permits offered in 2001.

Game Management Units are divided into controlled hunts to disperse hunters and to direct harvest to specific areas. Controlled hunts are typically for antlered animals only; however, in 1999, 2 antlerless moose hunts (Hunts 8-2 and 8A-2 with 4 tags each) were initiated to increase hunting opportunity, address increasing moose densities, and minimize the potential for moose-automobile collisions and other conflicts in these areas. Hunting seasons for moose in the Clearwater Region again ran 86 days for antlered moose hunts and 40 days for antlerless hunts in 2017. Since 1986, persons applying for moose tags have been prohibited from applying for any other controlled hunt to improve drawing odds. Additionally, unsuccessful tag holders must wait 2 years before reapplying. Tag levels are based on trends in antler spread of harvested moose and hunter success rates of recent tag holders in the respective controlled hunts.

Management Objectives

The 1991-1995 moose species management plan is currently being updated and will identify updated management objectives in addition to the following objectives previously identified.

- Moose populations will be allowed to increase in GMUs where habitat and other conditions will support expansion.
- Legal harvest will continue to be focused on antlered bulls. Antlerless moose hunting opportunities will be continued in those areas where population control measures are considered desirable.
- Moose harvest will be adjusted where necessary to reflect changes in hunter success rates and antler spread.
- Known mortalities will be documented and information on antler size, effort, distribution and other data will be obtained from big game mandatory harvest checks.

Habitat Management and Monitoring

The majority of moose habitat in the Clearwater Region is found on federal national forest lands and private corporate timber lands. Timber harvest activities are more common on private corporate timber lands and State endowment lands. The drier southern portions of the Clearwater Region have experienced substantial forest fires in recent years that should improve foraging conditions for moose in those areas. In more mesic habitat types, the lack of disturbance has resulted in advancing forest succession that might be reducing forage availability based on results from a recent graduate research project (Schrempp 2017). This project conducted field sampling 1) to identify summer diet, 2) to evaluate the nutritional content of forage species, 3) to predict current and past availability of these forage species, and 4) to look for evidence that summer forage might be limiting declining populations. Forage species that were both moderate to high quality and highly available were most commonly consumed and comprised the bulk of individual diets. Statistically significant correlations were found between predicted forage parameters and harvest-based indices of population performance parameters at the GMU scale, which suggests that forage quantity and quality are impacting moose population performance at some level. Further research linking forage with nutrition and fitness of individuals is needed to quantify the extent to which forage might be influencing populations.

Biological Objectives

There is little known about moose population dynamics in the Clearwater Region. Population trends are monitored using hunter harvest information and anecdotal information. Declining hunting success and anecdotal information points towards declining moose population throughout the Clearwater. The department plans to initiate a moose research project in select GMUs in the region that will help identify survival rates and cause-specific mortality.

Capture, Radio-mark, and/or Telemetry

In January 2018, an effort was made to collar moose with GPS collars in order to quantify movement rates to inform research evaluating the efficacy of using remote cameras to monitor moose populations. Capture conditions were poor, resulting in only 5 adult female moose collared. Tick loads were low (0-6 ticks observed along shoulder and rump surveys) and no cropped ears associated with carotid arterial worm were observed, however, few to moderate amounts of eye bacteria were present. Location intervals were set at 30 minutes from January to mid-April and over this time period survival was 100%, including 1 shed collar. Of the 4 moose

tested for pregnancy via PSPB serum, 3 were pregnant. Movement rates averaged 18 meters per hour and 645 meters per day. Movement rates will help inform abundance estimation models that are currently being developed for remote camera data.

Population Surveys

Moose in the Clearwater Region are usually counted incidental to elk surveys. Consequently, many moose are not counted because these surveys are seldom flown at elevations where many moose normally winter and because moose tend to prefer dense subalpine fir plant associations for winter habitat where they are less visible. A sightability survey of moose in GMU 15 was attempted in 2000. Results were unsatisfactory because of overly large confidence intervals due to extreme correction factors applied to animals detected under heavy canopy cover. As a result, no comparative population data have been collected on a regular basis for moose in the Region; however, the development of alternative population monitoring methods remains an important priority.

Hunting and Harvest Characteristics

Moose populations large enough to support hunts are currently found in GMUs 8, 8A, 10A, 10, 12, 14, and 16. The number of permits offered in the Clearwater Region has declined in response to declining population levels evidenced by declining harvest success rates and increasing hunter effort. The 106 moose permits currently offered represents a 63% reduction from the high of 290 permits offered in 2001, with most of the reduction occurring in southern controlled hunt areas. Despite these reductions, harvest success rates have not improved significantly.

Harvest levels, hunter success, and hunter days are determined from mandatory harvest reports (Tables 1 & 2). In 2017, Clearwater Region hunters harvested 49 antlered moose from 20 antlered-only controlled hunts and an additional 8 antlerless moose in 2 antlerless-only controlled hunts. A total of 106 tags (94 antlered and 12 antlerless) were available across the Region in 2018, which resulted in a harvest of 62 total moose (53 antlered, 9 antlerless) for an overall success rate of 58%. Antlered and antlerless success rates were 56% and 75%, respectively. The mean antler spread for the 49 antlered moose harvested in the Region was similar to past years at 38.7 inches. Antlered success increased from 52% in 2017 to 56% in 2018, however, it was still below the previous 3-year average of 58%. An additional Hunt of a Lifetime and Super Hunt tag resulted in the harvest of two additional antlered moose.

Several changes have been made to Regional moose hunt areas in recent years. Hunt Areas in GMUs 12, 15, and 17 were combined and/or renamed in 2001 and 1 new Hunt Area was added in GMU 10 (10-6) in 2001. Tag numbers were adjusted in the Region to respond to changes in hunter success rates and/or antler spread with a net loss of 22 tags in 2001 (from 290 to 270) and a further reduction of 20 tags in 2005 (250). For the 2009 and 2010 seasons, the total number of tags was reduced from 250 (242 antlered and 8 antlerless) to 169 (161 antlered and 8 antlerless). A large portion of this reduction came about as result of a reconfiguration (elimination of numerous small hunts into one GMU-wide hunt with reduced tag levels in GMUs 16A, 17, 19 and 20). Antlered-only tags were further reduced in 2011 from 161 to 145 as a result of combining the 4 hunts (with 24 tags) in GMU 15 into 1 GMU-wide hunt with 8 tags. Additional permit reductions were implemented prior to the 2013-2014 moose hunting seasons due to poor

population performance (Hunt Areas not meeting management criteria of $\geq 75\%$ hunter success, $\geq 35"$ antler spread). Tags were reduced from 153 total tags available in 2012 to 106 in 2013 (94 antlered, 12 antlerless). Hunt Areas 12-3 and 12-4 were combined and available tags were reduced to 2. Hunt Areas 14-1 and 14-2 were combined and available tags were reduced to 5. Hunt Areas 16-1 and 16-2 were combined and available tags were reduced to 2. Despite these changes, harvest metrics did not improve and moose hunts were closed in GMUs 15, 16A, 17, 19, and 20 in 2013. An additional 2 tags were added to each of the antlerless moose hunts in Hunt Areas 8 and 8A in 2013.

Reported moose mortalities due to methods other than legal harvest have varied considerably by year (Table 3). In 2018, eleven moose were killed, primarily due to illegal kill and vehicle collisions. This is the highest mortality recorded since at least 2008 (Table 3) and it is likely that the level of mortality is considerably higher than what is reported.

Capture and Translocation

Moose that pose public safety hazards are occasionally captured for translocation to more remote areas, however, no translocation for the purpose of population augmentation or establishment has occurred.

Disease Monitoring

In 2013, sample kits were sent to 846 moose hunters statewide in an effort to assess the health status of moose in Idaho. Blood, feces, and liver samples were collected to develop baseline health parameters. Results from 344 complete kits suggested low prevalence of parasites and pathogens.

In January 2018, an effort was made to collar moose with GPS collars in order to quantify movement rates. Although the sample size was small (5 moose captured), tick loads were low (0-6 ticks observed along shoulder and rump surveys) and no cropped ears associated with carotid arterial worm were observed, however, moderate amounts of eye bacteria were present in some individuals. Although results from this assessment indicated relatively healthy moose, enhanced disease monitoring is a priority given recent population declines and sample kits will be sent to hunters in 2019 as part of this effort.

Management Discussion

Tag levels will continue to be allocated based on trends in antler spread of harvested moose and hunter success rates of recent tag holders. Numbers of tags may be increased or decreased as dictated by harvest data. Tag numbers have been adjusted in the Region to respond to changes in hunter success rates and/or antler spread with a net loss of 184 tags since 2001 (from 290 to 106).

As evidenced by the tag reductions described above, moose have been declining in portions of the Clearwater Region over the past 15-20 years. Declines have been most pronounced in the southern portion of the Region. Reasons for these declines are poorly understood, but have also been documented along the southern distribution of moose range across North America (Great

Lakes states, Northeast/New England states, and elsewhere in the Pacific Northwest). Idaho is currently part of a research collaborative that includes Wyoming, Montana, and Washington to investigate potential causes of these declines in the Northwest. Idaho conducted a graduate research project (Schrempp 2017) as part of this multi-state effort. This research found statistically significant correlations between harvest-based indices of population performance parameters and forage quantity and quality estimates at the GMU scale. Although these associations suggest that forage quantity and quality are impacting moose population performance at some level, further research linking forage with nutrition and fitness of individuals is needed to quantify the relationship (Schrempp et al. 2019).

Preliminary results from other on-going research being conducted elsewhere has identified a wide range of possible factors potentially contributing to these observed declines. Some of these include climate change related shifts in plant phenology (forage quantity and quality) and changing parasite prevalence and impacts on moose. In addition, impacts of predation (especially wolf-related) are being evaluated (although some moose populations have declined in areas devoid of wolves).

The effects of the expansion of wolves across Idaho and the Region on moose populations are as yet largely undetermined. In 2008, the Region began monitoring moose in GMU 10 that were captured and radio-collared to determine mortality rates and causes of death in the presence of wolves. This work was done in conjunction with a wolf-elk interaction research project in the Lolo Zone. Unfortunately, sample sizes of radio-marked moose never reached desired levels. Results of this work were summarized in previous years' reports. In summary, wolves were not a significant cause of mortality on adult moose. However, calf mortality was high (6 of 12 radio-marked animals) in the only year that calves were collared (2011).

Literature Cited

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Figure 6. Clearwater Antlered Moose Hunt Areas.

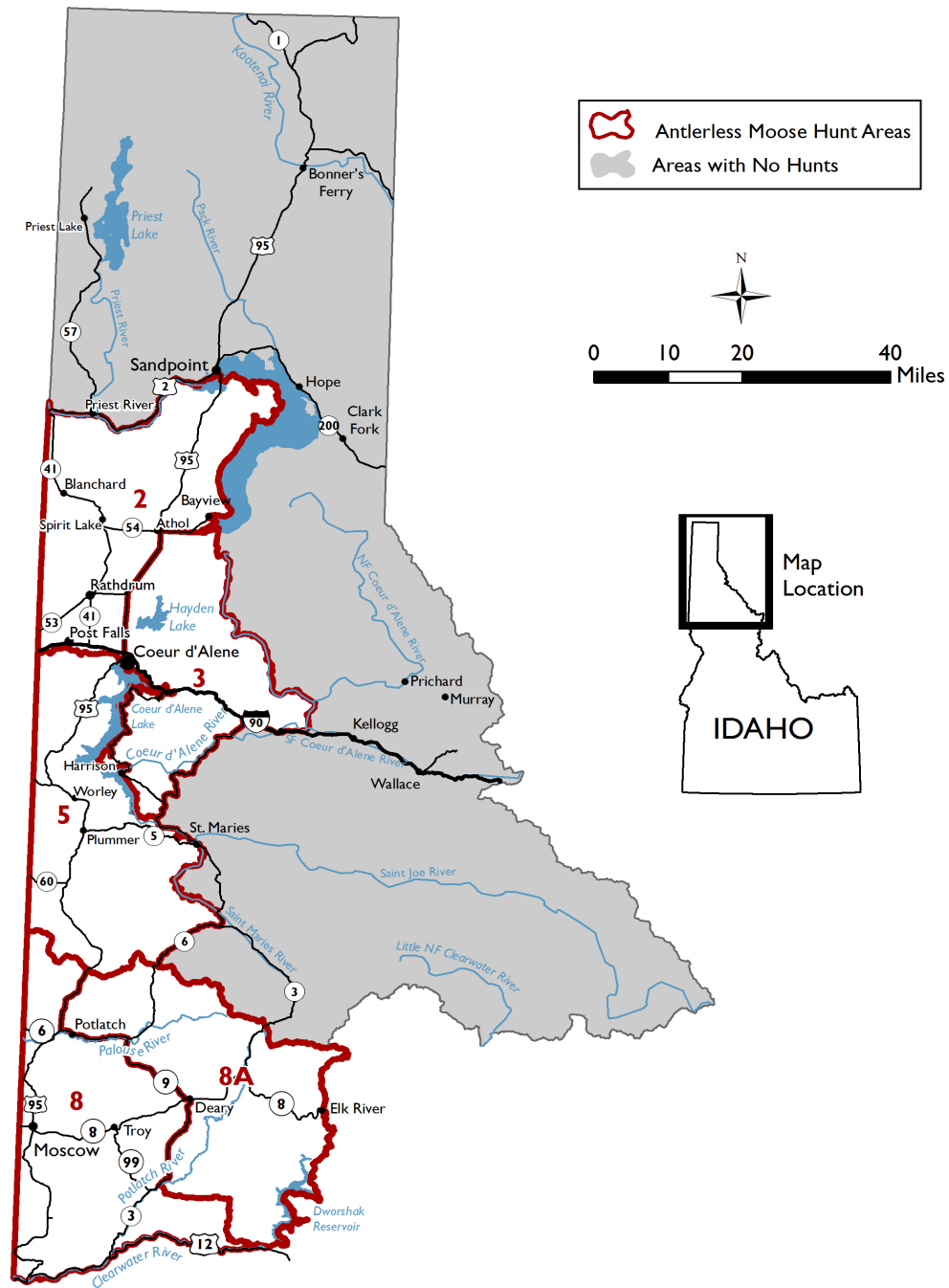


Figure 7. Panhandle and Clearwater Antlerless Moose Hunt Areas.

Table 1. Moose harvest and drawing odds, Clearwater Region, 2008-present.

Year	Tags	Harvest			Hunter success (%)	First-choice applicants	Drawing odds (%)
		M	F	Total			
2008	250	117	8	125	50	850	29.4
2009	169	79	6	85	50	788	21.4
2010	169	79	8	87	51	801	21.1
2011	156	71	7	78	51	625	25.0
2012	147 ^a	64	6	70	48	644	22.8
2013	108 ^{b,c}	60	11	71	66	730	14.8
2014	107 ^c	62 ^c	8	70	65	631	16.8
2015	107 ^c	58 ^c	8	66	62	694	15.3
2016	107 ^c	60	8	68	64	715	14.8
2017	108 ^c	50 ^c	8	58	54	718	14.8
2018	108 ^c	55 ^c	8	63	58	641	16.5

^a 153 tags were issued in 2012, although 6 hunters elected to take rain checks (wildfire related) and did not participate in the hunt.

^b 106 tags were issued to include 4 rain check holders from 2012.

^c Includes Super Hunt and/or Hunt of a Lifetime tag(s).

Table 2. Moose harvest and drawing odds by GMU, Clearwater Region, 2008-present.

Hunt Area	Year	Tags	Harvest		Hunter success (%)	Days/hunter ^a	First-choice applicants	Drawing odds (%)
			M	F				
8	2008	12	7	4	92	3.1	112	10.7
	2009	12	7	4	92	5.3	123	9.8
	2010	12	7	4	92	3.0	164	7.3
	2011	12	8	4	100	7.9	144	8.3
	2012	12	7	3	83	4.3	144	8.3
	2013	18 ^d	12	6	100	9.0	207	8.7
	2014	16	9	5	88	7.8	167	9.6
	2015	17 ^d	10 ^d	5	88	10.7	130	12.3
	2016	17 ^d	10 ^d	6	94	11.4	135	11.8
	2017	17 ^d	10 ^d	5	88	12.9	145	11.0
	2018	17 ^d	10 ^d	5	88	8.5	91	11.0
8A	2008	12	8	4	100	6.5	181	6.6
	2009	12	8	2	83	7.9	201	6.0
	2010	12	8	4	100	7.5	223	5.4
	2011	12	8	3	92	5.5	171	7.0
	2012	12	8	3	92	10.4	218	5.5
	2013	16	11	5	100	8.1	268	6.0
	2014	17 ^d	10 ^d	3	76	7.2	197	8.1
	2015	16	10	3	81	11.6	223	7.2
	2016	16	11	2	81	9.0	222	7.2
	2017	16	9	3	75	13.1	242	6.6
	2018	17 ^d	9 ^d	4	76	5.5	158	6.0
10	2008	32	17	0	53	6.6	106	30.2
	2009	32	22	0	69	9.2	120	26.7
	2010	32	19	0	59	5.8	97	33.0
	2011	32	13	0	41	6.2	77	41.6
	2012	32	14	0	44	2.7	48	66.7
	2013	27	9	0	33	7.9	67	40.3
	2014	27	12	0	44	8.1	64	42.2
	2015	27	10	0	37	9.1	92	29.3
	2016	27	12	0	44	8.4	101	26.7
	2017	28 ^d	8 ^d	0	26	11.4	95	28.4
	2018	27	10	0	37	9.0	102	37.8
10A	2008	34	24	0	71	9.0	192	17.7
	2009	29	20	0	69	13.9	168	17.3
	2010	29	20	0	69	6.1	152	19.1
	2011	29	19	0	66	8.2	131	22.1
	2012	29	16	0	55	5.4	115	25.2
	2013	24	17	0	71	10.9	121	19.8
	2014	24	19	0	79	11.0	126	19.0
	2015	24	16	0	67	6.4	125	19.2
	2016	24	17	0	71	10.4	160	15.0

Table 2. Continued.

Hunt Area	Year	Tags	Harvest		Hunter success (%)	Days/hunter ^a	First-choice applicants	Drawing odds (%)
			M	F				
12	2017	24	13	0	54	15.2	157	15.3
	2018	24	16	0	67	10.4	130	22.1
	2008	43	21	0	49	10.6	64	67.2
	2009	26	9	0	35	5.9	42	61.9
	2010	26	15	0	58	11.1	48	54.2
	2011	26	10	0	38	5.9	27	96.3
	2012	26	13	0	50	3.2	44	59.1
	2013	16	5	0	31	18.0	41	39.0
	2014	16	8	0	50	8.6	30	53.3
	2015	16	9	0	50	6.3	61	26.2
	2016	16	8	0	50	11.4	58	27.5
	2017	16	6	0	38	6.3	43	26.9
	2018	16	7	0	58	9.6	46	28.8
14	2008	13	6	0	46	8.0	83	15.7
	2009	11	6	0	56	9.2	42	26.2
	2010	11	5	0	45	4.4	55	20.0
	2011	11	6	0	56	12.8	33	33.3
	2012	7 ^d	2	0	29	0.5	37	16.1
	2013	6	6	0	100	12.3	20	30.0
	2014	5	2	0	40	3.0	42	11.9
	2015	5	3	0	60	15.3	29	17.2
	2016	5	1	0	20	12.0	30	16.0
	2017	5	3	0	60	19.7	29	11.9
	2018	5	1	0	20	n/a	36	14.0
15 ^c	2006	45	25	0	55	12.4	143	31.5
	2007	45	20	0	44	11.1	117	38.5
	2008	45	18	0	40	11.0	108	41.7
	2009	24	3	0	13	6.0	70	34.3
	2010	24	4	0	17	25.8	46	52.2
	2011	8	2	0	25	12.0	27	29.6
	2012	8	1	0	13	0.3	13	61.5
16	2008	12	3	0	25	12.7	38	31.6
	2009	4	2	0	50	6.5	7	57.1
	2010	4	1	0	25	ND	7	57.1
	2011	4	2	0	50	6.8	5	80.0
	2012	4	0	0	0	ND	4	100.0
	2013	2	0	0	0	ND	6	33.3
	2014	2	0	0	0	ND	5	40.0
	2015	2	0	0	0	ND	4	50.0
	2016	2	1	0	50	9.0	9	22.0
	2017	2	1	0	50	61.0	6	33.3
	2018	2	0	0	0	0	7	29.0

Table 2. Continued.

Hunt Area	Year	Tags	Harvest		Hunter success (%)	Days/hunter ^a	First-choice applicants	Drawing odds (%)
			M	F				
16A ^c	2006	7	4	0	57	10.7	9	77.8
	2007	7	1	0	14	30.0	18	38.9
	2008	7	3	0	43	4.5	6	100.0
	2009	4	0	0	0	ND	2	100.0
	2010	4	0	0	0	ND	4	100.0
	2011	4	1	0	25	40.0	1	100.0
	2012	4	1	0	25	1.8	1	100.0
17 ^c	2006	18	6	0	33	6.5	13	100.0
	2007	18	0	0	0	ND	18	100.0
	2008	18	5	0	28	8.5	17	100.0
	2009	5	1	0	20	15.0	7	71.4
	2010	5	1	0	20	1.0	2	100.0
	2011	5	1	0	20	1.0	1	100.0
	2012	5	0	0	0	ND	1	100.0
19 ^c	2006	12	8	0	66	4.9	19	63.2
	2007	12	0	0	0	ND	19	63.2
	2008	12	3	0	25	6.7	7	100.0
	2009	5	1	0	20	5.0	3	100.0
	2010	5	1	0	20	2.0	1	100.0
	2011	5	0	0	0	ND	7	71.4
	2012	5	0	0	0	ND	9	55.6
20 ^c	2006	10	2	0	20	12.0	12	83.3
	2007	10	3	0	30	4.0	11	90.9
	2008	10	2	0	20	15.0	6	100.0
	2009	5	0	0	0	ND	3	100.0
	2010	5	0	0	0	ND	2	100.0
	2011	5	1	0	0	14.0	1	100.0
	2012	3 ^b	1	0	33	1.0	1	100.0

^a Data from successful hunters only.^b 5 tags issued but 2 hunters elected to take rain checks (fire-related) and did not hunt^c Hunts no longer offered after 2012.^d Includes Super Hunt and/or Hunt of a Lifetime tag(s).

Table 3. Known moose mortalities, excluding Controlled Hunts, Clearwater Region, 2008-present.

Year	Mortality agent					Total
	Native American harvest	Illegal kill	Road kill	Natural	Other	
2008	0	1	3	0	1	5
2009	1	2	3	0	0	6
2010	0	2	2	1	0	5
2011	0	0	2	1	1	4
2012	0	0	0	3	1	4
2013	0	0	1	0	0	1
2014	0	0	4	2	1	7
2015	0	2	2	0	0	4
2016	0	0	2	0	1	3
2017	0	2	2	0	0	4
2018	0	3	4	2	2	11

MAGIC VALLEY REGION

GMUs 44, 48, 49, 55, 56, 57

Historical Background

Prior to 1990, transient moose were recorded throughout the Magic Valley Region, but there were no viable, resident populations. From 1986-2000, 31 moose were released in GMUs 43 and 44. Following these releases, moose numbers in the region increased as a result of good reproduction and natural ingress. Presently, populations capable of sustaining limited harvest occur in GMUs 44, 48, 49, 54, 55, 56, and 57 (Figure 6).

Management Objectives

Management Objectives for moose in the Magic Valley Region include: 1) allowing established populations to expand, 2) transplant moose where feasible, and 3) increase efforts to record sightings and mortalities.

Habitat Management and Monitoring

To date, habitat has not been managed specifically for moose; however, the Department annually partners with state and federal land management agencies to plan, fund, and implement a variety of habitat restoration projects that directly benefit moose. These include riparian restoration and aspen regeneration projects throughout the region.

Biological Objectives

Maintain or increase moose populations within the region capable of supporting hunter harvest.

Capture, Radio-mark, and/or Telemetry

No moose were captured for radio-collaring during this reporting period. However, 1 adult bull was radio-collared and relocated from an urban area near Heyburn during this reporting period.

Population Surveys

Aerial population surveys for moose have not been conducted in the region. During the 1990s and 2000s, increasing anecdotal observations indicated a growing moose population along the South Fork Boise River in GMU 43, Willow Creek in GMU 44, Big Wood River in GMU 48, and in the Trail Creek drainage on the border of GMUs 48 and 49. Populations in these GMUs appear to be stable as evidenced by fairly consistent annual harvest rates. Populations in the Sublett area (GMU 56) appear to be stable to increasing as observations are common. In recent years, moose have continued to expand their distribution and have become increasingly common in GMUs 54, 55, and 57. While not entirely suggestive of an increasing population, confirmed reports of moose getting caught in fences and succumbing to wounds inflicted during the rut in the South Hills are becoming more common. Additionally, 2-3 moose-vehicle collisions are reported each year within the region.

Hunting and Harvest Characteristics

In response to dwindling populations in the northern GMUs of the Magic Valley Region, antlerless harvest was eliminated and antlered tags reduced from 6 tags to 3 in Hunt Area 44 after the 2010-2011 hunting season. At this time, the boundary for Hunt Area 44 was changed to include the eastern portion of GMU 44 and all of GMUs 48 and 49, which eliminated Hunt Area 48. Hunter success has remained stable since these changes were implemented, with 1-2 more moose being taken in recent years than were harvested in 2008 and 2009. In 2018, 3 tags were issued in Hunt Area 44 and 3 bulls were harvested.

The southern GMUs of the region have enjoyed increasing moose populations and expanding hunting opportunity. In 2011, hunts were authorized for the first time in Hunt Area 55. Prior to this inaugural hunting season, Hunt Areas 55 and 56 was restructured and condensed down into a single Hunt Area 55, which includes GMUs 55, 56, and 57. Prior to this change, Hunt Area 55 had only included its representative GMU, while Hunt Area 56 had included GMUs 56, 73, and 73A. Five tags were issued in 2018 for Hunt Area 55, with all 5 hunters successfully harvesting moose.

A new hunt was opened in GMU 54 starting in 2015. Only 1 hunt tag has been issued each year. This has become a coveted moose unit, with super tag winners frequently harvesting large, mature bulls in this GMU. The single tag holder for Hunt Area 54 was successful, and 3 Supertag holders and 1 Hunt of Lifetime tag holder also harvested moose in GMU 54 in 2018. The average antler spread of animals taken in 2018 was 48.5 inches.

No antlerless hunts were offered in the Magic Valley Region during 2018. Seasons in all 3 hunt areas ran from the end of August until November 23, 2018, allowing hunters the opportunity to hunt for 85 days. In total, 9 tags were issued between the three hunt areas, with all 9 hunters successfully harvesting moose.

Capture and Translocation

Three moose (1 adult bull, 1 adult cow, and 1 yearling bull) were captured in urban areas and relocated in the region during this reporting period.

Disease Monitoring

While no active disease monitoring for moose is being conducted in the region, samples are sent to the health lab from dead moose for which no apparent cause of mortality can be determined. One adult bull was captured, sampled, radio-collared and relocated from an urban area near Heyburn during this reporting period. Samples were sent to the lab for testing, although no results are available at this time. In 2017, samples from one moose found dead in GMU 52 (outside of any Hunt Area boundaries) were sent to the lab for testing.

Management Discussion

Although no formal population surveys are planned, moose within the Magic Valley Region will continue to be monitored through incidental observations by agency personnel and the public, and moose observations will continue to be recorded during aerial surveys for deer and elk.

A major objective for moose management in the Magic Valley Region is to identify methods for surveying moose. While moose numbers have increased, the densities of moose are not high enough for aerial or ground surveys to be a viable option for assessing populations. Improvements in the methodology for using camera traps as a means to count animals could be useful for this purpose.

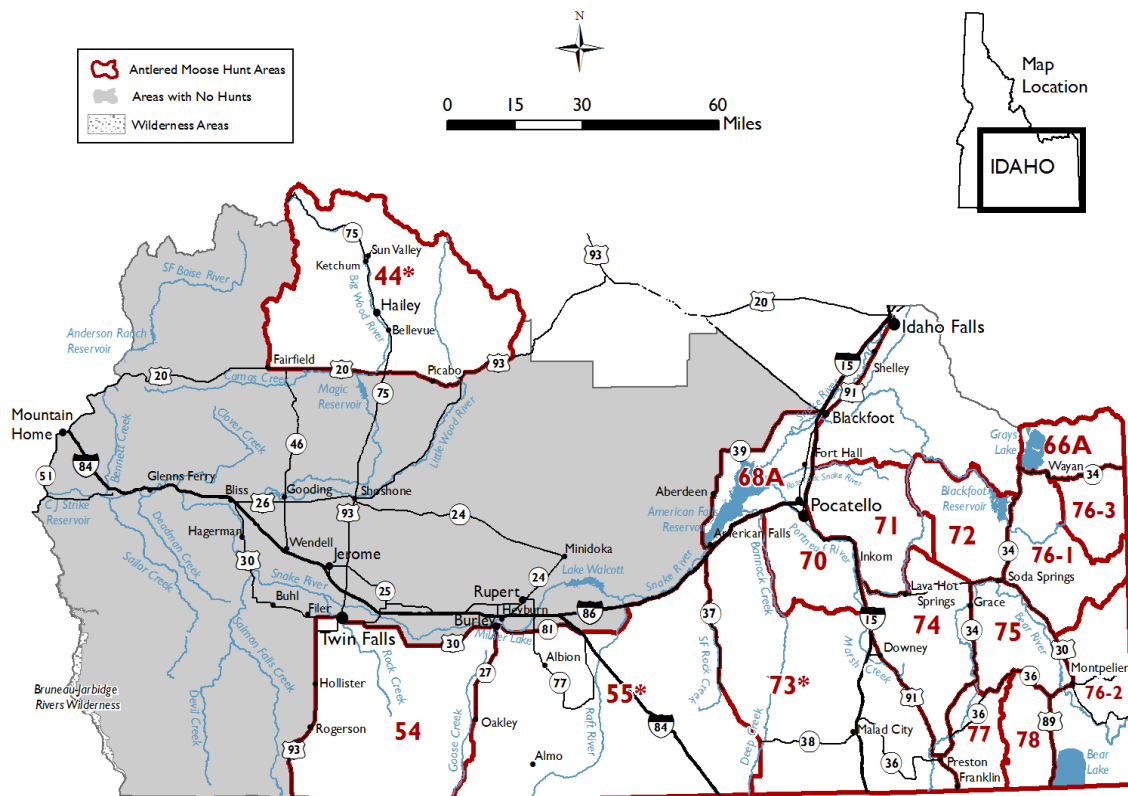


Figure 8. Magic Valley and Southeast Antlered Moose Hunt Areas.

Table 1. Moose harvest and drawing odds by Hunt Area, Magic Valley Region, 2008-present.

Hunt Area	Year	Tags	Harvest		Hunter success (%)	Days/hunter	First-choice applicants	Drawing odds (%)
			M	F				
44 ^a	2008	6	1	1	33	5.0	23	26.1
	2009	6	1	1	33	19.5	18	33.3
	2010	6	1	0	17	5.0	11	54.5
	2011	3	2	0	67	4.5	17	17.6
	2012	3	3	0	100	5.0	11	27.3
	2013	3	3	0	100	17.3	16	18.8
	2014	3	3	0	100	8.0	35	8.6
	2015	3	3	0	100	4.7	28	10.7
	2016	3	2	0	67	2.0	27	11.1
	2017	3	2	0	67	17.0	35	9.0
	2018	3	3	0	100	25.0	45	6.7
48 ^b	2005	4	2	2	100	6.3	8	50.0
	2006	4	1	2	75	4.5	9	44.4
	2007	4	0	0	0	0	6	66.7
	2008	4	2	0	50	12.0	8	50.0
	2009	4	2	2	100	4.5	11	36.4
	2010	4	2	0	50	8.0	9	44.4
	54	2015	1	1	0	100	2.0	106
2016		1	1	0	100	2.0	36	2.7
2017		3 ^d	3 ^d	0	100	1.0	71	1.4
2018		5 ^d	5	0	100	9.5	110	4.5
55	2011	5	5	0	100	7.0	138	3.6
	2012	5	5	0	100	2.4	97	5.2
	2013	5	5	0	100	9.2	139	3.6
	2014	5	3	0	60	11.3	129	3.9
	2015	5	5	0	100	9.3	115	4.3
	2016	5	5	0	100	9.3	114	4.4
	2017	5	4	0	80	7.5	159	3.1
	2018	5	5	0	100	4.6	147	3.4
	56 ^c	2003	5	5	0	100	17.2	37
2004		5	5	0	100	5.6	44	11.4
2005		5	5	0	100	12.3	46	10.9
2006		5	5	0	100	4.5	42	11.9
2007		5	5	0	100	7.8	73	6.8
2008		5	3	0	60	10.0	114	4.4
2009		5	5	0	100	4.0	116	4.3
2010		5	5	5	100	6.8	111	4.5

^a Hunt established in 2001; includes portions of GMUs 44 and 48.

^b Hunt established in 2005, ended 2010; includes all of GMU 49 and a portion of GMU 48.

^c Prior to 2011 Hunt Area included GMUs 56, 73, and 73A. In 2011 and 2012 Hunt Area 55 was established and included GMUs 55, 56 and 57, closing Hunt Area 56.

^d Includes Super Hunt and/or Hunt of a Lifetime

SOUTHEAST REGION

GMUs 66A, 68A, 70, 71, 72, 73, 73A, 74, 75, 76, 77, 78

Historical Background

Prior to the 1950s, there were too few moose in Southeast Region to justify a harvest. The first hunt for moose in the region was held in 1959 when 5 antlered-only tags were issued for a portion of GMU 76. As moose populations continued to grow and expand to other areas in the Southeast Region so did the hunting opportunity and harvest, reaching a high of 180 moose harvested in 11 GMUs in 2003. Tag levels and total harvest have decreased significantly since 2003 in response to apparent changes in population densities. Illegal moose harvest may be substantial (Kuck and Ackerman 1984), although reporting of these cases is sporadic. The Department issued a small number of tags for any moose in several GMUs from 1975-1990. An average of 80% of that harvest was antlered moose. In 1991, antlerless-only hunts were instituted in GMUs 66A and 76. Since 1991, tags have been issued for antlered or antlerless-only moose (Figures 9 and 10). Antlerless moose hunts start later than antlered hunts to provide more time for calf development.

Management Objectives

Management Objectives for moose in Southeast Region follows that for the state in general: to provide “high-quality” hunting and other moose-related recreational opportunities. Consequently, tag levels are conservative, and hunter success is high relative to hunts for other cervid species. For antlered-only hunts, emphasis is on providing each hunter with the opportunity to harvest a mature bull moose. Antlerless-only moose hunting is also offered in some GMUs due to relatively high moose populations. Non-consumptive values of moose are also important.

Habitat Management and Monitoring

Winter 2018-2019 snow depths averaged 80-124% of the 30-year mean for most of the Southeast Region. This is in contrast to the 2017-2018 winter when averages were 50-90% of the 30-year mean. Spring conditions were normal with near average moisture levels extending into the summer months.

Biological Objectives

The 1991-1995 Moose Management Plan established the goals of providing high-quality moose hunting and other moose-related recreational experiences for as many people as possible, assisting the expansion of moose populations into available habitat, and increasing tag numbers where possible. Specific numerical objectives for moose populations are not defined in the 1991-1995 Moose Management Plan.

Capture, Radio-mark, and/or Telemetry

During the winter of 2017-2018 IDFG initiated a moose research project in GMU 76. This is a pilot project to test a novel methodology for estimating moose abundance. Traditional aerial

surveys are expensive, labor intensive, and often result in large confidence intervals. A more reliable and efficient technique to estimate moose abundance would improve the decision making process for wildlife managers.

A resource selection function (RSF) was used to identify moose winter habitat in GMU 76. Remote cameras (n = 45) were then deployed in GMU 76 using predicted winter habitat for moose from the RSF. In addition to using remote cameras to detect moose, information on movement rates of moose was necessary for a valid estimate of abundance. As such, in January 2018, 8 moose (7 cows and 1 bull) were captured in GMU 76 and equipped with GPS collars. Data from this project did not yield conclusive results and future work is planned to investigate estimating moose abundance and understanding factors driving moose populations.

Population Surveys

In January 2018, IDFG conducted a moose specific abundance survey in GMUs 66A and 76. Prior to 2018, the most recent moose specific survey was conducted during January of 2000-2002 in the same area. The goal of the 2018 survey was to assess changes in moose abundance from the early 2000s in GMUs 66A and 76. In total, 178 moose were observed in 2018 compared to 400 moose 2000-2002, a 56% decline. The bull:cow:calf ratio during the 2018 survey was 85:100:56.

Moose were also counted incidentally during mule deer surveys in the Bannock PMU (GMUs 70, 71, 73, 73A, 74, 75, 77, 78) in 2015 and the Caribou PMU (GMUs 76, 72, 71) in 2019. A total of 282 moose were observed during the 2015 Bannock PMU mule deer survey with a bull:cow:calf ratio of 71:100:32. A total of 231 moose were observed during the 2019 Caribou PMU mule deer survey with a bull:cow:calf ratio of 56:100:30. Lastly, in January 2017 IDFG incidentally counted moose during the Bear River Elk survey (GMUs 75, 77, and 78). A total of 109 moose were observed with a bull:cow:calf ratio of 87:100:31. Because these were not randomized aerial sightability surveys designed specifically for moose, caution must be taken interpreting the results as there is observability bias in the data; however, this information does provide some general baseline trend information for future comparison.

Hunting and Harvest Characteristics

Eighty antlered-only and 39 antlerless-only tags were offered in 2018. A total of 59 antlered (73.8% hunter success) and 23 antlerless (58.9% harvest success) moose were harvested. This is similar to 2017 when 57 antlered (71.2% hunter success) and 23 antlerless (58.9% hunter success) moose were harvested. The average outside antler spread was 36.7 inches in 2018, which is very similar to the 37.0 inch average from 2017 (for antlered moose for which data are available).

Tag levels decreased from 123 total tags in 2016 to 119 total tags in 2017 and 2018. Previously, GMU 75 had 5 antlerless tags, however, reduced hunter success and concern regarding moose populations in resulted in removal of antlerless opportunity. Conversely, the archery-only hunt in GMU 68A indicated more opportunity could be offered, and as such 4 antlered-only and 4 antlerless only tags were added to this hunt.

Other sources of moose mortality include (but aren't limited to) Native American harvest, natural mortality, road-kills, and illegal harvest. For this reporting period, 4 non-harvest mortalities were reported (Table 4). Reporting of non-hunting mortalities is believed to be much lower than the actual number.

Capture and Translocation

Moose translocations and hazing activities are expanding to include the entire year rather than spring and early summer. Over the course of a year, on average, 5 – 30 moose wander into congested urban areas in the Southeast Region. These are usually yearlings or 2-year olds and are most often hazed back into the surrounding hills or captured using chemical immobilization and translocated to more suitable habitat. During this reporting period 12 moose were immobilized and released in the Southeast Region. Of those 9 were radio-collared.

Disease Monitoring

Throughout the course of the year IDFG responds to numerous moose mortalities that are unrelated to hunter harvest. When feasible, these animals are necropsied and samples are sent to a lab for testing. Additionally, moose that are captured and translocated are assessed for diseases and parasites. Mortalities from winter tick infestations and bacterial eye infections have been documented in recent years. Carotid artery worm has also been detected in many moose in the Southeast Region. These moose include hunter harvested moose and non-harvest mortalities. It is unknown if carotid artery worm is a proximate cause of mortality for moose. Disease monitoring will be important moving forward to assess impacts to moose populations.

Management Discussion

The mandatory check of moose harvested provides the majority of information available for management. Aerial surveys, using sightability models such as Anderson (1994) and Unsworth et al. (1994), provided historical perspective data in 2002 and years prior, but limitations on resources has not allowed for consistent repetition of these surveys. The most recent survey, in 2018, was the first aerial survey for moose since the early 2000s. Currently, the majority of moose population data is obtained from incidental observations during mule deer and elk aerial surveys. As such, tag levels are set at conservative levels.

The drawing odds for antlered-only tags indicate strong demand for moose hunting opportunity. Drawing odds varied considerably in 2017, with antlered draw odds varying between 4% and 32% and antlerless odds varying between 12% and 100%, depending on the hunt.

Moose also have high non-consumptive values for viewing by the public. Their relative abundance and general lack of fear of humans when in the open make them easy for people to observe.

Declining moose populations in parts of Idaho and elsewhere across their range highlight the need to better understand mechanisms influencing moose populations. Research targeted at understanding these mechanisms will be important for wildlife managers moving forward.

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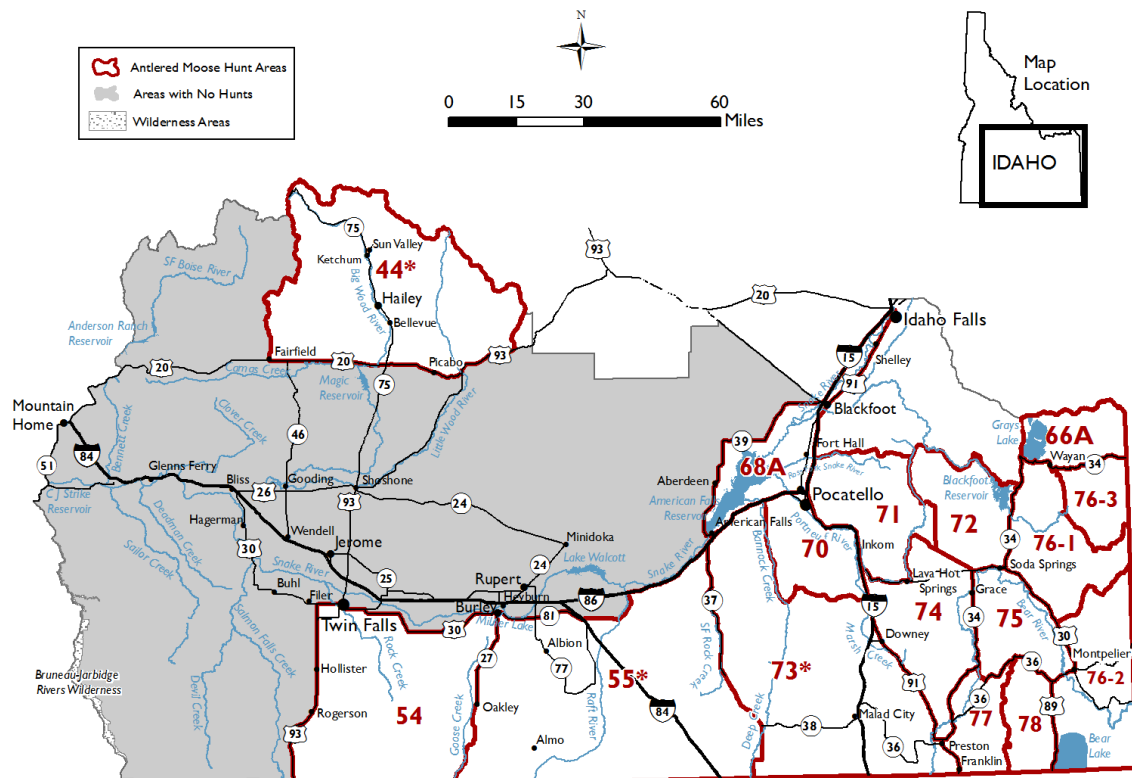


Figure 9. Southeast and Magic Valley Antlered Moose Hunt Areas. Hunt area 68A added for 2015 season.

Upper Snake & Southeast Region Antlerless Moose Hunts

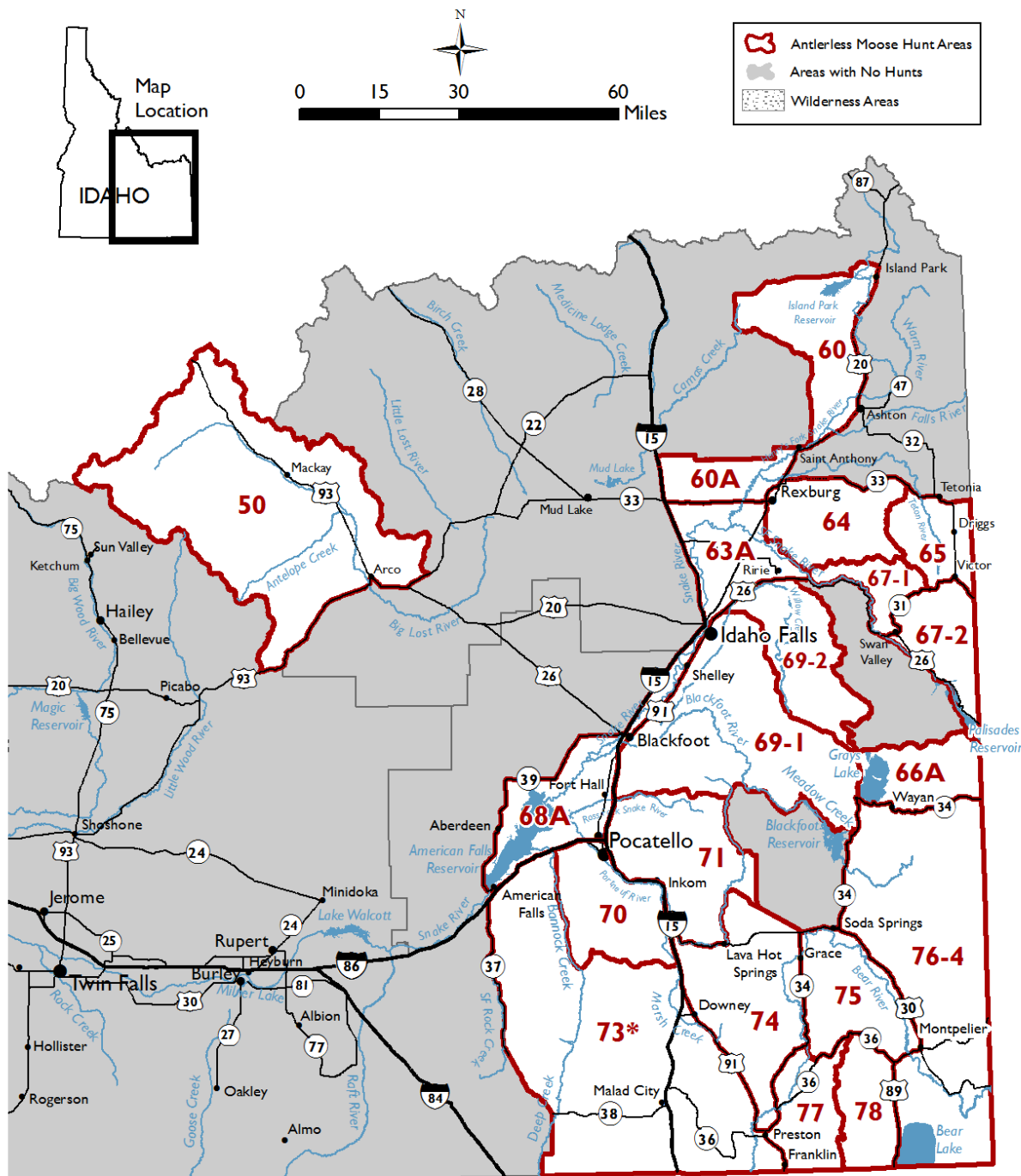


Figure 10. Southeast and Upper Snake Antlerless Moose Hunt Areas. Hunt area 68A added for 2015 season.

Table 1. Total observed moose by sex/age class and model estimates of moose from aerial surveys, Southeast Region, 1991-2002.

Hunt area Year	Observed		Estimate	
	Total	Bull:cow:calf	Total	Bull:cow:calf
76-1, 2				
1994	90	42:100:42	432	26:100:50
2000	286	74:100:42	510±83	74:100:42
76-3, 4				
1993	104	76:100:37	192	76:100:36
1997	89	85:100:44	190	100:100:53
76-5, 6				
1991	136	49:100:60		
1995	121	55:100:40	167±22	54:100:34
2002	103	117:100:34	174±40	110:100:35
76				
1999	140	100:100:62	583±146	99:100:60
66A				
1995	159	69:100:49	285±60	67:100:43
2002	152	64:100:39	219±31	71:100:37

Table 2. Moose harvest and drawing odds, Southeast Region, 2008-present.

Year	Tags	Harvest			Hunter success (%)	First-choice applicants	Drawing odds (%)
		M	F	Total			
2008	160	72	37	109	68	667	24.0
2009	160	80	44	124	78	809	19.8
2010	160	71	36	107	67	696	23.0
2011	127	63	23	86	68	788	16.1
2012	127	63	27	90	71	623	20.4
2013	130	70	23	93	72	793	16.4
2014	130	66	31	97	75	732	17.8
2015	123 ^a	64	24	88	72	831	14.8
2016	123	59	19	78	63	913	13.5
2017	119	57	23	81	66	969	12.3
2018	119	59	23	82	69	799	14.9

^a One each Archery antlered and Archery antlerless hunts added in 2015.

Table 3. Moose harvest and drawing odds by Hunt Area, Southeast Region, 2008-present.

Hunt Area	Year	Tags	Harvest		Hunter success (%)	Days/hunter	First-choice applicants	Drawing odds (%)
			M	F				
66A	2008	25	12	8	80	4.7	131	19.1
	2009	25	13	8	84	4.6	151	16.6
	2010	25	14	5	76	5.5	147	17.0
	2011	15	9	3	80	6.1	129	11.6
	2012	15	9	3	80	6.8	85	17.6
	2013	15	6	2	53	7.1	120	12.5
	2014	15	6	2	53	11.1	87	17.2
	2015	15	8	1	60	7.7	10	15.0
	2016	15	7	0	47	17.7	108	13.9
	2017	15	8	3	73	5.1	110	13.6
	2018	15	8	2	67	5.8	85	17.6
68A ^a	2015	4	1	0	25	14.0	31	12.9
	2016	4	2	1	75	5.3	16	25.0
	2017	8	2	1	75	7.3	55	14.5
	2018	8	1	1	25	18.0	27	29.6
70	2008	5	5	0	100	10.8	50	10.0
	2009	5	4	0	80	4.0	99	5.1
	2010	5	5	0	100	22.0	68	7.4
	2011	5	4	0	80	7.8	105	4.8
	2012	5	5	0	100	4.6	89	5.6
	2013	8	6	1	88	11.4	131	6.1
	2014	9 ^b	8 ^b	1	100	6.0	89	9.0
	2015	8	6	2	100	8.6	109	7.3
	2016	8	6	2	100	12.5	93	8.3
	2017	8	6	2	100	10.6	129	6.2
	2018	8	6	2	100	9.5	123	6.5
71	2008	20	6	4	50	7.0	52	38.5
	2009	20	6	7	65	5.8	58	34.5
	2010	20	2	6	40	7.5	25	80.0
	2011	20	7	4	55	10.9	32	62.5
	2012	20	3	4	35	4.4	39	51.3
	2013	20	8	5	65	8.8	49	40.8
	2014	20	7	5	55	8.4	56	35.7
	2015	11	3	4	64	3.7	41	26.8
	2016	11	2	1	27	7.6	52	21.2
	2017	11	4	4	72	11.8	62	17.7
	2018	11	3	5	72	6.8	39	28.2
72	2008	5	5	0	100	12.2	41	12.2
	2009	5	5	0	100	10.6	36	13.9
	2010	5	5	0	100	12.4	44	11.4
	2011	5	4	0	80	14.0	35	14.3
	2012	5	2	0	40	9.0	35	14.3

Table 3 Continued

Hunt Area	Year	Tags	Harvest		Hunter success (%)	Days/hunter	First-choice applicants	Drawing odds (%)
			M	F				
	2013	5	4	0	80	9.0	38	13.2
	2014	5	4	0	80	5.5	45	11.1
	2015	5	4	0	80	5.0	49	10.2
	2016	5	5	0	100	5.8	78	6.4
	2017	5	5	0	100	8.6	77	6.5
	2018	5	4	0	80	6.3	57	8.8
73/73A ^c	2011	6	6	0	100	15.8	96	6.3
	2012	5	5	0	100	8.7	86	5.8
	2013	5	5	0	100	7.2	103	4.9
	2014	5	4	0	80	5.0	107	4.7
	2015	8	5	3	100	11.9	100	8.0
	2016	8	5	2	88	12.6	124	6.5
	2017	8	4	3	88	7.0	171	4.7
	2018	8	5	1	75	20.4	126	6.3
74	2008	5	3	0	60	12.0	22	22.7
	2009	5	5	0	100	16.5	29	17.2
	2010	5	5	0	100	19.0	34	14.7
	2011	5	4	0	80	8.5	33	15.2
	2012	5	4	0	80	19.0	21	23.8
	2013	5	5	0	100	16.8	39	12.8
	2014	5	5	0	100	8.0	40	12.5
	2015	7	5	0	71	4.8	52	13.5
	2016	7	4	1	71	5.2	45	15.5
	2017	7	3	2	71	11.2	58	12.1
	2018	7	2	2	57	3.0	60	11.7
75	2008	10	4	4	80	11.4	40	25.0
	2009	10	4	4	80	6.9	71	14.1
	2010	10	4	3	70	5.9	51	19.6
	2011	10	4	4	80	11.0	47	21.3
	2012	10	4	1	50	8.3	49	20.4
	2013	10	3	3	60	6.2	57	17.5
	2014	10	4	3	70	6.4	38	26.3
	2015	10	2	3	50	3.8	49	20.4
	2016	10	4	4	80	15.3	59	16.9
	2017	5	4	0	80	24.8	42	11.9
	2018	5	4	0	80	11.8	21	23.8
76	2008	70	28	13	59	6.7	270	25.9
	2009	70	36	14	71	6.9	299	23.4
	2010	70	24	16	57	9.1	231	30.3
	2011	42	18	8	62	6.7	210	20.0
	2012	42	22	12	81	6.6	143	29.4
	2013	42	22	6	67	8.8	170	24.7
	2014	42	21	10	74	7.0	186	22.6
	2015	37	21	6	73	8.6	219	16.9

Table 3 Continued

Hunt Area	Year	Tags	Harvest		Hunter success (%)	Days/hunter	First-choice applicants	Drawing odds (%)
			M	F				
77	2016	37	18	5	62	11.6	229	16.2
	2017	34	17	3	59	9.6	177	19.2
	2018	34	19	3		8.9	168	20.2
	2008	10	4	4	80	15.1	38	26.3
	2009	10	5	3	80	8.5	29	34.5
	2010	10	4	3	70	8.9	41	24.4
	2011	10	2	1	30	6.3	37	27.0
	2012	10	4	3	70	7.3	25	40.0
	2013	10	6	1	70	18.0	32	31.3
	2014	10	4	5	90	15.0	32	31.3
	2015	8	5	3	100	11.4	31	25.8
78	2016	8	3	1	50	20.0	50	16.0
	2017	8	3	1	50	13.0	36	22.2
	2018	8	4	2	75	16.7	36	22.2
	2008	10	5	4	90	5.4	23	43.5
	2009	10	4	5	90	7.4	37	27.0
	2010	10	5	5	100	5.7	45	22.2
	2011	10	5	4	90	11.75	64	15.6
	2012	10	5	5	100	3.7	51	19.6
	2013	10	4	5	90	8.0	54	18.5
	2014	10	4	4	80	7.3	52	19.2
	2015	10	4	2	60	6.0	50	20.0
	2016	10	3	2	50	6.6	59	16.9
	2017	10	3	2	50	10.2	52	19.2
	2018	10	3	5	80	6.5	57	17.5

^a Archery only hunts added 2015.

^b Included a Super Hunt.

^c Prior to 2011 Hunt Area included GMUs 56, 73, and 73A. In 2011 and 2012 Hunt Area 73 was established and included GMUs 73 and 73A.

Table 4. Known moose mortalities, excluding Controlled Hunts, Southeast Region, 2008-present.

Year	Mortality agent						Total
	Native American harvest	Illegal kill	Road kill	Natural	Train kill	Other	
2008	0	1	1	3	0	1	6
2009	0	0	4	1	0	0	5
2010	0	0	0	0	0	1	1
2011	0	2	3	1	0	3	9
2012	1	0	7	2	0	5	15
2013	1	0	3	4	0	2	10
2014	5	1	0	0	0	3	9
2015	0	1	4	0	0	0	5
2016	0	0	1	1	0	1	3
2017	0	1	0	0	0	0	1
2018	0	0	2	2	0	0	4

UPPER SNAKE REGION

GMUs 50, 51, 58, 63, 63A

Historical Background

In early 1980, 6 moose were released near North Fork of the Big Lost River (GMU 50). Most initially remained close to their release site, but there has been egress to other areas. Reproduction occurred, and additional transplants augmented this population. During winter 2001-2002, several nuisance moose were also translocated to GMU 50.

An antlered hunt in GMU 50 was initiated in 1993 and an antlerless hunt was initiated in 2003. An antlered moose hunt was opened in GMU 51 in 1999 as a result of an increasing number of moose being sighted incidentally during deer and elk sightability surveys and ground observations. In 2003 and 2004, an antlered hunt was authorized in GMU 58 for the same reason but was subsequently closed in 2005.

A significant population of moose exists in GMU 63A. Moose utilize riparian habitat along the North and South Forks of the Snake River and associated sloughs, and depredation and nuisance complaints occur on a fairly regular basis. Moose distribution in GMU 63 is dispersed around the Mud Lake Wildlife Management Area (WMA)-Camas National Wildlife Refuge (NWR) area.

Hunt Area 63A was initiated in 1987. GMU 63 was added to Hunt Area 63A in 1999 and was then split into 2 separate hunts (Hunt Areas 63 and 63A) in 2003. Due to declines in harvest success, average antler spread, and moose observed during Mud Lake WMA spotlight surveys, all moose harvest was eliminated in Hunt Area 63 for the 2009 and 2010 seasons. During the 2013 season, tags were once again offered in Hunt Area 63 that included 2 antlered tags. These 2 tags were offered once again in 2017.

Management Objectives

Moose populations within the region are managed for maintaining and increasing populations. Harvest and disease metrics should continue to be monitored carefully into the future when considering hunt structures.

Habitat Management and Monitoring

Habitats within these GMUs are quite varied. In GMU 50, extensive willow bottoms provide good summer and winter habitat, and the moose population appears to be increasing and ranging throughout the coniferous zone in summer. Habitat in GMUs 51 and 58 are limited to discontinuous willow riparian areas. Habitat in GMU 63 is almost entirely desert and unsuitable for moose, except areas on and adjacent to Mud Lake WMA and Camas NWR. Habitat in GMU 63A consists primarily of the Snake River riparian zone adjacent to private residential and agricultural lands.

Biological Objectives

There is limited data available to assess moose population dynamics in the Upper Snake Region. Population trends are monitored using hunter harvest information, anecdotal information, data

from aerial surveys. The department plans to initiate a moose research project in select GMUs including in the region that will help identify survival rates and cause-specific mortality.

Capture, Radio-mark, and/or Telemetry

As an effort to monitor movement of depredating moose, radio collars are randomly placed on moose prior to translocation. Three depredation moose were fitted with radio collars during this reporting period.

Population Surveys

On January 28, 2016, a moose survey was conducted in the Mud Lake area of GMU 63. Observations include location of a total of 22 moose with 11 adult antlerless moose, 3 antlered moose, 2 bull calves, 2 cow calves, and 3 unspecified calves. No aerial surveys were conducted during this reporting period.

Hunting and Harvest Characteristics

A total of 42 tags were issued in these GMUs in 2018, resulting in the harvest of 33 animals (79% success). For 2018, mean antler spreads were 39 inches ($n = 5$) in GMU 50, 27.7 inches ($n = 4$) in GMU 51, and 29.6 inches ($n = 15$) in GMUs 63/63A. These numbers are based on mandatory harvest reports (Table 3).

Capture and Translocation

Three depredation moose were captured within Unit 63A and were translocated to more suitable areas within the region.

Disease Monitoring

Disease concerns will be evaluated on a case by case and needs basis. Animals that are showing signs of illness will be collected and sent to the health lab for testing.

Management Discussion

Based on harvest data, populations in most Hunt Areas appear to be relatively stable. However, there may need to be changes made in Hunt Area 51 moose harvest opportunity to address declines in success rates and average antler spread.

GMUs 59, 59A

Historical Background

Former Hunt Areas 59 and 59A were combined in 1993 to form the current Hunt Area 59. Prior to 1993, 2 hunts with a total of 12 antlered tags were offered in these GMUs. Former Hunt Area 59 had been open continuously since 1974 with tag levels fluctuating between 4 and 8 with over 90% hunter success reported. Hunt Area 59A was closed in 1978 after only one moose was harvested in the preceding 4 years. In 1983, this hunt was reopened and 2 tags were issued

annually through 1988 with 100% hunter success. Four tags were issued each season from 1989-1992 with 100% hunter success. Due to declines in average antler spread and harvest success, combined with concerns from sportsmen and field personnel, harvest opportunity was significantly reduced in Hunt Area 59 for the 2009 and 2010 seasons. During the 2005-2008 seasons, there were 15 antlered and 5 antlerless tags available in this hunt. For the 2009 through 2018 seasons, tags were reduced and held to 5 antlered and no antlerless.

Habitat Management and Monitoring

Habitat consists primarily of conifer/sagebrush and aspen ecotones. Riparian areas are limited and discontinuous. Habitat extends down major drainages that have willows. Improving riparian zone management would increase habitat quality and quantity in this area.

Management Objectives

Moose populations within the region are managed for maintaining and increasing populations. Harvest and disease metrics should continue to be monitored carefully into the future when considering hunt structures.

Biological Objectives

There is limited data available to assess moose population dynamics in the Upper Snake Region. Population trends are monitored using hunter harvest information, anecdotal information, data from aerial surveys. The department plans to initiate a moose research project in select GMUs including in the region that will help identify survival rates and cause-specific mortality.

Capture, Radio-mark, and/or Telemetry

As an effort to monitor movement of depredating moose, radio collars are randomly placed on moose prior to translocation. No moose were captured or radio-marked during this reporting period.

Population Surveys

A moose trend count was flown in GMUs 59 and 59A on 17-18 December 1994 using a Bell Model G47 Soloy helicopter. Counting conditions were good, with 8 or more inches of relatively new snow cover present over the entire area. All probable moose habitat was surveyed. A total of 179 moose (129 in GMU 59 and 50 in GMU 59A) with a bull:cow:calf ratio of 44:100:54 was counted on the survey. Of the 40 bulls counted, 13 were classified as yearlings, 20 as adults, and 7 had already shed antlers.

Few previous data are available for comparison. Prior to this count, no surveys had been conducted in GMU 59 since 1984 (64 total moose), and GMU 59A had never been surveyed specifically for moose. However, during deer and elk sightability surveys, moose were counted on an incidental basis. In 1991-1992, 46 moose were counted in GMU 59 and 71 in GMU 59A. In 1993-1994, 49 moose were observed in GMU 59 and 46 in GMU 59A (unclassified). The 1999-2000 survey resulted in a total count of 90 moose (10 bulls, 19 cows, 13 calves, 48 unclassified). The 2004-2005 survey resulted in a total count of 74 moose (6 bulls, 13 cows, 6 calves, 49 unclassified). During the 2008 Beaverhead elk survey, 11 and 13 moose were

incidentally counted in GMUs 59 and 59A, respectively. Not all moose habitat is flown during elk surveys, so these incidental numbers are not a reliable estimate of the number of moose in an area. No aerial surveys were conducted in this Hunt Area during this reporting period.

Hunting and Harvest Characteristics

Five tags for antlered moose were offered in 2018, hunter success was 100% (Table 3) and mean antler spread was 37.2 inches ($n = 5$).

Known illegal kill (Table 2) was a serious problem in the early 1980s when it nearly equaled controlled harvest but has been of little significance, based on documented mortalities, in recent years.

Capture and Translocation

No moose were captured or translocated during this reporting period.

Disease Monitoring

Disease concerns will be evaluated on a case by case and needs basis. Animals that are showing signs of illness will be collected and sent to the health lab for testing.

Management Discussion

General observations suggest the moose population in these GMUs has declined in recent history. Additionally, average antler spread on harvested bulls was below the management objective of 35 inches during the 2005-2008 seasons. Therefore, tags were significantly reduced for 2009 and 2010 and continued through 2018 in an attempt to increase total numbers and bull quality in the Hunt Area. The effects of the tag reduction on average antler spread and harvest success should continue to be monitored.

GMUs 60, 60A, 61, 62, 62A

Historical Background

During the 1970s, the moose population in Fremont County was thought to be declining and experiencing high levels of illegal mortality and Native American harvest. As a result, all moose hunts in Fremont County were closed in 1977. After a boundary change to include only Clark County, Hunt 61-1 was the only hunt open from 1977 to 1982.

A winter aerial survey conducted in 1983 counted moose in numbers slightly below the highs of the early 1950s. The Island Park area is the only area where counts were clearly lower than those in the 1952-1956 periods. In response to the population recovery, 8 Controlled Hunts were opened in 1983 in Fremont County.

A new hunt was established in GMU 60A in 1986. The Hunt Area consists of agricultural land and the riparian zone along Henrys Fork of the Snake River. Many residences and farms are in

the area. The moose population within this corridor has been increasing. We received many depredation and nuisance complaints of moose in agriculture fields and near towns and residences, resulting in expanded antlerless hunting opportunity. Tags were reduced by approximately 50% on the Island Park caldera portion of the region in 1991 as a result of significant winter mortality during the winter of 1988-1989, but steadily increased through 2004 as the populations continued to grow. Like other portions of the region, tag levels were significantly reduced during 2005-2007 in an attempt to increase the number of larger bulls in the population.

Based on declines in harvest success and average antler spread in many of these Hunt Areas, along with concerns over the unknown effect of an expanding wolf population on moose numbers, antlered and antlerless tags were reduced within these hunts for the 2011 and 2012 seasons. A total of 55 antlered and 10 antlerless tags were offered in these GMUs since 2011, which was a 15% and 33% reduction in antlered and antlerless tags, respectively.

Management Objectives

Moose populations within the region are managed for maintaining and increasing populations. Harvest and disease metrics should continue to be monitored carefully into the future when considering hunt structures.

Habitat Management and Monitoring

Habitats within these GMUs are quite varied. In GMU's 61, 62, and 62A, extensive willow bottoms and forested areas provide good summer and winter habitat. Habitat in GMUs 60 and 60A contain excellent winter range consisting of sagebrush and bitterbrush dominated landscapes. The Sand Creek desert is an important core habitat for wintering moose within the region.

Biological Objectives

There is limited data available to assess moose population dynamics in the Upper Snake Region. Population trends are monitored using hunter harvest information, anecdotal information, data from aerial surveys. The department plans to initiate a moose research project in select GMUs including in the region that will help identify survival rates and cause-specific mortality.

Capture, Radio-mark, and/or Telemetry

As an effort to monitor movement of depredating moose, radio collars are randomly placed on moose prior to translocation. No radio collars were deployed during this reporting period.

Population Surveys

A population survey was conducted in GMU 62 and a portion of 62A during December 2000. The survey in 62A was not completed because of fiscal constraints. The final population estimate for GMU 62 was 366 moose including 180 cows, 109 bulls, and 77 calves (Table 4). This total compares to fixed wing censuses of 228 cows and 97 bull moose observed during 1989 and 1990, respectively.

Most of the area was surveyed by airplane from November 1989-February 1990 (Table 5). Survey results indicated that moose populations had decreased substantially since the previous winter. Moose appeared to be in poor condition prior to the 1988-1989 winter, following 2 years of drought, and significant winter losses probably occurred. In 2011, 125 moose were counted incidental to the Teton elk survey (portions of GMUs 65, 62, and 62A).

A helicopter survey was conducted along the North Fork Snake River corridor between St. Anthony and the Highway 33 Bridge in Hunt Area 60A in December 1991. Only the riparian corridor was searched, so this should be considered a minimum count. A total of 37 moose were observed (2 bulls, 21 cows, 14 calves).

Moose have been counted incidental to deer and elk sightability surveys in GMU 60A on a fairly regular basis. However, moose distribution varies greatly from year to year and, since not all search GMUs are surveyed, the utility of this information is less than optimal.

In 2010, a total of 241 moose (104 cows, 61 bulls, 55 calves, 21 unclassified) were counted incidental to an elk sightability survey in GMU 60A (and small portions of GMUs 60, 61, and 62A). This was the first time in recent history an effort was made to document composition of the moose seen incidentally to an elk or deer survey. Other recent totals for GMU 60A (most unclassified) include 328 (2007), 239 (2004), 185 (2003), 387 (2002), 473 (2000), 585 (1998), 340 (1997), 219 (1996), 272 (1996), 360 (1995), 187 (1994), and 312 (1993). Twenty-two moose were counted incidental to the 2010 elk survey in GMUs 62 and 65 East (12 cows, 6 bulls, 4 calves) and 38 moose (unclassified) were counted during 2007 deer trend surveys in GMU 62. No aerial surveys were conducted during this reporting period.

Hunting and Harvest Characteristics

Sixty-five moose tags were issued in 2018, resulting in the harvest of 51 animals (79% success) based on BGMR reports (Table 3). Mean antler spreads were 35.9($n = 14$ in. GMU 60, 37.8 in. ($n = 4$) in GMU 60A, 36 in. ($n = 15$) in GMU 61, 35 in. ($n = 4$) in GMU 62, and 44.4 in. ($n = 4$) in GMU 62A.

Capture and Translocation

One moose was captured and translocated to more suitable areas within the region during this reporting period.

Disease Monitoring

Disease concerns will be evaluated on a case by case and needs basis. Animals that are showing signs of illness will be collected and sent to the health lab for testing.

Management Discussion

The increase in desert-wintering moose has led to increased depredations and nuisance complaints during average to severe winters. Mortality during the 1988-1989 winter resulted in significant population declines. However, moose populations have rebounded rapidly to levels

above those present prior to the 1988-1989 die-offs. Consequently, tag levels were increased accordingly through 2004. Populations appear to be relatively stable, but mean antler spread and harvest success declined in many Hunt Areas between 2007 and 2009. The influence of wolves on the moose population in the Island Park caldera is not well understood. Therefore, harvest metrics should continue to be monitored carefully into the future. Research designed to investigate the relationship between wolves and moose in this area would be beneficial to effective moose management.

GMUs 64, 65, 67

Historical Background

All of GMU 64 except the Canyon Creek drainage, GMU 65, and GMU 67 north and west of State Highway 31 has been open to moose hunting since 1974. In 1983, this area (old Hunt Area 364) was split along GMU boundaries into 3 separate hunts. Increasing moose populations allowed a steady increase in tag levels until 1987. A new Hunt Area, 67-2, was created in 1983 and allowed the harvest of moose in that portion of GMU 67 previously closed. An antlerless hunt with 5 tags was created in 2005 in GMU 65.

Hunting opportunity has increased in these GMUs from 1 hunt with 2 tags during the early 1980s to 7 hunts with 78 tags (58 antlered and 20 antlerless tags) in 2004. Tags were subsequently reduced in 2005 to 65 (45 antlered and 20 antlerless) and have remained at this level since.

Management Objectives

Moose populations within the region are managed for maintaining and increasing populations. Harvest and disease metrics should continue to be monitored carefully into the future when considering hunt structures.

Habitat Management and Monitoring

Conifer with interspersed aspen and narrow riparian areas make up the majority of moose habitat in this area. Mountain mahogany on south-facing ridges provides important winter moose habitat in GMUs 65 and 67. In GMU 64, moose are found wintering primarily in stream bottom willow/aspen/dogwood communities.

Biological Objectives

There is limited data available to assess moose population dynamics in the Upper Snake Region. Population trends are monitored using hunter harvest information, anecdotal information, data from aerial surveys. The department plans to initiate a moose research project in select GMUs including in the region that will help identify survival rates and cause-specific mortality.

Capture, Radio-mark, and/or Telemetry

As an effort to monitor movement of depredating moose, radio collars are randomly placed on moose prior to translocation. Five depredation moose were fitted with radio collars to monitor movement after translocation to more suitable areas in the region.

Population Surveys

Historically, moose populations appeared to be increasing in these GMUs prior to the winter of 1988-1989. Forage was impacted by 2 years of drought and moose shifted their distribution to lower elevation agricultural and urban areas. Moose appeared to be in poor condition and significant winter losses likely occurred.

During winter 1992-1993, moose were first counted incidental to elk sightability surveys. Totals of 48, 26, and 90 moose were counted in GMUs 64, the western portion of 65, and 67, respectively. Most animals counted were unclassified. Moose were also counted incidental to elk sightability surveys during the 1995-1996 winter. Totals of 36, 101, and 60 moose were observed in GMUs 64, 65, and 67, respectively. Again, most animals were not classified. Moose were again counted incidentally during the 1997-1998 winter. Totals of 67, 30, and 88 (largely unclassified) moose were counted in GMUs 64, western 65, and 67, respectively. Moose were counted in GMUs 64, 65, and 67, incidental to elk surveys during the 2003-2004 winter and a total of 110 moose were observed. In 2007, a total of 38 moose were counted in GMU 64 incidental to mule deer trend surveys. During 2008, 139 moose were counted incidental to the Palisades elk survey (31 in GMU 64, 43 in GMU 65, and 65 in GMU 67). A total of 237 (59 in GMU 64, 107 in GMU 65, and 71 in GMU 67) moose (unclassified) were counted incidental to the Palisades deer survey in 2010. No aerial surveys were conducted during this reporting period.

Hunting and Harvest Characteristics

Hunters harvested 49 moose on 60 tags (82% hunter success) in 2018 (Table 3). Mean antler spreads were 38.4 in. ($n = 9$) in GMU 64, 41.2 in. ($n = 8$) in GMU 65, and 34.5 in. ($n = 18$) in GMU 67.

Capture and Translocation

Seven depredation moose were captured and translocated to suitable areas during this reporting period.

Disease Monitoring

Disease concerns will be evaluated on a case by case and needs basis. Animals that are showing signs of illness will be collected and sent to the health lab for testing.

Management Discussion

A 1989 aerial survey found approximately half the number of moose counted in 1985. A shift in moose distribution resulting from drought and severe winter conditions was partially responsible for the low count. Also, mortality during the 1988-1989 winter was above normal. Tag levels were maintained for the 1989 and 1990 seasons, but were adjusted in 1991 in response to data

analysis. Moose populations appear to have rebounded rapidly to levels at or above those present prior to the 1988-1989 die-off. Consequently, tag levels increased in 1993, 1995, 1997, and again in 1999. Additionally, an antlerless hunt was initiated in GMU 64 in 1993. Bull tags were reduced, starting in 2005, in an attempt to increase the number of larger bulls in the population. In recent years, the moose population appears relatively stable (based on incidental counts) and the bulls harvested in GMUs 65 and 67 have had the highest average antler spread in the Upper Snake Region.

GMUs 66, 69

Historical Background

The moose population in these GMUs increased at a fairly rapid rate during the late 1970s when populations elsewhere in Upper Snake Region were decreasing or remaining static. Hunts 66 and 69 were split in 1981 to create 4 hunts (66-1, 66-2, 69-1, and 69-2). This resulted in a 50% increase in tag levels from 1980 (16 to 24). A new hunt (69-3) was created in 1984 from adjacent portions of Hunts 66-1 and 69-2.

Hunt 69-1 was changed from antlered-only to either-sex in 1986 to address landowner concerns over grain field depredations. Either-sex tags were not effective in harvesting antlerless moose; no female moose were harvested. As a result, this hunt was changed back to antlered-only in 1991. However, beginning in 1993, an antlerless hunt (69-4) was initiated. This hunt had 10 tags and included all of GMU 69. In 1999, GMU 66 was added to this hunt, tags were increased to 20, and it was renumbered Hunt Area 66-3. This antlerless hunt was restructured again in 2001. GMU 66 was dropped from the Hunt Area and GMU 69 was split into 3 Hunt Areas (69-1, 69-2, and 69-3) that correspond to the like-numbered antlered hunts.

Average antler spread of bull moose harvested in GMU 66 from 2004-2008 was below the management goal of 35 inches. Therefore, both antlered and antlerless tags were reduced (antlerless tags eliminated) for the 2009 and 2010 seasons to increase moose numbers and increase trophy quality of bulls. Seven hunts with 55 antlered tags and 10 antlerless tags were offered in GMUs 66 and 69 during 2011, compared with 60 antlered tags and 15 antlerless tags that were offered from 2009-2010. This was a 8% reduction in antlered and a 33% reduction in antlerless tag levels.

Management Objectives

Moose populations within the region are managed for maintaining and increasing populations. Harvest and disease metrics should continue to be monitored carefully into the future when considering hunt structures.

Habitat Management and Monitoring

GMU 66 is characterized by conifer/aspen habitats with narrow canyon bottom riparian areas which support moderate willow/dogwood communities. GMU 69 is primarily aspen/sagebrush and private agricultural land with willow riparian areas in most canyon bottoms. Tex Creek

WMA contains important winter habitat for a variety of ungulates, including moose; and moose from adjacent areas may be migrating to the WMA to winter.

Biological Objectives

There is limited data available to assess moose population dynamics in the Upper Snake Region. Population trends are monitored using hunter harvest information, anecdotal information, data from aerial surveys. The department plans to initiate a moose research project in select GMUs including in the region that will help identify survival rates and cause-specific mortality.

Capture, Radio-mark, and/or Telemetry

As an effort to monitor movement of depredating moose, radio collars are randomly placed on moose prior to translocation. Two depredation moose were fitted with radio collars to monitor movement after translocation.

Population Surveys

No population surveys have been conducted in these GMUs specifically to monitor moose populations. However, moose were counted incidentally during deer and elk sightability surveys (not all subunits containing moose were surveyed). A total of 545 moose were counted incidentally to the Tex Creek elk survey (GMUs 66 and 69) in 2018. Other recent totals, during various deer and elk surveys, include 276 (2010), 169 (2008), 304 (2007), 384 (2005), 317 (2000), 228 (1999), 293 (1997), 200 (1995), 98 (1994), and 147 (1992).

Hunting and Harvest Characteristics

Seven hunts with a total of 65 tags were offered in these GMUs in 2018 (Table 3). A total of 45 moose were harvested on 65 tags (82% success). Mean antler spreads were 36.6 inches ($n = 15$) in GMU 66 and 36.7 inches ($n = 27$) in GMU 69.

Capture and Translocation

Five depredation moose were captured and translocated to suitable areas during this reporting period.

Disease Monitoring

Disease concerns will be evaluated on a case by case and needs basis. Animals that are showing signs of illness will be collected and sent to the health lab for testing.

Management Discussion

Steadily increasing moose populations in these GMUs resulted in an increase in tag levels in all of these hunts from the early 1990's through 2005. Additionally, an antlerless hunt has been offered since 1993. Bull tags were reduced, starting in 2005, in an attempt to increase the number of larger bulls in the population. Mean antler spread of bulls harvested remained slightly below the management goal of 35 inches from 2004-2008, in most Hunt Areas. GMUs 66 and 69 have the habitat conditions needed to produce trophy-class bulls. In an effort to increase bull quality, a

number of bull and cow tags in these GMUs (particularly in GMU 66) were eliminated during the 2009-2010 trophy species season setting process. These changes should continue to be monitored to evaluate their effectiveness in increasing trophy bull quality.

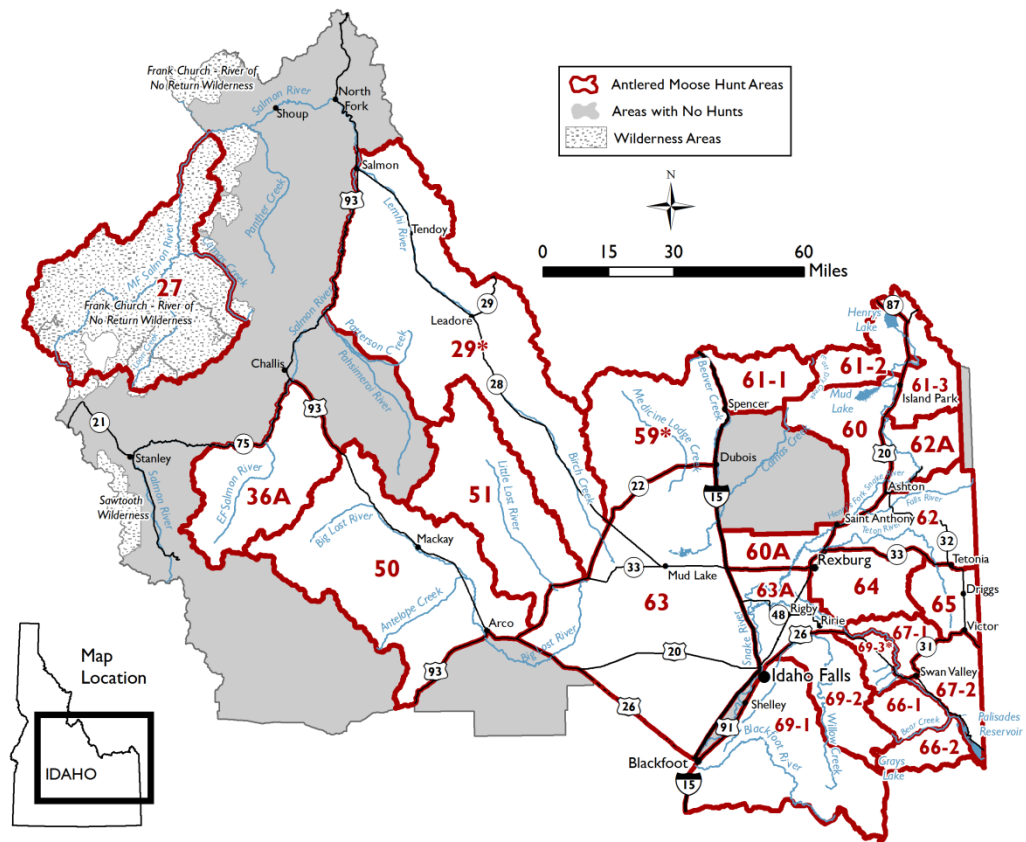


Figure 11. Upper Snake and Salmon Antlered Moose Hunt Areas.

Table 1. Moose harvest and drawing odds, Upper Snake Region, 2008-present.

Year	Tags	Harvest			Hunter success (%)	First-choice applicants	Drawing odds (%)
		M	F	Total			
2008	350	183	85	268	77	1,498	23.4
2009	260	147	53	200	77	1,339	19.4
2010	260	162	53	215	83	1,276	20.4
2011	235	144	45	189	80	1,393	16.9
2012	235	156	45	201	86	1,382	17.0
2013	242	159	39	198	82	1,591	15.2
2014	237	150	43	193	81	1,541	15.4
2015	237	162	41	203	86	1,712	13.8
2016	239 ^a	144 ^a	42	186	78	1,626	14.6
2017	237	147	32	179	76	1,653	14.3
2018	237	153	42	195	82	1,509	15.7

^a Includes Super Hunt

Table 2. Known moose mortalities, excluding Controlled Hunts, Upper Snake Region, 2008-present.

Year	Mortality Agent						Total
	Native American Harvest	Illegal kill	Road kill	Natural	Train kill	Other	
2008	1	0	2	0	0	2	5
2009	0	1	0	3	0	3	7
2010	0	1	0	1	0	0	2
2011	0	3	0	1	0	16	20
2012	0	2	0	1	0	7	10
2013	0	0	2	0	0	1	3
2014	0	0	1	1	0	3	5
2015	0	1	5	5	0	8	19
2016	0	0	2	9	1	4	16
2017	0	1	6	2	0	2	11
2018	0	1	7	2	0	2	12

Table 3. Moose harvest and drawing odds by analysis area, Upper Snake Region, 2008-present.

Analysis area	Year	Tags	Harvest		Hunter success (%)	Days/hunter	First-choice applicants	Drawing odds (%)
			M	F				
50, 51	2008	45	18	14	71	6.4	174	25.9
58 ^a , 63	2009	35	20	12	91	6.7	225	15.6
63A	2010	35	14	13	77	5.3	191	18.3
	2011	40	19	12	78	5.0	236	16.9
	2012	40	20	12	80	4.8	226	17.7
	2013	42	25	11	86	5.0	284	14.8
	2014	42	23	12	83	5.1	280	15.0
	2015	42	26	12	91	5.6	314	13.4
	2016	43 ^b	21	13	77	6.3	296	14.2
	2017	42	24	10	81	7.4	326	12.9
	2018	42	20	13	79	5.9	321	13.1
59, 59A	2008	20	15	4	95	6.1	74	27.0
	2009	5	3	0	60	11.0	39	12.8
	2010	5	4	0	80	9.0	30	16.7
	2011	5	5	0	100	11.8	45	11.1
	2012	5	5	0	100	4.8	48	10.4
	2013	5	5	0	100	3.4	58	8.6
	2014	5	5	0	100	9.4	47	10.6
	2015	5	5	0	100	9.4	62	8.1
	2016	5	4	0	80	12.0	54	9.3
	2017	5	5	0	100	11.4	56	8.9
	2018	5	5	0	100	6.8	37	13.6
60, 60A	2008	120	59	29	73	5.7	479	25.1
61, 62	2009	80	50	13	79	6.5	408	19.6
62A	2010	80	49	12	76	7.3	379	21.1
	2011	65	45	8	82	6.5	420	15.5
	2012	65	49	9	89	5.5	384	16.9
	2013	65	47	5	80	6.5	460	14.1
	2014	65	47	7	83	8.1	458	14.2
	2015	66 ^c	45	10	85	8.3	476	13.7
	2016	65	39	8	72	6.3	454	14.3
	2017	65	40	4	68	6.8	468	13.9
	2018	65	44	7	79	5.9	391	16.2
64, 65	2008	65	38	13	78	7.1	256	25.4
67	2009	65	30	14	68	7.5	275	23.6
	2010	65	38	15	82	8.6	295	22.0
	2011	60	30	17	78	6.6	296	20.3
	2012	61 ^b	31	18	80	7.1	291	21.0
	2013	60	33	14	78	6.7	366	16.4
	2014	60	31	14	75	6.1	294	20.4
	2015	61 ^c	37	14	85	7.0	395	15.2
	2016	61 ^c	35	12	78	8.3	385	15.6

Table 3. Continued.

Analysis area	Year	Tags	Harvest		Hunter success (%)	Days/hunter	First-choice applicants	Drawing odds (%)
			M	F				
66, 69	2017	60	29	10	65	7.1	378	15.9
	2018	60	35	14	82	7.4	295	20.3
	2008	100	53	25	78	7.1	345	29.0
	2009	75	44	13	76	7.3	392	19.1
	2010	75	53	11	85	5.4	295	25.4
	2011	65	45	5	77	7.7	396	16.4
	2012	65	51	6	88	6.2	433	15.0
	2013	65	49	9	89	5.1	418	15.6
	2014	65	44	10	83	6.1	462	14.1
	2015	66 ^c	49 ^c	5	83	7.6	465	14.0
	2016	65	45	8	82	7.5	437	14.9
	2017	65	47	8	85	6.6	440	14.8
	2018	65	45	8	82	7.3	406	16.0

^a No longer hunted beginning 2005.

^b Includes Super Hunt tag.

^c Includes rain check.

Table 4. Aerial survey of moose, Hunt Area 62, Upper Snake Region, 2000-2001.

	Observed	Estimated ($\pm 90\%$ CI)
Total moose	332	366 \pm 16
Cows	164	180 \pm 9
Bulls	98	109 \pm 8
Calves	70	77 \pm 5
Bulls:cows:calves	60:100:43	61:100:43

Table 5. Aerial survey of moose, Hunt Areas 60, 60A, 61, 62, Upper Snake Region.

Inclusive location	1990-1991		1991-1992	
	Bulls:cows:calves	Total	Bulls:cows:calves	Total
Middle to N Leigh Creek	67:100:83	15		0
Wiggleton Hollow to Johns Creek	56:100:56	19		7
N Fork Badger Creek to Bitch Crk	72:100:56	41		6
Bitch Creek to Conant Creek	7:100:68	49	56:100:67	20
Conant Creek to Fall River		14	27:100:55	20
Fall River Ridge to Cave Falls Rd	36:100:43	80		28
Cave Falls Rd to Fish Creek Rd		10	56:100:22	16
Fish Creek to Moose Creek		24		19
Warm River Hatchery to Survey Draw	17:100:67	11		5
Buffalo River		2		2
Macks Inn/Big Springs Henrys Lake Flat	42:100:52	59		19
Henrys Lake	22:100:56	16		19
Henrys Fork to Hatchery Butte west of Warm River	32:100:60	102		14
Humphrey to Spencer	73:100:55	25		14
Spencer to Rattlesnake Creek	25:100:75	24		23
Corral Creek to Spring Creek	5:100:47	29		7
West Camas Drainage		14		29
East Camas Drainage		9		4
Big Bend Ridge	14:100:105	88	22:100:122	68
Desert, east of Sand Creek		6		8
Desert, Red Rd to Sand Creek Rd ^a	100:100:100	85	65:100:41	50
Junipers and Hook of Sands ^a	118:100:44	103	33:100:67	18
Chokecherry Ridge and Second Sands ^a	69:100:45	63	72:100:36	48
Total		888		444

^a Moose counted in conjunction with helicopter deer survey, 18 December 1988.

SALMON REGION

GMUs 21, 21A, 27, 29, 30, 30A, 36A, 37, 37A

Historical Background

Habitats in these GMUs range from low elevation riparian river bottoms, sage-steppe and ponderosa pine to Douglas fir, lodgepole pine, and spruce-fir forests at higher elevations. Willow shrub communities usually associated with moose habitat are not common. Portions of these GMUs contain extensive cliff and rock talus areas at both low and high elevations which support mountain mahogany plant communities, important wintering habitats for moose. Riparian plant communities of varying sizes are found in all GMU's and provide important summer habitat.

Moose are commonly found in GMUs 21, 21A, 30, and 30A which border high-elevation summer habitat in Montana. Migrants from Montana may well have formed the initial nucleus for populations in GMUs bordering Montana. Cross-border movements are no doubt common in this area. No information exists on historical moose numbers other than an increase in moose sightings in recent decades. As a result, Hunt Area 21 (GMUs 21 and 21A) was initiated in 1990 with 3 tags. Similar increases in moose sightings resulted in establishment of Hunt Area 29 (GMUs 29 and 37A) in 1991 and Hunt Area 30 (GMUs 30 and 30A) in 1993. Hunt Area 30 was incorporated into Hunt Area 29 in 1999. Two new Hunt Areas were opened in 2005 with 1 tag each: 27 and 36A. GMU 58 (Upper Snake Region) was added to Hunt Area 29 beginning in 2007. Hunt Area 21 was closed beginning in 2011 because of low hunter success in recent years.

Management Objectives

The current statewide management plan states several objectives as follows:

- 1) Cooperate with other agencies to transplant moose into more suitable habitats
- 2) Develop management guidelines for evaluating and minimizing the impacts of development activities on moose habitat
- 3) Continue to record number, sex, and age of harvested moose for use in management decisions
- 4) Evaluate the potential for new hunts where moose numbers may be adequate to provide added hunting opportunity
- 5) Explore ways of developing an index to population trends that does not rely on aerial surveys in northern Idaho
- 6) Place enforcement emphasis on illegal moose kills, publicize moose poaching arrests, and caution deer and elk hunters that moose occur in their hunting areas in order to reduce illegal kills
- 7) Coordinate moose management activities with Canada and adjacent states of Washington, Montana, and Wyoming where shared moose populations occur,
- 8) Allow most existing moose populations to increase
- 9) Gather all available information on moose mortality and distribution from aerial surveys, hunter interviews, Indian tribes, land management agencies, and reports by biologists and conservation officers to help set permit levels and create new hunts
- 10) Cooperate with and encourage land management agencies to do research to determine how to preserve and reestablish valuable moose forage

- 11) Continue to use fixed-wing aerial surveys in southeastern Idaho to monitor trends in populations in cow:calf ratios
- 12) Encourage the US Forest Service to minimize access of motorized vehicles in areas commonly inhabited by moose to reduce illegal kill
- 13) Cooperate with the Idaho Department of Transportation to erect signs and reflectors along highway sections where there are frequent moose/auto collisions
- 14) Evaluate permit numbers and boundaries for all hunts and increase controlled hunt permits when and where possible
- 15) Department personnel will sample moose for parasites, bacterial, and viral diseases to increase understanding of the epidemiology of wildlife disease outbreaks

The Moose Plan Committee is drafting a new statewide moose management plan.

Habitat Management and Monitoring

Rainfall during summer months in the FY19 reporting period was about average with a relatively dry and warm fall. Vegetative growth was average. Winter conditions were mild early on, with average temperatures and below normal precipitation. Late February brought colder temperatures and increased snowfall. In general, animals should have entered winter in above average body condition and been in normal body condition through winter. Snow-pack (as measured at higher elevations) was near normal by early spring, 2019. Onset of spring weather and associated plant phenology was somewhat delayed, particularly at higher elevations. Water-year precipitation through June 2019 was near 100% of average, with cool, rainy conditions through the end of June.

Past logging operations and wildfire in primary moose range of GMUs 21 and 21A generally enhanced moose habitat by encouraging forb and shrub production in cutover areas. However, positive impacts may eventually be counter-balanced by negative effects of increased road access and loss of mature, dense-canopy forest stands used by moose for winter cover. A large wildfire burned through GMU 21 in 2013, and removed large blocks of mature, dense-canopy conifer.

Habitat in GMU's 29, 37 37A, and 36A have remained relatively unchanged over the last decade. Preferred areas within these GMUs appear to be riparian bottoms and stringers. The most beneficial habitat improvements to these riparian areas would be changes to livestock grazing that would decrease the time and intensity of grazing. Mountain mahogany is also an important browse species for moose. Improvements to unhealthy stands may be beneficial to moose populations.

Biological Objectives

There is little known about moose population dynamics in the Salmon Region and managers do not have a reliable method to estimate moose populations and vital rates. Nonetheless, Salmon Region wildlife staff endeavor to maintain or increase moose populations commensurate with available habitat and capable of supporting hunter harvest. Relatively high hunter success over the last several years indicates at least a stable population.

Capture, Radio-mark, and/or Telemetry

No moose capture or translocation operations were conducted in Salmon Region during the reporting period. Opportunities exist to expand moose populations in GMUs 36 and 36B via capture and translocation.

Population Surveys

Because of dense cover, low moose densities, and solitary habits of moose, formal population surveys are generally ineffective in occupied moose habitat in the Salmon Region. Incidental observations of moose are recorded during aerial surveys for other ungulates. During 2018 -2019 winter survey activities, 1 moose was observed in GMU 21A.

Hunting and Harvest Characteristics

Harvest and hunter information was compiled from Big Game Mortality Reports which hunters must complete within 10 days of harvest; antlers of males must be presented to a Department representative. Tag levels (Table 1) and season structure (Appendix A) was unchanged for Hunt Areas 27, 29, and 36A. Three Controlled Hunts with 14 total tags for antlered moose occurred in the Salmon Region during the 2018 season. 14 of 14 hunters harvested moose (100% hunter success). Average antler spread was 33.6 inches; the 5-year running average is 35.5 inches. Overall hunter success has varied over the last 10 years from 67% to 100%. Of 152 hunters since 2008, 126 (83%) have taken a moose (Table 1).

One moose death was attributed to non-hunting mortality during the FY19 reporting period (Table 3). Non-hunting mortality ranged from 0 to 8 moose per year since 1982.

Capture and Translocation

No moose capture or translocation operations were conducted in Salmon Region during the reporting period (Table 4). Opportunities exist to expand moose populations in GMUs 36 and 36B via capture and translocation.

Disease Monitoring

Department personnel will opportunistically sample moose for parasites, bacterial, and viral diseases.

Management Discussion

Intensive population or habitat data will not be available for this area in the foreseeable future. Management will be based on moose sighting reports, incidental field observations of moose, and data from moose harvest and miscellaneous mortalities until the new Moose Management Plan is complete and regions have specific objectives.

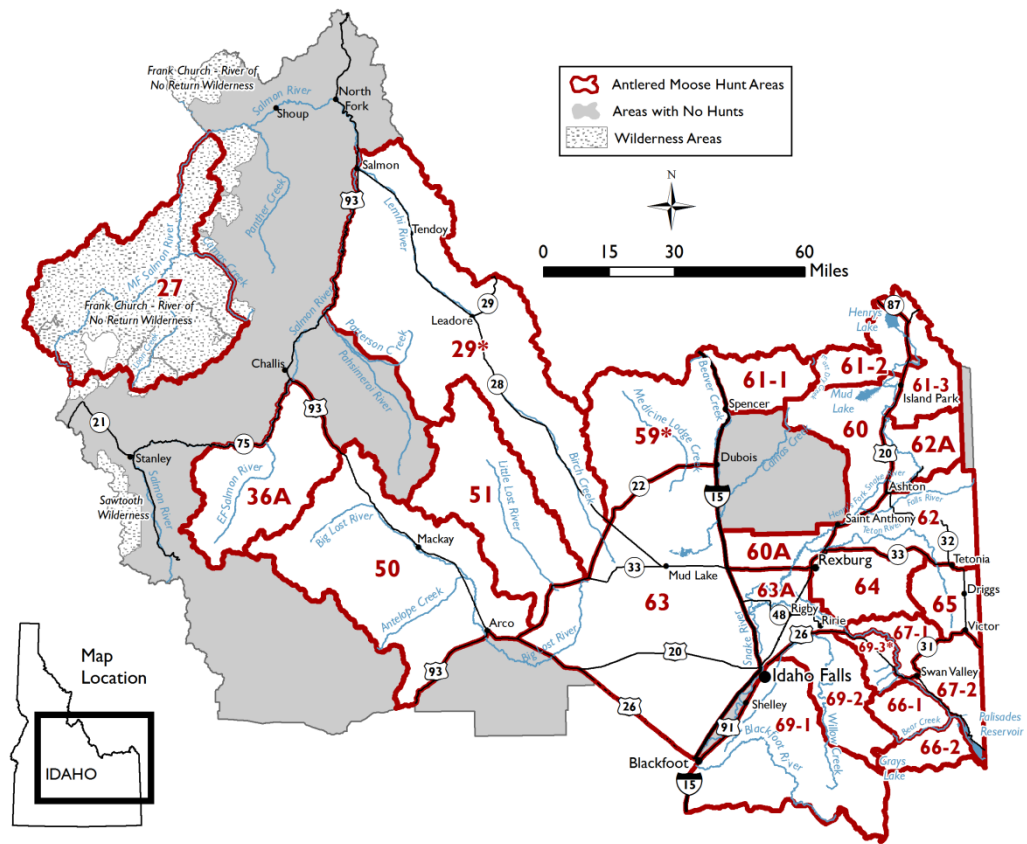


Figure 13. Salmon Antlered Moose Hunt Areas.

Table 1. Moose harvest and drawing odds, Salmon Region, 2008-present.

Year	Tags	Harvest			Hunter success (%)	First-choice applicants	Drawing odds (%)
		M	F	Total			
2008	16	11	0	11	69	113	14.2
2009	15	10	0	10	67	119	12.6
2010	16 ^a	13 ^a	0	13	81	116	13.8
2011	13	11	0	11	85	111	11.7
2012	13	12	0	12	92	124	10.5
2013	13	9	0	9	69	111	11.7
2014	13	12	0	12	92	145	9.0
2015	13	11	0	11	85	114	11.4
2016	13	12	0	12	92	131	9.9
2017	14	11	0	11	85	163	8.0
2018	14	14	0	14	100	121	12.0

^a Includes Super Hunt tag.

Table 2. Moose harvest and drawing odds by Hunt Area, Salmon Region, 2008-present.

Hunt Area	Year	Tags	Harvest		Hunter success (%)	Days/hunter	First-choice applicants	Drawing odds (%)
			M	F				
21 ^a	2006	4	2	0	50	12.5	9	44.4
	2007	4	2	0	50	6.0	4	100.0
	2008	4	1	0	25	11.0	6	66.7
	2009	2	0	0	0	0	0	
	2010	2	0	0	0	0	5	40.0
27	2008	1	0	0	0		2	50.0
	2009	1	0	0	0		5	20.0
	2010	1	0	0	0		2	50.0
	2011	1	0	0	0		2	50.0
	2012	1	0	0	0		0	
	2013	1	1	0	100	40	1	100.0
	2014	1	1	0	100	1	1	100.0
	2015	1	0	0			5	20.0
	2016	1	0	0			4	25.0
	2017	1	0	0	0		5	20.0
	2018	1	1	0	100	3	3	33.3
29	2008	10	10	0	100	5.7	97	10.3
	2009	11	9	0	82	11.0	99	11.1
	2010	11	11	0	100	4.7	99	11.1
	2011	11	10	0	91	8.1	102	10.8
	2012	11	10	0	91	6.0	108	10.2
	2013	11	8	0	73	9.0	95	11.6
	2014	11	10	0	91	18.3	133	8.3
	2015	11	10	0	91	6.0	93	11.8
	2016	11	11	0	100	4.9	115	9.6
	2017	11	10	0	91	13.6	114	9.6
	2018	11	11	0	100	13.0	100	11.0
36A	2008	1	0	0	0		8	12.5
	2009	1	1	0	100	4.0	15	6.7
	2010	2	2	0	100	16.5	10	20.0
	2011	1	1	0	100	2.0	7	14.3
	2012	1	1	0	100	2	16	6.3
	2013	1	0	0	0		15	6.7
	2014	1	1	0	100	1	11	9.1
	2015	1	1	0	100	6	16	6.3
	2016	1	1	0	100	7	12	8.3
	2017	2	1	0	50	2	2	50.0
	2018	2	2	0	100	2.5	18	11.1

^a Hunt ended in 2010.

Table 3. Known moose mortalities, excluding Controlled Hunts, Salmon Region, 2008-present.

Year	Mortality agent					Total
	Native American harvest	Illegal kill	Road kill	Natural	Other	
2008	0	0	1	0	0	1
2009	0	1	3	0	0	4
2010	0	0	0	0	0	0
2011	0	0	0	0	0	0
2012	0	0	2	0	0	2
2013	0	1	0	0	0	1
2014	0	0	2	1	1	4
2015	0	0	1	0	0	1
2016	0	0	1	0	0	1
2017	0	0	0	0	0	0
2018	0	0	0	0	1	1

Table 4. Moose translocation, Salmon Region, February 1993.

Capture site	Release site	Adults		Calves		Total
		M	F	M	F	
GMUs 60, 60A, 62 in various locations	GMU 36: Valley Cr.	1	2	0	0	3
	GMU 36: Decker Flat	0	2	1	0	3
	GMU 36: Gold Cr.	0	2	0	0	2

APPENDIX A

IDAHO

2018 SEASON

MOOSE RULES

Idaho Moose, Bighorn Sheep & Mountain Goat

2017 & 2018 Seasons & Rules



Controlled Hunt Application Period
April 1-30
idfg.idaho.gov



2017 & 2018 MOOSE HUNTING SEASONS

MOOSE

Antler Restrictions

- Only moose with at least one antler longer than six inches may be taken in any season open for antlered moose only.
- Only moose without antlers or with antlers less than six inches long may be taken in any season which is open for antlerless moose only.

Mandatory Check and Report Requirements

All successful moose hunters must report their harvest within 10 days of the date of the kill and have a big game mortality report completed. Any hunter killing an antlered moose must present the antlers to a conservation officer or at an Idaho Fish and Game regional office and have a big game mortality report completed within 10 days of the date of the kill. Any hunter killing an antlerless moose can report by phone to regional office within 10 days of the date of kill. Fish and Game's headquarters office is not equipped to check in moose. In the Boise area, these animals can be checked at the Fish and Game regional office in Nampa (3101 S. Powerline Rd, 208-465-8465) weekdays between the hours of 8 a.m. and 5 p.m. or by appointment at the Garden City facility, 109 W. 44th St., 208-327-7095.

A hunter may authorize another person to comply with the above report requirements if that person possesses the

necessary information to accurately complete the necessary form, see page 32.

Unsuccessful hunters must present or mail their unused tags to a Fish and Game office within 10 days after the close of the season for which the tag was valid. Tags can be mailed to: Idaho Fish and Game, Attn: Wildlife Bureau, PO Box 25, Boise, ID 83707. Cancelled tags will be returned to the hunter upon request. Failure to report may result in future ineligibility in moose drawings.

NOTE: Moose tags unfilled after the first drawing are available to any Idaho hunter during a second drawing, see page 39. Hunters who have previously harvested a bull and/or a cow moose and are not eligible for the first drawing may apply for and receive one of these tags in the second drawing or as a leftover tag if tags are still available.

No person may harvest more than one antlered and one antlerless moose in Idaho during their lifetime, except Super Hunt tag winners and leftover tag holders may harvest moose regardless of any previous harvest of moose in Idaho.

Drawing Odds: To review drawing odds and more detailed information about number of applicants please visit our website at <http://idfg.idaho.gov/CHodds>.

2017 & 2018 Antlered Moose Controlled Hunts - 669 Tags

Hunt No.	Controlled Hunt Area	Tags	Season Dates	Hunt No.	Controlled Hunt Area	Tags	Season Dates
3001	1-1	30	Sep 15 - Dec 1	3015	4	20	Sep 15 - Dec 1
3002	1-1	10	Oct 1 - Oct 14	3016	4	5	Oct 1 - Oct 14
3003	1-1	10	Nov 1 - Nov 14	3017	4	10	Nov 1 - Nov 14
3004	1-2	20	Sep 15 - Dec 1	3018	4A	5	Sep 15 - Dec 1
3005	1-2	5	Oct 1 - Oct 14	3019	5	15	Sep 15 - Dec 1
3006	1-2	5	Nov 1 - Nov 14	3020	5	5	Oct 1 - Oct 14
3007	1-3	10	Sep 15 - Dec 1	3021	5	5	Nov 1 - Nov 14
3008	1-3	5	Nov 1 - Nov 14	3022	6	20	Sep 15 - Dec 1
3009	2	20	Sep 15 - Dec 1	3023	6	5	Oct 1 - Oct 14
3010	2	15	Oct 1 - Oct 14	3024	6	5	Nov 1 - Nov 14
3011	2	15	Nov 1 - Nov 14	3025	7	5	Sep 15 - Dec 1
3012	3	15	Sep 15 - Dec 1	3026	7	5	Oct 1 - Oct 14
3013	3	5	Oct 1 - Oct 14	3027	8	10	Aug 30 - Nov 23
3014	3	10	Nov 1 - Nov 14	3028	8A	10	Aug 30 - Nov 23

2017 & 2018 MOOSE HUNTING SEASONS



MOOSE

2017 & 2018 Antlered Moose Controlled Hunts - continued

Hunt No.	Controlled Hunt Area	Tags	Season Dates	Hunt No.	Controlled Hunt Area	Tags	Season Dates
3029	9	5	Sep 15 - Dec 1	3067	64	10	Aug 30 - Nov 23
3030	9	5	Oct 1 - Oct 14	3068	65	10	Aug 30 - Nov 23
3031	10-1	6	Aug 30 - Nov 23	3069	66-1	10	Aug 30 - Nov 23
3032	10-2	5	Aug 30 - Nov 23	3070	66-2	10	Aug 30 - Nov 23
3033	10-3	10	Aug 30 - Nov 23	3071	66A	10	Aug 30 - Nov 23
3034	10-4	2	Aug 30 - Nov 23	3072	67-1	10	Aug 30 - Nov 23
3035	10-5	2	Aug 30 - Nov 23	3073	67-2	10	Aug 30 - Nov 23
3036	10-6	2	Aug 30 - Nov 23	3074	69-1	15	Aug 30 - Nov 23
3037	10A-1	3	Aug 30 - Nov 23	3075	69-2	15	Aug 30 - Nov 23
3038	10A-2	6	Aug 30 - Nov 23	3076	69-3*	5	Aug 30 - Nov 23
3039	10A-3	3	Aug 30 - Nov 23	3077	70	6	Aug 30 - Nov 23
3040	10A-4	8	Aug 30 - Nov 23	3078	71	6	Aug 30 - Nov 23
3041	10A-5	4	Aug 30 - Nov 23	3079	72	5	Aug 30 - Nov 23
3042	12-1	2	Aug 30 - Nov 23	3080	73*	5	Aug 30 - Nov 23
3043	12-2	8	Aug 30 - Nov 23	3081	74	5	Aug 30 - Nov 23
3044	12-3	2	Aug 30 - Nov 23	3082	75	5	Aug 30 - Nov 23
3045	12-4	2	Aug 30 - Nov 23	3083	76-1	10	Aug 30 - Nov 23
3046	12-5	2	Aug 30 - Nov 23	3084	76-2	7	Aug 30 - Nov 23
3047	14	5	Aug 30 - Nov 23	3085	76-3	7	Aug 30 - Nov 23
3048	16	2	Aug 30 - Nov 23	3086	77	5	Aug 30 - Nov 23
3049	27	1	Aug 30 - Nov 23	3087	78	5	Aug 30 - Nov 23
3050	29*	11	Aug 30 - Nov 23				
3051	36A	2	Aug 30 - Nov 23				
3052	44*	3	Aug 30 - Nov 23				
3053	50	5	Aug 30 - Nov 23				
3054	51	5	Aug 30 - Nov 23				
3055	54	1	Aug 30 - Nov 23				
3056	55*	5	Aug 30 - Nov 23				
3057	59*	5	Aug 30 - Nov 23				
3058	60 ^a	15	Aug 30 - Nov 23				
3059	60A ^b	5	Aug 30 - Nov 23				
3060	61-1	10	Aug 30 - Nov 23				
3061	61-2	5	Aug 30 - Nov 23				
3062	61-3	10	Aug 30 - Nov 23				
3063	62	5	Aug 30 - Nov 23				
3064	62A	5	Aug 30 - Nov 23				
3065	63 ^c	2	Aug 30 - Nov 23				
3066	63A ^{b, d}	15	Aug 30 - Nov 23				

Antlered Moose Archery ONLY Hunt

Hunt No.	Controlled Hunt Area	Tags	Season Dates
3088	68A	4	Aug 30 - Nov 23

* See controlled hunt area descriptions. This hunt includes other units or parts of other units.

^a Short-range weapons only on Chester Wetlands WMA.

^b Short-range weapons only. Limited access.

^c Short-range weapons only on Mud Lake WMA

^d Motorboat advised for game retrieval.



2017 & 2018 MOOSE HUNTING SEASONS

MOOSE

2017 & 2018 Antlerless Moose Controlled Hunts - 136 Tags

Hunt No.	Controlled Hunt Area	Tags	Season Dates
3089	2	20	Oct 15 - Dec 1
3090	3	5	Oct 15 - Dec 1
3091	5	5	Oct 15 - Dec 1
3092	8	6	Oct 15 - Nov 23
3093	8A	6	Oct 15 - Nov 23
3094	50	5	Oct 15 - Nov 23
3095	60 ^a	5	Oct 15 - Nov 23
3096	60A ^b	5	Oct 15 - Nov 23
3097	63A ^{b, c}	10	Oct 15 - Nov 23
3098	64	5	Oct 15 - Nov 23
3099	65	5	Oct 15 - Nov 23
3100	66A	5	Oct 15 - Nov 23
3101	67-1	5	Oct 15 - Nov 23
3102	67-2	5	Oct 15 - Nov 23

^a Short-range weapons only on Chester Wetlands WMA.

^b Short-range weapons only. Limited access.

^c Motorboat advised for game retrieval.

Hunt No.	Controlled Hunt Area	Tags	Season Dates
3103	69-1	5	Oct 15 - Nov 23
3104	69-2	5	Oct 15 - Nov 23
3105	70	2	Oct 15 - Nov 23
3106	71	5	Oct 15 - Nov 23
3107	73*	3	Oct 15 - Nov 23
3108	74	2	Oct 15 - Nov 23
3109	76-4	10	Oct 15 - Nov 23
3110	77	3	Oct 15 - Nov 23
3111	78	5	Oct 15 - Nov 23

Antlerless Moose Archery ONLY Hunt

Hunt No.	Controlled Hunt Area	Tags	Season Dates
3112	68A	4	Oct 15 - Nov 23



Photo by Noah Howard

TAG TRANSFER TO CHILD OR GRANDCHILD

- If an adult designates his or her "once in a lifetime" antlered moose, antlerless moose, Rocky Mountain Bighorn Sheep, California Bighorn Sheep or Mountain Goat tag to a child, and the child harvests using the tag, then the child has fulfilled their "once in a lifetime" eligibility and the child will no longer be eligible to apply for that species.
- Resident adults can only transfer tags to resident youth; Nonresident adults can only transfer tags to nonresident youth.



A form provided by Fish and Game must be used to designate the tag, which can only be done at a Fish and Game office, in person or by mail. For more information, please contact your local Fish and Game office or visit fishandgame.idaho.gov.

Submitted by:

Micah Ellstrom
Regional Wildlife Manager

Clay Hickey
Regional Wildlife Manager

Rick Ward
Regional Wildlife Manager

Regan Berkley
Regional Wildlife Manager


Mike McDonald
Regional Wildlife Manager

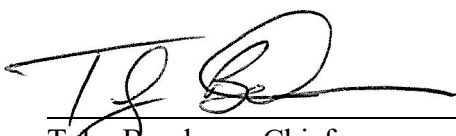
Josh Rydalch
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