Bison
Management Report
of survey-inventory activities
1 July 1999–30 June 2001

Carole Healy, Editor
Alaska Department of Fish and Game
Division of Wildlife Conservation
December 2002

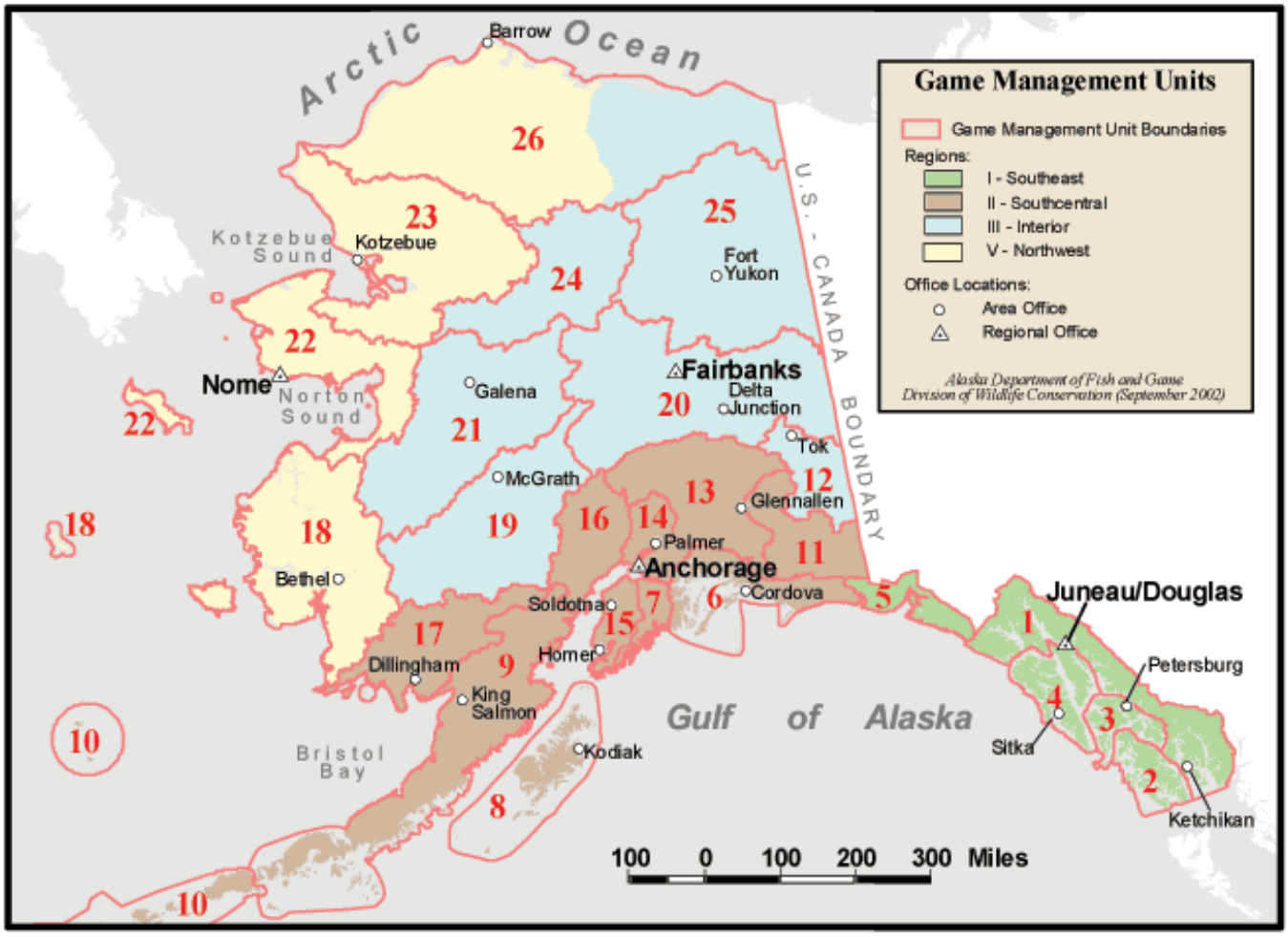
ADF&G

Please note that population and harvest data in this report are estimates and may be refined at a later date.

If this report is used in its entirety, please reference as: Alaska Department of Fish and Game. 2001. Bison management report of survey-inventory activities 1 July 1999–30 June 2001. C. Healy, editor. Project 9.0. Juneau, Alaska.

If used in part, the reference would begin with the unit author's name, unit number, and page numbers. Authors' names can be found at the end of each unit section.

Funded in part through Federal Aid in Wildlife Restoration, Proj. 9, Grants W-27-3 and W-27-4.


Arctic Ocean
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U.S. - CANADA BOUNDARY
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Game Management Units
Game Management Unit Boundaries
Regions:
I - Southeast
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BISON MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2001

LOCATION

GAME MANAGEMENT UNIT: 11 (12,782 MI^2)

Unit 11 – Copper River Herd – Dadina River to the Kotsina River

BACKGROUND

The Copper River bison herd originated from animals relocated from the National Bison Range in Moise, Montana to Delta Junction, Alaska in 1928. In 1950, 17 bison were moved from the Delta herd to the Nabesna Road in northern Game Management Unit 11. These bison moved away from the release site, and by 1961 they had moved into the Dadina and Chetaslina River area where they remained. The herd has, at times, numbered as many as 120 bison. Factors controlling herd size are hunter harvest and annual snow depth.

The department held the first hunt, by registration permit, for Copper River bison in 1964. Between 1964 and 1988, hunters harvested a total of 217 bison from this herd. The Copper River bison hunt was closed in 1989 by Emergency Order because of a decline in herd size. Hunting seasons for the Copper River herd remained closed for 10 years until 1999 when herd size and productivity increased enough to resume annual harvests.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

Maintain the herd at a minimum of 60 overwintering adults by controlling the number of bison taken by hunters.

METHODS

I conducted aerial surveys to determine composition of the herd in the spring following the calving period. Between 1984 and 1992, radio collars were used to facilitate finding the herd during spring surveys. Currently there are no radio collars on bison in this herd. Bison surveys are now conducted after calving in early June when bison are most aggregated in open areas along the Copper or Dadina Rivers.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The Copper River bison herd was relatively stable during the late 1960s and 1970s, following a period of growth in the 1950s. Bison numbers declined appreciably in the late 1980s and remained low until the mid 1990s. Bison numbers in the Copper River herd started increasing in 1996 after bottoming out in 1995 with a herd estimate of only 64. The 2001 count of 108 total bison is the highest in 27 years since 111 were counted in 1974 (Table 1). The highest count ever was 119 bison in 1970.

Population Composition

Survey results included 89 adults and 19 calves observed during aerial surveys of the Copper River herd during 2001 (Table 1). Calf production/survival has been high the last five years, averaging 17 calves (Range = 14–19) a year, compared to only 10 calves (Range = 3–14) during the five year period from 1988–92 when the herd declined. The number of adults in the herd reached 70 in 1997, exceeding the overwinter population objective of 60 adults for the first time since 1992. The management objective of 60 overwintering adults has been met every year since 1997.

Distribution and Movements

The Copper River bison herd inhabited a home range bounded by the Dadina River on the north, the Copper River on the west, the Kotsina River to the south, and the Wrangell Mountains to the east. Bison or bison sign were seldom observed north of the Dadina River or south of the Kotsina River. Seasonal distribution included intensive use of the Copper River flood plain and bluffs along the Copper River during winter and spring. During summer the bison moved to higher elevations along the Dadina and Chetaslina Rivers to feed on plants as they green up later in the season. During the late 1970s and the 1980s, there were only occasional reports of bison observed along the western bank of the Copper River in Unit 13. We surmised this was because of human disturbance from the Kenny Lake area and hunting pressure preventing range extension to the west. During the 1990s, however, bison have been reported grazing in hay and crop fields in the Kenny Lake area. If a large number of bison cross the Copper River and feed extensively on the Kenny Lake farms, a serious conflict with farmers will arise.

MORTALITY

Harvest

Season and Bag Limit. The established season for resident and nonresident hunters in Units 11 and 13D is 1 September to 31 March. The hunt area includes that portion of GMU 11 east of the Copper River, south of the Nadina River and Sanford Glaciers, west of a line from Mount Sanford to Mount Wrangell to Long Glacier, and west of the Kotsina River and that portion of GMU 13D east of the Edgerton Hwy. The bag limit is 1 bison every 5 regulatory years by drawing permit.

Board of Game Actions and Emergency Orders. During its spring 1999 meeting, the Board of Game opened the Copper River bison hunt for the first time in 10 years. The hunt was changed

from a registration hunt to a drawing permit hunt and the hunt area was enlarged to include a portion of GMU 13D.

Hunter Harvest. There were 5 bulls taken during the 2000 season (Table 2).

Permit Hunts. The Copper River bison hunt is administered as a drawing permit hunt (DI 454) with up to 12 permits authorized. In 2000, 617 hunters applied for the 12 available permits. Permittees are required to indicate prior to 1 September if they will hunt or an alternate will be chosen. Permittees must then report to the Glennallen office to pick up their permit and receive detailed maps of the hunt area. This also gives us the opportunity to emphasize the need to respect private property rights of the landowners. Successful hunters must report to the Glennallen office within one day of leaving the field.

Hunter Residency and Success. One local rural resident reported taking a bison while the other 4 successful hunters were non-local Alaskan residents (Table 3). Non-resident hunters were unsuccessful in obtaining permits. Historically, the Copper River bison hunt has always been popular with local rural residents and during the 1988 registration hunt, 40% of the hunters to register were local rural residents. Changing this hunt from a registration to a drawing permit hunt reduced the level of local resident and nonresident participation because nonlocal Alaskan residents account for the vast majority of the applicants and thus receive the majority of permits.

Harvest Chronology. Two bison were taken in September, 2 in October and 1 in February (Table 4). The season was not closed by EO, giving hunters approximately 210 days of hunting opportunity. When this hunt was a registration hunt, the last 3 seasons lasted only 2 or 3 days before the desired harvest was reached and the season was closed by Emergency Order.

Transport Methods. Historically, riverboats were the most popular method of transportation. This changed in 1999 when highway vehicles were more important (Table 5). In 2000, riverboats again became the most important method of transportation for successful hunters, followed by ORV's, snowmachines and highway vehicles, (Table 5).

Other Mortality

We monitored winter severity and the potential for winter starvation by recording snow depths at the Dadina Lake snow station. This station was near the bluffs along the Copper River where the herd winters. Snowfall in 1996 resulted in a "moderate" severity rating, but all the winters since have been rated as mild. Snow depth appears to be a critical factor in bison overwinter survival. In years with deep snow conditions, bison mortality increases and calf production/survival declines. Mild winters undoubtedly have been a factor in the herd increase observed during the last few years.

Observations of the Copper River herd suggest accidental death may be an important source of natural mortality to bison (Table 6). Sources of accidental mortality include falling off steep bluffs that border the Copper River and drowning in the river. During winter, bison use the bluffs extensively for feeding. These slopes have predominantly clay soils, which hold moisture and freeze. The frozen clay creates a steep slide with little, if any, secure footing for the bison. Drowning mortality is difficult to document because dead bison are swept downriver.

Wolves, black bears, and brown bears are relatively abundant in the Copper River bison range. These predators are certainly capable of killing bison, but we have not conducted research into predation rates on Copper River bison.

HABITAT

Assessment

Studies to evaluate habitat condition have not been conducted on the Copper River bison range. Most of the Copper River bison range is black spruce forest. Bison frequent swamps, sedge openings, grass bluffs, and river bars of the Copper, Dadina, and Chetaslina Rivers. Field observations of these preferred feeding locations, such as the Copper River bluffs, show evidence of heavy use and reduced forage production.

CONCLUSIONS AND RECOMMENDATIONS

The Copper River bison herd started increasing in 1996 and reached a 27-year high in 2001. Calf production/survival the last 5 years has been high, with 14 or more calves observed each year. The number of adult bison has exceeded the management objective of 60 overwintering bison for the last 5 years, thus allowing for annual harvests.

The Copper River bison hunt was opened in 1999 after being closed for 10 years. However, the hunt was changed from a registration to a drawing permit hunt. When this hunt was administered as a registration hunt, hunt conditions were overcrowded because the hunt area is very small. Also, with heavy hunting pressure, the harvest quota was often reached in 1 to 3 days, and the possibility was great that the harvest quota would be exceeded before the season could be closed by emergency order. The Board of Game addressed overcrowding and over-harvesting issues by changing the hunt to a drawing hunt in which participation is limited. However, hunters receiving a permit were assured a long season with aesthetic hunting conditions.

Access to the Copper River herd is limited to public lands along the Copper River and private farms along the Edgerton Highway. A large portion of the herd's range includes private property that is not open to trespass by bison hunters. As a result, successful hunters watched bison movements then conducted their hunt when bison were on lands open for access. To the best of my knowledge, there have been no trespass incidents by permittees in this hunt. Farmers in the Kenny Lake area responded very favorably to this hunt as it decreased the incidence of crop loss from bison. Access restriction eased somewhat in 2001 as an airboat transporter received access to a large amount of private land owned by the Chitina Native Village along the Copper River.

Limiting factors on the size of the Copper River herd includes human harvests, habitat, accidental deaths, snow depth, and predation. In years with good calf production/survival human harvests were used to keep the herd within the management objective. In years with deep snow conditions, survival and production declined and human harvests were stopped. Accidents such as falling from the river bluffs and drowning while crossing thin ice have been observed frequently enough to be considered an important cause of mortality. Wolves, black bears and grizzly bears are all numerous on the home range of the Copper River herd but their impacts have not been researched.

I recommend holding a bison hunt as long as calf production/survival is high enough to maintain 60 over-wintering bison. Because this hunt takes place in the timber, visibility is often poor, thus limiting this hunt to bulls only is really not feasible. Sex identification in the thick timber is difficult and could lead to mistakes and wasted cows should they be taken during a bulls-only season. The percent of cows in the harvest needs to be monitored and yearly harvest quotas adjusted to maintain productivity in the herd. Hunters need to be educated so that bulls are selected when possible, leaving adult cows in the herd. No changes in season length or bag limit are recommended, but the number of permits issued next year should be set after spring counts indicate the current recruitment and survival.

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SUBMITTED BY:

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Table 1 Copper River bison spring aerial composition counts and estimated population size, 1997–2001

Regulatory Year	Adults[a]	Calves	(%)	Bison Observed	Estimated Population Size[b]
1997–98	70	17	(20)	87	87
1998–99	67	17	(20)	84	84
1999–00	68	19	(22)	87	87
2000–01	73	14	(16)	87	87
2001	89	19	(18)	108	108

[a]Fixed-wing aircraft survey – no composition other than adults and calves.
[b]Extrapolated estimates not calculated from aerial counts.

Table 2 Copper River bison harvest data by permit hunt, 1988–2001 (DI 454)

Regulatory Year	Permits Issued	Applications	Percent Did not Hunt	Percent Unsuccessful Hunters	Percent Successful Hunters	Bulls	(%)	Cows	(%)	Unknown	Total Harvest
1988–89	38	38	32	73	27	6	(86)	1	(14)	0	7
1999–00	12	678	17	30	70	6	(86)	1	(14)	0	7
2000–01	12	617	25	33	42	5	(100)	0	(0)	0	5

Table 3 Copper River bison hunter residency and success, 1988–2001

	Successful					Unsuccessful				
Regulatory Year	Local[a] Resident	Nonlocal Resident	Nonresident	Total	(%)	Resident[b]	Non-resident	Total	(%)	Total hunters
1988–89	1	6	0	7	(27)	19	0	19	(73)	26
1999–00	0	7	0	7	(70)	3	0	3	(30)	10
2000–01	1	4	0	5	(55)	4	0	4	(45)	9

[a]Local means resident of Unit 11 or 13.
[b]Local residency data for unsuccessful hunters not available.

Table 4 Copper River bison harvest chronology percent, 1988–2001

Regulatory	HARVEST PERIOD							
Year	Sept	Oct	Nov	Dec	Jan	Feb	Mar	*n*
1988–89	2 days Closed by EO	0	0	0	0	0	0	7
1999–00	2	3	0	0	0	0	2	7
2000–01	2	2	0	0	0	1	0	5

Table 5 Copper River bison harvest percent by transport method, 1988–2001

	Percent of harvest								
Regulatory year	Airplane	Horse	Boat	3- or 4-wheeler	Snow-machine	ORV	Highway Vehicle	Unknown	N
1988–89	14%	0	86%	0	0	0	0	0	7
1999–00	14%	0	14%	14%	14%	0	43%	0	7
2000–01	0	0	40%	20%	20%	0	20%	0	5

Table 6 Copper River bison harvest and accidental death, 1988–2001

	Hunter Harvest										
Regulatory	Reported						Estimated				
Year	M	(%)	F	(%)	Unk.	Total	Unreported	Illegal	Total	Accidental death	Total
1988–89	6	(86)	1	(14)	0	7	--	--	--	5 [a]	12
1989–92[b]	--	--	--	--	--	--	--	--	--	0	0
1992–93[b]	--	--	--	--	--	--	--	--	--	7 [c]	7
1994–98[b]	--	--	--	--	--	--	--	--	--	0	0
1999–00	6	(86)	1	(14)	0	7	--	--	--	0	7
2000–01	5	(100)	0	(0)	0	5	--	--	--	0	5

[a]3 falling from bluffs of Copper River, 1 winter kill; 1 radiocollaring mortality.
[b]Hunting season closed.
[c]Includes all observed natural mortalities

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BISON MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2001

LOCATION

GAME MANAGEMENT UNIT: 11 (13,300 MI^2)

Unit 11 - Chitina River Herd - The Chitina River from the confluence of the Tana River to the Chitina Glacier

BACKGROUND

The Chitina bison herd originated from animals relocated from the National Bison Range in Moise, Montana to Delta Junction, Alaska in 1928. In 1962, 29 cows and 6 bulls were moved from Delta Junction to May Creek. The herd increased to as many as 56 bison in 1985, declined to a low of 30 bison in 1994, then increased until the winter of 1997–98. That year the herd was again reduced due to winter loss during a deep snow period.

The first Chitina bison hunt was held by drawing permit in September, 1976. Permit hunts were held for 13 years from 1976 to 1988. During these permit hunts, hunters took 57 bison from the Chitina herd, with an average yearly kill of 4 animals. The Chitina bison hunt was closed in 1989 because of a decline in herd size. Hunting was again allowed in 1999 with the establishment of a drawing hunt for bulls only.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

Maintain the herd at a minimum of 50 overwintering adults by increasing or decreasing human harvests when bison numbers exceed or fail to reach this herd goal.

METHODS

We conducted aerial surveys to determine composition of the herd in spring after the calving period. Survey techniques included flying transects throughout all bison habitat in the lower Chitina Valley to obtain a direct count.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

The Chitina Bison Herd was stable for the 10-year period from 1976 to 1985. Between 1985 and 1989 the number of bison observed in the Chitina herd declined 46% from 56 to 30 animals. From 1989 to 1994 the Chitina herd stabilized at 30 to 35 animals. The herd increased between 1995 and 1997, peaking at 46 bison in 1997. In 1998, the herd declined by 28% to 32 bison. The spring 2001 population estimate of 38 bison shows a 19% increase in herd size since the population low in 1998 (Table 1).

Population Composition

I observed 32 adults and 6 calves during aerial surveys of the Chitina Herd in 2001 (Table 1). Calf production and/or survival have been constant over the last 3 years. Historically, calf production and survival is low after a severe winter as observed during 1997–98 in the lower Chitina Valley. Timing of the surveys probably is not a factor in variable calf counts because surveys were usually conducted in June or early July every year.

Distribution and Movements

The Chitina Bison Herd ranges within the riparian and upland habitats below the 2000 feet elevation, along a 40-mile portion of the upper Chitina Valley. Although movements vary considerably, the herd can usually be located between the Tana River and Barnard Glacier. During the 1990s, biologists have observed especially heavy use of the riparian zone between Bryson Bar and Bear Island; survey efforts have focused on this area. Old bulls in this herd are loners and exhibit solitary behavior, often bedding in forested areas, making them difficult to count.

MORTALITY

Harvest

Season and Bag Limit. The established hunting season for resident and nonresident hunters in Unit 11 is 6 September to 30 November. The bag limit is 1 bull every 5 regulatory years by drawing permit (DI 450) only. Up to 2 drawing permits may be issued. The hunt area is that portion of the Chitina River east of the Chakina River and south and east of the Nizina River in Unit 11.

Board of Game Actions and Emergency Orders. In 1999 the Board of Game opened the Chitina bison hunt after a 10-year closure that started in 1989.

Hunter Harvest. Hunters killed 2 bulls during the 1999 season and one bull in the 2000 season (Table 2).

Permit Hunts. The Chitina bison hunt is administered as a drawing permit hunt (DI 450) with up to 2 permits authorized. In 1999 and 2000, 373 and 294 hunters applied for the 2 available permits. Successful permittees are required to report within one day of leaving the field.

Hunter Residency and Success. The hunter success rate was 100% (Table 3). Both permittees were non-local Alaskan residents in 1999, while the one successful hunter in 2000 was a local Alaskan resident (Table 4). The other permittee in 2000 was a non-local Alaskan resident who did not hunt.

Transportation Methods. All successful hunters reported the use of aircraft (Table 5). Historically, successful Chitina bison hunters used aircraft as they are the only practical means of accessing this remote hunt area.

Predation. Trappers and local residents have reported wolf predation on bison. Brown bears have also been observed feeding on bison carcasses, but it is not known if they killed the bison or were scavenging. Research on wolf or brown bear predation on bison has not been conducted because of high costs associated with such study and because of remote nature of the herd.

Other Mortality

Deep snow pack over a prolonged period during the winter may be an important cause of mortality and reduced productivity in the Chitina bison herd. Deep snows were considered important factors in the herd decline in the late 1980s and poor recruitment during the early 1990s. Unfortunately, snow records were not recorded until 1992–93 and were not available to ADF&G until May 1998 (Rick Kenyon, pers. commun. ADF&G files, Glennallen). Snow records for Chitina from 1992–95 indicate moderate winter severity, mild winter conditions from 1995–1998, and a very severe winter in 1998. Calf recruitment in the Chitina herd was low following moderate winters between 1992 and 1995 but increased after mild winters in 1996 and 1997. During the severe winter of 1997–98, 6 adult bison were found dead. All were judged to have starved because they were emaciated, had low bone marrow fat and there was no sign of predation. This assumption as to the cause of death is supported by a report from a local trapper (M. McCann, pers. commun.) that snow depths were the deepest he had observed in 20 years. He also reported that a lack of wind kept important feeding areas along the Chitina River snow covered. In other years wind often cleared river bars of snow, making foraging easier for bison.

HABITAT ASSESSMENT

In 1984 the National Park Service studied the range in the upper Chitina Valley (Miquele 1985). This range study indicated that grazing by ungulates on the Chitina bison range had not caused recent plant deterioration. The range was recovering from earlier overuse when horses were abundant on the grazing leases. Miquele (1985) also concluded that a bison herd of 50 animals had not adversely affected the habitat, and the management objective of 30 overwintering bison could be increased. He also concluded the range could not support a very large bison herd.

Appreciable vegetation loss occurred on the Chitina bison range during the early 1990s. This is a result of rechannelization of the Chitina River toward the north bank. The first area affected was the floodplain northeast of Bear Island. This was a heavily used riparian area before 1991 when flooding first occurred and over 50% of the vegetation was washed away. Since 1991 flooding has occurred east of Bear Island, near Bryson Bar, and has extended toward Hubert's landing. Recent bison mortality during a winter with deep snows indicates this loss of critical river bar habitat may have reduced the carrying capacity below the previous estimate during moderate or severe winters.

CONCLUSIONS AND RECOMMENDATIONS

The Chitina bison herd declined by almost 50% between 1985 and 1989, remained relatively stable through 1995, increased for 2 years, then experienced a severe die-off during the winter of 1997–98. The herd has increased slowly since. Small fluctuations in count data between years probably reflect survey technique rather than actual changes in bison numbers. Solitary bulls are especially difficult to find on aerial surveys. Legal harvests by sport hunting were stopped in 1989 after the herd declined. Because the herd continued to grow in prior years, even with a sport harvest, hunting was not considered a limiting factor on herd growth. Severe winters with deep snow and lack of sufficient wind to clear bars of snow are now considered important limiting factors on bison productivity and survival. Flooding of critical river bars and loss of vegetation cover has reduced carrying capacity, especially during periods of deep snow. Wolves and brown and black bears are abundant and could also influence herd size, but a lack of research precludes documenting predation rates.

The decline in productivity and survival during winters with moderate to severe snow conditions presents a management dilemma. The management objective of 50 overwintering bison was based on a range study conducted during the mid-1980s. Recent changes in the river have reduced food availability, lowering the carrying capacity during moderate to severe winters. I assume the impact of deep snow on survival is density independent because increased mortality and a decline in productivity have been observed at various stocking levels. Examination of winter-killed bison indicates that very old bison are especially susceptible. I suspect calves of the year also have high mortality rates, but they are not found because they die earlier in the winter and are more easily scavenged. The magnitude of a die-off in a deep snow year will depend on the calf production and number of aged bison in the population. The number of bison entering the old aged (>8 years) category will depend on the frequency of severe winters and human harvests.

Future management should focus on both reaching the herd objective and reducing the impact of severe winters by lowering the number of susceptible old bison present in the herd. To accomplish this, a limited harvest of adult bulls was instituted in 1999. Management efforts will focus on harvesting a limited number of adults every year, depending on herd size, thus reducing the number of animals in the "aged" class that are susceptible to winter mortality. Because winter mortality appears to be somewhat density independent, limited bull harvests should be allowed if the herd exceeds 30 bison but is below the 50 animals objective. Cow harvests would be instituted when the herd approaches 50 animals or when calf recruitment exceeds 8 calves. Because we cannot assure that hunters will select the oldest bison, we can only presume that by providing a long season for a very limited number of hunters that they would attempt to take large trophies. While this limited harvest will not prevent overwinter mortality, it will provide for some human use of the Chitina bison herd when herd numbers fall below the 50 bison objective. (To date, all harvested bison have been old, trophy bulls, thus current harvest strategies are meeting management objectives). Conducting a very small drawing permit hunt for bison is justified because of the popularity of all hunts on wild bison.

LITERATURE CITED

MIQUELE, DALE. 1985. Food habits and range conditions of bison and sympatric ungulates on the Upper Chitina River, Wrangell–St. Elias National Park and Preserve. U.S. Department of Interior. National Park Service. Alaska. Region Research/Resources Management Report AR-8. Anchorage. 112pp.

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SUBMITTED BY:
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Table 1 Chitina bison spring aerial composition counts and estimated population size, 1997 - 2001

Regulatory Year	Adults[a]	Calves	(%)	Bison Observed	Estimated Population Size[b]
1997–98	39	7	(15)	46	46
1998–99	29	3	(9)	32	32
1999–00	27	6	(18)	33	33
2000–01	31	6	(16)	37	37
2001–02	32	6	(16)	38	38

[a]Fixed-wing aircraft survey – no composition other than adults and calves.
[b]Extrapolated estimates not calculated from aerial counts.

Table 2 Chitina bison harvest and accidental death, 1988–2001

Regulatory Year	Hunter Harvest										
	Reported						Estimated				
	M	(%)	F	(%)	Unk.	Total	Unreported	Illegal	Total	Accidental death	Total
1988–89	4	(100)	0	0	0	4	0	0	0	4 [a]	8
1999–00	2	(100)	0	0	0	2	0	0	0	0	2
2000–01	1	(100)	0	0	0	1	0	0	0	0	1

[a]Radiocollaring mortalities

Table 3 Chitina bison harvest data by permit hunt, 1988–2001 (DI 450)

Regulatory Year	Permits Issued	Applications	Percent Did not Hunt	Percent Unsuccessful Hunters	Percent Successful Hunters	Bulls	(%)	Cows	Harvest
1988–89	6	423	33	0	100	4	(100)	0	4
1999–00	2	373	0	0	100	2	(100)	0	2
2000–01	2	294	50	0	100	1	(100)	0	1

Table 4 Chitina bison hunter residency and success, 1988–2001

	Successful					Unsuccessful				
Regulatory Year	Local[a] Resident	Nonlocal Resident	Nonresident	Total	(%)	Local[a] Resident	Nonresident	Total	(%)	Hunters
1988–89	2	2	0	4	(100)	0	0	0	(0)	4
1999–00	0	2	0	2	(100)	0	0	0	(0)	2
2000–01	1	0	0	1	(50)	0	0	0	(0)	1

[a]Local means Unit 11 or 13 resident.

Table 5 Chitina bison harvest percent by transport method, 1988–2001

	Percent of harvest								
Regulatory year	Airplane	Horse	Boat	3- or 4-wheeler	Snowmachine	ORV	Highway Vehicle	Unknown	*n*
1988–89	100	--	--	--	--	--	--	--	4
1999–00	100	--	--	--	--	--	--	--	2
2000–01	100	--	--	--	--	--	--	--	1

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BISON MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2001

LOCATION

GAME MANAGEMENT UNIT: 19 (36,486 mi^2)

UNIT 19 – FAREWELL HERD - All of the drainages into the Kuskokwim River upstream from Lower Kalskag. Bison inhabit only the Farewell area of Units 19C and 19D.

BACKGROUND

In 1965 a translocation of 18 animals from the Delta bison herd established the Farewell bison herd. The Alaska Department of Fish and Game translocated an additional 20 bison to the area from Delta in 1968 to supplement the herd. Since 1968 the herd has flourished, growing to approximately 350 animals. The first hunting season was held in 1972. Hunting the Farewell bison herd has been by permit only. Almost 2000 drawing permit applications are received annually for the combined fall and spring hunts, indicating strong hunter interest in remote bison hunts. In 1998 a governor's permit system was initiated and since then one additional permit was issued to a sportsman's group that auctioned the permits with 90% of the proceeds returned to the department.

MANAGEMENT DIRECTION

The Farewell bison herd is managed for optimal sustained yield of animals, while providing uncrowded and aesthetic hunting conditions. The herd generally ranges over the 1977 Bear Creek burn area or on the South Fork Kuskokwim River bars where available forage is adequate. Because range appears adequate, we will continue issuing the current number of drawing permits to allow the herd to slowly increase.

MANAGEMENT OBJECTIVES

- OBJECTIVE 1: Maintain a minimum population of 300 bison.

Activities

- Maintain a sample of radiocollared bison to monitor the herd distribution and movements.
- Conduct aerial surveys of bison to assess the population status and herd composition.

- ❖ Promote a diverse successional stage habitat mosaic within the range of the bison herd to benefit bison and other species by cooperating with other land and resource management agencies.

- ➢ OBJECTIVE 2: Maintain a harvest of up to 40 bison

Activity

- ❖ Issue 40 drawing permits, 20 for the fall season and 20 for the spring season.

METHODS

We conducted aerial surveys annually to document herd size and composition. Surveys were flown using fixed-wing aircraft and we used both visual search techniques and radiotelemetry to locate groups of bison. We estimated herd size by attempting to locate 4 radiocollared bison and counting bison associated with them. In addition, we searched heavily used bison habitat in the Farewell burn and along the South Fork of the Kuskokwim. We then adjusted the total number upward by estimating how many bison we might have missed. During surveys we classified bison as adults and calves. To assist in locating groups of bison, we radiocollared 6 adult cows in fall 1998 using helicopter-supported darting techniques.

Early spring survey flights were conducted within the traditional range of the herd to monitor the extent of winter mortality. We flew known wintering areas, using fixed-wing aircraft, to search for evidence of kill sites and to check for mortality among radiocollared animals.

Plans for enhancing habitat are underway. Cooperative work with the Alaska Department of Natural Resources (DNR) to formulate a prescribed burn prescription on state land was formalized by May 2000. A similar plan is being considered for lands managed by the US Bureau of Land Management.

The drawing permit hunts for Farewell bison were administered from the McGrath area office. Hunt reports collected from permittees included harvest date, location, chronology, transportation, and effort. Harvest data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY00 = 1 Jul 2000 through 30 Jun 2001).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Between 1968 (when aerial surveys were initiated) and 1988, the Farewell bison herd grew about 10% annually. Since 1988 no complete surveys were accomplished, but hunting and natural mortality factors have likely slowed the herd's growth (Table 1). In RY91, RY92, and RY95 the number of drawing hunt permits were reduced from 80 to 50 and then to 40. This was done to allow a slow increase in the bison herd (Table 2).

Population Size

Although no complete census has been conducted since 1988, recruitment, hunting mortality, and limited survey data indicate the population has recently increased to about 350 bison (Table 1). Repeated attempts to completely enumerate herd size during each of the past

5 years have not been successful because of unpredictable movements and a small number of bison with functioning radio collars. As of June 2001, 5 radiocollared bison remained in the herd.

Population Composition
During 5 surveys in May, June, or July 1997–2001 when most of the herd was seen, calf percentages were from 11.6 to 23.6%, averaging 16.1%(Table 1). The number of bison counted during 1996 was the most recorded, at 276 animals. Since 1996 the most bison observed on a single day survey was 265 on 30 May 2000 (Table 1).

Distribution and Movements
In winter the Farewell bison herd is typically scattered in small groups (10–40 animals) on the Bear Creek burn and surrounding ranges, taking advantage of windswept grass and sedge forage in these areas. These groups began moving onto the South Fork Kuskokwim River floodplain during the summer, generally moving in a southerly direction toward the headwaters of that drainage. In recent years, bison were seen as far upriver as Sled Pass (Hartman River/Stony River headwaters) and into Ptarmigan Valley (South Fork Kuskokwim/Happy River headwaters). Bison also were observed as far west as the Windy Fork of the Kuskokwim River and north to within 20 km of Nikolai on the South Fork Kuskokwim River. Several small groups pioneered into a large burn caused by lightning in 1991 on the east side of the South Fork Kuskokwim. In early spring 1998 it was used extensively by at least 150 bison and may be a potential area for permanent herd expansion. Since the last reporting period, the herd continued expanding its range to the south. Groups of bison were regularly found throughout the year south of Egypt Mountain and near Rohn Roadhouse, predominately on the east side of the South Fork Kuskokwim River. These areas were previously used only in summer.

MORTALITY
Season and Bag Limit.

Bag limit	Resident Seasons	Nonresident Seasons
Unit 19 1 bison every 5 regulatory years by drawing permit only.	1 Sep–30 Sep (DI351) 1 Mar–31 Mar (DI352)	1 Sep–30 Sep (DI351) 1 Mar–31 Mar (DI352)

Alaska Board of Game Actions and Emergency Orders. No Alaska Board of Game actions or emergency orders were taken or issued during this reporting period.

Hunt History. The first legal harvest from this herd occurred in RY72 after aerial surveys revealed that it could sustain nominal harvests. Since then, 41 hunts have been held in 27 of 28 regulatory years (no hunt in RY73). The Farewell bison hunt has generally been administered as a drawing permit hunt, although in RY79 it was a registration hunt and in RY84 it was a Tier II subsistence hunt. During RY80–RY83, 20 permits were allocated each

year. During RY85–RY88 the number of permits was increased to 40. The first spring bison hunt was held in March 1990. During RY89–RY90, 70 drawing permits were awarded annually, 40 for fall hunts and 30 for spring (March) hunts. In RY91, 80 permits were awarded, (40 fall/40 spring). In RY92–RY94, 50 permits were awarded (30 fall/20 spring), while in RY95–RY99, 40 permits were issued (20 fall/20 spring). In RY99, hunt conditions that confined hunters to a 10- or 15-day period during the season were changed to allow permittees to hunt any time during the fall or spring seasons.

Hunter Harvest. Annual harvest of bison was 16 to 29 from RY97–RY01 (Table 3). The proportion of bulls harvested during this period was 62% to 75%. Hunters preferred to take bulls because they are larger and have both more meat and trophy potential.

Illegal harvest was uncommon; however, during the spring 1999 hunt a radiocollared cow was probably illegally shot and not salvaged.

Permit Hunts. In RY98, a "Governor's Permit" was issued to a sportsman's group (Alaska Bowhunters Association) to auction for money. The group kept 10% of the proceeds and returned the rest to the department. These permits sold for $8100, $7500, and $5250 during 1999-2001. The first permittee (spring 1999) was not successful, but the spring 2000 permittee harvested a large bull using archery equipment. The price of the tag decreased steadily since the program's inception.

Harvest Chronology. Harvest chronology prior to RY99 was determined by the deliberate distribution of permittees through the season, rather than by hunter choice or success (Table 4). During RY99 when permittees were allowed to choose when to hunt, they distributed themselves throughout the season during the fall hunt and success was skewed toward the early half of the spring hunt primary because snowmobile traveling conditions were better earlier in the month. These data indicate hunters will naturally distribute themselves throughout the season, maintaining aesthetically pleasing hunt conditions.

Hunter Residency and Success. The vast majority of applicants and permittees for the Farewell bison hunt were Alaska residents (Table 5). Nonresidents obtained 8 permits in the past 5 years, making up only 4% of the permittees, while local residents (permittees residing in Unit 19) obtained 5 permits (2.5%), and nonlocal Alaska residents obtained 187 (93.5%) of the 200 possible permits.

Success rates for the September hunt DI351 were relatively low (mean RY97–RY01 = 38%). Hunter success rates in the March hunt DI352 remained at 79–100% (86% for those who actually hunted during RY97–RY01. The higher hunter success rates during March were due to increased access opportunities (snowmachines and airplanes), an absence of moose hunters, and use of guide services.

Transport Methods. During the September hunt (DI351), initial access to the Farewell area was typically by aircraft (Table 6). About half the September hunters used all-terrain vehicles as a secondary access method. During the March hunt (DI352), the primary access method was also by airplane. However, access by snowmachines became more popular among

permittees. Generally, hunters who used aircraft to reach the hunting area in March used skis or snowshoes to stalk and retrieve bison.

Natural Mortality

We did not find evidence that wolves and grizzly bears killed bison calves or adults. However, the reported harvest accounts for only about two-thirds of the number of calves seen each year. Either natural mortality of calves or adults has increased substantially in recent years or the Farewell bison population is growing. Disease was also rare in the herd. We planned to search for bison carcasses in April 2002 to estimate natural mortality, but no aircraft were available.

HABITAT

Little is known about the range conditions for the Farewell bison herd. The herd spends winters on and adjacent to the Bear Creek burn and on another burn east of the South Fork Kuskokwim where forage appears adequate. Summer range is generally limited to a smaller area of the Bear Creek burn and various river floodplains within the Alaska Range. Although no estimate of carrying capacity is available, a cursory examination of selected areas during summer 1995 by University of Alaska graduate student Maria Berger and an additional aerial evaluation by Robert Stephenson (ADF&G) in spring 1998 indicated adequate forage availability, with unused range to the north, east, and west.

In cooperation with DNR, a spring burn is planned to provide increased forage for bison and stimulate browse production for moose. This work will be conducted on a portion of the 1977 Bear Creek burn where grass and sedge growth is declining and is being replaced by black spruce. The prescription was met during spring 2000; however, the burn was not accomplished because burning conditions for black spruce were not favorable. The associated burn plan is being revised to adapt to knowledge gained during the spring 2000 attempt and to include a larger area including adjacent federal lands.

CONCLUSIONS AND RECOMMENDATIONS

I believe that we met our objective to maintain a minimum of 300 bison in the Farewell area. We maintained and monitored up to 6 radiocollared bison. Two other collars were shed or the bison died. We are planning to purchase up to 5 more collars and deploy them in RY03. At the end of RY00, we had 5 radiocollared bison on the air. We completed periodic aerial surveys of the bison, but aircraft availability made these flights less frequent than desired. We promoted habitat diversification by working with DNR and other landowners to conduct a prescribed burn. Although burning conditions were not favorable in spring 2000, we are considering plans for a burn during 2003. We plan on changing the burn plan to accommodate a greater range of burn options as far as timing and boundaries location.

We met our objective to maintain the harvest of bison (<40), while maintaining some herd growth. We administered permit hunts for the Farewell bison herd. The permit hunt continued to attract many prospective hunters to this truly unique hunting experience.

There is a significant discrepancy between the number of bison harvested and the number of calves seen in the herd annually. To further our understanding of the dynamics of the Farewell

bison population, we need better estimates of herd size and recruitment, and we need to determine why about a third of the calves being produced are not available for harvest. I recommend a greater investment in Farewell bison management for FY04.

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Table 1 Farewell bison aerial composition surveys and estimated population size, 1992–2001

Survey date	Adults	Calves	(%)	Bison observed	Estimated population size
5/18/92	123	18	(12.8)	141	
5/20/92	134	36	(21.2)	170	
5/22/92	141	34	(19.4)	175	
6/02/92	158	32	(16.8)	190	
6/30/92	117	31	(21.0)	148	
7/21/92	163	33	(16.8)	196	280
8/03/92	90	16	(15.1)	106	
11/11/92	110	18	(14.1)	128	
11/19/92	157	26	(14.2)	183	
6/22/93	171	51	(23.0)	222	
7/21/93	82	22	(21.2)	104	300
10/26/93	70	26	(27.1)	96	
5/07/94				175	
5/16/94	172	44	(20.4)	216	
5/26/94	155	42	(21.3)	197	
7/27/94	76	24	(24.0)	100	300
4/30/95	89	21	(19.9)	110	
7/05/95	210	50	(19.2)	260	300
7/18/95	153	30	(16.4)	183	
7/18/96	229	47	(17.0)	276	320
7/01/97	181	31	(14.6)	212	
7/28/97	140	24	(14.6)	164	320
8/25/99	42	13	(23.6)	55	350
5/30/00	234	31	(11.6)	265	350
6/18/01	157	31	(16.5)	188	350

Table 2 Farewell bison harvest data by permit hunt, regulatory years 1992–1993 through 2001–2002[a]

Hunt no.	Regulatory year	Permits issued	Permittees not hunting	(%)	Unsuccessful hunters[b]	(%)	Successful hunters[b]	(%)	Bulls	(%)	Cows	(%)	Unk	Total harvest
DI351	1992–1993	30	9	(30)	16	(76)	5	(24)	4	(80)	1	(20)	0	5
(Fall)	1993–1994	30	11	(37)	11	(58)	8	(42)	7	(88)	1	(12)	0	8
	1994–1995	30	9	(30)	11	(52)	10	(48)	7	(70)	3	(30)	0	10
	1995–1996	20	6	(30)	9	(64)	5	(36)	3	(60)	2	(40)	0	5
	1996–1997	20	4	(20)	6	(37)	10	(63)	7	(70)	3	(30)	0	10
	1997–1998	20	8	(40)	7	(58)	5	(42)	2	(40)	3	(60)	0	5
	1998–1999	20	3	(15)	12	(71)	5	(29)	3	(60)	2	(40)	0	5
	1999–2000[c]	20	3	(15)	4	(24)	13	(76)	8	(62)	5	(38)	0	13
	2000–2001	20	0	(0)	9	(45)	11	(55)	8	(73)	3	(27)	0	11
	2001–2002	20	8	(40)	8	(67)	4	(33)	4	(100)	0	(0)	0	4
	Subtotal	230	61	(26)	93	(55)	76	(45)	53	(70)	23	(30)	0	76
DI352	1992–1993	20	5	(25)	6	(40)	9	(60)	6	(67)	3	(33)	0	9
(Spring)	1993–1994	20	6	(30)	2	(14)	12	(86)	5	(22)	7	(78)	3	12
	1994–1995	20	7	(35)	0	(0)	13	(100)	5	(38)	8	(62)	0	13
	1995–1996	20	4	(20)	0	(0)	16	(100)	11	(69)	5	(31)	0	16
	1996–1997	20	4	(20)	0	(0)	16	(100)	12	(75)	4	(25)	0	16
	1997–1998	20	3	(15)	3	(18)	14	(82)	12	(86)	2	(14)	0	14
	1998–1999	20	6	(30)	3	(21)	11	(79)	8	(73)	3	(27)	0	11
	1999–2000	20	4	(20)	0	(0)	16	(100)	12	(75)	4	(25)	0	16
	2000–2001	20	5	(25)	2	(13)	13	(87)	7	(54)	6	(46)	0	13
	2001–2002	20	1	(5)	3	(16)	16	(84)	11	(69)	4	(25)	1	16
	Subtotal	200	45	(22)	19	(12)	136	(88)	86	(63)	46	(34)	4	136
Regulatory	1992–1993	50	14	(28)	22	(61)	14	(39)	10	(71)	4	(29)	0	14
year	1993–1994	50	17	(34)	13	(39)	20	(61)	9	(45)	8	(40)	3	20
totals	1994–1995	50	16	(32)	11	(32)	23	(68)	12	(52)	11	(48)	0	23
	1995–1996	40	10	(25)	9	(30)	21	(70)	14	(67)	7	(33)	0	21
	1996–1997	40	8	(20)	6	(36)	26	(64)	19	(73)	7	(27)	0	26
	1997–1998	40	11	(28)	8	(28)	19	(72)	14	(74)	5	(26)	0	19
	1998–1999	40	9	(23)	15	(48)	16	(52)	11	(69)	5	(31)	0	16
	1999–2000[c]	40	7	(18)	4	(12)	29	(88)	20	(69)	9	(31)	0	29
	2000–2001	40	5	(12)	11	(31)	24	(69)	15	(62)	9	(38)	0	24
	2001–2002	40	9	(22)	11	(35)	20	(65)	15	(75)	4	(20)	1	20
Total	1992–2002	430	106	(25)	112	(35)	212	(65)	139	(67)	69	(33)	4	212

[a] Figures only represent legally harvested animals.

[b] Successful/Unsuccessful Hunter information only includes those who actually hunted, not total permittees.

[c] Hunters were allowed to hunt anytime in September 1999; specific periods were not assigned.

Table 3 Farewell bison harvest, regulatory years 1992–1993 through 2001–2002

Regulatory	Reported						Estimated			
year	M	(%)	F	(%)	Unk	Total	Unreported	Illegal	Total	Total
1992–1993	10	(71)	4	(29)	0	14	0	0	0	14
1993–1994	9	(53)	8	(47)	3	20	0	1	1	21
1994–1995	12	(52)	11	(48)	0	23	0	0	0	23
1995–1996	14	(67)	7	(33)	0	21	0	0	0	21
1996–1997	19	(73)	7	(27)	0	26	0	1	1	27
1997–1998	14	(74)	5	(26)	0	19	0	0	0	19
1998–1999	11	(69)	5	(31)	0	16	0	1	1	17
1999–2000	20	(69)	9	(41)	0	29	0	0	0	29
2000–2001	15	(62)	9	(38)	0	24				
2001–2002	15	(71)	5	(24)	1	21				
Totals	139	(65)	70	(33)	4	213	0	3	3	

Table 4 Farewell bison harvest chronology by month/day, regulatory years 1992–1993 through 2001–2002

Regulatory	Harvest by month/day							
year	9/1–10	9/11–20	9/21–30	3/1–10	3/11–20	3/21–31	Unk	*n*
1992–1993	1	4	0	4	3	2	0	14
1993–1994	2	3	3	3	1	1	7	20
1994–1995	3	4	3	4	0	3	6	23
1995–1996	1	3	0	7	5	3	2	21
1996–1997	3	2	5	9	2	2	3	26
1997–1998	3	1	1	9	3	2	0	19
1998–1999	2	0	1	4	4	1	4	16
1999–2000	4	3	4	7	7	2	0	27
2000–2001	5	3	3	7	2	4	11	35
2001–2002	1	1	2	7	6	1	8	26
Total (%)[a]	25 (35)	24 (34)	22 (31)	61 (53)	33 (29)	21 (18)	41	227

[a] Percentage is calculated for each season.

Table 5 Farewell bison hunter residency and success, regulatory years 1992–1993 through 2001–2002 (hunters and nonhunters combined)

Regulatory year	Successful					Unsuccessful					Total permits
	Local[a] resident	Nonlocal resident	Nonresident	Unk	Total (%)	Local[a] resident	Nonlocal resident	Nonresident	Unk	Total (%)	
1992–1993	1	13	0	0	14 (28)	1	35	0	0	36 (72)	50
1993–1994	1	17	2	0	20 (40)	2	28	0	0	30 (60)	50
1994–1995	3	20	0	0	23 (46)	0	27	0	0	27 (54)	50
1995–1996	1	19	1	0	21 (52)	0	19	0	0	19 (48)	40
1996–1997	2	23	1	0	26 (65)	0	13	1	0	14 (35)	40
1997–1998	0	17	2	0	19 (48)	0	18	3	0	21 (52)	40
1998–1999	0	16	0	0	16 (40)	1	22	1	0	24 (60)	40
1999–2000	3	25	1	0	29 (73)	0	11	0	0	11 (27)	40
2000–2001	1	23	0	0	24 (60)	0	16	0	0	16 (40)	40
2001–2002	0	19	1	0	20 (50)	0	20	0	0	20 (50)	40
Totals	12	192	8	0	212 (49)	4	209	5	0	218 (51)	439

[a] "Local resident" refers to hunters living in Unit 19

Table 6 Farewell bison harvest by primary transport method, regulatory years 1992–1993 through 2001–2002

Regulatory year	Harvest percent by transport method					
	Airplane (%)	Boat (%)	3 or 4 wheeler (%)	Snowmachine (%)	Unknown (%)	*n*
1992–1993	10 (71)	0 (0)	0 (0)	4 (29)	0 (0)	14
1993–1994	14 (70)	0 (0)	0 (0)	4 (20)	2 (10)	20
1994–1995	17 (74)	0 (0)	0 (0)	4 (17)	2 (9)	23
1995–1996	11 (52)	0 (0)	0 (0)	8 (38)	2 (10)	21
1996–1997	15 (58)	0 (0)	0 (0)	8 (31)	3 (11)	26
1997–1998	11 (58)	0 (0)	0 (0)	8 (42)	0 (0)	19
1998–1999	7 (39)	0 (0)	0 (0)	10 (55)	1 (6)	18
1999–2000	12 (40)	0 (0)	1 (3)	16 (53)	1 (4)	30
2000–2001	13 (54)	0 (0)	0 (0)	11 (46)	0 (46)	24
2001–2002[a]	4 (100)	0 (0)	0 (0)	0 (0)	0 (0)	4
Totals	97 (57)	0 (0)	1 (1)	62 (36)	11 (6)	170

[a] Preliminary data

Alaska Department of Fish and Game
DIVISION OF WILDLIFE CONSERVATION
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BISON MANAGEMENT REPORT

From: 1 July 1999
To: 30 June 2001

LOCATION

GAME MANAGEMENT UNIT: 20D (5637 mi^2)

Unit 20D – Delta Herd – Central Tanana Valley near Delta Junction

BACKGROUND

The ancestors of modern bison first colonized North America after migrating from Asia to Alaska over the Bering Land Bridge (Reynolds et al. 1982). Subsequently, 2 subspecies developed: wood bison (*Bison bison athabascae*) in Alaska and parts of Canada, and plains bison (*B. b. bison*) in Canada and the contiguous United States. Bison were once the most abundant large mammal in Alaska, but became extinct about 200–300 years ago probably due to changing climate or overhunting (Skinner and Kaisen 1947; Guthrie, personal communication). Bison lived along the Delta River near Delta Junction before their extinction in Alaska (D Guthrie, personal communication).

In 1928, 23 plains bison were translocated from the National Bison Range in Montana to the Delta River. At the time biologists were unaware of the existence of wood bison in Canada. By 1947 the herd increased to 400 animals. Hunting began in 1950 and is now one of the most popular permit drawing hunts in the state. Hunting is used to manage the size of the herd. Delta bison have been translocated to other parts of Alaska, and 3 other herds have been established (i.e., Farewell, Chitina River, and Copper River herds).

As agriculture developed on their established range, the Delta bison herd (DBH) began to include hay and cereal grains in their fall and winter diets. In 1976 the State of Alaska made agricultural development a priority within the established range of the DBH, and large-scale agricultural land disposals began in 1978. Eventually bison began to negatively impact agricultural harvests by feeding on crops in the fall before harvest.

In 1979 the Alaska Legislature established the 90,000-acre Delta Junction Bison Range (DJBR) south of the Alaska Highway and adjacent to the Delta Agricultural Project (DAP). The purpose of the DJBR was to perpetuate free-ranging bison by providing adequate winter range and altering seasonal movements of bison to reduce damage to agriculture. In 1984 the legislature appropriated $1.54 million for DJBR development and increased the Delta bison permit hunt application fee from $5 to $10, with the intent that $5 from each application be used for DJBR management. Since 1984 the appropriated funds have been used to hire

personnel, purchase equipment for forage management, and develop 2800 acres of bison forage on the DJBR in 2 field complexes, the Panoramic and Gerstle Fields.

Bison damage to farms in the DAP was significantly reduced in 1985 with the first substantial forage production on the DJBR. The Delta Junction Bison Range forage development and management continued through this reporting period, reducing conflicts between bison and agriculture.

MANAGEMENT DIRECTION

MANAGEMENT GOALS AND OBJECTIVES

The 2000–2005 Delta Bison Management Plan has the following goals and objectives:

Herd Health Management Goal: Ensure that the DBH remains healthy and free of any diseases that might threaten the herd or other wildlife species.

Objective 1: Monitor the DBH to determine if any diseases are present that might threaten the health of the herd or other wildlife species.

Objective 2: Prevent the transmission of diseases between livestock and the DBH.

Objective 3: If diseases are transmitted from livestock to the DBH, prevent the spread of diseases from bison to other wildlife species or to other livestock.

Herd Size and Composition Goal: Manage the DBH to accomplish a reasonable balance between providing the greatest opportunity to hunt and view bison while keeping negative impacts to private property to a minimum.

Objective 1: Manage the DBH to maintain a herd size of approximately 360 bison at the precalving count.

Objective 2: Manage the DBH to maintain a sex ratio of no less than 50 bulls (≥ 1-year-old):100 cows.

Bison Conflict Management Goal: Minimize conflicts between bison and the public, including, but not limited to, agriculture interests in the Delta Junction area.

Objective 1: Administer the Delta bison hunt to minimize landowner/hunter conflicts in order to help maintain bison and hunter access to private agricultural land to the greatest extent possible.

Objective 2: Enhance bison summer range west of the Richardson Highway to increase its attractiveness to the DBH to attempt to delay the herd's migration towards the DJBR and private agricultural lands.

Objective 3: Manage the DJBR to encourage the DBH to remain south of the Alaska Highway, and out of private agricultural land as late in the fall as possible, and to

attract more bison to the DJBR in the winter and provide greater accessibility to the herd for bison hunters.

Objective 4: The department will provide assistance to the public regarding bison conflicts.

Bison Viewing Management Goal: Provide opportunities for nonconsumptive enjoyment of the DBH, such as bison viewing, interpretation, and education.

Objective 1: Investigate methods and funding sources other than bison permit fees to improve bison viewing opportunities for the public.

METHODS

DJBR MANAGEMENT

The perennial grasses, nugget bluegrass (*Poa pratensis*) and arctared fescue (*Festuca rubra*), were fertilized on the DJBR each year with N60-P20-K0-S10 at the rate of 200 lb/ac. Fertilizer was applied with an 8-ton capacity broadcast spreader, pulled by a John Deere 4250 tractor.

Oats were planted each year. Prior to planting, fields were fertilized with about 200 lb/ac of N60-P20-K0-S10 by broadcasting fertilizer onto the fallow soil with a broadcast spreader. Approximately 100 lb/ac of oat seed were then spread using the broadcast spreader, and the field was disked with a field disk to incorporate the fertilizer and seed into the soil.

We analyzed forage quality during 1999, 2000 and 2001 by collecting forage subsamples and pooling them into 1 composite sample by forage type and location. Samples were sent to the University of Alaska Plant and Soils Lab, Palmer, Alaska for analysis. Samples were analyzed moisture-free and as-fed for dry matter, crude protein, phosphorus, potassium, calcium, acid-detergent fiber, in vitro dry matter disappearance, total digestible nutrients, metabolizable energy, and net energy-lactation. To evaluate forage quality, comparisons were made in 1999 of percent crude protein and percent acid-detergent fiber. Beginning in 2000 a new composite forage quality rating called relative feed value (RFV) was used by the Soils Lab and was reported to compare forage quality.

We monitored rain gauges in both the Panoramic and Gerstle Fields.

1999

We fertilized 720 acres of nugget bluegrass and 80 acres of arctared fescue. Application in the Panoramic Fields was during 17–18 May and in the Gerstle Fields during 19–25 May. Approximately 80 acres of bluegrass in the Panoramic Fields were fertilized a second time on 15 June to test effects of an additional application on fall forage quality.

Approximately 375 acres were planted with oats in the Panoramic Fields. Oats were planted on 16, 25, and 30 June to provide a variety of maturation dates and forage quality. They were planted in acreage that had been heavily infested with bluejoint reedgrass (*Calamagrostis canadensis)* and had been disked and fallowed annually since 1993 to kill *Calamagrostis* with

nonherbicidal methods. Acreage infested with *Calamagrostis* was initially disked 2–3 times during the summer with a heavy field disk to expose *Calamagrostis* roots to desiccation. The acreage was left fallow over the winter to subject exposed root systems to freezing and further desiccation to reduce plant survival. The areas were then disked annually to further break up the root clumps and expose the root systems before planting with oats. Fertilizer purchases for perennial grasses and oat plantings totaled approximately 90 tons and cost $26,264.

Nonherbicidal control of *Calamagrostis* was also tested in the Panoramic Fields by mowing with a disk mower. This acreage had been mowed 2–3 times each year in previous years. The test areas were only mowed 1 time on 7–8 July.

Approximately 640 acres were mowed with a Brush Hog mower to remove aspen and willow growth, including approximately 200 acres in the Panoramic Fields and 440 acres in the Gerstle Fields. Maximum basal diameter of the woody vegetation was 3 inches.

Test plantings of 10 acres each of red clover, enigmo timothy, and carlton bromegrass were mowed on 15 July. One-half of each 10–acre plot was mowed to test bison preference for mowed versus unmowed forage when they arrived in the Panoramic Fields.

A winter forage technique called swath grazing was tested in the Panoramic Fields. Approximately 30 acres of oats planted on 16 June were swathed on 27 August. Oats were swathed by cutting the grain with a swathing mower in alternating rows with unswathed oats to test bison preference for each. Rows were approximately 40-feet wide by ½-mile long. The swathed oats should retain higher forage quality through the winter, and thus be more palatable to bison than oats that senesced through the fall. Swath grazing may be useful to attract bison to the DJBR for longer periods of time during the winter, reducing winter conflicts in the DAP and making them more accessible to hunters.

Additional bison attractants provided on the DJBR included 3 stock watering tanks with total capacity of 1820 gal and numerous 50–lb trace element salt blocks placed at various locations. An additional 300 gal capacity water tank was placed at the east end of the Panoramic Fields to provide an additional water source in that area.

2000

We fertilized 720 acres of nugget bluegrass and 50 acres of arctared fescue. Application in the Panoramic Fields was during 22–23 May and in the Gerstle Fields during 31 May–7 June. Fertilizer purchases for perennial grasses totaled approximately 47 tons and cost $14,460.

Approximately 350 acres were disked and prepared for planting with oats. Oats were planted on 260 ac. Oats were planted on 8 June (75 acres), 20 June (50 acres), 23 June (75 acres), and 29 June (60 acres). Fertilizer purchases totaled approximately 21 tons and cost $6,595 for oat plantings.

On 17 July, we planted bluegrass on 100 acres in the northeast corner of the Panoramic Fields on acreage that had been disked, planted with oats, and fallowed over the winter since 1993 to kill *Calamagrostis*. Bluegrass was planted at a seeding rate of 6 lb/ac with 20 lb/ac of oats as a cover crop using a Brillion seeder.

We administered a second application of fertilizer to 40 acres of bluegrass in the Panoramic Fields on 24 July to test its effect on forage quality. Fertilizer was applied at the rate of 200 lb/ac of N60–P20–K0–S10.

Nonherbicidal control of *Calamagrostis* was also tested in the Panoramic Fields by mowing with a disk mower. This acreage had been mowed each year in the previous 5 years. The test areas were mowed on 7–8 July.

Approximately 560 acres were mowed with a Brush Hog mower to remove aspen and willow growth in the Gerstle Fields. Maximum basal diameter of the woody vegetation was approximately 3 inches.

Additional bison attractants provided on the DJBR included 3 stock watering tanks with total capacity of 1820 gal and numerous 50–lb trace element mineral blocks placed at various locations.

2001

We fertilized 820 acres of nugget bluegrass and 50 acres of arctared fescue. Application in the Panoramic Fields was 21–30 May and from 4–11 June in the Gerstle Fields. Fertilizer purchases for fertilizing this acreage totaled approximately 69.5 tons and cost $28,760.

We planted approximately 400 acres with oats in the Panoramic Fields and Gerstle Fields on several occasions to provide a variety of maturation dates and forage quality. Plantings in the Panoramic Fields were on 17 May (40 ac), 8 June (60 ac), 20 June (125 ac), and 29 June (75 ac). Planting in the Gerstle Fields occurred on 2 July (100 ac). Fertilizer purchases for oat plantings totaled approximately 18 tons and cost $7600.

Nonherbicidal control of *Calamagrostis* was also tested in the Panoramic Fields by mowing with a disk mower. This acreage had been mowed each year in previous years. The test areas were mowed on 16–17 July.

Approximately 500 acres were mowed with a Brush Hog mower to remove aspen and willow growth, including approximately 220 acres in the Panoramic Fields and 280 acres in the Gerstle Fields. Maximum basal diameter of the woody vegetation was approximately 3 inches.

Additional bison attractants provided on the DJBR included 3 stock watering tanks with total capacity of 1820 gal and numerous 50–lb trace element salt blocks placed at various locations.

HERD MANAGEMENT

Population Status and Trend

We used aerial censuses to estimate herd size. A Piper Super Cub (PA-18) fixed–wing aircraft or a Robinson R–22 helicopter was used to conduct visual searches and to locate aggregations that contained a radiocollared bison during June–September. Aggregations were counted visually if possible. Aggregations difficult to count visually were photographed with a 35–mm camera on ASA 400 print film and counted from the photographs. We conducted replicate

censuses and considered the prehunt population size to be the maximum number of bison counted during a single census.

A precalving population estimate was obtained by subtracting hunting mortality, estimates of wounding loss, and other known and estimated sources of mortality from the prehunt population estimated for the previous fall.

Population Composition

Sex and age composition surveys were conducted from the ground by locating groups containing radiocollared bison. We determined the sex and age of bison by observing them with 8×40 binoculars or a 15–60 power spotting scope. Bulls were differentiated from cows by body size, head size, pelage, circumference of horn bases, horn shape, and presence of a penis sheath. Yearling bulls were differentiated from adult bulls by horn size and shape. We conducted multiple surveys, and the survey that resulted in the largest sample size was used to calculate composition data. Composition data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY00 = 1 Jul 2000 through 30 Jun 2001).

Bulls were further classified into 4 different horn categories to evaluate the possibility of determining age structure for the bull segment of the population based on horn morphology. Yearlings were bulls with straight horns, without any upward curvature. "Small bulls" were young bulls with horn tips that were starting to curve upward (vertically relative to the horn base) but were not pointing straight up. "Medium bulls" were bulls with horn tips turned 90° vertical, relative to the horn bases. "Large bulls" were mature bulls with horns whose tips curved inward toward the center of the skull. To aid in the classification of age relative to horn shape, photographs were taken when possible of all bison killed by hunters. Horn morphology relative to age will be evaluated by comparing horn shape to age based on tooth eruption and wear.

Distribution and Movements

We monitored bison movements by locating radiocollared bison and from reports by people who observed and reported bison moving through the area. We located radiocollared bison from the ground by using a single antenna and listening for peak signal strength to determine general location. We also obtained more precise locations using aircraft.

We captured bison to attach radio collars by immobilizing them with darts from a Cap-Chur™ rifle. Each year when bison first migrated from the Delta River to the DJBR, they could be approached with a vehicle. We used a truck to slowly approach within 50–75 feet of bison, or approached with a Robinson R-22 helicopter and fired a syringe dart from a Cap-Chur rifle. Darts were loaded with 5 mg carfentanil citrate (Wildnil®, Wildlife Pharmaceuticals, Fort Collins, Colorado USA) and 60 mg xylazine hydrochloride (Anased®, Lloyd Laboratories, Shenandoah, Iowa USA). Once immobilized, bison were fitted with radio collars. After collaring, they were given an intramuscular injection of naltrexone hydrochloride (Trexonil®, Wildlife Pharmaceuticals) at a dose of 100 mg naltrexone citrate/mg carfentanil citrate to reverse the immobilization.

Disease Management
Bison hunters were asked to collect approximately 30 ml of blood from their kills. These samples were centrifuged and serum was removed by aspiration. Sera were frozen until tested for diseases that included epizootic hemorrhagic disease, bluetongue, infectious bovine rhinotracheitis, bovine viral diarrhea, respiratory syncytial virus, parainfluenza 3, *Brucella suis* IV, *Leptospira interrogans*, *Toxoplasma gondii*, and Q fever. Samples of uncoagulated whole blood were also collected for future genetic work.

Harvest Management
Bison hunters attended a mandatory prehunt orientation. The purpose of the orientation was to teach hunters to differentiate between bulls and cows, to discuss land status in the hunt area, and to give hunters supplies and instructions for collecting biological samples.

Bison hunters were required to check out within 24 hours after their hunt. They completed a questionnaire concerning date and location of kill, number of days afield, number of shots required, weight of bullet, and caliber of firearm. If hunters checked out after normal office hours, they put the questionnaire, blood samples, and the distal end of the lower jaw in a drop box at the Delta Junction ADF&G office. If hunters checked out during working hours, we examined the carcass to record tooth eruption and to extract an I1 tooth from bison that had all permanent teeth. We sent teeth to Matson Laboratories (PO Box 308, Milltown, Montana 59851) for aging. Horns were measured according to the Boone and Crockett Club scoring system and photographed. Harvest was monitored using permit harvest reports and questionnaires. Harvest data were summarized by regulatory year.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size
RY99. Estimated prehunt population size in fall 1999 was 434 bison (Table 1) from surveys flown on 20 May; 11 June; 11 and 26 August; and 16, 22, and 29 September 1999. The highest count was achieved during the 29 September survey when the bison were located in the DAP. Estimated precalving population in spring 2000 was 359, which essentially met the population objective.

RY00. Estimated prehunt population size was 453 bison (Table 1) from surveys flown on 30 May; 28 June; 8, 21 and 28 August 2000. The highest count was achieved during the 28 June survey when the bison were located along the Delta River. Estimated precalving population in spring 2001 was 361, which essentially met the population objective.

RY01. Estimated prehunt population size was 471 bison (Table 1) from surveys flown on 20 and 27 June; 23 and 27 August; and 6, 10, 18, and 20 September 2001. The highest count was during the 10 September survey when the bison were located in the DAP. Estimated precalving population in spring 2002 was 373, which exceeded the population objective by 13 bison.

Population Composition

RY99. We calculated sex and age composition from a sample of 270 bison counted on 9 and 10 September 1999 (Table 2). Calf survival was 43 calves:100 cows, and calves composed 22% of the sampled population. Adult and yearling cows composed 51% of the herd.

The bull:cow ratio was 54:100, which met the objective, and bulls ≥1–year–old composed 22% of the observed population. The yearling bull:cow ratio of 8:100 was similar to last year's ratio. We observed 74 bulls during composition surveys; 15 of these were not classified by horn morphology. Based on the sample of 59 classified bulls, "small bulls" were the largest component, composing 44% of all bulls (Table 3).

RY00. We calculated sex and age composition from a sample of 272 bison counted on 5 September 2000 (Table 2). Calf survival was 58 calves:100 cows and calves composed 26% of the sampled population. Adult and yearling cows composed 45% of the sampled population.

The bull:cow ratio was 63:100 which met the objective, and bulls ≥1–year–old composed 15% of the sampled population. The yearling bull:cow ratio of 18:100 was slightly higher than last year. We observed 78 bulls during composition surveys but 17 of these were not classified by horn morphology. Based on the sample of 78 bulls, yearlings were the largest component composing 36% of all bulls classified (Table 3).

RY01. We calculated sex and age composition from a sample of 278 bison counted on 25 and 27 September 2001 (Table 2). Calf survival was 57 calves:100 cows and calves composed 25% of the sampled population. Adult and yearling cows composed 45% of the sampled population.

The bull:cow ratio was 68:100, which met the objective, and bulls ≥1–year–old composed 23% of the sampled population. The yearling bull:cow ratio of 11:100 was slightly higher than last year's ratio. We observed 84 bulls during composition surveys; 6 of these were not classified by horn morphology. Based on the sample of 78 bulls, "medium bulls" were the largest component composing 39% of all bulls (Table 3).

The 2000–2005 Delta Bison Management Plan states on page 17 that "The Delta bison permit hunt will be managed to provide the greatest reasonable hunting opportunity. This objective will provide the greatest number of bison for hunting and viewing but will not maximize the number of large mature bulls in the herd." The department has interpreted this to mean that the bull:cow ratio will be managed for not less than 50 bulls ≥1-yr-old:100 cows to maximize the number of permits. However, with declining hunter success in recent years, it was necessary to increase the number of permits to meet the precalving population objective. It is my assessment that approximately 130 permits is the practical limit that can be managed satisfactorily when taking into account landowner issues, hunter crowding, department orientations, etc. Therefore, I have allowed the bull:cow ratio to increase in recent years to limit the number of hunting permits to approximately 130 per year. I reviewed this strategy with the Delta Bison Working Group at their meeting on 15 May 2001 and they concurred with this management approach.

Distribution and Movements

RY99. Although the DBH began moving west toward the Delta River in February 2000, a few animals were still east of the Richardson Highway long after most animals had migrated west. A group of 9 bison were seen moving south along Granite Creek near the base of the Granite Mountains on 5 May. A group of 5 females and 3 newborn calves was seen on approximately 20 May on DAP Tracts 4, 5, and H (S Schultz, personal communication). This was the first report of bison calving in the DAP in recent years. In the early 1980s, D Quarberg (personal communication) reported seeing several cows with a newborn calf during May on Tract M.

A group of 10 bison were seen on the Panoramic Fields during 30 May–12 June. During an aerial census flight on 30 May, most bison were distributed along the Delta River from Buffalo Dome to approximately 2.5 mi north of Bolio Lake, with some bison also in the Texas Range portion of Fort Greely. An aerial census on 28 June located 443 bison in the Delta River drainage from slightly south of Big Lake to a point west of Ruby Creek.

Three female bison were darted from a Robinson R-22 helicopter on 28 July and fitted with radio collars. Induction time was 3–4 min. After an intramuscular injection of naltrexone, recovery time was 4–7 min. There were no postcapture mortalities.

RY00. The first evidence of bison moving from the Delta River drainage to the DJBR was 13 July 2000 when 100 bison were seen in the Panoramic Fields. Within several days, approximately 200 bison were present in the Panoramic Fields.

The first report of bison in the DAP occurred when tracks of a "good sized herd" were reported on 19 July (S Schultz, personal communication). These bison moved to the DAP after spending approximately 6 days on the DJBR. However, Delta farmers F O'Donald and V Gebauer reported having 10–15 bison that did not migrate all summer from their property east of Cummings Road. During an aerial census on 8 August, 75 bison were observed in the Panoramic Fields, 49 in the Gerstle Fields, and approximately 180–200 on Tract 3 of the DAP. It was not possible to search the Delta River area on 8 August due to military flight restrictions. During aerial census flights on 21 and 28 August, all bison were located in the DAP. On 20 September, 2 radiocollared bison were located on the DJBR.

The first report of bison moving to the Delta River drainage in spring 2001 was 15 March when 50 bison were reported on the Texas Range portion of the Donnelly Training Area of Fort Wainwright (formerly Fort Greely Military Reservation). During aerial census flights on 20 and 27 June, all bison were located in the Delta River drainage from Big Lake south to near Buffalo Dome.

One female bison was darted from the ground on 1 June 2001 and fitted with a radio collar. Induction time was approximately 2 min. After an intramuscular injection of naltrexone, recovery time was 6 min.

RY01. The first report of bison moving west to the Delta River drainage was received on 1 April 2002, when approximately 50 bison were seen crossing the Richardson Highway in the Donnelly Flats area. On the same day I received reports of 12–15 bison in both the Gerstle Fields and Panoramic Fields, and approximately 50 on Tract 3 of the DAP. On 26 April, 18

bison were seen with 1 newborn calf on the Panoramic Fields. This is the first report of bison possibly calving on the DJBR. Eight bulls were reported on the Panoramic Fields on 1 May. Approximately 40 bison were reported on Tract 3 of the DAP on 4 May. On 7 May, approximately 50 bison were reported on Tract 3 with a newborn calf and approximately 20 bison were seen in 2 groups on the Panoramic Fields.

The US Army monitored bison use of the Donnelly Training area during spring 2002 to determine potential conflicts between development of new military training areas and bison calving. These aerial observations occurred earlier in the year than we typically conduct aerial surveys. During a military survey on 7 May, approximately 193 adults and 16 newborn calves were observed along the Delta River. The most northerly bison were approximately 1.5 miles north of Buffalo Dome at latitude 63°45.12 and longitude 145°56.82. The most southerly group was located approximately 1 mi south of the mouth of McGinnis Creek at latitude 63°37.69 and longitude 145°55.09 (A. Payne, personal communication). This survey stopped about 4 miles north of Black Rapids Glacier.

During a military observation flight on 13 May, 223 adults and 38 calves were observed along the Delta River between points opposite Allen Army Airfield and Black Rapids Glacier. The group farthest north was located on the Donnelly Training Area's Washington Range at latitude 63°48.27, longitude 145°58.73. The group farthest south was located in the Delta River opposite Bear Creek at latitude 63°37.09, longitude 145°55.03.

I received a report that a "large group of bison" were seen at Black Rapids Glacier on 13 May and on 14 May, 21 adults and 13 calves were located in the DAP on Tracts 3 and 7. Therefore, in mid May, bison were located from the northern portions of the DAP to Black Rapids Glacier.

MORTALITY

Harvest

Season and Bag Limit. The resident and nonresident bison hunting season was 20 July–31 March during the RY99, RY00, and RY01 hunting seasons. Hunting did not begin until 1 October each year so farmers in the DAP could finish harvesting their crops before the hunt started.

Participation in the hunt was by drawing permit. Hunt DI403 was for bulls only and hunt DI404 was for cows only. Additional permits were issued some years by the department and the Governor's office. These hunts were designated as DI405. Recipients of these permits were required to follow all regulations and permit conditions that applied to the drawing permits. The following conditions applied to each permit:

- Permittees were required to attend an orientation course before hunting. Hunter orientations were scheduled every 5 days until all hunters had an opportunity to begin, and periodically thereafter.

- Permittees were assigned specified periods to begin hunting that were determined by the order permits were drawn.

- Permittees were required to use a rifle capable of shooting a 200-grain bullet with 2000 ft/lb of retained energy at 100 yards. Bows had to comply with 5 AAC 92.075(4) to be a legal means of harvest. Crossbows were prohibited. Certain muzzleloading firearms qualified.

Alaska Board of Game Actions and Emergency Orders. At the March 2000 Alaska Board of Game meeting, the department presented the draft 2000–2005 Delta Bison Management Plan for review and approval. The board adopted the plan with no recommended changes. The board also considered but did not adopt a public proposal to establish a 1 October–31 March bison hunting season for muzzleloader hunting only.

The hunting season was changed by emergency order during RY99. The closing date was extended from 31 March to 15 April to allow hunters the opportunity to harvest additional bison. Anticipated harvest was lower than expected and additional harvest was desirable to accomplish the precalving population objective.

At the March 2002 Board of Game meeting, the board considered a proposal from the Alaska Farm Bureau to extend the hunting season date from 31 March to 30 June. The purpose of the proposal was to allow harvest of bison that do not migrate from the DAP to the Delta River during the summer. The board did not adopt this proposal but requested the department meet with the Delta Bison Working Group to develop a strategy for dealing with nonmigratory bison.

At the March 2002 meeting, the Board of Game also considered a proposal to establish the Bison Range Youth Hunt Management Area on the DJBR. The purpose was to restrict the growing number of moose hunters that were damaging bison crops and reducing the department's ability to meet legislative mandates for the DJBR. The board adopted the proposal.

Human-Induced Mortality.
RY99 – Total human-induced mortality was estimated to be 77 bison (Table 4). Hunters killed 67 bison (30 bulls and 37 cows), estimated wounding loss was 7 bison (7% of the number of permits issued), and known loss from other causes was 3. Hunters with bull-only permits (DI403) killed 29 bulls and 3 cows (Table 5). Hunters with cow-only permits (DI404) killed 34 cows and 0 bulls. Three hunters killed bison of the wrong sex. One special use permit was issued to Alaska Fish and Wildlife Safeguard who raffled it to a hunter who killed a bull (Table 5).

Successful hunters with bull permits (DI403) hunted a mean of 7.0 days and unsuccessful hunters hunted a mean of 14.1 days (Table 6). Successful hunters with cow permits (DI404) hunted a mean of 6.7 days and unsuccessful hunters hunted a mean of 22.8 days.

RY00 – Human-induced mortality was estimated to be 79 bison (Table 4). Hunters killed 72 (36 bulls, 35 cows, and 1 bison of unknown sex), estimated wounding loss was 7 (7% of the number of permits issued), and known loss from other causes was 0. Hunters with bull-only permits (DI403) killed 35 bulls and 2 cows, and hunters with cow-only permits (DI404) killed

33 cows, 1 bull, and 1 bison of unknown sex (Table 5). Three bison were killed of the wrong sex. Two special use permits were issued and both hunters killed bulls (Table 5).

Successful hunters with bull permits (DI403) hunted a mean of 4.2 days and unsuccessful hunters hunted a mean of 9.5 days. Successful hunters with cow permits (DI404) hunted a mean of 7.7 days and unsuccessful hunters hunted a mean of 19.0 days (Table 6).

Permit Hunts. The number of permit applications was critical to DJBR operating funds because this was the only funding source for DJBR management, and legislative intent was that $5 from each application be used for DJBR management. The number of applications for Delta bison permits totaled 15,443 in 1999, 16,178 in 2000 and 15,470 in 2001 (Table 7).

RY99 – We issued 101 permits, with 50 permits for the bull-only hunt (DI403), 50 for the cow-only hunt (DI404), and 1 permit to Alaska Fish and Wildlife Safeguard for the either-sex permit (DI405) (Table 5).

RY00 – We issued 102 permits, with 50 permits for the bull-only hunt (DI403), 50 for the cow-only hunt (DI404), and 2 special permits for the either-sex permit, DI405 (Table 5).

RY01 – We issued 130 permits with 70 for the bull–only hunt (DI403), 60 for the cow–only hunt (DI404), and 1 either-sex permit to Alaska Fish and Wildlife Safeguard (DI405) (Table 5).

Hunter Residency and Success.
RY99 – Most Delta bison hunters continued to be nonlocal Alaskan residents, with 98% of all hunters residing outside of Unit 20D (Table 8). Permittees that hunted had a 69% success rate, a continuation of the decreased hunter success since RY98. Sixty-six percent of all permit recipients killed bison, 30% were unsuccessful, and 4% did not hunt (Table 4).

Decreased hunter success in RY99 may have been due to a combination of below-average snowfall and recent wildland fires, which allowed bison better access to winter forage outside of the agricultural fields. In these winters I observed numerous bison tracks in the Granite Creek (1987) and Hajdukovich Creek (1994) burns and in natural areas such as dry ponds vegetated with *Calamagrostis*. Average late March and early April snowfall at the Natural Resource Conservation Service Granite Creek snow depth survey site was 17.8 inches during 1968–2000. Snow depth was 12 inches on 1 April 1999 and 16 inches on 1 April 2000. Therefore, because shallow snow made forage within the wildland burns and other nonagricultural sites more accessible, hunting pressure may have forced bison to feed more extensively in nonagricultural areas that were less accessible to hunters.

Several other factors may also have contributed to lower hunter success rates in RY99. Bison may have been harder to find. Hunters in recent years commented that bison were spending a lot of time in forested areas instead of cleared land (this may also be a result of below average snowfall) and feeding nocturnally within the agricultural areas. Hunters may have had more difficulty determining the correct sex of bison. The age of bulls in the herd probably decreased since bull:cow ratios were reduced during the 1990s, and the younger bulls were more difficult to differentiate from cows than older bulls, prolonging hunting effort and lowering success. Also, hunters lost access, and hunting fees increased for private farmland in

the DAP. As tracts of land in the DAP sold in recent years, they were commonly subdivided into smaller parcels. Hunters were forced to contact more landowners for permission to hunt. During a hunt it was more difficult for hunters to determine parcel boundaries, especially when bison moved quickly from 1 parcel to another, complicating hunters' chances of acquiring permission to hunt on private property and ultimately reducing hunter success.

Another factor that may have contributed to lower hunter success rates was the continuing effort by landowners to remove berm rows and piles from their property to improve agricultural efficiency. As a result, there was less cover in the fields for both hunters and bison, making hunting more difficult.

RY00 – Most Delta bison hunters continued to be nonlocal Alaskan residents, with 93% of all hunters residing outside of Unit 20D (Table 8). Ninety percent of permittees hunted and permittees that hunted had an 80% success rate, a continuation of the decreased hunter success since RY98. Seventy-two percent of all permit recipients killed bison, 18% were unsuccessful, and 10% did not hunt (Table 4).

Harvest Chronology.
RY99 – Harvest chronology was similar to chronology in previous years, with most harvest (58%) in October and November and with rate of harvest slowing during December-February and increasing during March (Table 9).

RY00 – Harvest chronology was similar to chronology in previous years, with most harvest (78%) in October and November and with rate of harvest slowing during December-February and increasing during March (Table 9).

Transport Methods.
RY99 – Successful bison hunters used highway vehicles most commonly (58%), while 33% of successful hunters used snowmachines. These modes of transportation continue to be the most common (Table 10).

RY00 – Successful bison hunters used highway vehicles most commonly (79%), while 11% of successful hunters used snowmachines. These modes of transportation continue to be the most common (Table 10).

Harvest Locations.
RY99 – Most bison (51%) continued to be killed on private property in the DAP; however, the proportion of bison killed in this area decreased from 95% in RY89 to 51% in RY99 (Table 11). The number of bison killed on the DJBR increased as harvest in the DAP decreased, with 29% of bison killed there. However, this relatively high kill rate on the DJBR reflects forage management practices aimed at providing overwinter forage on the DJBR to attract bison there during the hunting season. Also, the number of bison killed in other areas increased substantially this year, with 19% of all bison killed in other areas. Most of these were killed west of the DJBR in the Granite Creek–Jarvis Creek area as bison migrated toward the Delta River during the extended hunting season. There were also several bison killed this year on state land in the Gerstle River greenbelt through the DAP.

RY00 – Most bison (77%) continue to be killed on private property in the DAP; however, the proportion of bison killed in this area decreased from 95% in RY89 (Table 11). The number of bison killed on the DJBR declined from recent years, with 13% of bison killed there. The number of bison killed in other areas decreased to 10%.

Other Mortality
Natural mortality was not quantified for the DBH. Humans caused most nonhunting mortality through road kills, trapper snares, and other factors.

Disease Management
Disease transmission from domestic livestock in the Delta Junction area was the greatest potential source of nonhunting mortality. Cattle in the area have had infectious bovine rhinotracheitis, bovine viral diarrhea, bovine respiratory syncytial virus, infectious bovine kerato conjunctivitis, parainfluenza 3 (PI3), Johne's disease, and Neospora caninum (D Quarberg and C Crusberg, personal communication). During RY99-RY00 no serum tests were conducted, although serum samples were preserved for future testing.

HABITAT

1999 DJBR Habitat Management
Oats and barley collected in Tract F of the DAP on 20 August 1999 had similar crude protein (CP) (10.3% and 10.4%, respectively) and acid-detergent fiber (ADF) (23.7 and 24.0%, respectively) (Table 12).

Forage samples were collected for several forage management tests on the DJBR. Bluegrass in the Panoramic Fields that received 2 applications of fertilizer had a significant increase in forage quality with 20.9% CP and 26.9% ADF on 20 August (Table 12). This bluegrass also appeared to produce a larger quantity of forage but there was not an apparent increased use of this area by bison. Test plots of brome had significant quality differences between brome that was mowed on 8 July compared to brome that was not mowed. The mowed brome had 22.8% CP and 30.5% ADF on 20 August compared to the unmowed brome with 5.8% CP and 33.6% ADF. Oats swathed on 27 August had 8.8% CP and 33.3% ADF when sampled on 19 October (Table 12). Bison did not appear to prefer swathed oats to unswathed oats during the winter, based on visual observations of postwinter grazing. Part of these results may have been due to a midwinter thawing/freezing cycle that may have made the swathed oats more difficult to graze.

The *Calamagrostis* mowing trial was reduced to 1 mowing in 1999 due to time limitations. The grass was mowed on 7–8 July and was 13–24 inches high, generally with 1 tiller and 3 leaves.

The nonherbicidal method of controlling *Calamagrostis*, disking and fallowing, proved more effective than repeated mowing. About 110–120 acres in the northeast corner of the Panoramic Fields were originally planted with nugget bluegrass but became infested with *Calamagrostis*. The field was disked in summer 1993 to eliminate the *Calamagrostis* by killing the plants through root desiccation. The acreage was disked annually and planted with oats for bison forage. Bison grazed the oats during fall and the soil was left fallow over the winter to reduce survival of *Calamagrostis* by root desiccation. In 1995 visual estimates

indicated that about 75% of the *Calamagrostis* had been eliminated. We continued disking and fallowing the acreage to determine the time required to eliminate *Calamagrostis*. In summer 1999 we estimated that *Calamagrostis* was growing on only 1–5% of the acreage and attempts to reduce it further through fallowing were not efficient. The acreage was replanted to bluegrass in summer 2000. Earlier attempts to make *Calamagrostis* more palatable for bison (and a preferred forage species) through mowing and fertilizing were ineffective. Therefore, it seems the most practical nonherbicidal method of controlling bluejoint on the DJBR is disking and fallowing over a 3- to 7-year period, depending on the degree of elimination required.

Test plantings of red clover, engimo timothy, and carlton bromegrass from 1996 survived the winter. The test plantings were each mowed on 8 July to provide bison with higher quality regrowth to determine forage preference for these species. When bison arrived on the DJBR, they grazed most extensively on the mowed red clover and did not graze the unmowed grasses. However, the bison did not appear to prefer the mowed red clover to the nugget bluegrass elsewhere on the DJBR. Therefore, any acreage planted to perennial grasses in the near future will be planted with nugget bluegrass.

Approximately 640 acres of trees and brush were cut using a brush hog mower.

2000 DJBR Habitat Management

We collected forage samples from the DJBR and DAP near the time some bison began moving into the DAP. On 10 August, 60 acres of oats planted in the Panoramic Fields on 29 June were in the tillering stage, 4-8 inches tall and with RFV of 232. One hundred twenty-five acres of oats planted in the Panoramic Fields on 20 June were 8-18 inches tall with a RFV of 206. Sixty acres of oats planted in the Panoramic Fields on 8 June were 18-24 inches tall with RFV of 205. For comparison, oats on Tract U and 3 in the DAP had RFVs of 168 and 95, respectively, and barley on Tract U had RFV of 130. Therefore, it is likely bison moved from the DJBR to the DAP for reasons other than to search for higher quality forage.

The second application of fertilizer on 40 acres of bluegrass in the Panoramic Fields resulted in a higher RFV (118) on 14 August (Table 12) than bluegrass fertilized in May only in the Gerstle Fields (RFV of 101). Subjective evaluations indicated that bison more intensively grazed the bluegrass that was fertilized twice.

Brome that was mowed 7 July on the DJBR had a RFV of 106, compared to unmowed brome with a RFV of 83. Brome planted for the Conservation Reserve Program on Tract F of the DAP had a RFV of 92 when sampled on 16 August (Table 12). Test plots of unmowed fescue and timothy on the DJBR had relatively low RFVs of 97 and 92, respectively.

Calamagrostis test plots were mowed when plants were 12–22 inches tall with 1 tiller containing 2 leaves. It appeared that mowing plants 3 times per summer from 1995–1998 reduced the height of the plant and the number of tillers in succeeding years. However, after mowing only once each year in 1999 and 2000, the plants may have increased in size. Mowing did not noticeably improve forage quality sufficiently to entice bison to graze it in much quantity. *Calamagrostis* mowed once in July had a RFV of 110 when sampled on 10 August, compared to unmowed *Calamagrostis* that had a RFV of 100.

Water tanks were kept filled on the Panoramic Fields for the duration of the fall. Bison used the tanks more this year than in previous years when they first arrived on the DJBR, and drank approximately 8400 gal of water from the tanks in fall 2000. With the abundance of rain this summer, bison also drank water from several small ponds and bogs near the Panoramic Fields. Trace mineral blocks placed by the water tanks and other areas around the Panoramic and Gerstle Fields were readily used by bison.

Rainfall May-September totaled 14.60 inches on the Panoramic Fields and 10.45 inches on the Gerstle Fields.

Approximately 560 acres of woody vegetation (willow and aspen) were mowed to retard its growth on the Gerstle Fields.

When bison arrived on the DJBR they grazed oats intensively, consuming approximately 75% of available forage, based on visual estimates. Grazing pressure on the oats prevented the early seeded oats from forming seed heads. When bison moved to the DAP, there was an estimated 25% of oat crops and 50% of bluegrass remaining on the DJBR, so the movement was likely not caused by lack of forage.

2001 DJBR Habitat Management
Oats that were ungrazed in fall 2000 were grazed extensively over winter 2000–2001, with an estimated 90% of forage consumed in these areas. Bluegrass also appeared to have been grazed heavily over the winter.

When bison began arriving on the DJBR on 19 July, oats were in the following growth stages: the 17 May planting was headed out and 16–28 inches tall; the 8 June planting was 18–24 inches tall; the 20 June planting was 8–18 inches tall; and the 29 June and 2 July planting was 4–8 inches tall.

Forage samples collected from the DJBR Panoramic Fields on 9–16 August indicated a wide range of forage quality available for bison. Oats planted on 20 and 28 June had very similarly high RFVs of 205 and 206 respectively. Oats planted during May had RFVs ranging from 90–100. Bluegrass replanted in 2000 did not vary in forage quality from bluegrass planted in the 1980s. The 2000 planting had an RFV of 113 compared to RFV of 117 for older bluegrass. Brome grass that had been mowed 11 July had higher forage quality (RFV = 115) than unmowed brome (RFV = 103). Bluegrass and oats in the Gerstle Fields had slightly lower forage quality than in the Panoramic Fields. Oats planted on 2 July had a RFV of 192 and bluegrass had an RFV of 93.

Calamagrostis was mowed on 16–17 July when the plants were 16–32 inches tall with 0–3 tillers.

Approximately 500 acres of woody regrowth were mowed in the Panoramic and Gerstle Fields. Approximately 115 acres in the Panoramic Fields were disked and fallowed to reduce *Calamagrostis*.

Bison Viewing
No bison viewing enhancement activities occurred during this reporting period.

DELTA BISON WORK GROUP ANNUAL MEETING

A meeting of the Delta Bison Working Group was held on 15 May 2001 to discuss the bison plan and the following topics: 1) nonmigratory bison, 2) Bison Range Youth Hunt Management Area, 3) bison hunt management pertaining to the bull:cow ratio, and 4) refilling the Fort Greely representative on the group. Conclusions reached at the meeting included 1) having the department work with the Alaska Farm Bureau to draft a regulation proposal for the March 2002 Board of Game meeting to modify the Delta bison hunt to allow harvest of nonmigratory bison, 2) having the department work with the Delta Fish and Game Advisory Committee to draft a regulation proposal for the March 2002 Board of Game meeting to restrict moose hunting on DJBR fields in an attempt to reduce crop damage and disturbance to bison caused by moose hunters, 3) concurring with the goal of allowing the bull:cow ratio to increase to regulate the number of bison permits at this time to approximately a maximum of 130, and 4) requesting that the US Army nominate Mr Jeff Mason to serve as the Fort Greely representative on the working group.

CONCLUSIONS AND RECOMMENDATIONS

The DBH continued to do well. Good herd productivity and calf survival continued. Precalving herd size was slightly above the objective in RY01 but this objective was met during RY99–RY00. The bull:cow ratio objective was met in RY99–RY01 and increased during RY99–RY00.

Herd movements showed a problematic trend with some bison appearing to spend the summer in the DJBR/DAP area rather than migrating to the Delta River. Some of these cows calved in the agricultural areas. If this trend continues, options will be explored to reverse the trend.

The ability to monitor herd health was reduced due to funding cuts. Delta Bison Herd serum was collected and stored. The serologic health of the DBH continued to be jeopardized by close contact with domestic livestock in the Delta Junction area and by the potential for domestic bison to escape captivity and join the wild herd. Interagency efforts should continue to encourage regulatory changes that provide greater oversight of domestic bison to assure they do not escape captivity and are disease-free.

Permit application fees continued to fund management of the DJBR. The DJBR met the legislative intent to reduce conflicts between bison and agriculture and continued to benefit farmers by delaying and/or reducing bison movements into the DAP.

The greatest challenges to DJBR management continued to be 1) controlling the native grass, bluejoint reedgrass (*Calamagrostis canadensis*), and woody regrowth with nonherbicidal techniques; 2) developing more cost-effective forage management techniques; and 3) holding bison on the DJBR as late in the fall as possible. We will continue work to improve these aspects of DJBR management.

Hunter success remained low relative to earlier years. The decline in hunter success will be monitored closely in the future to determine if it is an anomaly or a trend.

The objective to administer the Delta bison hunt to reduce landowner conflicts and to maintain hunter access to private property was only partially met because more landowners charged access fees or closed their property to hunters. Efforts will be made to work with landowners to maintain good relations and access for bison hunters.

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Table 1 Delta bison precalving and postcalving population estimates, 1983–2002

Year	Spring precalving[a] population estimate	Fall prehunt population estimate
1983	355	360
1984	300	356
1985	285	378
1986	300	361
1987	275	396
1988	337	426
1989	366	432
1990	373	440
1991	378	484[b]
1992	384	482
1993	392	465
1994	340	446[c]
1995	397	485
1996	375	496
1997	381[d]	474
1998	349	414–471
1999	335–393	434
2000	359	453
2001	361	471
2002	373	

[a] Calculated by subtracting known mortality from previous prehunt population estimate.
[b] Includes 17 domestic bison that escaped and were incorporated into the herd.
[c] Includes 15 domestic bison that escaped and were incorporated into the herd in May 1994.
[d] Includes 6 domestic bison that escaped and were incorporated into the herd in April 1997.

Table 2 Delta bison fall ground composition count data and estimated population size, regulatory years 1986–1987 through 2001–2002

Regulatory year	Bulls:100 Cows	Yrlg bulls: 100 Cows	Calves:100 Cows	Adults		Percent yrlg bulls	Percent calves	Total sample size	Estimated prehunt population size
				% Bulls	% Cows[a]				
1986–1987	44	10	47	38	62	5	25	119	361
1987–1988[b]									
1988–1989	72	17	45	42	58	8	21	141	426
1989–1990	106	25	50	51	49	10	20	225	432
1990–1991	114	19	47	53	47	7	18	110	440
1991–1992	74	10	29	42	58	5	14	201	484[c]
1992–1993	87	14	46	31	43	6	20	381	482
1993–1994	67	21	62	20	44	9	27	308	465
1994–1995	70	21	53	24	45	7	24	172	446[d]
1995–1996	87	22	52	27	42	9	22	231	485
1996–1997	65	13	54	24	46	6	25	279	496[e]
1997–1998	53	3	47	25	50	2	24	200	474
1998–1999	48	9	53	19	50	5	27	354	414–471
1999–2000	54	8	43	22	51	4	22	270	434
2000–2001	63	18	58	15	45	8	26	272	453
2001–2002	68	11	57	23	45	5	25	278	471

[a] Includes yearlings and adult cows.
[b] No data.
[c] Includes 17 domestic bison that escaped and were incorporated into the herd.
[d] Includes 15 domestic bison that escaped and were incorporated into the herd.
[e] Includes 6 domestic bison that escaped and were incorporated into the herd.

Table 3 Percent Delta bull bison with different horn categories based on horn morphology, 1997–2001

		Horn Category			
Date	Yearling	Small	Medium	Large	Total
Sep 1997	6	45	37	12	49
Sep 1999	19	44	27	10	59
Sep 2000	36	12	25	28	61
Sep 2001	18	26	39	18	78

Table 4 Delta bison harvest and accidental death, regulatory years 1986–1987 through 2000–2001

	Hunter harvest								
Regulatory	Reported				Estimated			Other	
year	M (%)	F (%)	Unk (%)	Total	Unreported[a]	Illegal	Total	mortality	Total
1986–1987	15 (24)	47 (75)	0 (0)	62	5	0	5	0	67
1987–1988	35 (76)	11 (24)	0 (0)	46	4	0	4	0	50
1988–1989	21 (47)	24 (53)	0 (0)	45	4	0	4	0	49
1989–1990	22 (37)	38 (63)	0 (0)	60	5	0	5	0	65
1990–1991	59 (67)[b]	27 (31)	0 (0)	86	6	0	6	2	94
1991–1992	50 (54)	43 (46)	0 (0)	93	7	0	7	0	100
1992–1993	62 (65)	33 (34)	1 (1)	96	7	0	7	3	106
1993–1994	51 (47)	58 (53)	0 (0)	109	8	0	8	0	117
1994–1995	20 (53)	18 (47)	0 (0)	38	3	0	3	4	45
1995–1996	60 (57)[b]	46 (43)	0 (0)	106	8	0	8	0	114
1996–1997	56 (54)	47 (46)	0 (0)	103	8	0	8	6	117
1997–1998	57 (48)	61 (52)	0 (0)	118	9	0	9	8	135
1998–1999	27 (38)[b]	44 (61)[c]	1 (1)	72	7	0	7	4	83
1999–2000	30 (45)[b]	37 (55)	0 (0)	67	7	0	7	3	77
2000–2001	36 (50)	35 (49)	1 (1)	72	7	0	7	0	79

[a] Estimated wounding loss equal to 7% of the permits issued.
[b] One bull was harvested via the Alaska Wildlife Safeguard Raffle.
[c] One cow was harvested via a Governor's permit.

Table 5 Delta bison harvest data by permit hunt, regulatory years 1986–1987 through 2001–2002

Hunt/Area	Regulatory year	Permits issued	Percent did not hunt	Percent unsuccessful permittees that hunted	Percent successful permittees that hunted	Bulls (%)	Cows (%)	Unk (%)	Total harvest
403[a]	1986–1987	10	0	0	100	9 (100)	0 (0)	0 (0)	9
	1987–1988	35	0	0	100	33 (100)	0 (0)	0 (0)	33
	1988–1989	20	10	0	100	18 (100)	0 (0)	0 (0)	18
	1989–1990	30	3	4	96	21 (81)	5 (19)	0 (0)	26
	1990–1991	70	0	3	97	59 (87)	9 (13)	0 (0)	68[b]
	1991–1992	70	0	6	94	50 (74)	18 (26)	0 (0)	68[c]
	1992–1993	80	4	1	95	62 (82)	13 (17)	1 (1)	76
	1993–1994	90	1	7	92	50 (60)	33 (40)	0 (0)	83
	1994–1995	20	5	0	95	19 (100)	0 (0)	0 (0)	19
	1995–1996	70	6	10	85	58 (97)	2 (3)	0 (0)	60
	1996–1997	70	4	9	86	53 (88)	7 (12)	0 (0)	60
	1997–1998	60	3	8	88	51 (96)	2 (4)	0 (0)	53
	1998–1999	45	2	29	69	26 (84)	4 (13)	1 (3)	31
	1999–2000	50	2	34	64	29 (91)	3 (9)	0 (0)	32
	2000–2001	50	6	16	74	35 (95)	2 (5)	0 (0)	37
	2001–2002	70	NA	NA	NA	NA	NA	NA	NA
404	1986–1987	55	0	0	100	6 (11)	47 (89)	0 (0)	53
	1987–1988	15	0	0	100	2 (15)	11 (85)	0 (0)	13
	1988–1989	30	0	10	90	3 (11)	24 (89)	0 (0)	27
	1989–1990	35	0	0	100	1 (3)	33 (97)	0 (0)	34
	1990–1991	20	5	5	95	0 (0)	18 (100)	0 (0)	18
	1991–1992	30	0	17	83	0 (0)	25 (100)	0 (0)	25
	1992–1993	20	0	0	100	0 (0)	20 (100)	0 (0)	20
	1993–1994	30	3	10	87	1 (4)	25 (96)	0 (0)	26
	1994–1995	20	0	5	95	1 (5)	18 (95)	0 (0)	19
	1995–1996	50	2	6	92	2 (4)	44 (96)	0 (0)	46
	1996–1997	50	0	12	86	3 (7)	40 (93)	0 (0)	43
	1997–1998	70	3	4	93	6 (9)	59 (91)	0 (0)	65
	1998–1999	55	5	24	71	0 (0)	39 (100)	0 (0)	39

Hunt/Area	Regulatory year	Permits issued	Percent did not hunt	Percent unsuccessful permittees that hunted	Percent successful permittees that hunted	Bulls (%)	Cows (%)	Unk (%)	Total harvest
	1999–2000	50	6	26	68	0 (0)	34 (100)	0 (0)	34
	2000–2001	50	8	20	70	1 (3)	33 (94)	1 (3)	35
	2001–2002	60	NA	NA	NA	NA	NA	NA	NA
405	1998–1999	2[bc]	0	0	100	1 (50)	1 (50)	0 (0)	2
	1999–2000	1[b]	0	0	100	1 (100)	0 (0)	0 (0)	1
	2000–2001	2	0	0	100	2 (100)	0 (0)	0 (0)	2
	2001–2002	1	NA	NA	NA	NA	NA	NA	NA
Totals for all permit hunts	1986–1987	65	0	0	100	15 (24)	47 (75)	0 (0)	62
	1987–1988	50	0	0	100	35 (76)	11 (24)	0 (0)	46
	1988–1989	50	2	7	96	21 (47)	24 (53)	0 (0)	45
	1989–1990	65	2	2	98	22 (37)	38 (63)	0 (0)	60
	1990–1991	90	2	3	97	59 (67)	27 (31)	0 (0)	86
	1991–1992	100	0	9	91	50 (54)	43 (46)	0 (0)	93[c]
	1992–1993	100	3	1	99	62 (65)	33 (34)	1 (1)	96
	1993–1994	120	2	8	91	51 (47)	58 (53)	0 (0)	109
	1994–1995	40	3	3	95	20 (53)	18 (47)	0 (0)	38
	1995–1996	120	4	8	88	60 (57)	46 (43)	0 (0)	106
	1996–1997	120	3	10	86	56 (54)	47 (46)	0 (0)	103
	1997–1998	130	3	6	91	57 (48)	61 (52)	0 (0)	118
	1998–1999	102	4	26	71	27 (38)	44 (61)	1 (1)	72
	1999–2000	101	4	30	66	30 (45)	37 (55)	0 (0)	67
	2000–2001	102	7	18	73	38 (51)	35 (47)	1 (1)	74
	2001–2002	131	NA	NA	NA	NA	NA	NA	NA

[a] Hunt 403 was an either-sex hunt during regulatory years 1989–1990 through 1993–1994.
[b] One permit was issued for an Alaska Fish and Wildlife Safeguard raffle.
[c] One permit was issued for a Governor's permit.

Table 6 Delta bison mean number of days hunted for hunts DI403 and DI404, regulatory years 1991–1992 through 2000–2001

Regulatory year	Mean number of days hunted			
	Hunt DI403		Hunt DI404	
	Successful	Unsuccessful	Successful	Unsuccessful
1991–1992	3.8	4.3	3.5	15.6
1992–1993	2.2	1.0	1.9	0.0[a]
1993–1994	4.3	7.2	3.5	5.0
1994–1995	3.0	0.0[a]	3.0	2.0
1995–1996	5.1	10.1	3.8	5.0
1996–1997	6.1	14.8	4.3	6.8
1997–1998	5.6	9.0	4.4	9.7
1998–1999	6.0	9.4	7.0	10.4
1999–2000	7.0	14.1	6.7	22.8
2000–2001	4.2	9.5	7.7	19.0

[a] Zero days hunted indicates there were no unsuccessful hunters.

Table 7 Delta bison hunts DI403 and DI404 applications received and permits issued, 1977–2001

Year	Applications received	Permits issued
1977	2,121	20
1978	3,555	15
1979	3,970	25
1980	4,561	35
1981	5,237	55
1982	8,105	75
1983	7,889	75
1984	11,276	55
1985	666[a]	55
1986	6,585	65
1987	6,434	50
1988	9,705	50
1989	10,151	65
1990	11,822	90
1991	11,057	100
1992	12,387	100
1993	13,654	120
1994	13,977	40
1995	15,257	120
1996	17,895	120
1997	15,479	130
1998	16,188	100
1999	15,443	100
2000	16,178	100
2001	15,470	130

[a] Eight thousand nine hundred thirty-one applications were received before Tier II regulations were implemented and applications were returned.

Table 8 Delta bison hunter residency and success for drawing permit hunts DI403 and DI404, regulatory years 1986–1987 through 2000–2001

Regulatory year	Successful					Unsuccessful					Total hunters
	Local[a] resident	Nonlocal resident	Nonres	Unk	Total (%)	Local[a] resident	Nonlocal resident	Nonres	Unk	Total (%)	
1986–1987	4	57	0	1	62 (100)	0	0	0	0	0 (0)	62
1987–1988	1	44	0	1	46 (100)	0	0	0	0	0 (0)	46
1988–1989	2	40	1	2	45 (94)	0	3	0	0	3 (6)	48
1989–1990	3	57	0	0	60 (98)	0	1	0	0	1 (2)	61
1990–1991	4	31	0	0	85 (97)	0	3	0	0	3 (3)	88
1991–1992	3	86	2	0	91 (91)	2	7	0	0	9 (9)	100
1992–1993	6	87	1	2	96 (99)	0	1	0	0	1 (1)	97
1993–1994	5	103	1	0	109 (92)	0	9	0	0	9 (8)	118
1994–1995	0	38	0	0	38 (97)	0	1	0	0	1 (3)	39
1995–1996	3	103	0	0	106 (91)	0	10	0	0	10 (9)	116
1996–1997	2	97	1	3	104 (90)	0	11	0	1	12 (10)	116
1997–1998	5	101	12	0	118 (94)	0	6	2	0	8 (6)	126
1998–1999	0	72	0	0	72 (74)	0	25	1	0	26 (27)	98
1999–2000	0	67	0	0	66 (69)	2	27	1	0	30 (31)	96
2000–2001	5	67	0	0	72 (80)	0	18	0	0	18 (20)	90

[a] Local residents reside in Unit 20D.

Table 9 Delta bison percent harvest by month, regulatory years 1994–1995 through 2000–2001

Regulatory year	Percent harvest by month							
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	*n*
1994–1995[a]	61	11	8	0	5	16	0	38
1995–1996[a]	42	25	8	5	8	14	0	106
1996–1997[a,b]	23	34	3	6	11	13	11	103
1997–1998	46	26	6	0	8	14	0	118
1998–1999	45	16	4	1	13	21	0	71
1999–2000[c]	39	19	2	5	14	14	9	65
2000–2001	55	23	3	1	10	8	0	74

[a] The hunting season opened on 7 October versus 1 October.
[b] The hunting season was extended by emergency order to include 1–31 April 1997.
[c] The hunting season was extended by emergency order to include 1–15 April 2000.

Table 10 Delta bison harvest percent by transport method for Hunts DI403and DI404, regulatory years 1991–1992 through 2000–2001

Regulatory year	Harvest percent by transport method								
	Airplane	Horse/ Dog team	Boat	3- or 4-wheeler	Snowmachine	Other ORV	Highway vehicle	Unknown	*n*
1991–1992	1	0	0	1	14	3	67	14	93
1992–1993	0	0	0	4	49	1	41	5	96
1993–1994	0	2	0	5	24	4	66	0	109
1994–1995	0	0	0	0	39	3	56	0	39
1995–1996	0	0	0	3	16	2	78	0	116
1996–1997	0	0	0	2	13	4	78	3	100
1997–1998	0	0	1	3	33	3	59	2	118
1998–1999	0	0	0	1	19	1	74	4	72
1999–2000	0	0	0	9	33	0	58	0	67
2000–2001	0	0	0	4	11	6	79	0	72

Table 11 Delta bison harvest percent by kill location during permit hunts DI403 and DI404, regulatory years 1989–1990 through 2000–2001

Regulatory year	Location of kill			
	Delta Agriculture Project	Delta Junction Bison Range	Other	Unknown
1989–1990	95	5	0	
1990–1991	91	9	0	
1991–1992	77	23	0	
1992–1993	78	17	5	
1993–1994	75	24	1	
1994–1995	86	14	0	
1995–1996	68	26	6	
1996–1997	56	32	12	
1997–1998	70	21	4	4
1998–1999[a]				
1999–2000	51	29	19	2
2000–2001	77	13	10	0

[a] Data not available.

Table 12 Delta Junction Bison Range (DJBR) and Delta Agricultural Project (DAP) forage quality, 1999–2001

Date/Location/Forage	% Crude protein	% Acid-detergent fiber	Relative feed value
1999			
DAP Tract F			
Barley, sampled 20 Aug	10.4	23.7	
Oats, sampled 20 Aug	10.3	24.0	
DAP Tract 1B			
Brome, sampled 15 Sep	14	25.9	
DJBR Panoramic Fields			
Bluegrass 2X fert, sampled 20 Aug	20.9	26.9	
Brome (uncut), sampled 20 Aug	5.8	33.6	
Brome (cut 8 Jul), sampled 20 Aug	22.8	30.5	
Oats(swathed 27 Aug), sampled 19 Oct	8.8	33.3	
DJBR Gerstle Fields			
Bluegrass, sampled 20 Aug	9.3	31.2	
2000			
DAP Tract U			
Oats (preboot), sampled 17 Aug	32.0	22.4	168
Barley (mature), sampled 16 Aug	8.3	26.9	130
DAP Tract 3 Oats (headed), sampled 16 Aug	13.4	32.5	97
DAP Tract F brome (boot), sampled 16 Aug	5.6	37.6	92
DJBR Panoramic Fields			
Oats planted 8 Jun, sampled 10 Aug	35.8	20.3	205
Oats planted 20 Jun, sampled 10 Aug	33.6	19.3	206
Oats planted 28 Jun, sampled 10 Aug	36.5	16.5	232
Bluegrass, fertilized 1X, sampled 14 Aug	12.6	31.3	101
Bluegrass, fertilized 2X, sampled 10 Aug	19.2	26.7	118
Brome (unmowed), sampled 14 Aug	4.4	39.6	83
Brome (mowed), sampled 14 Aug	23.9	33.0	106
Fescue (unmowed), sampled 10 Aug	8.5	32.8	97

Date/Location/Forage	% Crude protein	% Acid-detergent fiber	Relative feed value
Timothy (unmowed), sampled 14 Aug	5.2	36.2	92
Calamagrostis (unmowed), sampled 10 Aug	9.3	32.8	100
Calamagrostis (mowed), sampled 10 Aug	19.8	28.6	110
2001			
DJBR Panoramic Fields			
Oats planted 17 May, sampled 9 Aug	13.1	32.7	100
Oats planted 31 May, sampled 9 Aug	12.0	35.4	90
Oats planted 12 Jun, sampled 8 Aug	15.9	33.6	94
Oats planted 20 Jun, sampled 9 Aug	34.6	19.5	205
Oats planted 28 Jun, sampled 9 Aug	34.9	17.7	206
Bluegrass planted 2000, sampled 9 Aug	18.5	27.1	113
Bluegrass planted 1980s, sampled 9 Aug	14.1	26.4	117
Arctared fescue, sampled 10 Aug	10.2	33.5	95
Brome (unmowed), sampled 16 Aug	9.3	33.7	103
Brome (mowed), sampled 14 Aug	19.6	31.3	115
Timothy, sampled 14 Aug	10.8	30.8	111
Calamagrostis, sampled 10 Aug	11.9	32.1	98
DJBR Gerstle Fields			
Oats planted 2 July, sampled 15 Aug	37.9	20.5	192
Bluegrass, sampled 15 Aug	11.3	33.2	93