

Status Report on the Yellowstone Bison Population to the Superintendent

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Summary

- 4,830 (95% range: 4,550 – 5,125) bison in August 2023 recovered from a low of 3,960 (3,690 – 4,250) in May.
- Current population is near the 10-year average of 4,890.
- 1,551 bison removed during winter 2022-2023 equating to 27±1% of the 2022 summer population.
- The NPS continued to reduce shipments to slaughter and support tribal access to surplus bison with 282 bison placed in the Bison Conservation Transfer Program and at least 1,010 bison harvested by Tribes outside the park.
- IBMP partners should not remove more than 1,100 animals during the upcoming winter (22% of the summer population) to ensure the end-of-winter population exceeds 3,500 animals.
- The NPS does not recommend a removal target, because removal of anywhere between 0 to 1,100 animals would result in a 2024 bison population within a range that IBMP partners have and will continue to manage successfully.
- The number of animals removed by IBMP partners should depend on the magnitude of the migration, which largely depends on winter severity.
- IBMP partners should consider restricting removals to the northern management area.
- Removal breakdown by age should include at least 20% calves and no more than 80% adults.
- Proportion of adult females (57-70%) removed should exceed adult males (30-43%) removed.
- NPS capture operations depend on numerous factors, including migration intensity, available space in the BCTP, hunter success, bison-related conflicts outside the park, and the number of bison removed by IBMP partners.

Management Recommendations

- IBMP partners should not remove more than 1,110 animals during the upcoming winter (22% of the summer population).
- In general, the NPS recommends a removal limit of 25% of the population. This year, the removal limit is 22% to ensure the end-of-winter population exceeds 3,500 animals.
- The NPS does not recommend a removal target, because removal of anywhere between 0 to 1,100 animals would result in a 2024 bison population within a range that IBMP partners have and will continue to manage successfully.
- The number of animals removed by IBMP partners should depend on the magnitude of the migration, which largely depends on winter severity.
- IBMP partners should consider restricting removals to the northern management area.
- Removal breakdown by age should include at least 20% calves and no more than 80% adults.
- Proportion of adult females (57-70%) removed should exceed adult males (30-43%).
- NPS capture operations depend on numerous factors, including migration intensity, available space in the BCTP, hunter success, bison-related conflicts outside the park, and the number of bison removed by IBMP partners.
- If capture is needed, passive capture could be used through winter to bait some animals into the facility while allowing other animals to move towards park boundaries to support hunting. If few animals migrate, the NPS may release animals that do not qualify for the BCTP. As numbers of animals in the northern management area increase, brucellosis exposed animals could be selectively shipped to slaughter, while others are released. If removals near the 1,100 threshold, captured animals could be held for release in spring regardless of brucellosis exposure.

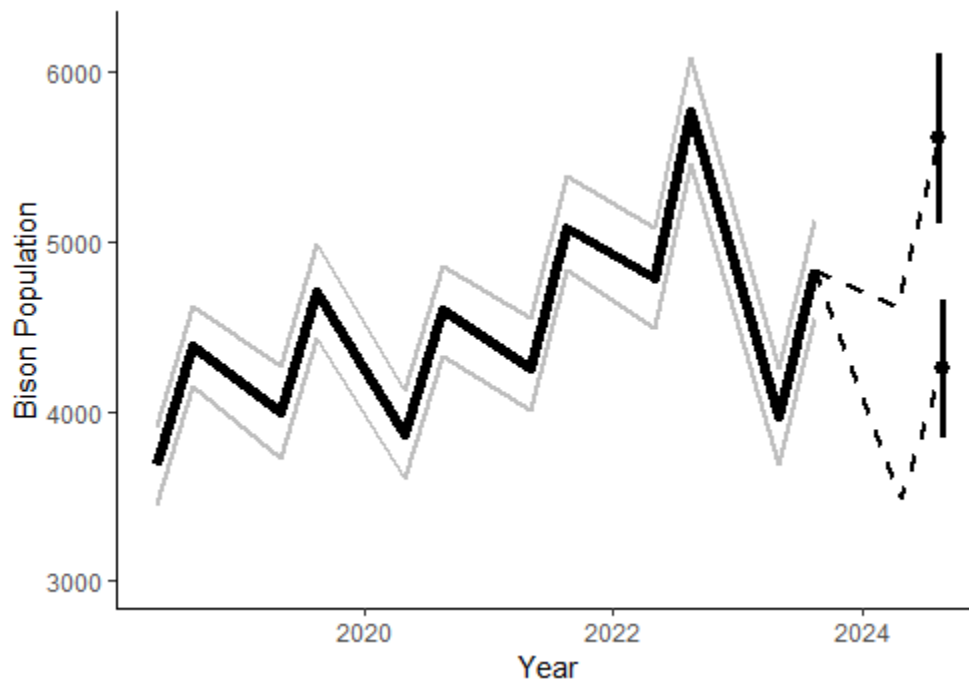


Figure 1. Predicted numbers of bison. Dark lines show the average and gray lines show the range. Dotted lines and point estimates show the expected population through summer 2024 given removing 0 or 1,100 animals during the upcoming winter.

Objective 1. Sustain a viable wild population.

- 4,830 (95% range: 4,550 – 5,125) bison in August 2023 recovered from a low of 3,960 (3,690 – 4,250) in May.
- 930±400 reduction in population size between summer 2022 and 2023 with a current population near the 10-year average.
- 15% population growth rate (when accounting for removals) maintained despite the 2022-23 winter being the most severe of the IBMP era based on wintering area snowpack.
- The population sustained growth because calving rate was 45±9 calves per 100 2+ year-old females matching the long-term average and the proportion of females in the population reached a 10-year high of 57±5%. These changes offset reduced adult female survival of 82%, which was below the long-term average of 95±1%.
- The status of the bison population illustrates its resiliency to removal of up to 25% of the population.
- The population remains below predicted capacity based on forage production of 5,000 in northern regions of the park and 10,000 across the entire park. Higher numbers since 2012 increased tribal access to surplus bison, improved visitor experience, promoted genetic conservation, and sustained grassland ecosystem function.
- At least 3,500 bison are needed to sustain existing genetic diversity.

Objective 2. Remove fewer than 25% of the population and less than 1,000 animals when possible.

- 1,551 bison removed during winter 2022-2023 equating to 27±1% of the preceding summer population.
- 1,175 hunt related mortality including 75 state harvests, 1,010 tribal harvests, 37 agency-related dispatched/wounding loss, and 53 unattributed harvests.
- 1,213 bison captured through winter by NPS with 837 released back into the park, 282 entered in the Bison Conservation Transfer Program, 88 consigned to slaughter, and 6 dying while held.
- 660 of 1,213 bison tested for brucellosis exposure with exposure rates of 2% (n=183) for calves, 44% (n=199) for yearlings, 70% (n=234) for adult females, and 68% (n=44) for adult males.
- 97% of removals occurred near the northern park boundary.
- Removals consisted of 32±2% adult male, 32±2% adult female, 7±1% yearling and 29±2% calf.
- Removals reduced the proportion of juveniles in the current population, because the proportion of calves removed over winter was 1.7 times their occurrence in the population.
- The NPS continued to reduce shipments to slaughter with 121 bison removed over the last three winters.
- 116 bison completing brucellosis quarantine transferred to the Fort Peck Assiniboine and Sioux Tribes for assurance testing.
- Removing less than 25% of the population and preferentially removing pre-reproductive animals reduces the chances of altering population composition and reducing genetic diversity.

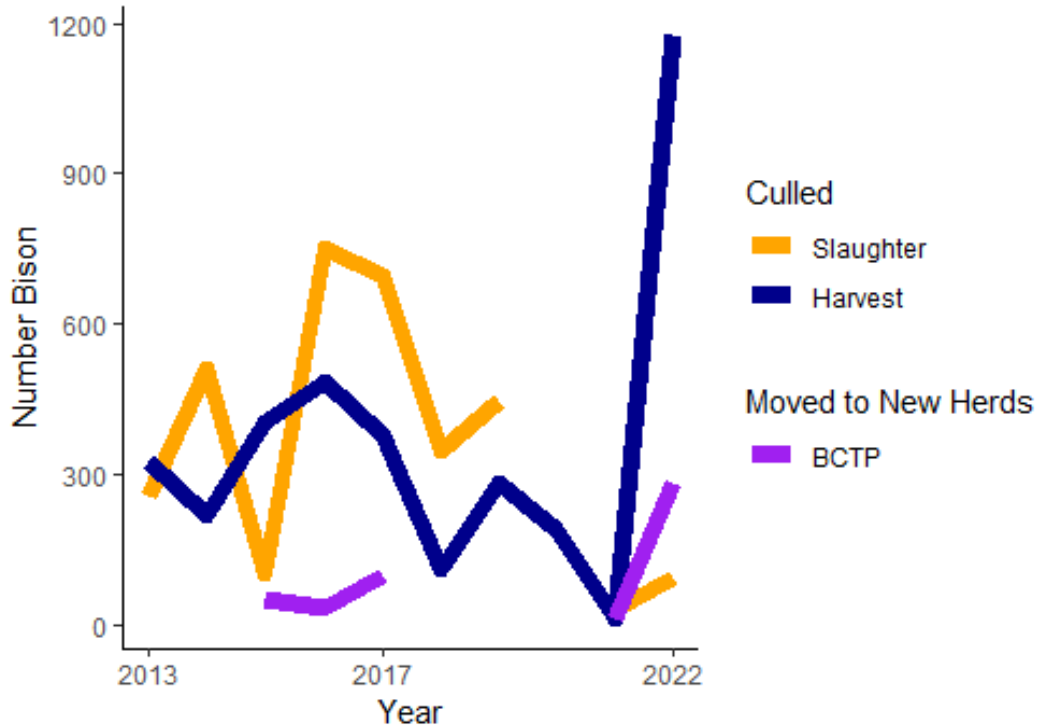


Figure 2. Numbers of bison culled from the population through slaughter and hunting during winter 2022-23. Purple lines show numbers of bison placed in the BCTP to be moved into herds outside the park.

Objective 3. Maintain more than 1,000 bison in northern and central herds.

- Over the last year, the northern herd decreased 14% from an average count of 4,453 to 3,819 and the central herd decreased 16% from 1,363 to 1,156.
- The central and northern herds experienced similar reductions to abundance as the result of removals, natural movements, birth, and survival.
- Northern herd bison were in central herd count units of the Pelican Valley during some counts based on radio collars.
- Bison breed in northern or central geographic regions of the park with some interchange of animals between breeding areas among years. Genetic analyses do not indicate distinct subpopulations.
- Maintaining more than 1,000 bison in each breeding herd helps to protect any existing unique diversity or rare alleles. It also allows bison to be a meaningful component of the food web and support visitor experiences across a broad geographic area of the park.

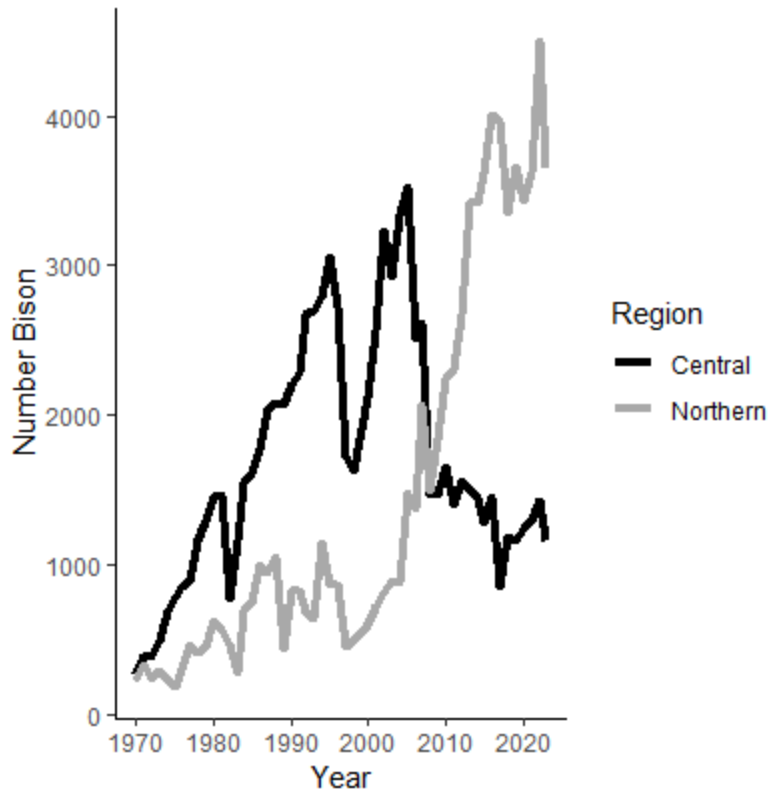


Figure 3. Summer counts of bison in northern and central regions of the park.

Objective 4. Maintain a balanced sex ratio.

- The male to female proportion in the population continued to decrease from a high $55\pm 4\%$ in 2020 to $43\pm 5\%$ in 2023.
- The reduction in males is likely due to natural conditions because removals matched male to female ratios since 2020. Reduced adult male survival during the severe 2022-2023 winter likely contributed to the recent decline.
- The male to female proportion decreased from 52% to 49% in the central herd and 45% to 42% in the northern herd.
- A balanced sex ratio supports mate competition allowing natural selection to affect population genetics.

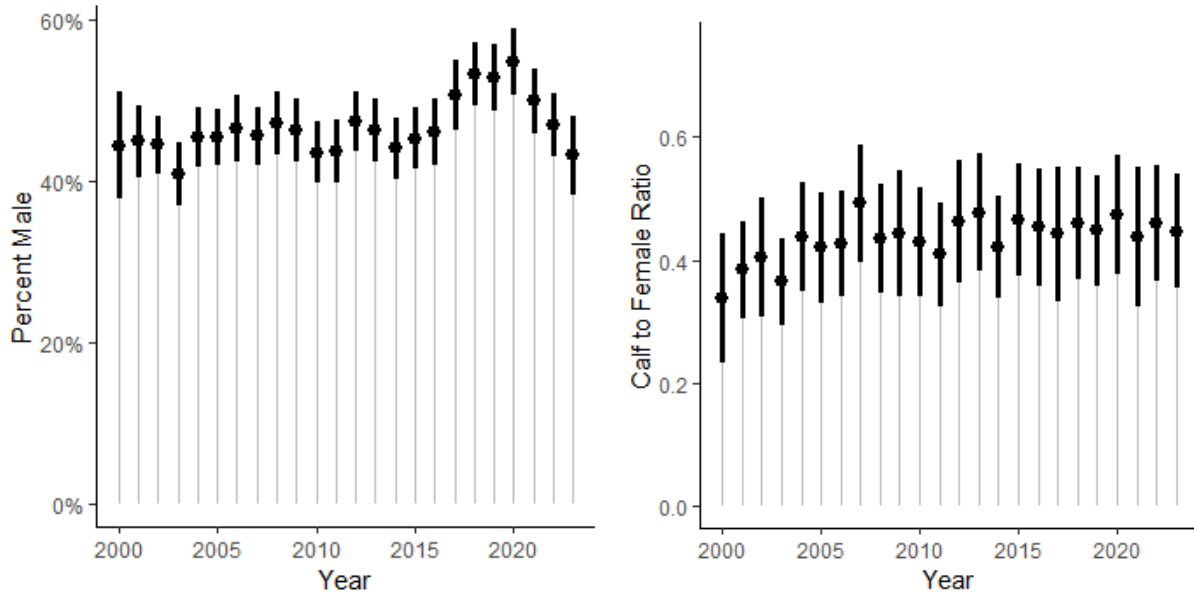


Figure 4. Estimated percentages of females and percentages of calves to females.

Objective 5. Maintain an age structure of about 70% adults and 30% juveniles.

- The juvenile (calf and yearling) proportion was $30 \pm 3\%$.
- Calving rate was 45 ± 9 calves per 100 2+ year-old females matching the long-term average.
- Juveniles made up 27% of animals in the central herd and 30% in the northern herd.
- An age structure of about 70% adults and 30% juveniles is based on the expected population composition based on age-specific birth and survival rates.

Appendix A: Summaries of Counts, Classifications, and Removals during 2000-2023

Table A1. Aerial counts of the Yellowstone bison population completed during 2000 to 2023^a.

		Park Total	Central Herd			Northern Herd		
			Total	Adults	Calves	Total	Adults	Calves
2000	June 4, 2000	2,613	2,060	1,734	326	553	460	93
	July 13, 2000	2,432	1,924			508		
	August 31, 2000	2,708	2,118			590		
2001	June 21, 2001	3,256	2,595	2,126	469	661	557	104
	July 24-25, 2001	2,859	2,564			719		
2002	June 25, 2002	3,648	3,100	2,560	540	548	477	71
	July 29, 2002	3,715	2,902			812		
	August 22, 2002	4,045	3,240			805		
2003	July 10, 2003	3,778	2,900	2,466	434	878	753	125
	August 8, 2003	3,811	2,923			888		
	August 28, 2003	3,766	2,770			996		
2004	July 21, 2004	4,148	2,811	2,310	501	1,337		
	July 28, 2004	3,995	3,027			968		
	August 4, 2004	4,215	3,339			876		
2005	July 19, 2005	4,819	3,553			1,266		
	July 26, 2005	4,747	3,394			1,353		
	August 1, 2005	5,015	3,531			1,484		
2006	July 19, 2006	3,713	2,430	2,146	284	1,283		
	July 26, 2006	3,889	2,512			1,377		
	August 2, 2006	3,775	2,496			1,279		
2007	June 14, 2007	4,554	2,734	2,385	349	1,820	1,499	321
	July 30, 2007	3,959	2,390			1,569		
	August 6, 2007	4,694	2,624			2,070		
2008	June 14, 2008	2,943	1,150	1,047	103	1,793	1,468	325
	July 8, 2008	2,881	1,540			1,341		
	July 15, 2008	2,969	1,469			1,500		
2009	June 12, 2009	3,301	1,464	1,295	169	1,837	1,518	319
	July 9, 2009	2,977	1,544			1,433		
	July 16, 2009	3,183	1,535			1,648		
2010	June 14, 2010	3,898	1,652	1,425	227	2,246	1,891	355
	July 8, 2010	3,715	1,730			1,985		
	July 22, 2010	3,563	1,708			1,855		
2011	June 21, 2011	3,651	976	880	96	2,675	2,188	487
	July 12, 2011					2,288		
	July 18, 2011	3,720	1,406			2,314		
	July 25, 2011	3,485	1,330			2,155		
2012	June 21, 2012	3,885	1,395	1,194	201	2,490	2,097	393
	July 8, 2012	4,171	1,640			2,531		

	July 22, 2012	4,230	1,561			2,669		
2013	June 6, 2013	4,492	1,327	1,159	168	3,165	2,631	534
	July 15, 2013	4,924	1,504			3,420		
	July 22, 2013	4,565	1,334			3,231		
2014	June 20, 2014	4,857	1,340	1,192	148	3,517	2,926	591
	July 18, 2014	4,386	1,444			2,942		
	July 25, 2014	4,865	1,441			3,424		
2015	June 13-14, 2015	4,910	1,282	1,113	169	3,628	2,997	631
	July 12, 2015	4,616	1,291			3,325		
	July 19-20, 2015	4,764	1,323			3,441		
2016	June 18 & 28, 2016	5,459	1,451	1,280	171	4,008	3,312	696
	July 18, 2016	4,736	1,584			3,152		
	July 25, 2016	4,809	1,638			3,171		
	August 8, 2016		NA			4,042		
2017	August 03, 2017					3,619		
	August 4-5, 2017	4,816	847			3,969		
2018	June 4-5, 2018	4,401	758	679	79	3,643	2,994	649
	August 4-5, 2018	4,527	1,190			3,337		
	September 2-3, 2018	4,372	1,162			3,210		
2019	June 12-13, 2019	4829	1,162	1013	149	3,667	2995	672
	July 29-30, 2019	4664	1,124			3,540		
2020	August 21-22, 2020	4,680	1,243			3,437		
	August 23-24, 2020	4,658	1,251			3,407		
2021	August 24-25, 2021	5,394	1,564			3,830		
	August 26-28, 2021	4,922	1,299			3,623		
2022	August 26-29, 2022	5,704	1,284			4,420		
	August 30-31, 2022	5,939	1,432			4,507		
2023	August 26, 2023	4,022	449			3,573		
	August 27-29, 2023	4,944	1,733			3,211		
	Aug 28 – Sept 7, 2023	4,802	1,186			3,616		

^a We reevaluated flight totals during summer 2017 using updated count areas for each herd based on an improved understanding of bison movements.

Table A2. Composition surveys of the Yellowstone bison population during 2003 to 2023. Numbers in parentheses show results from repeated counts.

Year	Herd	Classified in Mixed Gender Groups					Air Count	
		Male>1	Male1	Female>1	Female1	Calf	Bachelor	Mixed
2003	C	438	150	1,426	241	498	379	2,521
	N	159 (133)	23 (11)	176 (227)	12 (15)	46 (110)	83	795
2004	C	638 (523)	179 (125)	1,082 (932)	126 (131)	497 (397)	217	2,594
	N	247 (232)	35 (26)	331 (458)	33 (49)	164 (145)	127	1,210
2005	C	500 (674)	178 (175)	1,098 (1,060)	162 (148)	430 (443)		
	N	276 (205)	63 (49)	441 (324)	51 (37)	153 (97)		
2006	C	368 (386)	141 (152)	654 (757)	101 (111)	258 (301)	352	2,078
	N	102	27	202	40	103		

2007	C	375 (555)	100 (119)	709 (805)	109 (106)	342 (305)		
	N	300 (173)	139 (28)	637 (366)	101 (28)	339 (169)		
2008	C	116	36	387	50	110	439	1,101
	N	198	87	433	61	232	183	1,158
2009	C	145 (161)	63 (62)	427 (498)	73 (47)	158 (186)	481	1,063
	N	244 (224)	84 (83)	414 (391)	53 (53)	237 (179)	194	1,239
2010	C	340 (369)	72 (82)	517 (537)	57 (81)	219 (228)	338	1,370
	N	228 (298)	126 (150)	934 (679)	140 (121)	391 (344)	230	1,755
2011	C	118 (163)	58 (53)	323 (309)	37 (40)	105 (106)	444	962
	N	303	131	915	99	361	185	2,103
2012	C	282 (420)	68 (80)	493 (477)	41 (55)	173 (216)	398 (212)	1,242 (1,349)
	N	375 (405)	187 (114)	876 (698)	165 (84)	466 (288)	80 (50)	2,451 (2,619)
2013	C	287 (372)	101 (102)	415 (401)	82 (77)	197 (191)	342 (186)	1,162 (1,148)
	N	457 (608)	231 (249)	1,061 (1,149)	191 (198)	528 (538)	145 (80)	3,275 (3,151)
2014	C	275 (296)	113 (71)	565 (380)	69 (63)	206 (145)	276 (282)	1,168 (1,159)
	N	310 (565)	155 (266)	1,023 (1,314)	126 (259)	422 (612)	145 (261)	2,797 (3,163)
2015	C	187 (310)	43 (58)	301 (364)	42 (58)	165 (166)	240 (166)	1,051 (1,157)
	N	651 (738)	219 (192)	1,499 (1,144)	203 (141)	689 (507)	149 (69)	3,176 (3,372)
2016	C	350 (327)	106 (37)	457 (316)	79 (25)	185 (95)	169 (142)	1,415 (1,496)
	N	770 (839)	316 (304)	1,510 (1,570)	248 (200)	763 (766)	123 (56)	3,029 (3,115)
2017	C	388	44	275	39	106	88	759
	N	1,167	221	1,279	231	585	59	3,910
2018	C	405	59	324	34	126	105	1,085
	N	983	179	1,065	134	512	35	3,302
2019	C	317	37	213	27	84	106	1,018
	N	1,065	192	1,140	195	500	175	3,365
2020	C	174	37	153	19	71	151	1,092
	N	296	44	283	37	140	100	3,337
2021	C	346	79	372	72	198	208	1,356
	N	898	251	1,273	224	556	159	3,671
2022	C	331	78	348	76	158	90	1,182
	N	767	217	1,091	189	515	118	4,302
2023	C	156	35	215	29	91	93	1,064
	N	380	145	869	123	545	108	3,537

Table A3. Numbers of bison removed from Yellowstone National Park or nearby areas of Montana during winters from 1970 to 2023.

Winter	Maximum No. Bison Counted Previous June-August ^h			Sent to Slaughter/Management Culls		Hunter Harvest ^{ch}		Sent to Quarantine or Research		Total	Age and Gender Composition of Culls/Harvests			
	North	Central	Total	N	W	N	W	N	W		M	F	C	Unk
1970-84				0	0	13	0	0	0	13	4	7	0	2
1984-85	695	1,552	2,247	0	0	88	0	0	0	88	42	37	8	1
1985-86	742	1,609	2,351	0	0	41	16	0	0	57	42	15	0	0
1986-87	998	1,778	2,776	0	0	0	7	0	0	7	5	2	0	0
1987-88	940	2,036	2,976	0	0	2	37	0	0	39	27	7	0	5
1988-89	1,058 ^h	2,089 ^h	3,147 ^h	0	0	567	2	0	0	569	295	221	53	0
1989-90	432 ^h	2,075 ^h	2,507 ^h	0	0	1	3	0	0	4	0	0	0	4
1990-91	818	2,203	3,021	0	0	0	14	0	0	14	0	0	0	14
1991-92	822	2,290	3,112	249	22	0	0	0	0	271	113	95	41	22
1992-93	681	2,676	3,357	0	79	0	0	0	0	79	9	8	9	53
1993-94	636 ^h	2,693 ^h	3,329 ^h	0	5	0	0	0	0	5	0	0	0	5
1994-95	1,140	2,974	4,114	307	119	0	0	0	0	426	77	66	31	252
1995-96	866	3,062	3,928	26	344	0	0	0	0	370 ^c	100	71	10	189
1996-97	860 ^h	2,724 ^h	3,584 ^h	725	358	0	0	0	0	1,083 ^d	329	330	144	280
1997-98	455	1,715	2,170	0	11	0	0	0	0	11	0	0	0	11
1998-99	489 ^h	1,622 ^h	2,111 ^h	0	94	0	0	0	0	94	44	49	1	0
1999-00	540	1,904	2,444	0	0	0	0	0	0	0	0	0	0	0
2000-01	590 ^h	2,118 ^h	2,708 ^h	0	6	0	0	0	0	6	6	0	0	0
2001-02	719	2,564	3,283	0	202	0	0	0	0	202	60	42	16	84
2002-03	805 ^h	3,240 ^h	4,045	231	13	0	0	0	0	244	75	98	43	28
2003-04	888	2,923	3,811	267	15	0	0	0	0	282	58	179	23	22
2004-05	876	3,339	4,215	1	96	0	0	0	17	114	23	54	20	17
2005-06	1,484	3,531	5,015	861	56	32	8	87	0	1,044	205	513	245	81
2006-07	1,377	2,512	3,889	0	4	47	12	0	0	63	53	6	0	4
2007-08	2,070	2,624	4,694	1,288	160	59	107	112	0	1,726	516	632	332	246
2008-09	1,500	1,469	2,969	0	4	1	0	0	0	5	5	0	0	0
2009-10	1,837 ^h	1,464 ^h	3,301 ^h	3	0	4	0	0	0	7	7	0	0	0
2010-11	2,246 ^h	1,652 ^h	3,898 ^h	6	0	Unk	Unk	53	0	260	106	102	52	0
2011-12	2,314	1,406	3,720	0	0	15	13	0	0	28 ^e	14	12	2	0
2012-13	2,669	1,561	4,230	0	0	148	81	0	0	250 ^f	116	85	28	0
2013-14	3,420	1,504	4,924	258	0	258	69	60	0	645 ^g	202	287	152	4
2014-15	3,424 ^h	144 ^h	4,865	511	0	201	18	7	0	737	276	297	161	3
2015-16	3,627 ^h	1,282 ^h	4,910 ^h	101	0	378	24	49	0	552	175	227	146	4
2016-17	4,008	1,451	5,459	753	0	389	97	35	0	1,274	311	585	342	36
2017-18	3,969	847	4,816	697	0	285	90	99	0	1,171	300	491	288	92
2018-19	3,337	1,190	4,527	348	0	109	3	0	0	460	97	159	204	0
2019-20	3,667	1,162	4,829	445	0	221	63	105	0	834	180	328	193	133
2020-21	3,427	1,243	4,670	0	0	153	34	0	0	187	64	57	42	24
2021-22	3,830	1,564	5,394	27	0	6	7	10	0	50	15	29	6	0

2022-23	4,507	1,432	5,939	94	0	1,133	42	282	0	1,551	510	532	424	85
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^a Total includes bison harvested by game wardens and State of Montana hunters during 1973 through 1991, and state and tribal hunters after 2000.

^c The Final Environmental Impact Statement reported 433 bison, but records maintained by Yellowstone National Park only indicate 370 bison.

^d Total does not include an unknown number of bison captured at the north boundary and consigned to a research facility at Texas A&M University (about 100 bison).

^e There is a report of 29 removals with differences owing to reported harvests.

^f There is a report of 260 removals with differences owing to reported harvests.

^g There is a report of 650 removals with differences owing to reported harvests.

^h We reevaluated flight totals during summer 2017 using updated count areas for each herd and including flights occurring June 1-August 31.