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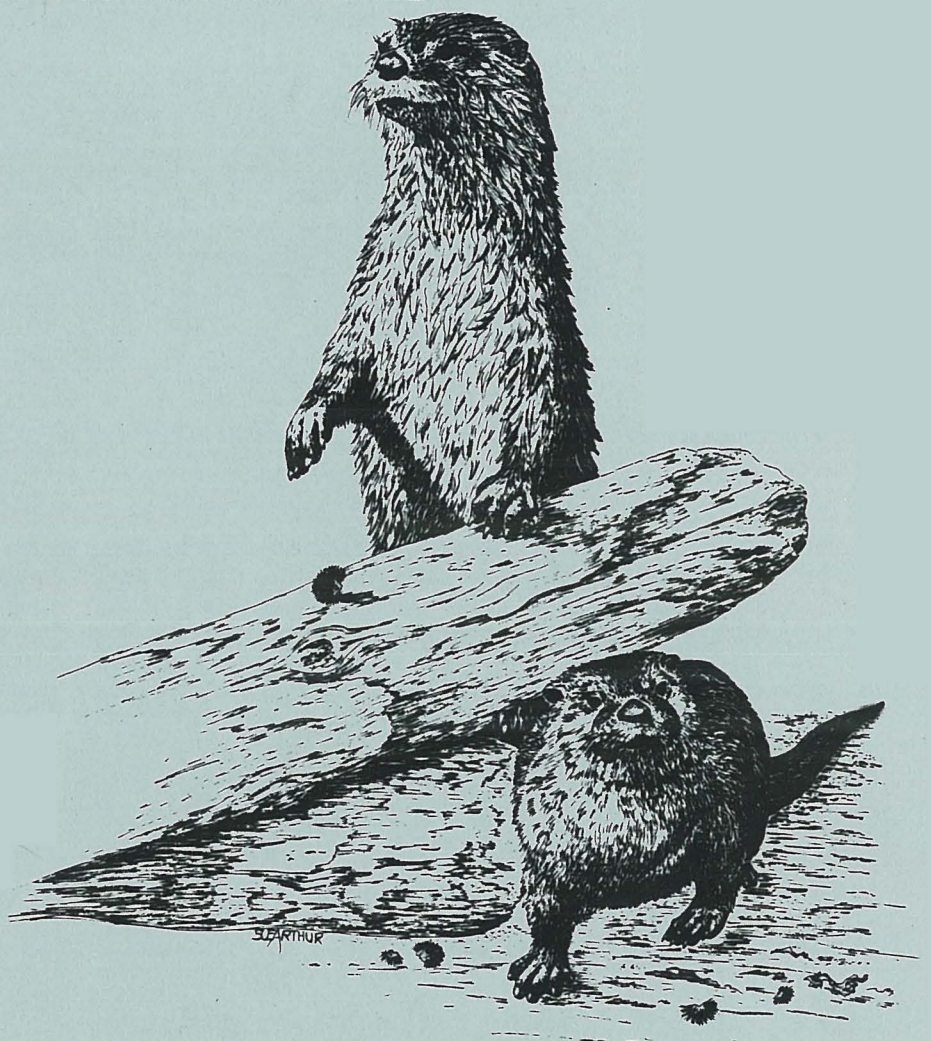
FURBEARERS



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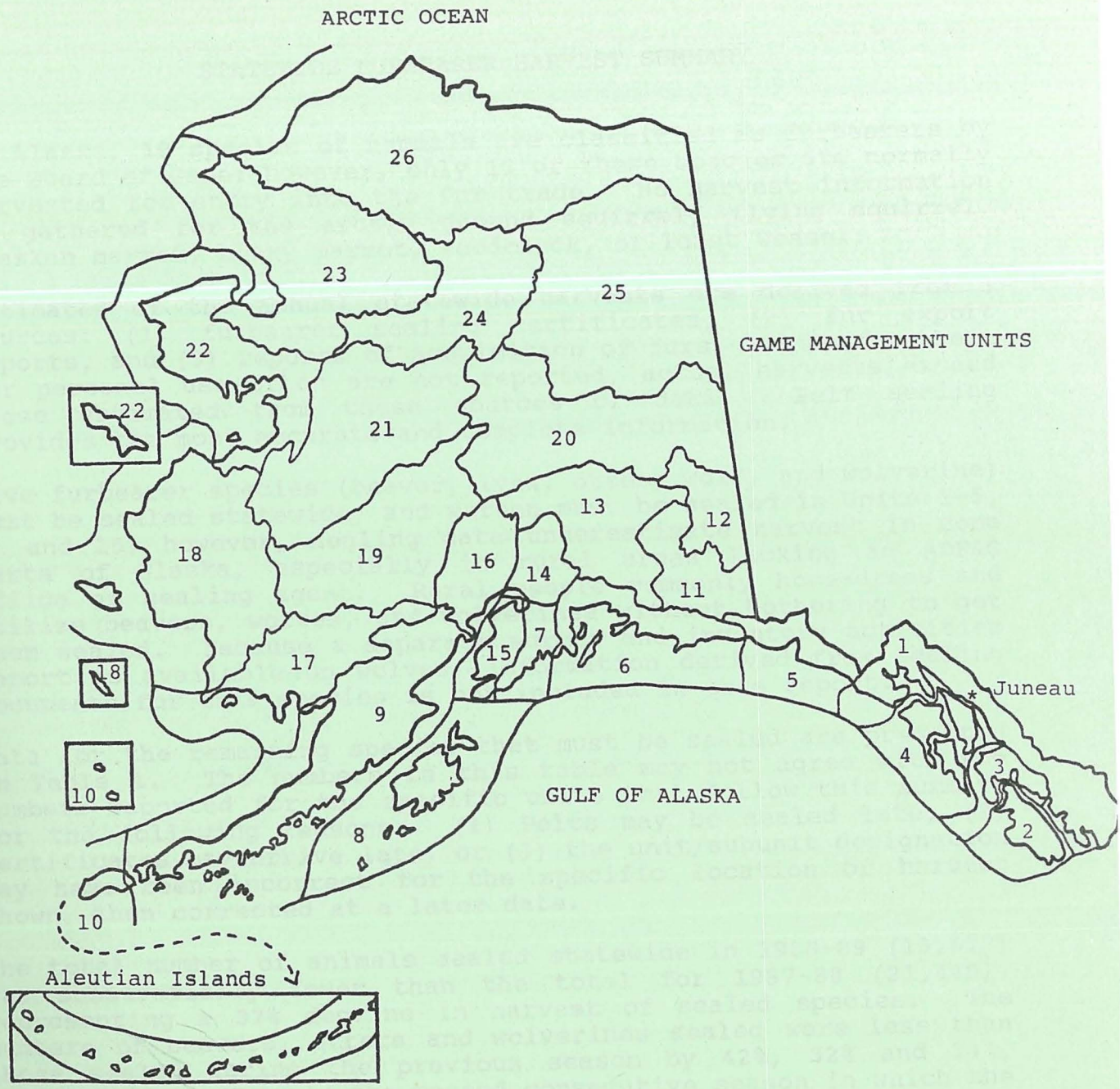
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STATEWIDE FURBEARER HARVEST SUMMARY

In Alaska, 19 species of mammals are classified as furbearers by the Board of Game; however, only 13 of these species are normally harvested for entry into the fur trade. No harvest information is gathered for the arctic ground squirrel, flying squirrel, Alaskan marmot, hoary marmot, woodchuck, or least weasel.

Estimates of the annual statewide harvests are derived from 3 sources: (1) furbearer sealing certificates, (2) fur export reports, and (3) reports of acquisition of furs. Since furs kept for personal use often are not reported, actual harvests exceed those estimated from these sources of data. Pelt sealing provides the most accurate and complete information.

Five furbearer species (beaver, lynx, otter, wolf, and wolverine) must be sealed statewide, and marten must be sealed in Units 1-5, 7, and 15; however, sealing data underestimate harvest in some parts of Alaska, especially in rural areas lacking an ADF&G office or sealing agent. Rural people commonly home-dress and utilize beavers, wolves, and wolverines without bothering to get them sealed. Because a separate survey and inventory activities report is available on wolves, information derived from sealing documents for this species is not included in this report.

Data for the remaining species that must be sealed are presented in Table 1. The numbers in this table may not agree with the numbers reported for the specific units that follow this summary for the following reasons: (1) Pelts may be sealed late, (2) certificates may arrive late, or (3) the unit/subunit designation may have been incorrect for the specific location of harvest shown, then corrected at a later date.

The total number of animals sealed statewide in 1988-89 (13,612) was substantially fewer than the total for 1987-88 (21,449), representing a 37% decline in harvest of sealed species. The numbers of beavers, otters and wolverines sealed were less than those sealed during the previous season by 42%, 32% and 14%, respectively. This is the second consecutive season in which the wolverine harvest has declined by 14%; however, the number of lynx sealed was greater than that for the previous season by 14%.

The number of lynx pelts sealed increased for the first time since the peak season of 1982-83, when 5,673 lynx had been sealed. The natural cyclic decline of lynx that follows the decline in the abundance of their principal prey, the snowshoe hare, and the shortened or closed seasons for lynx in some units are responsible for the overall downward trend in lynx harvests since the 1982-83 season. Reports of increases in hare abundance in several areas of Alaska indicated the increasing phase of the hare-lynx cycle has begun.

In the fall of 1987 the Department recommended, and the Board of Game adopted, a tracking harvest strategy for managing lynx in those areas of Alaska where trapping pressure is increasing. The new management approach was initiated with the 1988-89 season. As the lynx population and it's recruitment increases in those areas, seasons currently closed to the trapping of lynx will be reopened. Similarly, seasons that were shortened during the decline in the lynx population will be lengthened. The Board of Game adopted regulations that will effect some of these changes during the 1990-91 season.

The 32% decrease in the number of land otters sealed in 1988-89, compared with that for 1987-88, reflects the general decrease in the number of beavers harvested. Otters are commonly caught in sets made for beaver. Analyses of beaver and land otter harvests in Alaska and Canada have showed a statistically significant correlation between beaver and otter harvests over several decades (Saunders and Melchior 1984). This was true, even though the data sets included harvests from areas of Alaska, such as the coastal portions of the Gulf of Alaska where trappers make sets specifically for otter in areas where beaver do not occur. If data from these areas had been removed from the analysis, the correlation would have been stronger.

Data from fur export and acquisition-of-furs reports are summarized in Table 2. The number of pelts reported by fur dealers in 1988-89 (40,481) was 15% less than that for the previous season (47,408). Also, the number of pelts exported by trappers in 1988-89 was 6.6% less than those for 1987-88. These decreases in trapper exports and dealer purchases accounted for the overall 12% decrease in the harvest (Table 2) in 1988-89 from that for 1987-88.

In 1986-87 dealer exports exceeded dealer purchases (Melchior 1988). Although the same relationship occurred again in 1988-89 (Table 2), it was reversed for 1987-88. As a general rule, the ratio of dealer acquisitions to dealer exports is approximately 1:1, provided dealers export in the same season all the pelts they had purchased. If the ratio is greater than 1:1, it may indicate dealers are holding furs over to another season or that they have found intrastate markets. If the ratio is less than 1:1, it may indicate that dealers have been exporting pelts acquired during more than 1 season or they have not been reporting all of their purchases. Without more information, it is not possible to distinguish among the alternative explanations.

Trappers also hold over furs from one year to next before exporting or selling them; for example, in 1986-87 total dealer purchases and trapper exports were 15,065 beavers; however, the number sealed was 17,090, or 13% more than had been sold to dealers or exported for sale or processing (Melchior, 1988). A similar situation occurred again this season. The number of beavers sold or exported was 7,308, but the number sealed was

9,470, or 29.6% more than the number sold or exported. Although we do not know for certain, some of the beaver pelts harvested this season have been held over by trappers for sale or export in 1989-90. Alternatively, some pelts have been used in making handicrafts.

Statewide beaver populations continued at relatively high levels, exceeding population goals in some areas. Several wildlife biologists (i.e., following GMU S&I reports) reported increasing beaver populations. Although timber harvesting of old-growth forests in Southeast Alaska is detrimental to some furbearer species (e.g., marten), the regrowth can improve habitat for beavers. Logging operations improve trapper access; because marten are relatively easy to capture, this increased access, as well as relatively high pelt prices, increased trapping pressures in several parts of Southeast Alaska. Low prices for otter pelts have discouraged trapping for this species.

Lynx are rare to absent throughout most of Southeast Alaska; however, a few are harvested every 10 years or so as populations further north expand and disperse southward. During the reporting period, 10 lynx were harvested in Unit 5; all but one of these were taken in the eastern coastal area of Subunit 5A, representing the highest harvest recorded for that unit since 1977-78. It is probable that most of these lynx (7 adults, 2 kits or yearlings, and 1 unknown) moved into this unit from the north. The lynx populations in southern Yukon Territory and northern British Columbia began increasing rapidly in 1987-88, leading to high densities by 1988-89 (Slough and Ward 1990).

Harvests of all furbearers declined in Subunit 1C after the Board of Game had adopted regulations closing local trails and some coastline areas to trapping. In Southcentral Alaska, coyotes were reported as abundant or increasing in several units. In Unit 6 the increase in coyotes may have been a major factor in the near extirpation of red foxes. Increased abundance of coyotes may have contributed to continuing declines in the red fox populations in other units of Southcentral Alaska as well. Although a rabies epidemic reduced red fox populations in the Bristol Bay area, the degree of reduction was not measured.

Lynx numbers remained low throughout most of Southcentral Alaska. Muskrats seemed to be increasing in a few areas. Harvests of furbearers in Southcentral were lower in 1988-89 than they had been in 1987-88. Low fur prices, poor trapping conditions, and changes in regulations contributed to reduced harvests, compared with the 1987-88 season. There were no open seasons for lynx in Units 6, 7, 8, 10, 11, 13, 14, 15 and 16. In addition, same-day-airborne hunting of foxes and wolverines was prohibited beginning with the 1988-89 season. On the Kenai Peninsula, several regulatory changes occurred, including a requirement to check traps more frequently on the Kenai National Wildlife Refuge.

Wolverine harvests continued to decline in Southcentral Alaska, indicating declines in population or trapper effort or both. Because lynx populations were low and the seasons have been closed in most Southcentral units, some trappers have either reduced the number or eliminated the use of cubby sets for large carnivores. Although an overall reduction in the number of these sets could result in lower harvests of wolverines that are commonly caught in them, we lack the data to evaluate this possibility.

In Interior Alaska beaver populations were high; in some areas they were expanding. Marten populations were at moderate-to-high levels throughout much of the Interior, but some evidence indicated a population decline in Unit 12 and Subunits 20E, 21A, and 21E. Generally, lynx populations remained low, but they showed signs of increasing, particularly in Units 20 and 25 where the snowshoe hare population was increasing. Recovery of the lynx population in Unit 12 was slow, reflecting a slow recovery of the hare population.

Furbearer harvests were down in Interior Alaska, compared with those of 1987-88. Low fur prices, deep snow in December, and bitter cold (-50° to -80° F) for 3 weeks beginning in mid-January affected trapping in many areas.

While the number of lynx sealed continued to decline in Units 19, 21, and 24, the numbers sealed rose by 35% and 28% in Units 20 and 25, respectively, compared with those for 1987-88. These differences in trend within the Interior reflected the overall geographic asynchronmy of the hare-lynx cycle within the state.

Marten continued to be the "bread and butter" species for Interior trappers. Although marten are not sealed in the Interior, dealer purchase and trapper export data, two mutually exclusive categories, provided us with an estimate of the number of animals harvested. In 1988-89, an estimated 30,061 marten were harvested (Table 2). At an estimated average price of $80.00 per pelt, this harvest earned Alaska trappers nearly 2.5 million dollars in 1988-89. Interior Alaska produced 74% of the statewide marten harvest.

In Southwestern and Western Alaska, beavers were abundant and the harvests have increased. Beavers have expanded their distribution in Units 18 and 23, moving into suboptimal habitats. Fur buyers in the Yukon-Kuskokwim delta area reported increasing incidents of bite marks on beaver pelts they had purchased, suggesting increased intraspecific strife is occurring within the population.

Muskrat populations were increasing in Western Alaska. A rabies epidemic occurred in the red fox population, with confirmed records from Units 18 and 23.

Unit 18 is one of our most productive furbearer areas for beavers, land otters, mink, muskrats, and red foxes. In 1988-89 34% of the statewide beaver and otter harvests came from this unit. Mink, muskrat, and red fox harvests in the Yukon-Kuskokwim delta were high, but they were below historical levels reported in the 1930's.

On the north slope of the Brooks Range and the arctic coast (Unit 26), arctic and red foxes occurred along with wolverines. Foxes were also common, but since wolverines are never very dense, it is difficult to access their status. Wolverines are highly sought after by local residents for use in making parkas (primarily ruffs and trim). Poor reporting of furbearer harvests in Northwestern and Arctic Alaska continues to be a problem. Even though it is mandatory, many wolverines are not sealed; consequently, harvest estimates are probably well below the actual harvest.

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Statewide Furbearer Coordinator

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Table 1. Number of beavers, lynx, land otters, and wolverines sealed statewide during the 1988-89 regulatory year.

Unit	Species			
	Beaver	Lynx	Otter	Wolverine
1	50	0	81	28
2	103	0	92	0
3	36	0	54	0
4	5	0	118	0
5	3	10	0	0
6	2	0[a]	62	11
7	10	1[a]	1	12
8	35	0[a]	87	0
9	244	12	139	64
10	0	0[a]	3	0
11	24	1[a]	2	7
12	15	70	2	15
13	183	0[a]	23	17
14	218	0[a]	8	10
15	41	4[a]	17	14
16	378	0[a]	47	15
17	970	1	143	45
18	3,217	17	556	6
19	1,061	23	54	27
20	1,081	237	64	46
21	1,121	34	46	23
22	14	4	0	16
23	30	0	6	40
24	316	76	9	23
25	313	708	4	46
26	0	0	0	6
Total	9,470	1,198	1,618	471

[a] No open season.

Table 2. Reported fur dealer acquisitions, dealer exports, trapper exports, and number sealed for 13 species of furbearers, 1988-89.

Species	(1) Dealer acquisitions	(2) Dealer exports	(3) Trapper exports	(4) Total exports	(5) Col. (1) + col. (3)	(6) Number sealed
Beaver	5,982	8,340	1,326	9,666	7,308	9,470
Coyote	76	408	81	489	157	
Lynx	741	575	232	807	973	1,198
Marten	16,859	15,851	13,202	29,053	30,061	
Mink	5,632	4,941	2,025	16,966	7,657	
Muskrat	6,137	17,418	1,245	18,663	7,382	
Otter (land)	770	1,130	302	7,432	1,072	1,618
Red fox[a]	3,179	5,474	1,156	6,630	4,335	
Red squirrel	473	1,630	372	2,002	845	
Weasel (Ermine)	106	511	422	933	528	
White (Arctic) fox[b]	293	1,227	68	1,295	361	
Wolf	106	487	109	596	215	855
Wolverine	127	403	83	486	210	471
Totals	40,481	58,395	20,623	79,018	61,104	13,612

[a] Includes cross and silver fox.

[b] Includes blue fox.

STUDY AREA

GAME MANAGEMENT UNITS: 1A and 2 (8,910 mi^2)

GEOGRAPHICAL DESCRIPTION: Ketchikan area including mainland areas draining into Behm and Portland Canals and Prince of Wales Island including adjacent islands south of Sumner Strait and west of Kashevarof Passage

BACKGROUND

Furbearer populations have generally been at moderate-to-high levels over the past 5 years. Trapping pressure has not been heavy, except for marten during the last 2 years. Fur prices have been the primary factor affecting trapping pressure and harvest.

Southeast Alaska has excellent otter habitat, producing high-quality pelts. High prices in the late 1970's have declined, and trapper interest is low. Otters are difficult to trap and handle; accordingly, prices must be high to affect harvest levels.

Beaver prices have been relatively stable at a fairly low level for many years, and trapper interest has been low, except for the roaded areas on Prince of Wales Island. This easy access has resulted in large harvests by a few good trappers. Additionally, early stages of clear-cuts provide good habitat, and beaver populations generally increase for the first 20 years following cutting. Harvests have fluctuated widely from year to year, depending on the number of active trappers.

Marten have been the most sought after furbearer in Southeast for many years. They are easy to trap and care for, and the monetary return is probably greater than for any other furbearer in Subunit 1A and Unit 2. Fur prices were fairly constant until the winter of 1986-87, when a large increase in the value of marten fur occurred. This is reflected in the large increase in harvest during the reporting period. Because of the ease of trapping them, high pelt value, and easy access to much of Prince of Wales Island, excessive harvest may occur in Unit 2. Extensive logging has also removed much of the prime uneven-aged old-growth habitat required by marten. The capability of the area to support marten populations is declining.

For the 1985 to 1989 period prices for mink pelts have been relatively low and stable, and trapper interest has been at moderate-to-low levels. There are no sealing requirements for mink and only estimates of total harvest are possible.

The weasel populations fluctuate from year to year. Trapping is not a factor that influences population trends, because the only harvest occurs incidentally to marten trapping. Very few muskrats are present in either Subunit 1A or Unit 2, but a few are harvested incidentally to beaver trapping throughout the area.

Wolverines are found only on the mainland portion of Subunit 1A, and very few are taken. Very little trapping effort is directed at wolverine. Most of the harvest is incidental to wolf trapping. There are no foxes or coyotes in either unit, and only an occasional lynx is taken from the mainland.

POPULATION OBJECTIVES

To maintain furbearer populations capable of sustaining harvest at the 1984-85 level as follows:

Species	Subunit 1A	Unit 2
Beaver	39	224
Marten	203	1,039
Otter	65	192
Wolverine and Lynx	occasional	not present

To develop objectives by 1990 for those species that sustain harvest in these areas but are not sealed.

METHODS

Harvest data is based on the mandatory sealing of marten, beavers, lynx, otters, and wolverines. The beaver sealing program began over 20 years ago, wolverines were first sealed in 1971-72, the river otter program started in 1978-79, and marten were first sealed in 1984-85. Harvest estimates for other species are derived from a fur export report that, while mandatory, does not account for all that are taken because not all are exported or reported. In Southeast there are no population surveys conducted on any furbearers, and only a few short-term research studies have been conducted on mink and otter.

RESULTS AND DISCUSSION

Population Status and Trend

Otter populations were low in the late 1970's when prices were high. Since that time prices have dropped significantly and trapper interest has been low. Populations have steadily increased since the early 1980's; they have been at moderate-to-high levels for several years.

Marten numbers in Subunit 1A have been at moderate levels over the past 5 years, despite increasing pressure. Difficult access to inland areas was responsible for the maintenance of reservoir populations. In Unit 2 the logging-road access to interior habitat and heavy trapping pressures will probably reduce marten populations. Harvests from this area will decline over the next several years.

Mink populations were high and stable over most of Subunit 1A and Unit 2. This will not change significantly unless pelt prices and trapping efforts increase.

Beaver populations were generally high over most of the area, but they are substantially lower in the more easily accessed areas. Typically, local populations will be temporarily reduced by trapping. Habitat changes also cause fairly large population fluctuations. Early stages of clear-cuts support higher populations than old growth, but when the canopy closes (i.e., 20 years after cutting), beaver populations drop dramatically to near-zero levels. Because current pelt prices are not high enough to draw much trapper pressure, except in easily accessed areas, beaver populations are holding at high levels over most of the area.

Mortality

Hunting Seasons and Bag Limits:

Mink, Marten, Otter, Weasel, Muskrat	No open season	
Beaver	No open season	
Wolverine	10 Nov-15 Feb	1 wolverine

Trapping Seasons and Bag Limits:

Mink, Marten, Otter, Weasel, Muskrat	1 Dec-15 Feb	No limit
Beaver	1 Dec-15 May	No limit
Wolverine	10 Nov-30 Apr	No limit

Human-induced Mortality:

Table 1 provides harvest figures for major furbearers in Subunit 1A and Unit 2 for the past 5 years (1984-85 to 1988-89). Table 2 displays more detailed harvest and trapper information for the 1988-89 season. In general, the number of trappers and animals harvested were down; the single exception was marten in Subunit 1A. These declines were primarily due to less harvest pressure, severe winters, and impassable roads during portions of the season. The numbers of marten harvested and trappers in Unit 2 declined somewhat; however, the average number of marten per trapper remained essentially the same as that for 1987-88. In Subunit 1A marten harvests, trappers, and marten/trapper all

increased substantially over those for 1987-88. Methods of transport used by trappers in both units changed very little from those for 1987-88.

In Subunit 1A and Unit 2, 100% and 98% of the marten harvest were trapped in old-growth habitat, respectively. Because of overharvesting in 1987-88, the marten harvest and the number of trappers declined; however, success remained the same. Although marten in Unit 2 can sustain a higher harvest, the long-range outlook is not good. Road access to the interior portions of the island has eliminated the refuge effects of beach trapping and the interior reservoir of untrapped animals. Moreover, the loss of old-growth habitat because of logging will continue to reduce the marten populations over much of Subunit 1A and Unit 2.

Habitat

Clear-cut logging of the uneven-aged old-growth forest in Subunit 1A and Unit 2 has affected most furbearers; it has been particularly damaging to marten. Conversion to second growth will eliminate large blocks of marten habitat, and populations will decline proportionately. The roading of areas and consequential elimination of the refuge effect is particularly evident in Unit 2, but it will also become a problem in Unit 1A. Under current forestry practices, these changes will be permanent.

Otter habitat is mostly confined to narrow strips along saltwater beaches and stream and lake systems; however, studies have shown natal dens to be up to one-half mile inland from beach areas. Old-growth forest is their preferred habitat, and little use is made of cut-over areas. Logging of these habitats will reduce the otter populations.

Mink habitat appears to be similar in many respects to otter habitat, and while impacts of beach logging on mink populations would seem to be less than those for otter, they will still decline. Beavers benefit from logging in the short term. Although early stages of clear-cuts produce abundant food and often support more beavers than had been the case previously (i.e., old-growth conditions), canopy closure will again reduce the populations.

Wolverine are found only on the mainland portion of Subunit 1A. Most of this area has been legislatively designated as Wilderness and therefore protected from logging. Only the lower Cleveland Peninsula is scheduled for intensive logging and roading. These activities are expected to have an adverse impact on wolverine populations.

Game Board Actions and Emergency Orders

Essentially the same seasons and bag limits have been in effect for the past 5 years. Opening dates for most species are based

on when pelt primeness occurs and the type of set (e.g., while marten are apparently prime before 1 December, mink are not prime until late December; since otters and beavers are prime by 1 December, this date was picked as the best compromise). The only change in season dates in the past 5 years has been a lengthening of the wolverine season to correspond with that for wolves because some wolverines are taken in wolf sets; however, the harvests have been so small that it will have no effect on population levels. Closing dates are based on loss of primeness and the desire for a uniform closing date for mink, marten, and otters. Beaver seasons run late to allow trapping on the major mainland river systems after the ice has gone out. Very little trapping occurs during the last month of the season, and since prices have been low, these larger rivers are seldom trapped for beaver.

CONCLUSIONS AND RECOMMENDATIONS

With the exception of marten in Unit 2, all furbearers in this area appear relatively secure. Only a significant increase in pelt prices would raise trapping effort to a level that would impact populations to a noticeable degree. Overtrapping of marten in Unit 2 is possibly occurring now, but several more years of high pelt prices are needed to definitely show this. The extensive road system and widely distributed human population in Unit 2 creates much greater trapping pressure than in Subunit 1A, and along with high marten pelt prices, it may lead to substantial overharvesting. Trapping seasons for species in the same area should have the same dates. The most convenient way to prevent overharvesting would be to prohibit trapping within a prescribed distance from a road.

Studies should be conducted to document the impacts of logging on furbearer habitat, particularly for marten. Logging permanently removes the uneven-aged old-growth forest, replacing it with an even-aged, closed-canopy, open-understory monoculture type forest that does not meet the habitat requirements of the major furbearers. The impacts of this forest management should be identified and publicized to point out the trade-offs between logging and furbearer populations.

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Table 1. Furbearer harvests in Subunit 1A and Unit 2, 1984-85 to 1988-89.

Subunit 1A

	Beaver	Marten[a]	Mink	Otter	Wolverine
1984-85	39	203	Unknown	65	0
1985-86	20	156	Unknown	70	0
1986-87	52	127	Unknown	63	2
1987-88	44	313	Unknown	88	1
1988-89	24	490	Unknown	45	0

Unit 2

	Beaver	Marten[a]	Marten[b]	Mink[c]	Otter
1984-85	234	1,039	--	--	192
1985-86	292	571	--	--	141
1986-87	411	301	--	--	62
1987-88	352	1,149	414	341	176
1988-89	103	908	--	--	92

[a] Marten harvest from sealing records.
[b] Marten harvest from fur export reports.
[c] Mink harvest from fur export reports.

Table 2. Furbearer data from sealing certificates by species in Subunit 1A and Unit 2, for 1988-1989.

		Otter		Beaver		Marten		Wolverine
Unit		1A	2	1A	2	1A	2	1A
No. Sealed		45	92	24	103	490	908	0
% Male		78	61	--	--	59	54	--
% Trapped		61	98	100	100	100	100	--
% harvested by:	Boat	71	91	33	5	84	44	--
	Road	11	9	67	90	16	56	--
	Air	0	0	0	1	0	0	--
	Unk.	18	0	0	4	0	0	--
# Trapped[a]		12	17	5	16	21	49	--
Avg/Trapper[a]		3.8	5.4	4.8	6.4	23.3	18.5	--
No. harvested	Dec.	8	60	12	31	95	519	--
	Jan.	20	21	4	4	43	63	--
	Feb.	17	11	0	7	2	29	--
	Mar.	0	0	8	2	0	--	--
	Apr.	0	0	0	48	0	--	--
	May	0	0	0	11	0	--	--
	Unk.	0	0	0	0	350	297	--

[a] Trappers under 16 years and over 60 years and others without trapping license numbers (and their harvests) are not included in these figures for otter, beaver, and wolverine.

STUDY AREA

GAME MANAGEMENT UNIT: 1B and 3 (5,950 mi^2)

GEOGRAPHICAL DESCRIPTION: Southeast mainland from Cape Fanshaw to Lemesurier Point and islands of the Petersburg, Kake, and Wrangell area

BACKGROUND

Beavers are locally abundant in both Subunit 1B and Unit 3. Trapper effort fluctuates greatly from season to season. Lynx are not found in Unit 3, and there have been no verified sightings in Unit 1B in recent years.

Marten occur naturally in Subunit 1B and Unit 3. Mandatory sealing began in 1984-85. Previously, only fur export reports showed the number of marten shipped by local trappers. No data were collected regarding location or chronology of the harvest prior to the 1984-85 season.

Mink are still an important furbearer; however, limited data has been collected. Although fur export reports show the number shipped by trappers living in Wrangell and Petersburg, they don't indicate the specific trapping area. Otters continue to be targeted by some trappers, and the annual harvest has varied greatly during the past few years. Wolverines are found on Mitkof Island in Subunit 3 and in Unit 1B. Some are caught incidentally in wolf sets, but a few trappers specifically target on them.

POPULATION OBJECTIVES

To maintain furbearer populations capable of producing harvests at the 1984-85 levels as follows:

Species	Subunit 1B	Unit 3
Beaver	4	52
Marten	185	250
Otter	15	141
Wolverine	4	3

METHODS

The harvest of beavers, marten, otters, and wolverines was monitored through the mandatory pelt-sealing program, while mink harvests were monitored through the mandatory fur buyer and fur export report program. Data routinely collected during sealing included number of furbearers taken, location, date taken, sex, and pelt size (for age-class estimation). Transportation and

harvest methods were also recorded. Habitat information was also recorded for marten during the sealing process.

RESULTS AND DISCUSSION

Population Status and Trend

Data were insufficient to estimate the size of the furbearer populations in Subunit 1B and Unit 3; however, incidental observations by staff, trappers, hunters, and others suggested a high and stable or increasing beaver population; no known incidence of lynx; a moderate-to-high marten population with decreasing numbers in local, heavily trapped areas; moderate and stable mink and otter populations; and a stable wolverine population.

Population Composition:

Sex was determined for all furs sealed except beaver. There are probably sexual biases in trapability, however. This precluded using the sealing data to make useful population composition estimates.

Mortality

Hunting Seasons and Bag Limits:

Lynx	1 Nov-31 Mar	2 lynx
Wolverine	10 Nov-15 Feb	1 wolverine
Marten, Mink, Otter	No open season	

Trapping Seasons and Bag Limits:

Beaver (except Mitkof Is.)	1 Dec-15 May	No limit
Beaver (Mitkof Is.)	1 Dec-15 Apr	No limit
Mink, Lynx, Marten, Otter	1 Dec-15 Feb	No limit
Wolverine	10 Nov-30 Apr	No limit

Human-induced Mortality:

Marten harvests have fluctuated widely in Subunit 1B and Unit 3. Trappers in Subunit 1B harvested 16, compared with 11 the previous year. Average harvest increased from 14 to 17 furbearers. During the reporting period, 14 trappers harvested an average of 15 marten each. During the 1986-87 reporting period, 14 trappers averaged 8 pelts each, compared with 32 trappers averaging 11 pelts in 1987-88. The number of trappers dropped to 16 during the 1988-89 season, and they averaged 10 pelts each. No data were collected concerning numbers of traps set/trapper or other indicators of effort.

Otter harvests have changed substantially in the last 3 seasons. In 1986-87, 2 trappers reported taking 9 otters. Both the harvest and the number of trappers jumped to 57 and nine, respectively, in 1987-88. During this reporting period, 4 trappers reported taking 6 otters. The number of trappers in Unit 3 increased from nine in 1986-87 to 13 in 1987-88, and the average harvest increased from 5 to 7 otters/trapper, respectively. The number of trappers dropped to nine again during the reporting period, and the average catch dropped to six. Historic furbearer harvests are shown in Tables 1 and 2. Occasionally, special permits are issued to harvest a few problem beavers during the closed season, primarily to reduce damage to roads.

Harvest Chronology. Tables 3 through 6 provides the harvest chronologies for beavers, marten, otters, and wolverines for the past 5 years. Most marten harvests occurred in December. Otter harvests were heaviest in December and January. Wolverines were harvested throughout the season.

Transport Methods. Marten trappers used boats and highway vehicles for harvesting 40% and 22% of the pelts, respectively. Off-road vehicles (ORV's) and snow machines were also used, and some trappers reported walking from their homes. Trappers used boats to take 53% of the other species and highway vehicles for 29%; aircraft, walking, and snow machines accounted for the remainder.

CONCLUSIONS AND RECOMMENDATIONS

Marten harvests were significantly reduced from those of previous years; otter and beaver harvests were also reduced. Because no data on trapper effort has been collected, the cause for the reduction is not known. Although market prices have a great influence on the effort, there is also the possibility that when initial trapping efforts were unsuccessful many of the less serious trappers abandoned the field. Wolverine harvests were down slightly, but still within the recent harvest range. Generally, furbearer populations seemed capable of supporting the harvests indicated in the population objectives.

The recent high prices paid for marten may have caused localized depletion of readily accessible stocks. I recommend closing the season in Region I on alternate years.

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Table 1. Furbearer harvest in Subunit 1B, 1983-84 to 1988-89.

Year	Beaver	Marten	Mink	Otter	Wolverine
1984-85	4	185[a]	unknown	15	4
1985-86	37	83	unknown	8	4
1986-87	122	149	unknown	9	15
1987-88	21	270	264[b]	50	11
1988-89	21	216	163[b]	6	12

[a] Number of pelts exported by Petersburg and Wrangell residents according to fur export reports; hence, these data are not comparable to other data shown in table which were derived from sealing certificates.

[b] Total number of mink reported on fur export reports and fur acquisition reports for all of Unit 1; hence, the proportion taken in Subunit 1B is unknown.

Table 2. Furbearer harvest in Unit 3, 1983-84 to 1987-88

Year	Beaver	Marten	Mink	Otter	Wolverine
1984-85	52	250	unknown	141	3
1985-86	62	155	unknown	51	5
1986-87	67	100	unknown	45	2
1987-88	123	362	198	97	1
1988-89	36	153	174	53	0

[a] Number of pelts exported by Petersburg and Wrangell residents according to fur export reports; hence these data are not comparable to other data shown in table which were derived from sealing certificates.

Table 3. Harvest chronology for beavers[a] in Subunit 1B and Unit 3, 1984-85 to 1988-89.

Month	1984-85		1985-86		1986-87		1987-88		1988-89	
	1B	3	1B	3	1B	3	1B	3	1B	3
Dec		11	5	7	31	30	6	46	17	50
Jan	1	21		29	8	7	8	30	7	12
Feb		5	10	10	8	7		31	8	15
Mar	1	1	14	6	46	14	1	0	1	2
Apr	2	14	8	8	11	9	6	10	16	5
May			2	1	18			6	0	1
Totals	4	52	39	61	122	67	21	123	49	85

[a] Some beaver were taken by permit in closed season.

Table 4. Harvest chronology for marten in Subunit 1B and Unit 3, 1984-85 to 1988-89.

Month	1984-85		1985-86		1986-87		1987-88		1988-89	
	1B	3	1B	3	1B	3	1B	3	1B	3
Dec	133	135	51	42	110	71	109	219	110	95
Jan	37	69	18	21	37	27	141	133	96	36
Feb	15	46	14	4	2	2	20	10	10	22
Totals	185	250	83	67	149	100	270	362	216	153

Table 5. Harvest chronology for otters in Subunit 1B and Unit 3, 1984-85 to 1988-89.

Month	1984-85		1985-86		1986-87		1987-88		1988-89	
	1B	3	1B	3	1B	3	1B	3	1B	3
Dec	5	61	5	16	5	18	19	41	0	33
Jan	10	62	1	26	3	21	29	51	3	10
Feb	0	14	2	9	1	6	9	5	3	10
Totals	15	136	8	51	9	45	57	97	6	53

Table 6. Harvest chronology for wolverines in Subunit 1B and Unit 3, 1983-84 to 1987-88.

	1984-85		1985-86		1986-87		1987-88		1988-89	
Month	1B	3	1B	3	1B	3	1B	3	1B	3
Nov			1	1						0
Dec	2	2	2	1	4			1	2	
Jan		1		3	4	1	7		3	
Feb	2		1	1	2		1		5	
Mar					2	1	2		1	
Apr					3		1		1	
Totals	4	3	4	6	15	2	11	1	12	0

STUDY AREA

GAME MANAGEMENT UNIT: 1C (7,560 mi^2)

GEOGRAPHICAL DESCRIPTION: The southeast Alaska mainland and the islands of Lynn Canal and Stephens Passage lying between Cape Fanshaw and Eldred Rock, including Sullivan Island and the drainages of Berners Bay

BACKGROUND

Marten, mink, otters, and beavers make up most of the harvest of furbearers in Subunit 1C. Smaller numbers of wolverines and weasels are also taken each year.

Beavers exist at moderate levels in most drainages along the coastal mainland where habitat is suitable. In other units in Southeast clear-cut logging may provide additional temporary habitat for beaver colonization. The natural or human-caused disturbances necessary for providing successional stages conducive to expansion and growth of beaver populations in Subunit 1C have been limited. Historically, Berners Bay produces the largest harvest each year, but the Taku River, Herbert-Eagle River system, Saint James Bay on the Chilkat Peninsula, and Shelter Island also contribute substantially to the total. Few harvests of beavers have been reported from Douglas Island.

River otters are fairly common along the mainland coast and on most larger islands. While little is known about otter populations, they are thought to be most abundant in sheltered bays and inlets. River otter ecology in southern Southeast Alaska has recently been investigated by Larson (1983) and Woolington (1984).

Marten have remained at moderate-to-high levels; the prices offered for their furs and the relative ease of trapping have kept harvest levels high. The sealing program for marten began in 1985, and it has provided valuable harvest data for this economically important furbearer.

Little data is available for mink or wolverines. Because sealing of mink is not required, most information has been anecdotal or derived from fur export and buyer's reports. Wolverines must be presented for sealing, but the number harvested each year has provided little insight into distribution or abundance. Wolverines are generally found inland along the coastal mountains, although elevations from which they are harvested varies with winter weather conditions. While wolverines may be one of the more elusive and uncommon species trapped in the subunit, high pelt prices have provided trapper incentive.

POPULATION OBJECTIVES

To maintain a furbearer population capable of sustaining harvests of 36 beavers, 1 lynx, 245 marten, 34 otters, and 9 wolverines.

METHODS

Mandatory sealing of marten, beavers, otters, wolverines, and lynx and export reports for all furbearers are the primary sources of data on harvests. For each species sealed, method and month of take, transportation means, and trap location were recorded at the time of sealing. Sex and pelt sizes were recorded for otters and lynx, while only pelt sizes were determined for beavers. Sex of the marten harvest was also noted. Trapper interviews provided additional insights into perceived population status and trapping pressure.

RESULTS AND DISCUSSION

Population Status and Trend

Populations of all furbearers were stable or increasing (i.e., beavers). Lynx remained relatively rare, while otters, mink, and marten were moderately abundant.

Beaver harvests dropped dramatically from a record high of 107 in 1986-87 to a record low of five during 1988-89. Although otter harvests declined by approximately 65%, the population did not necessarily decline. Similar declines in harvests of these and other species have been noted statewide and in Canada. While market factors have likely contributed to the declines observed elsewhere, the closure of a substantial portion of the Juneau mainland coast and trail system to trapping in 1987-88 was surely a factor in the depressed harvest in Subunit 1C.

Harvest levels do not always reflect population trends for beavers, otters, or mink. Contrarily, instances of beaver problems (e.g., dammed culverts and streams) have increased in the Juneau area in recent years, suggesting a growing or expanding population.

Mortality

Hunting Seasons and Bag Limits:

Marten, Otter, Mink, Beaver	No Open Season	
Lynx	1 Nov-31 Mar	2 lynx
Wolverine	10 Nov-15 Feb	1 wolverine

Trapping Seasons and Bag Limits:

Marten, Otter, Mink, Lynx	1 Dec-15 Feb	No limit
Beaver	1 Dec-15 May	No limit
Wolverine	10 Nov-30 Apr	No limit

Human-induced Mortality:

The number of beavers harvested declined to only five during the reporting period (Table 1), compared with a 5-year mean of 62. Omitting the peak year of 1986-87 (i.e., when one trapper accounted for 40% of the harvest), the mean harvest from 1983-84 to 1988-89 was 50 beavers, which was 10 times more from that for 1988-89.

At least 2 trappers elected not to pursue beavers or otters in Subunit 1C during the reporting period because of the closure of the Juneau mainland coast and trail system. Only 2 trappers reported harvesting beavers, compared with 10 the previous year. Only two of the 5 beavers were taken from areas open to trapping; the remaining three were taken under special permit after beavers had repeatedly obstructed the culverts draining Auke Lake.

A sharp decline in harvest was also noted for otters; a 10-year high of 55 in 1987-88 was followed by a record low of 19. Males, females, and unknowns accounted for 47%, 42%, and 11% of the harvest, respectively. The number of trappers taking otters (i.e., 8) decreased by nearly 50% from that of the previous year; the average harvest was 2.4 otters/trapper.

Ten wolverines were taken by 5 trappers during the 1988-89 season, up slightly from the eight trapped the previous year. No lynx were taken during the reporting period. The largest marten harvest (314) on record since 1985 occurred in 1987-88. Although the harvest declined to 209 in 1988-89, it was closer to the 5-year mean of 224 (Table 1). Males made up 60% of the harvest, down slightly from the 64% in 1987-88.

Harvest Chronology. Trappers reported taking 1 beaver in January and one in May. The remaining three were harvested in September. The otter harvest was evenly split between December and January; nine were taken in each month, and one was taken in February. Half of the wolverine harvest of five occurred in February, three were taken in January, and one each in December and April.

Table 2 depicts the chronology of the marten harvest. December continued to be the most productive trapping period, when 148 (72%) were harvested. The sex ratio of the December harvest was 61% males:39% females. In January, when 28% of the harvest took place, the sex ratio dropped to 57% males:43% females. No marten were harvested in February.

Transport Methods. Most (80%) otter trappers reported using boats as their primary means of transportation. A similar percentage of the beaver trappers reported using highway vehicles. Wolverine trappers primarily used boats (50%) or highway vehicles (20%). Thirty percent of the wolverine trappers did not report their transport means.

The 5 marten trappers (38%) who used highway vehicles accounted for 48% of the harvest. Six trappers (46%) who used boats accounted for 45% of the take. One trapper who did not report transport means and one that used an aircraft harvested the remaining 7%. Three of the 5 trappers that used the logging roads in the Hobart Bay area accounted for 35% (n = 72) of the harvest. Slightly more than half of their reported harvest (53%, n = 38) was taken in clear-cuts; the remainder (34) were trapped in stands of old-growth timber.

Habitat Assessment

Harvesting has recently been limited in Subunit 1C, excepting the Hobart Bay/Port Houghton areas. Harvest data for marten suggested declining populations in Southeast Alaska where logging activity and associated roading had opened previously inaccessible drainages. On the northeast Chichagof Peninsula, sex ratios of 50:50 or those slightly skewed toward females have been observed, indicating either overharvesting or a population decline. In contrast, the ratio of males:females in the Subunit 1C harvest, including those from the Hobart Bay/Port Houghton areas, have remained at 60:40 or greater. These ratios will probably decline, if continued heavy trapping pressure occurs along road systems in logging areas.

Berners Bay, a productive area for furbearers, is where the Juneau road system will probably extend. Both timber harvest and mining activity are planned in areas lying to the northwest of Echo Cove, the current terminus of the road. Additionally, a renewed effort has recently been mounted to gain public support for a road linking Juneau and Haines. The opening of these areas to vehicle-borne trappers, in conjunction with disturbance from logging and mining, could negatively impact furbearers in those areas.

CONCLUSIONS AND RECOMMENDATIONS

Beaver, otter, and marten harvests dropped substantially during the reporting period; those for beavers and otters reached record lows. Much of this decrease can be attributed to reduced opportunity, resulting from the closure of most of the Juneau coastline, the Douglas Island coastline along the road system, and a 1/2-mile strip centered on many area trails. The closed area accounted for a sizable portion of the pre-1988/89 harvests of otters, beavers, and to a lesser extent, marten.

The antitrapping movement continued to affect market demand for fur products, particularly in Europe. The increased availability of inexpensive farmed fur produced in Asia will also depress fur prices for some species. Lower prices, as well as harassment of trappers by animal rights groups, may serve to decrease the number of active trappers. The substantial drop in harvests noted in Subunit 1C in 1988-89 was accompanied by similar declines throughout Alaska. Reports from outside of Alaska suggested decling harvests were not an isolated event. The province of Alberta reported a 64% decline in beaver harvests, 58% in otter harvests, 53% in marten harvests, and 20% in wolf harvests during the past year (H. Melchior, pers. commun.).

To better interpret the fluctuations in furbearer harvests, trapper effort data is needed; thus far only anecdotal information has been available in Southeast Alaska. Trapper questionnaires have been used in some areas to obtain trapper perceptions of species abundance. A revised questionnaire designed to determine trapper effort will be used statewide in the near future. A pilot questionnaire-harvest calender will go to a sample of Southeast trappers in 1989-90.

Because harvest level fluctuations are produced by factors other than population status, it will continue to be difficult to judge whether the population objectives are being met. Only the harvest level for wolverines was met this year. Nevertheless, the population base necessary to sustain the harvest levels for beavers, marten, and otters existed within the subunit.

Lynx cycles in the Yukon influence lynx numbers in coastal Southeast, at least in the northern reaches of Subunit 1C. Lynx were approaching their cyclic high in both the Yukon Territory and northern British Columbia. We can expect to see some dispersal into the northern portions of the panhandle. This will appear in the 1989-90 or 1990-91 harvests. Because lynx numbers and harvests in Subunit 1C may be dependent on immigration from outside the subunit boundaries, establishment of population objectives or desired harvest levels may not be practical.

Prices paid for marten pelts will probably remain high enough to support continued heavy trapping pressure. We will continue to closely monitor harvest sex ratios, particularly in roaded areas that are the most susceptible to overharvesting. Because most marten are taken early in the season, it is difficult to control harvests by adjusting seasonal lengths. Should control become necessary, bag limits may be instituted or local areas closed. Population objectives previously identified for marten have failed to address harvest sex ratios, and they may need to be modified. I suggest that we maintain a marten population capable of sustaining a harvest of at least 250 with no less than 60% males.

LITERATURE CITED

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Table 1. Furbearer harvests in Subunit 1C, 1983-84 to 1988-89.

Year	Beaver	Lynx	Marten	Otter	Wolverine
1983-84	96	1	193	41	5
1984-85	36	1	245	31	9
1985-86	22	0	128	38	8
1986-87	107	0	241	31	9
1987-88	47	0	314	55	8
1988-89	5	0	209	19	10
Mean	52	<1	222	36	8

Table 2. Chronology of marten harvest by sex in Subunit 1C, 1988-89.

Month	Males		Females	
	n	%	n	%
December	90	60	58	40
January	33	57	25	43
February	0		0	
Unknown Date	1		1	
Total	124	60	84	40

STUDY AREA

GAME MANAGEMENT UNIT: 1D (2,600 mi^2)

GEOGRAPHICAL DESCRIPTION: That portion of the Southeast Alaska mainland lying north of the latitude of Eldred Rock, excluding Sullivan Island and the drainages of Berners Bay

BACKGROUND

Trapping in Subunit 1D may be limited by the relative scarcity of most furbearers. With relatively limited marine shoreline, little otter habitat is available, compared with most other Southeastern areas; hence, otter harvests have been proportionately lower. Harvest data suggest lynx populations have been low for at least the last 4 years. On the other hand, the rugged, mountainous terrain provides extensive wolverine habitat. In recent years, more wolverines have been taken from Subunit 1D than from any other area in Southeast. Beavers remain uncommon in the area, and the season has been closed since 1976; however, local residents have observed more beaver than usual in the Kelsall drainage within the last year.

POPULATION OBJECTIVES

To minimally maintain a population of furbearers capable of sustaining harvests at levels equal to the 1983-84 through 1987-88 averages for all sealed species, excepting lynx: 100 martin, 6 otters, and 9 wolverines.

METHODS

Mandatory sealing of marten, otters, wolverines, and lynx has provided the best source of data on furbearer harvests. For each species, method and month of take and transportation means were recorded. Sex composition of the marten harvest was noted, and habitat information for marten trap locations was collected. Sex and pelt size were determined for otters and lynx. Trapper interviews provided additional insights into perceived population status and trapping pressure.

RESULTS AND DISCUSSION

Population Status and Trend

Based on harvest reports, marten populations were stable. Marten harvests have increased because of improved pelt prices. Viewed alone, harvest levels would have suggested high populations or

excessive harvests; however, the sex ratios from this year's harvest indicated no signs of overharvesting.

Wolverine harvests were up during the reporting period; however, they were still below the 5-year average. Some former wolverine trappers may have been concentrating on marten while prices for those easily caught and prepared species remained high. If marten prices or numbers decline, a return to previous harvest levels for wolverine could be expected.

Lynx were scarce in Subunit 1D. Yukon Territory biologists and trappers have suggested that lynx cycles there will be approaching their apex in the near future. A corresponding increase in lynx numbers and harvests should result. The river otter population was stable.

Mortality

Hunting Seasons and Bag Limits:

Marten, Otter, Mink	No Open Season	
Lynx	1 Nov-31 Mar	2 lynx
Wolverine	10 Nov-15 Feb	1 wolverine

Trapping Seasons and Bag limits:

Marten, Otter, Mink, Lynx	1 Dec-15 Feb	No limit
Wolverine	10 Nov-30 Apr	No limit

Human-induced Mortality:

Seven otter were harvested during the reporting period, compared with the 5-year low of one recorded for 1987-88 (Table 1). Lynx trappers were unsuccessful continuing a 5-year slide from the 1983-84 high of 14. Although wolverines were harvested in larger numbers (i.e., 6) than in the previous year, it was still below the 5-year mean of nine.

Records for marten harvests have only been kept since 1984-85 (Table 1). The harvest for 1988-89 (i.e., 179) was the highest on record, well above the 5-year mean of 109. The percentage of males in the harvest remained high (66%), suggesting a healthy population.

Harvest Chronology. Six of 7 otter harvested in 1988-89 were trapped in January, the remaining one was taken in February. Of six wolverines, one was harvested in December, four in January, and one in February.

More marten than usual (15) were harvested in November (Figure 2), which was also the only month that the sex ratio favored females. Trappers reported taking 83 and 48 marten in

December and January, respectively. Only 2 marten were harvested in February. Harvest data were not obtained for part of the harvest.

In previous years, the marten harvest has remained generally constant during the later part of the season. A late-season decline in the harvest (i.e., January, February) is more characteristic for marten; however, the harvest during the reporting period was notably skewed toward the early season. Although the sex ratio of the harvest was also slightly less dominated by males, it was still indicative of a healthy population.

Transport Methods. Most successful wolverine trappers (83%) reported using snowmachines. The remainder used skis or snowshoes. Otter trappers primarily used snowshoes to reach their trap line (71%), although snowmachines and highway vehicles were also used. Marten transportation data were collected in insufficient quantities for meaningful comparison.

Habitat Assessment

Some marten habitat may be lost as old-growth forests, particularly riparian areas, are converted to clear-cuts. Many of the areas currently scheduled for harvesting, such as those along the upper Chilkat and Klehini Rivers, fall into this category. Most operable timber lands within the Haines State Forest support marten. While impacts to wildlife populations are considered in timber harvest plans, mitigation measures or habitat enhancement opportunities for marten are limited and the old-growth characteristics important for marten will not be reproducible in second-growth forests.

CONCLUSIONS AND RECOMMENDATIONS

Average harvests are at or above the tentative population objectives identified for this area. Marten populations appear strong within Subunit 1D, and no changes in season length or bag limit are recommended. The mandatory sealing of marten, which has allowed close monitoring of catch rates and sex ratios for shifts that may signify declining populations, should be continued.

Otter and wolverine harvests have rebounded to near-average levels, indicating that some trappers have begun to target these species. Several trappers have concentrated primarily on marten for the past few years, as prices for that species have continued to be high.

A questionnaire will be used to measure trapper effort beginning in 1989-90; this information will allow managers to better interpret harvest data. Anecdotal information gained from trappers during the sealing of furs can also provide valuable

information regarding furbearer populations, particularly those species for which sealing is not required. While budgetary concerns forced the elimination of the Division's day-to-day presence in Haines, routine visits during the fur season should be continued so that contacts and dialogue with trappers and sportsman can be maintained.

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Table 1. Furbearer harvests in Subunit 1D, 1983-84 to 1988-89.

Year	Lynx	Marten	Otter	Wolverine
1983-84	14	--[a]	10	18
1984-85	1	166	4	14
1985-86	1	49	5	1
1986-87	1	45	9	9
1987-88	0	108	1	3
1988-89	0	179	7	6
Mean	3	109	6	9

[a] Marten sealing program was begun in 1984.

Table 2. Chronology of marten harvest by sex in Subunit 1D, 1988-89.

Month	Males		Females		Total
	n	%	n	%	
November	7	47	8	53	15
December	59	71	24	29	83
January	27	56	21	44	48
February	2	100	0	0	2
Unknown	24		7		31
Total	119	66	60	34	179

STUDY AREA

GAME MANAGEMENT UNIT: 4 (5,820 mi^2)

GEOGRAPHICAL DESCRIPTION: Admiralty, Baranof, Chichagof, and adjacent islands

BACKGROUND

Furbearer trapping in Unit 4 is pursued as a part-time vocation or as recreation by local and nonlocal residents. Because the area is made up of 5 major islands (Admiralty, Baranof, Chichagof, Kruzof, and Yakobi) that are intersected by numerous bays and fjords, most trappers use boats for access; therefore, the intensity of harvest effort is regulated by the weather. During periods of high winds, trapping effort declines. The use of motorized land vehicles is increasing in areas where logging roads have been constructed. Furbearers occurring in Unit 4 include marten, land otters, mink, short-tailed weasels, red squirrels, and beavers. Sea otters, which also occur in Unit 4, are regulated by federal statute under the Marine Mammal Protection Act.

POPULATION OBJECTIVES

To provide for sustained annual harvests of 14 beavers and 1,355 marten.

METHODS

Trappers are required to submit the hides, including otters and marten, of some species for examination and sealing. In addition to ADF&G and Public Safety personnel who seal furs, there are appointed sealers located in Hoonah and Tenakee who are paid $1 for each fur sealed. To comply with state (5 AAC 92.170) and federal regulations (Convention on International Trade in Endangered Species of Wild Fauna and Flora [CITES]), wolf, otter, and lynx hides must be tagged with a dated, numbered CITES seal. Trappers are interviewed at the time of sealing to determine harvest methods (i.e., trap, snare, or firearm), transport means, and month and location of catch. The 20 most active trappers were provided with waterproof record books to help document capture dates and locations.

Sex is recorded for marten and otters, while pelt widths and lengths are recorded for otters and beavers. Otter pelts are easily sexed by the presence of the preputial orifice found in males. Marten are roughly sorted to sex by the larger size of the male pelts (Strickland and Douglas 1987). After sorting, the presence of a preputial orifice and/or the direction of the growth of the underfur at the posterior end of the abdominal

gland is used to verify sex; in females it grows in a posterior direction, while in males the fur grows in an anterior direction at the site of the penile opening (Lensink 1953).

RESULTS AND DISCUSSION

Population Status and Trend

Population data for marten were not collected. Although Strickland and Douglas (1987) observed that regulated trapping does not appear to limit populations, except in years of reproductive failure, they did not qualify "regulated." Marten populations are controlled by environmental factors (e.g., abundance and availability of prey) that are reflected in fecundity and mortality (Hawley and Newby 1957, Weckswerth and Hawley 1962). Also, overtrapping of marten on road systems may be a problem in Southeast Alaska.

Mink occur throughout Unit 4. Although no census techniques have been employed, the populations are thought to be stable. Land otters also occur throughout Unit 4. No census data were available, but populations were stable.

Beaver populations on Admiralty Island were stable. Beavers occurred in low numbers on Baranof Island. The season was closed on Chichagof Island, but beavers again caused road-flooding problems for the U.S. Forest Service during the reporting period, indicating that populations may be increasing.

Population Composition:

Of the 930 marten furs submitted for sealing, the sex of 794 was identified. Of these, 510 (64%) were males and 284 (36%) were females. The sex ratio of marten at birth is approximately 50:50 (Strickland and Douglas 1987). Male marten are more vulnerable to trapping, and two to three times as many males as females are usually taken by trappers (Soukkala 1983). Yeager (1950) suggested that this is attributable to males' larger foraging areas that increase the chance of encountering traps. When food is abundant, more females survive and reproduction is high, but females and young are more vulnerable to starvation because of high energy demands (Hawley and Newby 1957).

Of the 117 otters sealed, 57 (49%) were males, 59 (51%) were femalesm and one was not sexed. Males have dominated the harvest since 1984 (Table 1). While a preponderance of males in trappers' bags has been attributed to increased male vulnerability because of larger home ranges and more mobility than females (Melquist and Hornocker 1983), it is possible that harvest techniques in Southeast Alaska (i.e., shooting otters from boats) tends to sample the sexes more evenly.

Mortality

Hunting Seasons and Bag Limits:

No open season

Trapping Seasons and Bag Limits:

Beaver, east of Chatham Strait	1 Dec-15 May	No limit
Beaver, west of Chatham Strait	No open season	
Land Otter	1 Dec-15 Feb	No limit
Marten	1 Dec-15 Feb	No limit
Mink	1 Dec-15 Feb	No limit

Human-induced Mortality:

A total of 930 marten were reported trapped during the 1988-89 season (Table 1), a decrease of 27% from the 1987-88 harvest of 1,279 and similar to the 1986-87 harvest of 957. Johnson (1988) speculated that minimal snow fall during trapping seasons may reduce success; however, the winter of 1988-89 had significant snow accumulations, and marten harvest declined from that of the previous mild year (1987-88).

Records indicated that 571 marten (62%) came from Chichagof, 205 (22%) from Baranof, 126 (14%) from Admiralty, and 13 (1%) from Kruzof Island, compared with the 56%, 27%, 14%, and 3% that were harvested the preceding year, respectively (Table 2). Fur export reports indicated that 474 marten hides (51% of the sealed furs) were exported from Unit 4 (B. Strauch pers. commun.), compared with 465 in 1987-88.

Although sealing records were examined to determine the number of marten trapped on the Hoonah road system, many locations were not specific. Usable data showed that 207 marten (36% of the Chichagof total) were harvested on the Hoonah Peninsula in 1988-89, compared with 318 (44%) in 1987-88. Sealing records indicated that the marten population on the Hoonah Peninsula was declining.

According to sealing records, 119 otters were taken in Unit 4 during the 1988-89 season, representing a decline from the record-high harvest (186) of the previous season (Table 1). Baranof and Chichagof Island trappers harvested 57 and 52 otters, respectively (Table 2). Two otters were taken on the Hoonah Peninsula in 1988-89, compared with zero in 1987-88 (Table 3). The decline of the otter harvest was caused by the overtrapping that resulted from increased road access. A total of 60 (50% of total) otters were exported.

Trappers were not required to seal mink pelts, but fur export reports indicated that 568 mink pelts were exported from Unit 4

(B. Strauch, pers. commun.), compared with 417 in 1987-88. Assuming that the 51% report rate for marten exports is similar for mink, an estimated 1,114 mink were harvested in 1988-89.

Trappers took 5 beavers on Admiralty Island in 1988-89, compared with four during the previous season (Table 7). Beaver trapping was prohibited west of Chatham Strait.

Trapper Residency and Success. During the 1988-89 season, 51 trappers reported catching marten; 34 were residents of the unit. In 1987-88, there were 70 marten trappers reporting; 50 of these (71%) listed residency addresses in Unit 4 (Table 4). Of the 18 otter trappers in Unit 4, 12 (67%) were local residents. In 1987-88, 18 of 27 (18%) otter trappers reported residing in Unit 4 (Table 4).

Harvest Chronology. The most effective marten trapping month was December, when a total of 670 (81%) were taken. The month of catch was unreported in 11% of the sealing records (Table 5). Sixty-three (56%) otters were taken in December and 49 (38%) in January (Table 5). Three of the 5 beavers were trapped in December; two were trapped in April.

Transport. An overwhelming majority of otter trappers used boats (Table 6); and although the means of transport was not collected for other furbearer trappers, boats were the most common transportation means in Southeast Alaska.

Distribution and Movements:

Marten are found on the major islands of Unit 4, and they may have been endemic to Admiralty Island. Marten have been observed swimming in Stephens Passage, which separates Admiralty from the mainland (L. Johnson, pers. commun.). There are no records of marten occurring west of Chatham Strait, which forms the western boundary of Admiralty Island. Marten were introduced on Baranof and Chichagof Islands (Burris and McKnight 1973); the seven introduced on Baranof Island in 1934 are assumed to be the source of the current populations. Records indicate that a total of 21 marten were introduced to Chichagof Island beginning with 6 marten in 1949, one in 1950, nine in 1951, and five in 1952. Although Burris and McKnight (1973) stated that these transplants were of questionable economic value, prices for marten hides have increased dramatically in the 1980's, and the species has provided recreation as well as supplemental income for many residents of Baranof and Chichagof Islands.

Beavers occur on Admiralty, Baranof, and Chichagof Islands. Their distribution prior to statehood was not well documented. A transplant of 10 beavers to Goddard Hot Springs on Baranof Island occurred in 1927, and beavers are still found in the area; there is no record of a transplant to Chichagof Island, although a beaver transplant was planned (ibid).

CONCLUSIONS AND RECOMMENDATIONS

The beaver harvest was low during the reporting period. The harvest objective for beaver (14) will not be consistently met unless the season is opened on Chichagof Island. Timber harvest in valley bottoms on portions of Chichagof Island have produced an initial influx of deciduous plants and forbs that may be creating acceptable beaver habitat. A survey of Chichagof Island is needed to determine the current extent of the beaver populations. If populations are found to be at an appropriate level, a conservative season could be implemented. A bag limit may be necessary to prevent overharvesting.

Marten populations in local areas may decrease because of continued trapping pressure. Areas such as the Hoonah road system on Chichagof Island should be monitored to insure that populations are not overharvested. Logging-road access and high fur prices could combine to eliminate natural refugia and reduce interior marten stocks that normally repopulate heavily trapped coastal populations. Shortening the season may have little effect on the marten take, and a season closure or bag limit would be more effective. Season closures would necessarily include mink and otters as well, since incidental catches of marten by mink and otter trappers are common.

Clear-cut logging of old-growth timber in Southeast Alaska is detrimental to marten populations. Marten are found in greatest numbers in mature coniferous forests (Northcott 1977). While marten in drier climates use logging slash as feeding areas in winter, the high moisture content of snow in Southeast Alaska may inhibit use of logging debris for this purpose. Northcott (1977) suggested that some logging practices in Canada (e.g., small clear-cuts) may be compatible with marten habitat needs, but there is no evidence of this in Unit 4.

Acknowledgements

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Table 1. Reported marten and otter harvest data in Unit 4, 1984-85 to 1988-89.

Season	M	F	U	Total
Marten				
1984-85	894	466	1	1,361
1985-86	680	532	110	1,322
1986-87	537	375	45	957
1987-88	700	503	76	1,279
1988-89	510	284	136	930
Otter				
1984-85	89	73	5	167
1985-86	71	71	0	142
1986-87	82	79	0	161
1987-88	105	79	2	186
1988-89	57	59	3	119

Table 2. Marten and otter harvests in Unit 4 (by island), 1984-85 through 1988-89 seasons.

Season	Admiralty	Baranof	Chichagof	Baranof/ Chichagof[a]	Kruzof	Yakobi	Unknown	Total
Marten								
1984-85	119	215	840	147	2	38	0	1,361
1985-86	55	177	937	139	14	0	0	1,322
1986-87	188	166	433	144	26	0	0	957
1987-88	173	339	721	0	46	0	0	1,279
1988-89	126	205	571	0	13	0	15	930
Otter								
1984-85	28	92	41	0	1	3	2	167
1985-86	31	28	84	0	1	0	0	144
1986-87	49	47	25	17	1	0	22	161
1987-88	16	99	49	18	4	0	0	186
1988-89	5	57	52	0	5	0	0	119

[a] Location not specific.

Table 3. Marten and otter harvests on Hoonah Peninsula and Chichagof Island, 1984-85 to 1988-89.

	Marten			Otter			
Season	Males	Females	Total	Males	Females	Unk	Total
1984-85	162	119	281	3	2	2	7
1985-86	96	103	199	6	7	0	13
1986-87	84	58	142	6	4	0	10
1987-88	159	159	318	0	0	0	0
1988-89	117	89	207[a]	1	0	1	2

[a] Includes 1 sex unknown marten.

Table 4. Trapper residency and success in Unit 4, 1984-85 to 1988-89.

	Successful			
Season	Local Residents[a]	Nonlocal Residents	Nonresidents	Total
Marten				
1984-85	48	20	0	68
1985-86	37	12	0	49
1986-87	39	18	0	57
1987-88	50	20	0	70
1988-89	34	17	0	51
Otter				
1984-85	26	10	0	36
1985-86	23	8	0	31
1986-87	19	10	0	29
1987-88	18	9	0	27
1988-89	12	6	0	18

[a] Residents of Unit 4.

Table 5. Marten and otter harvest chronology in Unit 4, 1984-85 to 1988-89.

Season	December	January	February	Seasonwide	Total
Marten					
1984-85	702	236	54	369	1,361
1985-86	470	64	6	782	1,322
1986-87	510	117	22	308	957
1987-88	722	278	77	202	1,279
1988-89	670	124	35	101	930
Otter					
1984-85	64	58	33	12	167
1985-86	26	13	14	91	144
1986-87	41	56	11	53	161
1987-88	84	57	45	0	186
1988-89	63	49	6	0	119[a]

[a] Includes 1 otter taken in November.

Table 6. Successful trapper transport methods for otter only in Unit 4, 1984-85 to 1988-89.[a]

Season	Airplane	Boat	Highway vehicle	Walked	Transport unknown	Total
Otter						
1984-85[b]	--	--	--	--	--	--
1985-86	2	118	2	3	19[c]	144
1986-87	3	150	2	6	0	161
1987-88	3	176	3	4	0	186
1988-89	2	112	3	0	2	119

[a] No transport methods information required when marten sealing program begun 1984-85 season.
[b] Transport methods information for otter not required until 1985-86 season.
[c] Some sealers did not use revised forms when transport information requirement added.

Table 7. Furbearer harvest in Unit 4, 1984-85 to 1988-89 seasons.[a]

Season	Beaver	Mink	Marten	Otter
1984-85	14	123	1,361	167
1985-86	4	210	1,322	144
1986-87	5	505	957	161
1987-88	4	417	1,279	186
1988-89	5	568	930	119

[a] Data in tables may differ from previous reports because of late submission of certificates. Beaver, marten, and otter data are based on sealing certificates; mink numbers are from fur export reports and represent only a portion of the total.

STUDY AREA

GAME MANAGEMENT UNIT: 5 (5,770 mi^2)

GEOGRAPHICAL DESCRIPTION: Cape Fairweather to Icy Bay, eastern gulf coast

BACKGROUND

Furbearing species probably gained access to the Yakutat Forelands via the Alsek/Tatshenshini corridor (Klein 1965). Beavers, land otters, and mink are the common water-associated species; muskrats are noticeably absent. Lynx are present in small numbers, while marten are found in fair abundance. Wolverines occur in sparse distribution, which is common throughout their range. Trapping pressures have historically been light throughout the Malaspina and Yakutat Forelands.

POPULATION OBJECTIVES

To maintain furbearer populations capable of sustaining harvests at the 1983-84 to 1986-87 average levels as follows: 3 beavers, 1 lynx, 44 marten, 2 otters, and 2 wolverines.

METHODS

Furbearer hides were sealed by Fish and Wildlife Protection and Commercial Fisheries Division staff in Yakutat and Wildlife Conservation Division staff in Douglas. Hunters and trappers were queried on any observations they might have made while in the field.

RESULTS AND DISCUSSION

Three beavers, 10 lynx, and 17 marten were sealed from Unit 5 in 1988-89 (Table 1). No otters or wolverines were taken during the year.

Population Status and Trend

Population Size:

Incidental observations made while in the field suggested that the number of beavers may be increasing somewhat across the Yakutat Forelands. Dams and lodges both seemed to be on the increase. Lynx numbers have apparently increased following a recent surge in hare abundance. Little is known of marten abundance. Recent construction of logging roads has provided easy access to old-growth forest; i.e., prime marten habitat.

Land otters are more common in Subunit 5A than their harvest level indicates. The relatively low trapping effort in the unit probably accounts for the low incidence in harvest records. As with other furbearers, no population estimates exist for wolverines. It is believed that they occur in small numbers, generally away from town, the road system, and commercial fishing camps.

Mortality

Hunting Seasons and Bag Limits:

Beaver	No open season	
Coyote	1 Sept-30 Apr	2 coyotes
Fox, Red	1 Nov-15 Feb	2 foxes
Lynx	1 Nov-31 Mar	2 lynx
Marten, Mink, and Weasel	No open season	
Otter, Land	No open season	
Wolverine	10 Nov-15 Feb	1 wolverine

Trapping Seasons and Bag Limits:

Beaver	10 Nov-15 May	No limit
Coyote	1 Dec-15 Feb	No limit
Fox, Red	1 Dec-15 Feb	No limit
Lynx	1 Dec-15 Feb	No limit
Marten, Mink, and Weasel	1 Dec-15 Feb	No limit
Otter, Land	10 Nov-15 Feb	No limit
Wolverine	10 Nov-30 Apr	No limit

Human-induced Mortality:

Table 1 shows the recent 5-year harvest of furbearers. The beaver harvest remained at a low level in Unit 5. The lynx harvest has increased from a total of five for the period 1983-84 to 1987-88 to 10 in 1988-89. The increased harvest may be due, in part, to increased trapper effort. The marten harvest decreased substantially in Unit 5 in 1988-89; i.e., 17, compared with 111 in 1987-88. This decline is probably indicative of trapping pressure only, although expanded logging close to Forest Highway 10 may be having an effect on the quality of marten habitat. No otters or wolverines were taken during the 1988-89 season.

Trapper Residency and Success. One, 3, and 4 trappers were successful in harvesting beavers, marten, and lynx, respectively. All successful trappers were residents of Yakutat, except the one beaver trapper, who was a resident of Juneau.

Harvest Chronology. Furbearers were taken in the following months: beaver, May; lynx, November (1), December (9); and marten, November (10), December (6).

Transport Methods. The 1 beaver trapper travelled by aircraft. Lynx trappers used aircraft, highway vehicles, and snowshoes. Marten trappers used aircraft and highway vehicles.

Habitat Assessment

No comprehensive assessment of marten habitat in the spruce/hemlock forest of the Yakutat or Malaspina Forelands has ever been undertaken; however, in Subunit 5A clear-cut logging is going on at such a rate that some marten habitat has undoubtedly been lost. The degree of loss is unknown.

CONCLUSIONS AND RECOMMENDATIONS

Harvest efforts were within sustainable limits, with the possible exception of marten because of the impact of logging and the associated road construction occurring in Subunit 5A. Should Forest Highway 10 be extended beyond the Dangerous River, previous unexploited furbearer habitat will become very accessible. Any development of unexploited habitat should be evaluated for deleterious effects on furbearer habitat.

Lynx numbers are approaching record-high levels, based on harvest information. This is undoubtedly in response to increased hare populations in Yakutat and the southern Yukon Territory; it will be a short-lived phenomenon, and the population as both prey and predators will decline in the near future. While the low harvests of marten and otters fell below the population objectives for these species, they may only reflect low trapper effort, rather than declining populations.

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Table 1. Furbearer harvests[a] in Unit 5, 1984-85 to 1988-89.

Year	Beaver	Lynx	Marten	Mink	Otter	Weasel	Wolverine
1984-85	1	0	63	58	1	7	2
1985-86	6	2	0	NA	2	NA	0
1986-87	8	0	38	NA	2	NA	2
1987-88	7	0	111	NA	1	NA	1
1988-89	3	10	17	NA	0	NA	0

[a] Data from sealing certificates, trapper interview, trapper export reports, and Survey and Inventory Progress Reports. Data on nonsealed species should be considered low estimates.

Table 2. Marten harvest by sex and month[a] in Unit 5, 1988-89.

Month	Males N	Males %	Females N	Females %	Totals N	Totals %
November	7	(44)	3	(19)	10	(63)
December	5	(31)	1	(6)	6	(37)
Totals	12	(75)	4	(25)	16	(100)

[a] One additional marten was taken illegally in October.

STUDY AREA

GAME MANAGEMENT UNIT: 6 (10,140 mi^2)

GEOGRAPHICAL DESCRIPTION: Prince William Sound and north Gulf Coast

BACKGROUND

The distribution and density of beavers favor the abundant freshwater habitats of Subunits 6A, 6B, and 6C. Densities were high on the coastal deltas of the Copper and Bering Rivers between 1931 and 1954, but they have been reduced by hunting and trapping (ADF&G files). Clarence Rhode (ADF&G files) reported a beaver harvest of 700 from these deltas in 1938; harvests declined to a low of 27 in 1951, but they increased again to slightly more than 300 in 1960 and 1963. During the last 20 years beaver harvests have fluctuated between a high of 244 in 1979-80 and a low of three in 1981-82. Responses from the trapper questionnaire distributed after the 1987-88 season indicated beavers were abundant and stable.

Heller (1910) reported sighting beavers in the Rude River drainage of Prince William Sound (PWS), but he apparently found no evidence of them on the islands of PWS. In 1976 J. Reynolds (ADF&G files) solicited distribution information from long-time local trappers and determined that beaver occurred on Hawkins and Hinchinbrook Islands and the Rude River, Simpson Bay, and Gravina River drainages. Beaver harvests have been monitored by a mandatory sealing requirement since 1927 (Courtright 1968).

Coyotes are relatively newcomers to Unit 6. Heller (1910) failed to acknowledge their presence in or near PWS during his 1908 expedition. Campbell and Griese (1987) indicated that coyotes replaced red fox as the dominant canid on the Copper River Delta. Fred Robards (ADF&G files) suggested that 1938 may have represented the year that coyotes became established as the dominant canid. Coyotes have since become significant predators of dusky Canada geese on the Copper River Delta (Campbell and Griese 1987). Unit 6 trappers indicated that coyotes were common and stable during the 1987-88 season; however, they suggested that wolves were on their way to replacing coyotes as the dominant canid in eastern Unit 6 (ADF&G files). Harvest of coyotes was monitored in part through bounty records between 1960 and 1969 (Courtright 1968), but infrequent trapper questionnaires, export reports, and fur acquisition reports have been used since 1969 (Griese 1988b).

Red foxes, while locally common in the early 1900's, have become scarce because of displacement by coyotes. The last substantial harvest was 6 foxes reported during 1972 in Subunit 6C (Griese 1988[b]). While Unit 6 trappers reported fox as "scarce" during the 1987-88 season (ADF&G files), they may actually be either

rare or extirpated. The red fox harvest was monitored through trapper questionnaires, interviews, export reports, and fur dealer acquisition reports (ADF&G files).

Otto Koppen (1949, ADF&G files) indicated that lynx had always been scarce in Unit 6. The harvest of lynx seldom reached three between 1969 and 1986, and peaks in harvest were generally devoid of juveniles and coincided with population crashes in adjacent interior populations. This pattern suggests that Unit 6 serves as a refugia for lynx (Griese 1988[b]). Unit 6 trappers reported that the 1987-88 lynx population remained at a "scarce" level (ADF&G files). The lynx harvest has been monitored by the mandatory sealing process since 1978 and by interviews, questionnaires, export reports, and fur dealer acquisition reports prior to sealing (ADF&G files).

Otto Koppen (1949, ADF&G files) summarized the status of marten in Unit 6 as "scattered." The highest densities of marten occurred between Cape Suckling and Cape Yakataga; PWS and the Copper and Bering River deltas were frequently subjected to excessive trapping, resulting in generally low numbers. Marten populations increased during the 1980's, except in the heavily trapped areas near Valdez and Cordova (Griese 1988b). Trappers in Unit 6 indicated marten were "common" and stable during 1987-88 (ADF&G files).

Marten from an unknown mainland location were transplanted to Kayak Island during the 1940's (Burris and McKnight 1973; E. King, pers. commun.), resulting in an abundant population as early as 1978 (W. Cunningham, ADF&G files). The pelt color of this population was reported as undesirable. Marten harvests have been followed in the same manner as red foxes, mink, and muskrats.

Observations of mink populations between 1931 and 1955 (ADF&G files) suggested that mink had the potential of being numerous in Unit 6 but were infrequently subjected to excessive harvest with subsequent seasonal closures. During the 1980's trapping effort declined because of unfavorable fur prices; mink numbers then increased throughout the unit (L. Kritchen, pers. commun.). Trappers reported that mink were "common" during the 1987-88 season in Unit 6 (ADF&G files).

Twenty-four domestic mink from Petersburg were released on Montague Island during 1951 (Burris and McKnight 1973). Although mink became abundant, pelt characteristics were inferior. The mink harvest was monitored through trapper questionnaires, interviews, export reports, and fur dealer acquisition reports.

Muskrats occur in Unit 6 east of PWS. Heller (1910) made no mention of muskrats in PWS during his 1908 expedition, and J. Reynolds (ADF&G files) indicated that knowledgeable trappers confirmed the absence of muskrats from PWS in 1976. Muskrats were plentiful on the Copper River Delta in the early 1930's

(G. Nelson, ADF&G files); however, by 1935 winter icing and overflows reduced their numbers. In 1948 O. Koppen (ADF&G files) reported that coyotes and other predators were also responsible for depressed muskrat numbers on the Copper River Delta. By 1955 the muskrat population had recovered (F. Robards, ADF&G files), although they were not being trapped because of their low pelt value. Muskrats have been "infrequently and locally common" on the Copper River Delta since the 1964 earthquake (Griese 1988[a]). Trappers reported muskrats were "scarce" during the 1987-88 season in Unit 6 (ADF&G files). The muskrat harvest was monitored through trapper questionnaires, interviews, export reports, and fur dealer acquisition reports.

Heller (1910) reported that land otters were the most common carnivore in PWS. Trapping and hunting with dogs reduced them to low levels during the early 1930's (G. Nelson, ADF&G files). Otto Koppen (ADF&G files) suggested a population recovery had occurred during the 1940's, and F. Robards (ADF&G files) suggested they had become plentiful throughout the unit by 1951. Griese (1988[b]) indicated an increasing trend in trapper success and effort between 1982 and 1986. Trappers in the unit indicated that otters were common and stable during the 1987-88 season (ADF&G files).

Since 1978 the harvest of land otters has been monitored by mandatory sealing requirements. Previously, they had been monitored by questionnaires, interviews, export reports, and fur dealer acquisition reports (ADF&G files).

In the late 1930's in Unit 6, wolverines were plentiful and a nuisance (G. Nelson, ADF&G files). While poisons were banned in the late 1930's, a bounty was placed on wolverines in 1954 that caused "undue pressure" on their numbers (F. Robards, ADF&G files), increasing the harvest "5-fold." The bounty was removed in 1969, and by 1971 trappers and hunters were required to seal all harvested wolverines. A peak in the wolverine harvests between 1972 and 1978 reflected improved trapper access and increased effort, but it may also have reflected a population peak (Griese 1988[b]). Wolverine populations increased again during the 1980's because of reduced trapping pressures. In 1987-88 wolverines were relatively scarce in some areas of Unit 6 (ADF&G files).

POPULATION OBJECTIVES

To provide optimum harvests and maximum opportunities to participate in the hunting and trapping of furbearers (Rausch 1977).

METHODS

Trappers or hunters who harvested beavers, land otters, lynx, or wolverines were required to present their hides for sealing. Location and date of harvest, method of take, transportation, sex, and length and width of pelt were recorded for each animal at the time of sealing. While an annual trapper questionnaire was initiated in 1988, the Exxon Valdez oil spill on 25 March 1989 precluded its reissuance the following year (i.e., the 1988-89 reporting period).

During October and November 1988 a systematic survey for beaver caches was conducted on the Copper River Delta (178.5 mi^2) to assess relative status of the beaver population. Following leaf fall, aerial surveys were flown on 12 to 18 randomly selected 1- to 1.5-mi^2 plots that represented roughly 25% of (1) high-density uplifted marsh (pre-1964 tidal zone), (2) moderate-density alluvial shrubland, and (3) low-density upland glacial/forested wetlands. A PA-18 Supercub was used. While an attempt was made to enumerate lodges as well as fresh caches, visibility of lodges proved to be too difficult to validate lodge densities. Mean densities and 95% confidence intervals of active beaver caches were obtained for each stratum; they were then projected for the remainder of the sample area to produce a total cache density with 95% confidence intervals.

RESULTS AND DISCUSSION

Population Size, Status, and Trend

Assuming that each active beaver cache observed in 1988 represented a family (Murray 1961, Bergerud and Miller 1977), the Copper River Delta and associated uplands harbored 440 $\pm$ 170 (95% CI) families at an overall density of 2.46/ mi^2. Mean densities observed in individual stratum were as follows: (1) low-density upland glacial forested (0.3 $\pm$ 0.6/mi^2), (2) moderate-density alluvial shrubland (2.3 $\pm$ 1.1/mi^2), and (3) high-density uplifted marsh (3.9 $\pm$ 1.1/mi^2).

Assuming further that each cache represented 3 to 8 members (Novak 1987), the area supported between 800 and 4,900 beaver. However, by multiplying 5.5 (i.e., a mid-range family size) by 440 (i.e., the estimated mean number of caches), a total estimate of 2,420 beaver is produced. Incidental observations since the 1988 survey suggested that the beaver population on the Copper River Delta was increasing.

Coyotes seemed stable at estimated densities of 1.0-0.1 coyotes/mi^2 in suitable habitat. The red fox population remained in a "remnant" status, with only 1 unconfirmed sighting of tracks in Subunit 6A. Lynx have never been abundant. The population is believed to be at a mid-level density range, having declined from a peak in 1987.

Marten were at moderate densities; there were low-density localized areas near human communities. Marten numbers appeared to have remained stable. Marten on Kayak Island remained at high densities.

In general, mink were at moderate densities and appeared to be increasing slightly because of reduced trapping pressure. The exception to the general status and trend is expected to have occurred in the wake of the Exxon Valdez oil spill. The heavy oiling of the marine tidal zones utilized heavily by mink in PWS are expected to result in immediate and long-term adverse impacts to 30-40% of mink in PWS.

Although the muskrat population on the Copper River Delta was generally at low densities, it also appeared to be increasing in small areas. Land otters were at moderate densities and appeared to be stable or increasing. The impact of the oil spilled by the grounding of the T/V Exxon Valdez is expected to produce immediate and long-term adverse impacts to 30-40% of the land otter population in PWS.

Wolverine numbers were at low-to-moderate levels. The population is slowly increasing because of reduced trapping pressure outside of the Cordova and Valdez areas. The increase in the number of predators and moose, as well as a more severe winter than normal, in 1988-89 promoted the increased availability of food.

Mortality

Hunting Seasons and Bag Limits:

Beaver, marten, mink, muskrat, lynx and land otter	No open season	
Coyote		
Subunits 6B and 6C	1 Jul-30 Jun	No bag limit
Remainder of Unit 6	1 Sep-30 Apr	2 coyotes
Red fox	1 Nov-15 Feb	2 foxes
Wolverine	1 Sep-31 Mar	1 wolverine

Trapping Seasons and Bag Limits:

Beaver	1 Feb-31 Mar	20 beavers
Coyote		
Subunit 6C, that portion south of the Copper River Highway and east of the Heney Range	10 Nov-30 Apr	No limit
Remainder of Unit 6	10 Nov-31 Mar	No limit
Red fox	10 Nov-28 Feb	No limit
Lynx	No open season	
Marten	10 Nov-31 Jan	No limit

Mink and weasels	10 Nov-31 Jan	No limit
Muskrat	10 Nov-10 Jun	No limit
Land otter	10 Nov-31 Mar	No limit
Wolverine	10 Nov-28 Feb	No limit

Human-induced Mortality:

The harvest of 2 beaver was unquestionably the lowest historical harvest in Unit 6. In the most recent 5-year period, the mean annual harvest was 46 beaver; 98% came from Subunits 6C and 6B in the Copper River Delta (Table 1). Considering the current estimate of beavers in Subunit 6C, harvest levels for the past 5 years have been very low. Prior to reduced season lengths during 1988-89, less than 10% of beaver harvest occurred after 31 March. The destruction of beaver and their structures by the Department of Transportation to prevent damage to highways and runways has been relatively high.

A maximum of 20 coyotes were harvested in Unit 6 during 1988-89, compared with the 20 coyotes for 1987-88. Griese (1988[b]) estimated 10 coyotes were taken during the 1986-87 season. Serious hunting and trapping efforts have not occurred on the Copper River Delta, despite the most liberal season, bag limit, and methods and means of harvesting coyotes that has ever been allowed in Alaska.

Trappers and hunters have not reported the harvest of a single fox in Unit 6 in over 10 years. The closure of the hunting and trapping seasons for lynx on 30 November 1987 remained in effect through the 1988-89 season. No lynx were reported trapped in Unit 6. Prior to the closure, lynx harvest had peaked at seven during 1986-87 (Table 2). Before the closures, Subunits 6A and 6C had accounted for most of the harvest.

Fur acquisition reports indicated a minimum of 35 martens were harvested in Unit 6, primarily from Subunit 6A. During 1987-88 responses to the trappers questionnaire indicated a minimum of 120 martens were taken (80% from Subunit 6A); 90 martens were reported in the fur acquisition reports for the same period. Griese (1988[b]) reported that a minimum of 49 martens were taken during 1986-87.

At least 9 mink were harvested during 1988-89, according to responses from fur acquisition reports; this number is thought to be a fraction of the true harvest. Responses to fur acquisition reports indicated 76 and 81 mink harvested during 1987-88 and 1986-87, respectively. Responses to the trapper questionnaire indicated a minimum of 72 mink were harvested during 1987-88, less than those reported as acquired by fur dealers. Griese (1988[b]) estimated that no more than half of the mink harvest was reported in export or fur acquisition reports. The immediate and long-term loss of mink in PWS to the Exxon Valdez oil spill may never be known because of the secretive nature of mink when ill; however, the loss is expected to be high.

No muskrats were reported taken through the formal reporting methods. The harvest was about 10 or 20 during 1988-89. Responses to the trapper questionnaire indicated a minimum of 9 muskrats harvested during the 1987-88 season. Muskrat harvests probably have peaked in the last 2 years.

Trappers sealed 62 otters and reported an additional 12 as live-trapped for export during 1988-89. In the previous 2 years a substantial decline in harvest was indicated (Table 3), primarily because of the absence of an individual trappers who concentrated on them. One individual trapped 100 and 114 otters in Subunit 6D during 1986-87 and 1987-88, respectively. The trapper harvesting live otters for export captured 12 in successive years, all from Subunit 6C (Table 3). The loss of land otters in PWS caused by the Exxon Valdez oil spill may never be quantified; however, both immediate and long-term losses are expected to be significant.

During 1988-89, trappers sealed 11 wolverine: 5 males, 5 females, and 1 unknown (Table 4). Over the past 5 years, harvests have been fairly evenly distributed among subunits. Sixty percent of the known harvest was composed of males (Table 4). The mean annual harvest of wolverine during the last 5 years was 10.6.

Conditions Affecting Trapping. Weather during the trapping seasons in Unit 6 was dominated by a high-pressure system over the Interior. During November and early December rain and snow fell; by late December from 15 to 30 inches of snow had accumulated. The remainder of the trapping season was dry, reaching record-cold temperatures. Some trappers complained of frozen traps and their inexperience at trapping beaver through the thicker-than-normal ice. Fur prices remained low, except for mink, martens, and live-trapped land otters.

Game Board Actions and Emergency Orders

Beginning in the 1987-88 season, substantial changes in furbearer trapping and hunting regulations were undertaken by the Board of Game. In many cases the reason for changes was to produce uniform regulations between adjoining units. At the recommendation of the Department, the Board adopted a "uniform" season and bag limit for beavers, reducing season length by 45 days, but increasing the bag limit to 20 beavers in Subunit 6C.

The coyote season and bag limit for hunting and trapping were liberalized for Subunits 6B and 6C so that predation rates by coyote on dusky Canada geese could be reduced. The trapping season south of the Copper River Highway was extended 30 days, while the hunting season was opened year round; there was no limit, and spotlighting was prohibited.

The Board extended the red fox trapping season by 31 days at the recommendation of the Department to promote uniform seasons.

Lynx trapping and hunting seasons were closed by Emergency Order on November 1987. The Board subsequently adopted a more lasting closure. Unit 6 regulations were modified to follow the adjacent interior units.

The marten season was reduced by 28 days to retain uniformity and pelt primeness, while the land otter season was extended 20 days for purposes of uniformity, but with little regard for pelt primeness. The changes were made at the recommendation of the Department.

The Board adopted a 31-day reduction in the wolverine trapping season and extended the hunting season for wolverines by 115 days. While the Department expressed concern for wolverine populations, it recommended both of these changes.

CONCLUSIONS AND RECOMMENDATIONS

Further investigations of the literature and analyses of data are necessary before proposing specific population objectives, and the objectives will be forwarded to the next (1989-90) reporting period. Hunting and trapping season lengths and bag limits should be based upon biologically sound justifications. Regardless of how insignificant populations within Unit 6 may seem, the human population expects regulatory decisions to be based upon unit data. In that regard, the beaver season and bag limit could be liberalized extensively with little impact on the current population of beavers along the Copper River Highway. I recommend a trapping season of 1 February to 15 May and a bag limit of 40 beavers for Subunits 6B and 6C.

I recommend the closure of red fox hunting in Unit 6 until a viable population becomes reestablished. I support a minimal fox trapping season to allow the reporting of incidentally trapped foxes. The trapping bag limit should also be minimal; i.e., 5 to 10.

I recommend a reduction of the wolverine hunting season to correspond with the reduced trapping seasons so that population growth can be promoted. A minimal hunting season should correspond with the major big game hunting seasons. A more appropriate wolverine hunting season would be 1 September to 31 December.

I recommend all commercial trapping seasons in Unit 6 be based upon fur primeness; subsistence needs may be met with longer season lengths and smaller limits. The land otter season should be reduced to the original 1 December opening date, because too many pelts are not yet prime in November. In addition, the impacts of the Exxon Valdez oil spill on land otters and mink should be given serious consideration. Production of young by those individual animals remaining alive may be hindered for many years. Reduced or closed mink and land otter trapping seasons

may be appropriate for portions of Subunit 6D (PWS). A thorough investigation of the impact of the Exxon Valdez oil spill on mink and land otter populations and their prey base is warranted.

Another beaver cache survey should be conducted within the next 2 years to provide quantitative evidence of trend, because many USFS and Department management programs are potentially affected by the activities of beavers on the Copper River Delta. Additional research needs include the investigating of the prolonged depression of the muskrat population and the impacts of canids as predators. The current status and the predatory impact of the wild canid populations in Unit 6 warrants an in-depth investigation into the dynamics and biology of these populations associated with the Copper River Delta.

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Table 1. Summary of beaver harvest for Unit 6 by subunit, 1984-88.

Regulatory year	6A	%	6B	%	6C	%	6D	%	Total	Juveniles (%)[a]	No./success. trapper
1984-85	4	11	0	0	30	86	0	0	35	36	5.0
1985-86	2	3	0	0	59	97	0	0	61	31	5.5
1986-87	11	11	11	11	81	79	0	0	103	25	5.4
1987-88	2	7	0	0	28	93	0	0	30	39	3.8
1988-89	0	0	0	0	2	100	0	0	2	50	2.0
Totals	19	8	11	5	200	87	0	0	231		
Mean	3.8		2.2		40.0		0	0	46.2	29.6	5.0

[a] % of measured skins, where length + width is less than or equal to 52".

Table 2. Summary of lynx harvest in Unit 6, 1984-88.

Regulatory Year	Sex Male	% [a]	Female	%	Unk	Subtotal	Juveniles [b]	%
1984-85	1	100	0	--	0	1	0	0
1985-86	2	100	0	--	0	2	0	0
1986-87	2	40	3	60	2	7	1	14
1987-88 [c]	1	50	1	50	0	2	0	0
1988-89 [d]	0	--	0	--	0	0	0	--
Total	6	60	4	40	2	12	1	8
Mean	1.2		0.8		0.4	2.4	0.2	

[a] % of known sex.
[b] % of measured skins smaller than 32 x 7 inches.
[c] trapping and hunting season closed by E.O. 30 November.
[d] no open season during 1988-89.

Table 3. Summary of land otter harvest in Unit 6, 1984-88.

Regulatory year	Subunit	Sex					
		Male	%[a]	Female	%[a]	Unknown	Subtotal
1984-85	6A	1	50	1	50	0	2
	6B	0	--	0	--	0	0
	6C	2	29	5	71	0	7
	6D	17	68	8	32	0	25
	Subtotal	20	59	14	41	0	34
1985-86	6A	1	100	0	0	0	1
	6B	0	--	0	--	0	0
	6C	5	63	3	37	3	11
	6D	29	64	16	36	1	46
	Subtotal	35	65	19	35	4	58
1986-87	6A	7	70	3	30	0	10
	6B	0	--	0	--	0	0
	6C	5	50	5	50	2	12
	6D	88	57	67	43	5	160
	Subtotal	100	57	75	43	7	182
1987-88	6A	5	71	2	29	0	7
	6B	0	0	0	0	0	0
	6C[b]	14	67	7	33	1	22
	6D	105	62	63	37	11	179
	Subtotal	124	63	72	36	12	208
1988-89	6A	0	0	0	0	0	0
	6B	0	0	0	0	0	0
	6C[c]	5	38	8	61	0	13
	6D	29	58	21	42	11	61
	Subtotal	34	53	29	46	11	74
Totals		313	59	209	40	34	556
Mean		62.6		41.8		6.8	111.2

[a] % of known sex only
[b] Includes 12 otters (7 males, 5 females) live-trapped for export from Alaska
[c] Includes 12 otters (5 males, 7 females) live-trapped for export from Alaska

Table 4. Summary of wolverine harvest in Unit 6, 1984-88.

Regulatory year	Subunit	Sex					Subtotal
		Male	%[a]	Female	%[a]	Unknown	
1984-85	6A	1	50	1	50	2	4
	6B	0	--	0	--	0	0
	6C	0	--	0	--	0	0
	6D	4	50	4	50	0	8
	Subtotal	5	50	5	50	2	12
1985-86	6A	1	100	0	--	0	1
	6B	1	100	0	--	0	1
	6C	1	50	1	50	0	2
	6D	1	100	0	--	1	2
	Subtotal	4	80	1	20	1	6
1986-87	6A	2	50	2	50	0	4
	6B	2	67	1	33	0	3
	6C	2	67	1	33	0	3
	6D	3	60	2	40	1	6
	Subtotal	9	60	6	40	1	16
1987-88	6A	4	100	0	0	0	4
	6B	0	--	0	--	0	0
	6C	0	0	1	100	0	1
	6D	2	67	1	33	0	3
	Subtotal	6	75	2	25	0	8
1988-89	6A	0	--	0	--	0	0
	6B	1	25	3	75	0	4
	6C	3	75	1	25	0	4
	6D	1	50	1	50	1	3
	Subtotal	5	50	5	50	1	11
Totals		29	60	19	40	5	53
Mean		5.8		3.8		1.0	10.6

[a] % of known sex only

STUDY AREA

GAME MANAGEMENT UNIT: 7 and 15 (9,970 mi^2)

GEOGRAPHICAL DESCRIPTION: Kenai Peninsula

BACKGROUND

The Kenai Peninsula has a diverse complement of furbearers that includes all commonly recognized Alaska furbearers, except Arctic fox. The distribution and density of red foxes and marten are limited on the Kenai. Red foxes were abundant prior to 1930, according to long-time Kenai residents; however, they quickly disappeared as coyotes became established and rapidly increased their range during the 1930's. Subunit 15C supports a small remnant population of red foxes; others are sighted occassionally in other areas of the Kenai Peninsula.

Marten are moderately abundant in Unit 7 and rare in Unit 15. Since marten have never been common in Unit 15, habitat, rather than human-induced mortality, controls their distribution on the Kenai Peninsula. Beavers, land otters, wolverines, lynx, coyotes, mink and weasels are found throughout the Kenai Peninsula at varying density levels, dependent upon habitat quality or prey abundance.

POPULATION OBJECTIVES

To maintain furbearer trapping seasons and bag limits consistent with population levels during periods of pelt primeness.

To maintain furbearer hunting seasons and bag limits consistent with population levels, but not necessarily limited to periods of pelt primeness.

METHODS

Harvests are monitored through mandatory sealing program and reports from local trappers.

RESULTS AND DISCUSSION

Population Status and Trend

Beavers were common in suitable habitat on the Kenai Peninsula; however, because population densities and trends have not been measured, they are poorly understood in most areas. Incidental observations and the trend in nuisance beaver complaints indicated beaver populations in Subunit 15C peaked about 1984; they may have since declined slightly. Midwinter flooding has

been common, and it may provide a significant source of mortality for beavers in some years.

According to sealing certificates, since 1984 the annual beaver harvest has exceeded 200 in 3 of 5 years and averaged 168 (range = 51-240) (Table 1). Harvests have steadily declined for the past 3 seasons because of reduced trapping effort. The order of magnitude of harvest by subunit and unit during the past 5 years has been 15A > 15C > 7 > 15B. Recreational trappers were responsible for most of the beaver harvest; few trappers harvest more than 10 beavers annually.

Marten were added to the list of species requiring mandatory sealing during the 1988-89 trapping season. Table 2 shows 38 marten (68% males) were trapped in Unit 7. Sealing documents also revealed no marten were trapped in Unit 15, because of unsuitable climatic conditions. Marten apparently are better suited to mountainous habitat having consistent weather patterns and deep snow (i.e., Unit 7). Unit 15 commonly experiences inconsistent weather; i.e., frequent periods of rain during mid-winter.

Land otters were fairly common in inland waters and sheltered coastal areas of the Kenai Peninsula. Little is known about the population dynamics of this species. Observations of animal sign and harvest information indicated that otters are most abundant in drainages that support large numbers of anadromous fish, large stream connected lakes, and sheltered coastal waters (e.g., south shore of Kachemak Bay).

Otter harvests have shown little variation in recent years, excepting 1988-89, when it declined 69% from the previous 5-year average. The mean annual, 5-year harvest (Table 3) was 46 otters (range = 18-65). Males have consistently outnumbered females; the mean 5-year male:female ratio was 1.7:1.0.

Wolverines are most commonly found in the Kenai Mountains, including the southern and eastern peninsula coastal areas, Caribou Hills, and the hilly terrain that forms the headwaters of the Deep Creek and Anchor River drainages. Wolverines are seldom observed in the northern lowlands or the western coastal fringes of the peninsula. The historical distribution of wolverines on the Kenai Peninsula has not been documented; however, harvest records suggested a wider distribution during the late 1960's and early 1970's when moose densities were high and wolf densities low.

In the past 5 years, the reported wolverine harvest has been relatively stable. The mean annual 5-year harvest was 21 wolverines, ranging from 12 to 26 (Table 4). Males have consistently predominated in the harvests; the mean, 5-year male:female ratio was 2.3:1.0.

Lynx are cyclically abundant in the forest habitats of the Kenai Peninsula. Early-seral/mixed deciduous-spruce forests in Subunits 15A and 15B appear to have a higher carrying capacity for snowshoe hares and, consequently, lynx numbers are usually higher in these areas than in the subclimax spruce forests of Subunit 15C and Unit 7. Lynx populations on the Kenai Peninsula increased noticeably during the early 1980's in response to an abundance of hares. The densities in Subunit 15A and 15B peaked in either 1985 or 1986, and those in Subunit 15C peaked in 1987. The population on the Kenai Peninsula was in a phase of low abundance during the reporting period.

Lynx harvests in Units 7 and 15 have steadily increased since 1984-85, despite trapping closures in Subunit 15A in 1985-86, 1986-87, and 1987-88 and reduced seasons in the remainder of Units 7 and 15 (Table 5). The reported harvest of 75 lynx (including 5 non-sport) in 1986-87 is the largest on record since mandatory sealing began in 1977. The proportion of kittens in the harvest declined sharply in 1985-86, one year after the decline of snowshoe hares in the northern portion of the Kenai lowlands. Since 1984, the ratio of harvested lynx has been 0.9 males:1.0 females.

Season and Bag Limit

See Trapping and Hunting Regulations No. 29.

Game Board Actions and Emergency Orders

Game Board action during the fall of 1987 resulted in significant season reductions in trapping seasons for several furbearers in Units 7 and 15. These changes were initiated by joint proposals presented to the Board by the Department and U.S. Fish and Wildlife Service (USFWS). The impetus for these reductions was focused on protection of wolves, rather than coyotes, wolverines, or otters. However, since these furbearers are commonly caught in sets made for wolves, all furbearers were treated commonly when seasons were reduced.

In addition to the Board actions, USFWS implemented a new requirement as part of their permit to trap on the Kenai National Wildlife Refuge. The requirement reduced the time interval between traps checked from 7 to 4 days on a portion of the refuge. The focus of this permit requirement was to reduce the number of days between trap checks in accessible areas but to retain the standard 7-day check in more remote portions of the refuge. The reduction in season length by Board action and the new trap check policy imposed by the USFWS may reduce catch and trapper opportunities unnecessarily. The impact of these changes will be monitored jointly by the Department and USFWS.

CONCLUSIONS AND RECOMMENDATIONS

Beaver populations have been underutilized in portions of the Kenai Peninsula, particularly Subunit 15C. Trapping effort declined sharply during 1988-89 because of increased regulations and low pelt values. Establishment of beaver cache surveys along several representative drainages is recommended to monitor population trends and to determine whether additional harvesting is warranted.

Since harvests of marten have been documented through mandatory sealing for only 1 year, population trends are not available; however, no harvests were reported from Unit 15, suggesting marten are perhaps rare there. Since historical records substantiating the trapping of marten in Unit 15 are also rare, Unit 15 is poor marten habitat, compared with that in Unit 7. Harvests were distributed over most of Unit 7; however, they were generally all near road systems.

Land otter harvests declined sharply in 1988-89, compared with those of the previous 4 years. A reduction in season length in 1988-89 and overall reduced trapping efforts caused the reduction in harvest. Reports from trappers and staff suggested land otters were as abundant during 1988-89 as in the previous 4 years.

Wolverine harvests slightly increased during 1988-89, despite the reduction in season length. The increase in harvests can be attributed essentially to deep snow providing better snowmobile access while forcing wolverines to lower elevations where they were more vulnerable to trapping. The male:female ratio remained high (73:100), and the overall impact to the population was minimal during 1988-89.

Lynx management on the Kenai Peninsula, particularly on the Kenai National Wildlife Refuge, has been a controversial issue in recent years. The USFWS believes lynx have been overexploited on the refuge during the last decade, especially in accessible areas (Bailey et al. 1986). The Department maintains that recent trapping efforts on the peninsula during cyclic highs in the lynx population have not exceeded sustained-yield levels; however, as lynx numbers decline during the low cycle, reductions of the season should be made to maintain optimum lynx numbers prior to entering the rebuilding phase. Interagency and public discussion of lynx management on the Kenai Peninsula have resulted in closures (i.e., Subunit 15A, 1984-85 to 1986-87) or reductions (i.e., Unit 7 and Subunits 15B and 15C) in the trapping seasons by the Department and Board of Game.

During a lynx population decline in Alberta, Brand and Keith (1979) suggested that trapping mortality was additive to natural mortality. Using computer modeling, they showed that more lynx would be produced and greater long-term harvests would be achieved when trapping was curtailed for 3-4 years starting with

the 2nd year after the peak in the lynx harvest. This "harvest tracking" management strategy has been implemented on the Kenai Peninsula. Hare and lynx cycles in Subunits 15A and 15C are not synchronous; however, to avoid displacement of trappers, closures should be consistent in Units 7 and 15. A closure for hunting and trapping is recommended for the 1989-90 season, a time when lynx numbers and kit production will be low. However, I recommend opening a brief season, contiguous with other management units, as soon as lynx numbers have shown an increase. A lynx density estimation technique is being developed at the Kenai Moose Research Center (Schwartz and Hundertmark 1989). Hare trapping reported by Bailey (1989) on the Kenai Refuge will also determine when to reopen Kenai Peninsula lynx seasons.

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Table 1. Summary of annual beaver harvests on the Kenai Peninsula by unit and subunit, 1984-85 to 1988-89.

Regulatory year	7	15A	15B	15C	All 15	Total
1984-85	36	92	16	64	172	208
1985-86	56	111	7	66	184	240
1986-87	79	48[a]	12	75	135	214
1987-88	49	45	8	25	78	127
1988-89	10	14	6	21	41	51
$\bar{x}$	46	62	10	50	122	168

[a] Two non-sport harvest included.

Table 2. Summary of annual marten harvests on the Kenai Peninsula in Unit 7, 1988-89.[a]

Regulatory year	Males	%	Female	Unk.	Total
1988-89[b]	26	68%	12	0	38

[a] No harvest were reported in Unit 15

[b] Initiated mandatory sealing for Unit's 7 and 15.

Table 3. Summary of land otter harvests on the Kenai Peninsula by unit or subunit, 1983-89.

Regulatory year	Unit or subunit	Sex				Total
		Male	(%)	Female	Unk.	
1984-85	7	9		8	--	17
	15A	10		11	--	21
	15B	2		--	--	2
	15C	11		11	--	22
	Subtotal	32	(52)	30	--	62
1985-86	7	8		2	1	11
	15A	12		4	--	16
	15B	6		5	--	11
	15C	17		8	2	27
	Subtotal	43	(69)	19	3	65
1986-87	7	6		1	--	7
	15A	8		7	1	16
	15B	3		1	--	4
	15C	9		5	1	15
	Subtotal	26	(65)	14	2	42
1987-88	7	3		5	1	9
	15A	7		2	1	10
	15B	5		2	--	7
	15C	6		10	--	16
	Subtotal	21	(53)	19	2	42
1988-89	7	1		--	--	1
	15A	1		--	--	1
	15B	2		2	--	4
	15C	8		2	2	12
	Subtotal	12	(75)	4	2	18
Totals		146		86	9	229
$\bar{x}$		29		17	1.8	46

Table 4. Summary of wolverine harvests on the Kenai Peninsula by unit or subunit, 1983-89.

Regulatory year	Unit or subunit	Sex				Total
		Male	(%)	Female	Unk.	
1984-85	7	9		8	--	17
	15A	1		--	1	2
	15B	--		--	--	-
	15C	1		2	--	3
	Subtotal	11	(52)	10	1	22
1985-86	7	6		1	--	7
	15A	--		--	--	-
	15B	--		1	--	1
	15C	2		2	--	4
	Subtotal	8	(67)	4	--	12
1986-87	7	9		2	--	11
	15A	--		--	--	-
	15B	3		--	--	3
	15C	4		3	--	7
	Subtotal	16	(76)	5	--	21
1987-88	7	12		2	--	14
	15A	1		--	--	1
	15B	2		1	--	3
	15C	2		2	--	4
	Subtotal	17	(77)	5	--	22
1988-89	7	8		2	2	12
	15A	--		--	--	-
	15B	1		--	--	1
	15C	7		4	2	13
	Subtotal	16	(73)	6	4	26
Totals		68		30	5	103
$\bar{x}$		14		6	1	21

Table 5. Summary of lynx harvests on the Kenai Peninsula by unit or subunit, 1983-89.

Regulatory year	Unit or subunit	Adults M	Adults F	Adults Unk.	Kittens M	Kittens F	Kittens Unk.	%	Unclass	Total
1984-85	7	1	1	--	--	--	--		--	2
	15A	--	--	--	--	--	--		--	--
	15B	8	7	--	5	4	--		--	24
	15C	--	3	--	--	--	--	--	3	
	Subtotal	9	11	--	5	4	--	31.0	--	29
1985-86	7	6	8	--	2	1	--		1	18
	15A	--	2	--	--	--	--		--	2
	15B	9	6	4	2	2	1		--	24
	15C	5	11	--	1	3	--		--	20
	Subtotal	20	27	4	5	6	1	18.7	1	64
1986-87	7	13	7	--	1	2	--		--	23
	15A	1	1	--	1	1	--		--	4[b]
	15B	10	13	--	3	2	--		3	31[c]
	15C	5	7	--	2	3	--		--	17
	Subtotal	29	28	--	7	8	--	20.6	3	75
1987-88[d]	7	--	--	--	--	--	--		--	--
	15A	1	1	--	--	--	--		--	2
	15B	5	--	--	1	--	--		--	6
	15C	--	--	--	--	--	--		--	--
	Subtotal	6	1	--	1	--	--	13.0	--	8
1988-89[e]	7	--	1	--	--	--	--		--	1
	15A	--	1	--	--	--	--		--	1
	15B	--	1	--	--	--	2		--	3
	15C	--	--	--	--	--	--		--	--
	Subtotal	--	3	--	--	--	2	40.0	--	5
Total		64	70	4	18	18	3		4	181

[a] Includes 1 incidental mortality.
[b] Includes 3 incidental mortalities.
[c] Includes 2 incidental mortalities.
[d] Hunting season for 1987-88 was Nov. 1-Nov. 30. First year trapping was completely closed for GMU's 7 & 15. Includes 8 incidental mortalities.
[e] No open season, 5 incidental mortalities.

STUDY AREA

GAME MANAGEMENT UNIT: 8 (5,100 mi^2)

GEOGRAPHICAL DESCRIPTION: Kodiak and adjacent Islands

BACKGROUND

Indigenous furbearers include red foxes, land otters, and short-tailed weasels. Beavers, muskrats, marten and red squirrels have been successfully introduced by wildlife agencies (Burris and McKnight 1973); a mink introduction was unsuccessful. Raccoons were illegally introduced, but sightings are rare. Both red and arctic foxes escaped or were released from the widespread fox farms in the early 1900's. Arctic fox are known to occur only on Chirikof Island.

Red foxes, land otters, beavers, and short-tailed weasels are the most abundant furbearers. Marten occur only on Afognak Island. Red foxes and land otters are the species most commonly pursued by trappers.

POPULATION OBJECTIVES

To develop measurable objectives for all furbearer species.

METHODS

Harvests of beavers and land otters were monitored by a mandatory sealing program. Questionnaires were also sent to 21 trappers who had sealed at least 3 hides each.

RESULTS AND DISCUSSION

Population Status and Trend

Furbearer populations appear to be stable, but no quantitative methods of assessing status or trend were applied. Except in a few road-accessible areas of northern Kodiak Island, harvests have been relatively light.

Mortality

Hunting Seasons and Bag Limits:

Beaver	No open season	
Red fox	1 Nov-15 Feb	2 foxes
Marten	No open season	
Mink & Weasel	No open season	
Muskrat	No open season	

Land otter	No open season	
Red squirrel	No closed season	No limit

Trapping Seasons and Bag Limits:

Beaver	10 Nov-30 Apr	30 beavers
Red Fox	10 Nov-31 Mar	No limit
Marten	10 Nov-31 Jan	No limit
Mink & Weasel	10 Nov-28 Feb	No limit
Muskrat	10 Nov-10 Jun	No limit
Land otter	10 Nov-31 Jan	No limit
Red squirrels	No closed season	No limit

Human-induced Mortality:

Eight trappers harvested 35 beavers, representing the lowest take and effort in the past 5 years (Table 1). Fourteen trappers took 87 land otters, also representing the lowest take in the past 5 years (Table 2). The male harvest slightly exceeded the female harvest. Thirty-three (38%) otters were taken from Raspberry and Afognak Islands, and 54 (62%) otters were taken from Kodiak Island.

Eight active trappers returned questionnaires, but only six reported their harvests. Five trappers reported harvesting a total of 105 red foxes; the largest reported take by an individual trapper was 43 foxes. A minimum of 19 individual trappers harvested furbearers in Unit 8 during the 1988-89 season.

CONCLUSIONS AND RECOMMENDATIONS

Trapping effort and harvest are declining. Low prices and low demand for red foxes and land otters, the most commonly sought species in Unit 8, have dampened interest in trapping. Harvests of all furbearer species were well below sustainable levels. No changes in seasons or bag limits are recommended.

LITERATURE CITED

Burris, O. E. and D. E. McKnight. 1973. Game transplants in Alaska. Wildlife Technical Bulletin 4. Alaska Dep. Fish and Game. Juneau. Fed. Aid Wildl. Rest. Project W-17-R. 57pp.

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Table 1. Beaver harvest and trapper effort in Unit 8, from 1984-85 to 1988-89.

Regulatory year	No. beaver	No. successful trappers	Mean no. beaver/trapper	Largest catch by one trapper
1984-85	98	14	7.0	19
1985-86	241	17	14.2	57
1986-87	147	20	7.4	43
1987-88	88	18	4.9	19
1988-89	35	8	4.4	11

Table 2. Land otter harvest and trapper effort in Unit 8 by regulatory year from 1984-85 to 1988-89.

Regulatory year	No. M	% M	No. F	% F	No. unk	Total	No. successful otter trappers	Mean no. otters/trapper	Largest catch one trapper
1984-85	108	58%	79	42%	0	187	28	6.7	41
1985-86	132	55%	109	45%	9	250	26	9.6	50
1986-87	62	56%	49	44%	0	111	21	5.3	19
1987-88	78	55%	60	45%	0	142	24	5.9	19
1988-89	43	52%	38	48%	5	87	14	6.2	14

STUDY AREA

GAME MANAGEMENT UNITS: 9 (33,640 mi^2) and 10 (9,680 mi^2)

GEOGRAPHICAL DESCRIPTION: Alaska Peninsula mainland, offshore islands, and Aleutian and Pribilof Islands

BACKGROUND

The furbearers in this report include beavers, coyotes, red foxes, arctic foxes, lynx, marten, mink, muskrats, land otters, and wolverines. All species, except the arctic fox, are found on at least part of the mainland of the Alaska Peninsula. There are fewer furbearer species on the islands off shore of the Alaska Peninsula and on Aleutian and Pribilof Islands. On some islands furbearers are present as a result of past introductions for fur farming or from efforts to establish harvestable wild populations.

Beavers are presently found on the mainland of the Alaska Peninsula north of Port Moller. The most productive beaver habitat has a dependable water supply that has little fluctuation in stream flow and is adjacent to abundant and easily accessible willow, aspen, cottonwood, or birch vegetation. Beavers are found from sea level to elevations of 3,000 feet.

Coyotes apparently first arrived in about 1915 and rapidly expanded. Coyotes are restricted to the mainland of Unit 9. The relatively few coyotes harvested are usually trapped incidentally in sets made for foxes, lynx, or wolves. A few coyotes are taken by sport hunters.

Red foxes occur on the mainland of the Alaska Peninsula, on some of the offshore Alaska Peninsula islands, and on the larger islands of the eastern Aleutians. Red fox introductions to the Aleutians and offshore Alaska Peninsula islands go back to the Russian period, and they continued through 1932. Although some of these earlier red fox introductions became established, they were later exterminated to facilitate introduction of the arctic fox. Rabies, mange, and distemper epidemics periodically occur in fox populations, resulting in wide-spread mortality.

Arctic foxes occur in a narrow band along marine coasts, open tundra, rocky beaches, and on sea ice many miles from shore. Their natural distribution extends to the northwestern shore of Bristol Bay. Arctic foxes of the blue color phase were introduced on some of the offshore islands of the Alaska Peninsula, the majority of the Aleutian Islands, and the Pribilof Islands during the Russian period. Arctic foxes are noted for their extreme fluctuations in population levels; periodic peaks in populations occur approximately every 4 years. Their densities are are linked to cyclic fluctuations in small rodent

populations. Foxes also patrol beaches in search of carrion. Because foxes are an efficient predator of nesting birds, the USFWS is attempting to eliminate them from many of the islands where they had been introduced.

Lynx occur on the mainland of the Alaska Peninsula north of Port Heiden. The lynx is primarily an inhabitant of the northern boreal forest, where it feeds largely on snowshoe hares. It occasionally occurs on the tundra beyond treeline; in starvation years it ventures onto the tundra in search of Arctic hares, lemmings, and ptarmigan. Lynx populations fluctuate in response to the primary prey abundance. Although the lynx-hare cycle is well known and population highs can sometimes be predicted (i.e., usually every 8 to 10 years), Unit 9 is on the fringe of the range for both lynx and snowshoe hares and the fluctuations for both of these species are less consistent than elsewhere in Alaska.

Marten occur only in the northern parts of Subunits 9A and 9B. The distribution of marten is limited primarily to climax spruce forests from sea level to timberline. Mink are found on the mainland of the Alaska Peninsula and on the Unimak Island section of the Aleutian Islands. Microtine rodent populations typically fluctuate drastically, and they are a primary factor affecting mink abundance. An abundance of mice or hares in upland areas will sometimes prompt mink populations to expand inland in search of prey. In some areas spring flooding may reduce populations by drowning young mink in dens.

Land otters occur on the mainland of the Alaska Peninsula, some of the close in islands east of the Alaska Peninsula, and the Unimak Island section of Unit 10. Otter populations are relatively stable, with coastal areas providing abundant marine food. Parasites and disease are not normally important mortality factors. Flooding in the spring sometimes drowns young otters in dens.

Wolverines live on the mainland of the Alaska Peninsula and Unimak Island. Compared with other furbearers, wolverines never attain high densities because of their large territorial requirements and low reproductive rates.

POPULATIONS OBJECTIVES

To develop measurable objectives for all furbearer species.

METHODS

Current efforts to monitor furbearer population trends have been targeted on harvest enumeration and information obtained from trappers through annual questionnaires. During this reporting period, no field work was funded for surveying furbearers. All

field observations of furbearers were incidental to moose, caribou, and brown bear surveys.

The recorded annual furbearer harvest data came from furbearer sealing certificates, fur trapper export reports, and dealer acquisition reports. Since furs kept for personal use sometimes are not reported, actual harvests exceeded those obtained from these data sources. Pelt sealing provided the most accurate and complete information. Four species (i.e., beaver, lynx, otter, and wolverine) must be sealed. The number of lynx sealed was very close to the actual number harvested because of their high commercial value. For unsealed furbearers (i.e., coyote, red fox, arctic fox, martin, mink, and muskrat) the recorded harvest is the combined total of fur trapper export and dealer acquisition reports. This recorded harvest is unquestionably an understatement of actual harvest.

An estimate for actual harvest for unsealed furbearers can be obtained by assuming that the combined trapper export and dealer acquisition reports represent 34% of the total harvest (Table 1); i.e., the proportion of the sealed harvest that is reported from trapper export and fur dealer export reports. This proportion is then used to estimate the harvest of species that are not sealed. This technique is based on the following assumptions: (1) all harvested beaver, lynx, river otters, and wolverines are sealed, (2) for these species a constant percentage (34%) of the total harvest is also reflected in combined trapper export and dealer acquisition reports, (3) this percentage can also be applied to other unsealed furbearer species tallied on export and acquisition reports. These assumptions have not been tested, and the estimates derived for unsealed species should be viewed as approximations; for example, from 1977 to 1989 the reported harvests of beavers, lynx, and land otters in Unit 9 (i.e., combined trapper export and dealer acquisition reports) ranged between 9% and 92% of the total pelts sealed (Table 1).

RESULTS AND DISCUSSION

Population Status and Trend

No beaver cache surveys were conducted in 1988. Observations during aerial surveys of other species, comments from trappers, and complaints from the public indicated beaver populations remained high north of Subunit 9D. According to responses from the trapper questionnaire, abundance was high and there may be more beavers available during the 1988-89 trapping season than in 1987-88 (Table 3).

From information obtained from the trapper questionnaire, coyote abundance was low during the 1988-89 trapping season, and there was a slight increase in abundance during the 1987-88 trapping season (Table 3).

Trappers in Unit 9 reported the red fox population had significantly increased over that of previous year (Table 3). During late winter and early spring a widespread rabies epidemic affected western Alaska; a number of dead foxes were reported from Bristol Bay. Rabid foxes were confirmed from several villages in Unit 9. It is believed the population sustained a significant decline.

Lynx abundance was extremely low during the 1988-89 trapping season; densities were similar to lynx densities during the 1987-88 trapping season in Unit 9 (Table 3). On the brighter side, trappers believed the abundance of lynx's primary prey species, the snowshoe hare, was increasing and moderate to high during the 1987-88 and 1988-89 trapping seasons, respectively. Lynx populations may increase in the near future.

Marten abundance in Unit 9 was low during the 1988-89 trapping season, or slightly less than what was available in the 1987-88 trapping season (Table 3). Mink abundance in Unit 9 was moderate during the 1988-89 trapping season, and it slightly less than that during the 1987-88 trapping season (Table 3). Muskrat abundance in Unit 9 was low during the 1988-89 trapping season, similar to that during in the 1987-88 trapping season (Table 3). Otter abundance in Unit 9 was moderate to high during the 1988-89 trapping season; however, more otter were available in the 1987-88 trapping season (Table 3). Wolverine abundance in Unit 9 was from low to moderate during the 1988-89 trapping season, similar to their availability in 1987-88 (Table 3).

Mortality

Hunting Seasons and Bag Limits:

Coyote (Units 9 & 10)	1 Sep-30 Apr	2 coyotes
Red Fox (Units 9 & 10)	1 Nov-15 Feb	2 red foxes
Arctic Fox (Unit 9)	1 Dec-15 Mar	No limit
(Unit 10)	No closed season	No limit
Lynx (Units 9 & 10)	1 Nov-31 Mar	2 lynx
Wolverine (Units 9 & 10)	1 Sep-31 Mar	One per person

Trapping Seasons and Bag Limits:

Beaver (Unit 9)	1 Jan-31 Mar	40 beavers
(Unit 10)	No open season	
Coyote (Units 9 & 10)	10 Nov-31 Mar	No limit
Red Fox (Units 9 & 10)	10 Nov-28 Feb	No limit
Arctic Fox (Units 9 & 10)	10 Nov-28 Feb	No limit
Lynx (Unit 9)	10 Nov-28 Feb	No limit
Marten (Unit 9)	10 Nov-28 Feb	No limit
(Unit 10)	No season	
Mink (Units 9 & 10)	10 Nov-28 Feb	No limit
Muskrat (Units 9 & 10)	10 Nov-10 Jun	No limit

Otter (Units 9 & 10)	10 Nov-31 Mar	No limit
Wolverine (Units 9 & 10)	10 Nov-28 Feb	No limit

Human-induced Mortality:

A total of 239 beavers were sealed in Unit 9 (Table 2), representing a significant drop from the 865 beavers taken in 1987-88. Mean harvest over the last 5 years was 463. Subunits 9B, 9C and 9E produced 76%, 18%, and 6% of the total harvest respectively. Kits made up 25.5% of the harvest, which is similar to the average for the previous 6 years.

Dealer acquisition and trapper export reports indicated there were 3 coyotes harvested during the 1988-89 trapping season in Unit 9, compared with 8 for the 1987-88 trapping season. The 1988-89 reported harvest of 115 and 34 red foxes in Units 9 and 10, respectively, (Table 4) vastly underestimated the actual take. A recent harvest high of 543 in 1984-85 and 426 in 1976-77 were taken in Units 9 and 10, respectively. However, extremely low prices and a record-cold winter substantially reduced the harvest of red foxes and other furbearers.

Only 2 arctic foxes were reported harvested during the 1988-89 trapping season in Units 9 and 10 (Table 4). Recent harvest highs of 30 in 1980-81 and 319 in 1977-78 were taken in Units 9 and 10, respectively.

Eight and 4 lynx were sealed in Subunits 9B and 9E, respectively; this was similar to the 1987-88 harvest of 7 and 3 lynx in Subunits 9B and 9E, respectively (Table 5). There were 36 marten reported harvested during the 1988-89 trapping season in Unit 9 (Table 4). A harvest high of 70 marten was taken in the 1982-83 trapping season.

The 1988-89 reported mink harvest of 46 and 16 mink in Units 9 and 10, respectively, (Table 4) vastly underestimated the actual take. A recent harvest high of 225 mink was taken in the 1984-85 trapping season in Unit 9. Unit 10 has never recorded a significant harvest of mink.

There were no muskrats harvested during the 1988-89 trapping season in Unit 9 (Table 4). A recent harvest high of 161 muskrats were taken in the 1976-77 trapping season.

A total of 139 otters were sealed in Unit 9, compared to a harvest high of 220 otters in 1987-88 for the 12-year reporting period in Unit 9 (Table 6). Three otters were harvested in Unit 10, compared with a reported harvest of zero since 1980. A recent harvest low of 64 otter was taken in Unit 9 during the 1985-86 season.

A total of 64 wolverines were sealed in Unit 9, representing a typical harvest over the past 12 years ($\bar{x}$ = 63) (Table 7). No harvests have been reported from Unit 10 since 1980.

Game Board Action and Emergency Orders

Beaver populations appear to be relatively stable at high densities in Unit 9; in an effort to standardize season lengths for beaver, the beaver trapping season was standardized at 1 January-31 March. This regulatory change is not expected to have much impact on the harvest.

Red fox populations have appeared to be relatively stable at high densities throughout Unit 9 and 10 for several years. In an effort to standardize season lengths for several species to prevent incidental catch of nontarget species and enforcement problems, the red fox season was standardized at 10 November-28 February for both units. This regulatory change is not expected to have much impact on red fox harvests or the population.

In an effort to standardize season lengths for several species, prevent incidental catch of nontarget species, and minimize enforcement problems, the arctic fox season was standardized at 10 November-28 February for both units. This regulatory change is not expected to have any impact on the harvest of Arctic foxes.

Lynx hunting and trapping seasons were shortened or closed in much of Interior and Southcentral Alaska to speed the recovery phase of the population cycle. The reduction in season length for Unit 9 was 1 month; it was less severe than in most other areas because of the lack of a pronounced cycle. In addition, several refugia exist within National Parks and in other inaccessible areas. However, concern over increased trapping pressure caused by very high lynx pelt prices, higher beaver prices, and the closure of lynx seasons elsewhere in Southcentral Alaska justified closing the lynx trapping season on 28 February 1988 by Emergency Order. In the spring of 1988 the Board of Game made 28 February the closing date. During the past 5 years an average of 14% of the harvest occurred during March.

Mink populations appeared to be relatively stable at moderate densities throughout Unit 9. In an effort to standardize season lengths for several species, prevent incidental catch of nontarget species, and minimize enforcement problems, the mink season in Units 9 and 10 were extended by 1 month; i.e., 28 February closure. This regulatory change is not expected to have much impact on the mink harvest.

Wolverine populations appear to be relatively stable at low densities throughout Unit 9. Nevertheless, throughout most of Southcentral Alaska there continues to be concern about a possible decline in their numbers; consequently, the Board

adopted a standardized, shortened wolverine trapping season (10 Nov-28 Feb) effective for the 1988-89 season.

CONCLUSIONS AND RECOMMENDATIONS

Currently, harvest information is sufficient for management purposes for all species of furbearers, even though we are still obtaining incomplete data from the fur harvest information generated by combined trapper export and dealer acquisition reports. What we are lacking in furbearer management is adequate field observations to augment harvest data and trapper questionnaires to evaluate population size and trend. For many furbearing species, methods for obtaining this information have not been addressed nor has there been adequate funding to conduct surveys. There are several things that could be done with a minimum of funding: (1) beaver cache surveys should be conducted in areas where considerable harvest occurs, (2) red fox counts could be incorporated with current moose composition surveys to tally the number of foxes observed per hour of moose survey, (3) monitoring trends in the lynx population by field survey should be standardized, funded, and implemented for each unit. Wolverines represent a problem for establishing a population trend from field observations, because they occur only at low densities. Techniques for obtaining the population size or trend for other furbearing species should be considered a priority assignment for the furbearer coordinator and regional and area personnel. In Units 9 and 10 the indicated furbearer harvests appear low; and even though we are lacking information on population sizes, I believe we are harvesting furbearers below their sustainable yield.

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Table 1. The sealed and reported[a] harvests as well as the percentage[b] of the sealed harvest that was reported for beavers, lynx, and otters, 1977-78 to 1988-89.

Year	Beaver		Lynx		Otter	
	Sealed	Reported (%)	Sealed	Reported (%)	Sealed	Reported (%)
1977-78	724	275 (38)	195	65 (33)	120	67 (56)
1978-89	332	187 (56)	129	80 (62)	103	50 (48)
1979-80	660	377 (57)	151	67 (44)	156	76 (49)
1980-81	508	260 (51)	118	46 (39)	145	64 (44)
1982-83	315	144 (46)	97	33 (34)	205	83 (40)
1983-84	182	32 (18)	26	24 (92)	120	30 (25)
1984-85	239	71 (30)	52	18 (35)	146	35 (24)
1985-86	368	91 (25)	45	30 (67)	64	6 (9)
1986-87	604	94 (16)	51	22 (43)	163	29 (18)
1987-88	865	90 (10)	10	1 (10)	220	30 (14)
1988-89	239	33 (14)	12	6 (50)	139	40 (29)

[a] Reported harvest derived by combining trapper export and other acquisition reports; 34% of the total sealed harvest from 1977 to 1989 was reported, and 20% of the total sealed harvest for 1988-89 was reported.

[b] $(\%) = \frac{\text{reported harvest}}{\text{sealed harvest}}$

Table 2. Historical beaver harvest and number of trappers in Unit 9 by Subunit, 1974-75 to 1988-89.

Year	9A		9B		9C		9E		Total Unit 9		Beavers per trapper
	No. trappers	Harvest	No. trappers	Harvest	No. trappers	Harvest	No. trappers	Harvest	No. trappers	Harvest	
1974-75	4	126	20	231	3	15	7	66	35	439	12.5
1975-76	1	40	18	173	5	44	8	80	43	451	10.5
1976-77	--	--	--	--	--	--	--	--	--	686	--
1977-78	1	40	34	355	19	196	10	132	40	724	11.1
1978-79	1	1	24	191	6	46	8	92	40	332	8.3
1979-80	4	47	40	448	10	85	7	68	66	660	10.0
1980-81	0	0	23	271	15	119	5	57	53	508	9.6
1981-82	2	6	11	76	14	116	6	64	37	286	7.7
1982-83	0	0	16	138	17	171	3	7	37	315	8.5
1983-84	1	2	9	84	9	79	7	17	26	182	7.0
1984-85	2	15	16	107	17	103	4	14	39	239	6.1
1985-86	2	27	20	181	13	126	6	34	41	368	9.0
1986-87	2	28	336	14	189	8	51	52	604	11.6	--
1987-88	1	6	27	605	12	140	11	114	61	865	13.1
1988-89	1	1	15	181	6	43	1	14	23	239	10.4

Table 3. Population abundance and trend indices for furbearers and small game in Unit 9.[a]

Species	Abundance in 1988-89				Compared with 1987-88			
	Low	Mod	High	Index[b]	Fewer	Same	More	Index[c]
Beaver	1	4	11	7.5	2	8	4	5.6
Coyote	7	2	1	2.6	0	6	3	6.3
Red Fox	1	4	12	7.6	1	4	7	7.0
Lynx	10	2	0	1.7	2	7	0	4.1
Marten	6	0	0	1.0	1	5	0	4.3
Mink	4	12	1	4.3	4	6	2	4.3
Muskrat	8	4	2	3.3	1	9	0	4.6
Otter	1	10	6	6.2	0	5	4	6.8
Wolverine	8	9	1	3.4	2	6	1	4.6
Wolf	9	7	1	3.1	2	4	2	5.0
Snowshoe Hare	3	7	6	5.8	1	4	3	6.0
Red Squirrel	4	5	2	4.3	2	3	1	4.3
Mice/Rodents	3	6	6	5.8	2	5	1	3.9
Grouse	4	7	0	3.5	1	7	0	4.5
Ptarmigan	1	8	8	6.6	1	5	3	5.9

[a] Based on responses from the trapper questionnaire.

[b] Index was calculated from the number of answers to each question; not all cooperators answered every question. Low values indicate scarcity; high values indicate that a species is common.

[c] Index values range from 1.0 through 9.0 and were derived by assigning an arbitrary value of 9.0, 5.0, and 1.0 to each "High" (More), "Moderate" (Same), and "low" (Fewer) answer, respectively. The total value of the answers for each species was divided by the number of answers to that question. Low values indicate that a species was less abundant than the previous year; high values indicate that a species was more abundant than during the previous year.

Table 4. Red fox, arctic fox, marten, mink, and muskrat harvests[a] in Units 9 and 10, 1976-77 to 1988-89.

Unit 9	76/77[b]	77/78[b]	78/79[b]	79/80[b]	80/81[b,c]	82/83[b]	83/84[b]	84/85[d]	85/86[d]	86/87[d]	87/88[d]	88/89[d,b]
Red Fox	290	377	566	505	219	335	403	543	68	155	89	115
% unk.[d]	1	0	1	0	2	5	4	25	21	15	22	--
Arctic Fox	7	1	3	4	30	18	5	0	0	0	0	1
% unk.[d]	4	1	6	1	7	0	1	64	23	27	19	--
Marten	18	15	16	62	14	70	25	12	28	24	7	36
% unk.[d]	1	3	2	1	2	2	2	20	16	7	21	--
Mink	170	95	129	128	300	128	105	225	21	36	18	46
% unk.[d]	0	1	2	2	1	1	1	28	24	14	12	--
Muskrat	161	38	88	3	41	0	0	1	0	0	0	0
% unk.[d]	3	1	2	1	1	1	0	26	76	50	10	--
Unit 10												
Red Fox	426	0	145	264	178	141	15	0	27	0	20	34
Arctic Fox	66	319	3	19	50	0	10	16	25	1	35	1
Mink	5	0	0	0	0	0	0	0	2	2	4	16

[a] Harvests are based on trapper export and dealer acquisition reports.
[b] Harvest area on report forms used address of trapper or dealer (1975-84) and (1988-89).
[c] Furbearer data for 1981-82 were not tabulated.
[d] Harvest area on report forms used unit (1984-89).
[e] Percentage of statwide species harvest recorded from unknown units.

Table 5. Reported harvest of lynx in Unit 9, 1977-78 to 1988-89.

Year	Total trappers	Total harvest	% male	Method				Chronology					Subunit				
				Shot	Trapped	Snared	Unk. & other	Nov	Dec	Jan	Feb	Mar	A	B	C	D	E
Lynx																	
1977-78	39	195	63	0	194	1	0	22	53	58	27	18	0	106	77	0	12
1978-79	30	129	56	2	105	3	19	3	10	31	47	37	0	36	48	0	45
1979-80	24	151	59	5	139	1	5	3	19	42	39	36	0	61	67	0	23
1980-81	26	118	57	4	107	2	5	12	55	29	14	5	0	41	25	0	52
1981-82	24	60	39	1	51	0	8	1	8	15	21	13	0	32	18	0	10
1982-83	27	97	45	1	90	0	6	17	20	27	19	14	0	40	12	0	45
1983-84	10	26	60	0	26	0	0	10	0	7	4	5	0	16	0	0	10
1984-85	17	52	35	3	49	0	0	2	8	23	11	8	0	41	3	0	8
1985-86	16	45	31	1	42	2	0	0	10	4	26	1	0	42	2	0	21
1986-87	21	51	30	0	44	1	3	0	6	9	25	9	0	23	1	0	26
1987-88	7	10	0	0	10	0	0	1	1	4	3	1	0	7	0	0	3
1988-89	8	12	--	1	11	0	0	1	6	3	2	0	0	8	0	0	4

Table 6. Reported harvest of land otters in Unit 9, 1977-78 to 1988-89.

Year	Total harvest	% male	Method				Chronology					Subunit				
			Shot	Trapped	Snared	Unk. & other	Nov	Dec	Jan	Feb	Mar	A	B	C	D	E
Otter																
1977-78	120	57	5	107	6	2	9	19	22	52	9	6	46	17	2	49
1978-79	103	50	3	97	3	0	2	13	20	49	15	4	48	5	0	46
1979-80	156	54	2	110	27	17	21	5	24	70	30	6	37	42	17	52
1980-81	145	52	18	107	13	9	10	33	44	38	13	0	46	23	8	67
1981-82	151	55	11	125	3	9	8	35	40	41	20	5	35	58	15	38
1982-83	205	50	27	150	6	8	20	454	49	47	24	0	75	46	23	61
1983-84	120	53	3	102	0	15	27	29	14	23	18	1	31	16	28	44
1984-85	146	56	11	114	1	20	8	20	47	26	31	6	36	60	8	36
1985-86	64	48	7	47	7	3	5	4	13	33	8	7	23	12	9	10
1986-87	163	56	11	136	13	3	8	16	19	95	22	6	28	40	16	72
1987-88	220	63	1	195	22	2	8	49	58	59	35	3	56	63	9	89
1988-89	139	51	12	120	7	0	1	14	26	72	26	2	63	10	21	43

Table 7. Reported harvest of wolverines in Unit 9, 1977-78 to 1988-89.

Year	Total trappers	Total harvest	% male	Method				Chronology						Subunit				
				Shot	Trapped	Snared	Unk & other	Oct	Nov	Dec	Jan	Feb	Mar	A	B	C	D	E
Wolverine																		
1977-78	47	86	65	19	66	1	0	6	4	27	19	23	7	1	45	10	3	27
1978-79	35	79	68	18	55	1	5	1	0	13	14	33	12	4	28	8	2	37
1979-80	31	64	60	13	47	4	0	5	0	14	15	17	11	7	14	10	4	28
1980-81	25	39	70	5	30	1	3	1	3	9	21	2	1	0	4	0	2	33
1981-82	37	72	68	21	51	0	0	7	1	13	20	18	10	1	22	6	6	37
1982-83	29	68	58	17	49	0	0	2	0	8	16	31	10	0	8	13	3	44
1983-84	27	51	66	14	31	3	3	3	2	9	20	10	6	7	19	6	3	16
1984-85	26	50	68	13	33	1	3	1	5	10	9	8	17	6	42	14	0	38
1985-86	21	37	56	10	27	0	0	1	3	7	10	11	5	5	9	3	2	18
1986-87	38	70	72	12	54	4	0	0	1	2	15	31	20	2	44	7	2	15
1987-88	30	72	75	18	52	2	0	0	2	9	25	20	16	1	40	15	1	15
1988-89	40	64	69	21	42	1	0	7	3	14	7	26	7	3	25	16	0	20

STUDY AREA

GAME MANAGEMENT UNIT: 11 (12,780 mi^2)
13 (23,380 mi^2)

GEOGRAPHICAL DESCRIPTION: Nelchina and upper Susitna Rivers and Wrangell Mountains

BACKGROUND

Historic harvest data are not available for furbearers in Units 11 and 13 prior to the initiation of sealing requirements. Wolverine and beaver sealing became mandatory in 1971, followed by lynx and land otters in 1977. Because little research on furbearer populations has been conducted until recently, data pertaining to population densities, movements, and distribution of furbearers are limited. Other than harvest records, reports by hunters and trappers and field observations by Department personnel are the only historic sources of information concerning furbearer abundance.

POPULATION OBJECTIVES

To develop measurable objectives for management of furbearer populations.

METHODS

Randomly distributed aerial and ground transects were surveyed within favorable lynx habitat in late winter to monitor trends in lynx track abundance. Each aerial transect was approximately 2.0 miles long and 0.25 miles wide. In addition, approximately 30 miles of traplines and seismic lines were surveyed by snowmachine. A density estimate for wolverines was obtained in a portion of Subunit 13C, using a technique developed by the Department. While beaver, lynx, river otter, and wolverine pelts were sealed, trappers were interviewed to obtain harvest statistics on these species. Additional harvest and relative abundance information on both sealed and unsealed furbearers was obtained through a trapper questionnaire survey.

RESULTS AND DISCUSSION

Population Status and Trend

Beavers were relatively abundant in both units. Although beaver cache surveys were not conducted, frequent field observations of beaver ponds and food caches made during aerial surveys for big game suggested beaver numbers were high. Trappers responding to

the trapper questionnaire also considered beavers to be abundant on their lines. The population trend is not known.

Land otters occur in both units, but they were not abundant in either one. Trappers reported land otters to be scarce to common on their lines in 1988-89. The population trend is not known.

Lynx numbers were low in both units. Lynx began to increase in 1988-89, after several years in the low-density phase of an approximate 10-year cycle. Eighty-four percent of the trappers responding on the trapper survey listed lynx as scarce or not present on their traplines; they also indicated that lynx numbers were stable or increasing slightly. Twenty-two of 26 aerial transects (19 in Unit 13 and 7 in Unit 11) established and surveyed in 1988 were surveyed in 1989, and 8 lynx tracks were observed on 6 of the transects.

Although lynx tracks had been observed on five of these transects in 1988, less time (3 days) elapsed between snowfall and the 1989 survey. In 1988 surveys were flown up to 14 days after fresh snowfall, greatly increasing the chance of observing tracks, because lynx had a much longer period to lay them down. No tracks of litters were observed in 1989, compared to only one for the previous year.

In addition to aerial transects, track counts were conducted on snowmachines. Tracks of 2 lynx were observed on a 10-mile trail in Subunit 13A and the 22-mile Klutina Lake road in Subunit 13D. Both of these trails were surveyed in 1988, and no lynx tracks were observed. A portion of the Chitina-McCarthy Road (Unit 11) was also surveyed. Unfortunately, ice dams prevented travel beyond the Chokosna River, whereas in 1988 the road was passable to the Lakina River. Two lynx tracks were observed, compared with none in 1988. Because of increased observations of tracks on ground transects and increased evidence of tracks during aerial transects, only 72 hours after a snowfall, I have concluded that lynx numbers have increased.

Wolverines were abundant in the more remote, mountainous regions of each unit, but they are relatively scarce in the forested basin. Of the trappers responding to the questionnaire, 68% considered wolverines scarce; the remainder believed they were common. Comments by trappers suggested wolverine numbers may have declined in both units over the past 20 years.

Marten populations in both units declined after reaching an historical population high in 1987-88. Trappers whose traplines were located in favorable marten habitats in 1988-89 still reported marten to be common; however, 35% of the trapper reports indicated fewer marten on their lines. I expect a decline in marten numbers to occur.

Coyotes were abundant, and their numbers have increased in both units. Prior to 1980 coyotes occurred primarily along the larger

rivers (e.g., Copper and Chitina Rivers); however, they have become numerous along most waterways. Fox numbers declined during the mid-1980's in areas where coyotes increased. Foxes were still common over much of the forested lowlands, and they were abundant in subalpine and tundra habitats. Fox numbers were higher in Unit 13 than in Unit 11.

Muskrat numbers were very low throughout both units. Muskrats were abundant during the early 1980's, but their numbers declined dramatically during the mid-1980's. Responses to the trappers questionnaire suggested muskrats were relatively scarce; little population increase was noted. Mink were reported to be scarce to common by trappers in both units.

Population Size:

Unitwide population estimates were not available for furbearers in Units 11 or 13. A density estimate of 5.05 wolverines (1/254 mi^2) (80% CI of 2-12 wolverines [1/63-375 mi^2]) was obtained during 1989 in a 750-mi^2 portion of Subunit 13C. Previous density estimates in other portions of Unit 13 included 1 wolverine/29-55 mi^2 (Gardner and Ballard 1982) in the upper Susitna River area of Subunits 13A and 13E and 1 wolverine/51-97 mi^2 in the Chugach Mountains of Subunit 13D (Becker and VanDaele 1988). The Susitna estimates were based on radio-collared wolverines relocated over a period of time, rather than on a census; whereas, the Subunit 13D estimates were obtained using the same systematic track survey procedures employed in 1989. The lower density observed in 1989 probably resulted from having a substantial portion of the survey area in lowland black spruce habitat, where wolverines are normally uncommon.

Distribution and Movements:

Beavers and land otters are found throughout both units wherever favorable aquatic habitat occurs. Unit 13 has substantially more riparian habitat than Unit 11, and it generally supports larger numbers of aquatic furbearers.

Lynx distribution follows that of the spruce forest habitat in both units. Lynx numbers are higher in the southern portions of Unit 11, especially in the Chitina Valley and in Subunits 13D, eastern 13A, and southern 13C. Movement of lynx between the two units occurs, because favorable habitat types are continuous between them. An incident of long-distance dispersal of 1 lynx into Unit 13 has also been documented: an adult male lynx previously radio-collared and ear-tagged on the Kenai Peninsula by the U.S. Fish and Wildlife Service and last observed on the Kenai National Wildlife Refuge in April 1987 was trapped during December 1987 near Chitina in Subunit 13D. This straight-line movement of at least 250 miles occurred within a 7-month period and included crossing a major mountain range.

Wolverines are most abundant in mountainous habitats of the Chugach, Talkeetna, and Alaska Ranges in Unit 13 and the Wrangel Mountains in Unit 11. Prior to the late 1970's wolverines were more numerous near settlements and on the Lake Louise Flats than they have been recently. Movement patterns for radio-collared wolverine in Unit 13 were reported by Gardner (1985). He observed that movements declined during the fall but increased again in February with the dispersal of juveniles into vacant habitat. A long-distance dispersal of 1 subadult was also reported.

Mortality

Hunting Seasons and Bag Limits:

Coyote	1 Sep-30 Apr	2 coyotes
Red Fox	1 Nov-15 Feb	2 foxes
Lynx	1 Nov-30 Nov	2 lynx
Wolverine	1 Sep-31 Mar	1 wolverine

Trapping Seasons and Bag Limits:

Beaver (Unit 11)	10 Nov-15 Apr	No limit
Beaver (Unit 13)	10 Nov-15 Apr	20 beavers
Coyote, Land Otter	10 Nov-31 Mar	No limit
Red fox, Wolverine	10 Nov-28 Feb	No limit
Lynx	No open season	
Marten, Mink, Weasel	10 Nov-31 Jan	No limit
Muskrat	10 Nov-10 Jun	No limit

Human-induced Mortality:

The 1988-89 beaver harvest in Unit 11 was 24, similar to the previous year's harvest of 21, but somewhat less than the annual average (33) reported for the years 1984 to 1988 (Table 1). Recent harvests have been substantially higher than the average annual take of nine (range = 0-22) from 1971 and 1982. The percentage of kits in the 1988-89 harvest averaged 13%, slightly lower than the 5-year (1984-88) average of 17%.

The beaver harvest in Unit 13 declined in 1988-89, following a 3-year period of high harvests (Table 2). The 1986-87 harvest of 333 beaver was the largest ever reported in the unit. The harvest of 173 for the reporting period was well above the yearly average (81 beaver, range = 33-176) reported for the period between 1972 and 1982. The percentage of kits in the 1988-89 harvest was 21%, equal to the 5-year (1984-88) mean.

Land otter harvests in Unit 11 have averaged three per year since 1984, compared with six per year (range = 1-11) from 1977 to 1983. In Unit 13 the 1988-89 harvest of 23 otters was close to the 1984-88 yearly average of 25. Annual harvests from 1977 to 1982 averaged 30 (range = 10-68).

The lynx hunting and trapping seasons were closed in both units during the reporting period; however, 1 lynx was shot in Unit 11 during the fall of 1988 by a hunter who didn't realize the season had been closed. Lynx harvests were extremely low during the last open season (1986-87), when only 16 were taken in Unit 11 and nine in Unit 13; the percentages of kittens in the harvests were only 13% and 11%, respectively. From 1984 to 1987 when the lynx population was declining, the average yearly catch was 38 in Unit 11 and 27 in Unit 13. The reported take at the last cyclic high in 1982-83 was 137 in Unit 11 and 290 in Unit 13.

Wolverine harvests in Units 11 and 13 since 1983 are provided in Tables 1 and 2. In Unit 11 wolverine harvests have been declining since the early 1970's, except for 1982-84. Between 1971 and 1983 the average annual harvest was 27 wolverines, but it has averaged only 14 wolverines since 1984. The high harvests reported in 1983 and 1984 probably reflected increased trapping activity associated with the peak of the lynx cycle. Harvest levels over the past 4 years have been the lowest ever reported in the unit. Males have composed 64% of the harvest over the past 5 years (range = 56-78%).

Wolverine harvests have also declined in Unit 13. Between 1971 and 1982, the average annual harvest was 81 wolverines, compared with 37 since 1983. The 1988-89 harvest of 16 wolverines is the lowest number of animals sealed since initiation of sealing in 1971. Males have composed 61% (range = 53-74%) of the take in Unit 13 over the last 5 years. Most of the harvest occurred in mountainous areas of the unit, especially the Alaska and Talkeetna ranges in Subunit 13E and the Chugach range in Subunit 13D.

Hunter and Trapper Success. During the 1988-89 season, 5 trappers reported taking beavers in Unit 11. Since 1984 an average of 8 trappers have taken beavers, averaging four per trapper. The number of individuals trapping beavers in Unit 13 increased from 15 in 1984-85 to a high of 55 in 1986-87, then declined to 27 in 1988-89. The catch per trapper in Unit 13 has been fairly consistent, ranging between 5.8 and 7.5. Trapping and snaring were the most successful harvest methods, accounting for 98% of the take in Unit 13 and 100% in Unit 11.

In Unit 11, 1 trapper harvested 2 otters, and in Unit 13, 13 trappers harvested an average of 1.8 otters each during the 1988-89 season. These figures are similar to the 5-year-average annual catch per trapper of 1.5 otters in Unit 11 and 1.9 otters in Unit 13. Trapping or snaring was the method reported for all the otters harvested in Unit 11 and 61% of those taken in Unit 13. Shooting accounted for 26% of the Unit 13 harvest.

In Unit 11, 4 wolverine trappers reported taking an average of 1.8 wolverines during 1988-89, a catch rate similar to the 5-year average of 9 trappers reporting 1.5 wolverines each. In Unit 13,

14 trappers harvested an average of 1.1 wolverines, down slightly from the 5-year average of 25 trappers reporting 1.4 each.

The most successful method of taking wolverine in Unit 11 over the past 5 years has been trapping (83%), followed by snaring (9%) and landing-and-shooting (7%). In Unit 13 over the past 5 years, trapping accounted for 80% of the wolverine harvest, while the land-and-shoot method accounted for 16%. During the 1988-89 season, however, trapping accounted for only 69% of the harvest, while the percentage taken by ground shooting was 25%.

Questionnaire Response. Twenty-nine (49%) of the 59 trappers contacted in 1988-89 returned the questionnaire. This response rate was lower than the 57% return for the previous year's (1987-88) questionnaire. Those trappers that cooperated were for the most part very experienced with their areas. Unit 11 trappers reported an average of 18 years of trapping experience, while Unit 13 trappers averaged 19 years of trapping experience. Trapping pressure declined in 1988-89; 75% of the Unit 11 trappers and 68% of the Unit 13 trappers reported reduced effort. The questionnaiare response indicated that with the closure of the lynx season, marten were the most important furbearer in terms of their availability and number taken. In Unit 13 other important furbearers were beavers and red foxes. Trappers also considered hares to be stable or increasing; since hares are the main prey for lynx, they must increase substantially before lynx populations will recover.

Eleven of the 29 trappers responding to the questionnaire reported taking marten in 1988-89; Unit 11 trappers averaged 18 marten apiece (range = 2-40), compared with 30 (range = 7-87) in 1987-88. Unit 13 trappers averaged 16 marten apiece during the last 2 seasons, ranging from 2-50 in 1988-89 to 3-91 in 1987-88. Trappers in Unit 11 also averaged 7 coyotes and 7 foxes apiece in 1987-88. In Unit 13 red foxes were much more important commercially; trappers averaged 22 apiece (range = 2-80). Coyote and mink catches averaged four and 10, respectively, per trapper in Unit 13.

Harvest Chronology. Beaver harvests tended to be larger at the beginning and the end of the season in both units. In Unit 11, 46% of the harvest occurred in November and December. In Unit 13, 49% were taken during November and December and 32% in March. The early part of the season is popular because the ice is thinner and beaver meat is sought for trap bait. High harvests in March reflected increased trapper activity associated with longer days, moderating temperatures, and higher pelt prices.

Harvest chronology for otters in Unit 11 have showed no particular pattern over the past 3 years, probably because of the small number taken. The Unit 13 harvest chronology also fluctuates, but it appears that more otters are taken in the first three months of the season than later on, a pattern that generally reflects overall trapping pressure.

During the last open season (1986-87), 63% of the lynx harvest in Unit 13 occurred in November and December. The lynx take in Unit 11 was more evenly distributed through the season. These lynx harvest chronologies generally reflect the different trapping patterns in the 2 units. In Unit 13 where there are more trappers and intense competition, the emphasis has been to take furs early before someone else does. In Unit 11 there are fewer trappers and more traditional trapping areas, so there is less competition; weather and snow conditions often dictate when trapping pressure is the heaviest.

Harvest chronology data for wolverines in both units indicate more have been taken later in the season. Before the season was shortened in 1985 (February 28 closure), almost half of the total harvest occurred during February and March. In 1988-89, 50% of the Unit 13 wolverine harvest and 43% of that for Unit 11 occurred during February.

Transportation Methods. The transportation methods most used by successful trappers for all species of furbearers in both units were snowmachines and either dog sleds, snowshoes, or skis (Table 3). Otter and wolverine trappers in Unit 13 also reported using aircraft; an effective wolverine trapping method is to fly until a dead ungulate is located, then set traps near the carcass.

Game Board Actions and Emergency Orders

The Board of Game, during its November 1987 meeting, prohibited the land-and-shoot method of harvesting wolverines and foxes in Units 11 and 13 beginning with the 1988-89 season. During this same meeting, marten seasons were shortened by 28 days (31 January closure) beginning in the 1988-89 season. Lynx trapping was closed by the Board beginning with the 1988-89 season and by Emergency Order for the 1987-88 season. There were no Board of Game actions concerning furbearers in either unit during 1988.

CONCLUSIONS AND RECOMMENDATIONS

The track survey transects may become important management tools for monitoring the population status and trend of a number of important furbearers; however, much work is needed to fully develop the necessary techniques. Special emphasis should be given to determining the best time interval after a snowfall to conduct surveys. The effects of changes in animal densities and movement patterns on survey results must be evaluated; to compensate for these changes, survey techniques must be modified. In addition, survey techniques should be evaluated to determine their applicability to specific species.

Ground transects for lynx should be expanded by adding additional snowmachine lines, and all transects surveyed last year should be surveyed annually. Additional wolverine surveys should also be

completed in Subunits 13A and 13E, so density estimates can be derived and compared with estimates obtained in the early 1980's (i.e., Susitna Hydroelectric impact studies). A portion of the forested areas in Subunit 13A should also be stratified to relate wolverine distribution and densities to those of the census areas.

Although trapping pressure was not directly measured, information gathered from trapper questionnaires, sealing data, and contacts with trappers suggested that the effort had been substantially reduced during the 1988-89 season. Fox and coyote prices were very low; only the highest quality pelts were sold. Mink and beaver prices also declined, but not as much as canids. The lynx season was closed, and the number of marten were down from that of the previous year. In addition, early and deep snow persisted over much of the Basin, making the job of keeping traps operable very difficult. All of these factors had a negative impact on trappers. Traplines, as well as the amount of time they were operated, were generally shortened.

The beaver harvest in Unit 13 declined, following 2 years of record harvests. Beaver harvests have increased over the past few years because the population was increasing. In response to increased populations, the trapping season was extended to 82 days. In spite of increased harvests, beaver problems along the roadside still occurred and the percentage of kits in the harvest (21%) remained below the level indicating that overharvesting had occurred (Buckley and Libby 1955).

Because a large portion of the beaver harvest comes from colonies adjacent to the road system, localized overtrapping and a high proportion of kits in the harvest occurred. Remote beaver populations were virtually untrapped. Management guidelines will eventually need to be developed to address overharvesting in accessible areas adjacent to the road system, while allowing for consumptive and nonconsumptive uses. Management should promote trapping of more remote populations.

Lynx populations are increasing following several years of low densities. Lynx numbers were substantially lower in the recent low phase of the cycle than they had been during the previous low. Lynx harvests during the current cycle were below those reported a decade earlier. Reduced lynx populations may be a result of overharvesting, especially during low points in the cycle. Lynx prices were especially high over the last cycle, and trapping pressure did not decline when lynx became less abundant. Higher prices for pelts offset reduced catches, and trappers still made money.

Because of the lack of recruitment during cyclic lows, lynx have become vulnerable to overharvesting. To prevent overharvesting closed seasons need to be initiated for a 3- or 4-year period during the cyclic lows. Because the lynx population appears to be increasing, the season should be opened beginning with the

1990-91 season. This season should not exceed 60 days, and its opening should coincide with those for other furbearers. Close monitoring of the lynx cycle will require information on recruitment so that the season can be shortened or closed when production declines. The best indicator of recruitment is the percentage of kittens in the harvest. Pelts should continue to be measured at the time of sealing to obtain age composition of the harvest.

A decline in the number of wolverines sealed and reports of low numbers on trapper questionnaire responses suggest that wolverine numbers have declined in portions of both units. In areas of low wolverine densities, I recommend that the season be closed on 31 January. This earlier closure should reduce the harvest by 25%, because it would include the time when wolverine movements are increasing and trappers are more successful. Protection of dispersing animals may allow individuals to find and inhabit territories now vacant. Since moose and caribou have increased substantially in Unit 13 in recent years, a reduction in the harvest may allow wolverines to increase in areas formerly having higher numbers, unless these areas had been abandoned by wolverines because of increased human settlement.

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Table 1. Furbearer harvests[a] in Unit 11, 1984-85 to 1988-89.

	1984-85	1985-86	1986-87	1987-88	1988-89
Beaver	20	56	46	21	24
Land Otter	3	4	5	3	2
Lynx	76	22	16	0	1
Wolverine	32	10	9	11	7

[a] Data from sealing records.

Table 2. Furbearer harvests[a] in Unit 13, 1984-85 to 1988-89.

	1984-85	1985-86	1986-87	1987-88	1988-89
Beaver	90	201	333	300	173
Land Otter	19	29	36	16	23
Lynx	48	23	9	1	0
Wolverine	56	33	42	27	16

[a] Data from sealing records.

Table 3. Successful trapper transportation methods[a] in Units 11 and 13, 1988-89.

Species	Unit	Method of Transport[b] 1	2	3	4	5	6	7	Unknown
Beaver	11	0%	58%	0%	0%	42%	0%	0%	0%
Beaver	13	3%	39%	0%	0%	43%	0%	8%	7%
Otter	11	0%	0%	0%	0%	100%	0%	0%	0%
Otter	13	26%	22%	0%	0%	26%	0%	13%	13%
Lynx	11[c]	--	--	-	-	--	-	--	-
Lynx	13[c]	--	--	-	-	-	-	--	-
Wolverine	11	0%	29%	0%	0%	57%	0%	0%	14%
Wolverine	13	25%	25%	0%	0%	38%	0%	6%	6%

[a] Data from sealing records.

[b] Method of transport:
1. Air
2. Dog sled, skis, snowshoes
3. Boat
4. 3/4 wheeler
5. Snowmachine
6. ORV
7. Highway vehicle

[c] Season closed by EO in 1987/88.

STUDY AREA

GAME MANAGEMENT UNIT: 12 (9,980 mi^2)

GEOGRAPHICAL DESCRIPTION: Upper Tanana and White River drainages

BACKGROUND

Trapping of furbearers has long been a seasonally important part of the economy in eastern Interior Alaska. Commercial trapping supplemented income of miners and Alaskan Natives after the turn of the century. Following World War II and the construction of the Alaska Highway, trapping-augmented summer incomes derived largely from road maintenance and services to travelers. Even today, the economy of the upper Tanana River drainage is largely seasonal and dependent upon subsistence, construction work, and services to travelers of the Alaska Highway and the Tok Cutoff. Trapping continues to provide incomes and opportunities for productive winter work for many local residents.

In economic terms, muskrats, marten, and lynx are the most important furbearers sought in Unit 12. Little intentional trapping effort is expended on coyotes, red foxes, mink, land otters, beavers, ermine, red squirrels, or wolverines because of low pelt values, low abundance, or difficulty and expense of trapping these species. The production of high-quality pelts by fox and mink fur farmers has lowered demands for and values of the pelts of wild foxes and mink. Although beavers were abundant, pelt prices were not high enough to stimulate much interest in trapping them, given the physical difficulties of trapping through thick ice. The presence of wolverines and otters has been uncommon, contributing little to the overall value of the harvest in Unit 12. Similarly, coyotes, ermine, and red squirrels are of little interest to Unit 12 trappers.

POPULATION OBJECTIVES

To maintain accurate annual harvest records based on sealing documents.

To develop more specific population objectives for furbearers.

METHODS

Furbearer management is based largely upon annual harvest estimates. Sealing of pelts is mandatory for wolverines, lynx, land otters, and beavers. During the course of sealing, information is obtained on the specific location and date of harvest, sex of the animals, and estimates of age (young-of-the-year or adult). Additionally, pelts of all furbearers exported from Alaska must be enumerated, attributed to a specific game

management unit, and reported on the Raw Fur Skin Export Report. I deem unit-specific furbearer harvest estimates based upon the mandatory sealing program to be more accurate than harvest estimates derived from export reports. Subjective assessments of species abundance and trapping efforts are made through informal discussions with local fur buyers and trappers working throughout Unit 12. Documentation of similar responses is carried out by statewide staff through the annual trapper questionnaire, but the number of respondents to this voluntary program has been low in Unit 12.

An aerial survey technique for estimating abundance of lynx has been developed (Stephenson 1986), but it has not been used in Unit 12. Areas of lynx concentration and individual lynx tracks were mapped during March 1988 in the course of approximately 100 hours of extensive aerial wolf surveys. The absence, presence, and relative abundance of tracks of other furbearer species are also noted during aerial surveys of other wildlife species from October through March each year.

RESULTS AND DISCUSSION

Population Status and Trend

Based upon the harvest of only 70 lynx during the winter of 1988-89, the lynx population failed to increase during this reporting period. Kittens composed 21% of the harvest, based upon pelt lengths of 35 inches or less. Thus far, expansion of the snowshoe hare population has been slow. I expect lynx numbers to increase only if hare numbers increase significantly throughout Unit 12.

The number of wolverines were lower in Unit 12 than they had been in the 1960's and 1970's, and their distribution has been reduced largely to mountainous habitat where high densities of Dall sheep, ground squirrels, and marmots provide an adequate prey base. A severe reduction in moose and wolf populations during the 1970's and subsequent reduction in the availability of carrion may be partly responsible for the wolverine's population decline. The density of trappers in accessible lowland areas and the susceptibility of wolverines to trapping may also be responsible. The reduction of the wolverine trapping season by 1 month may allow their recovery to some extent in Unit 12.

Based on interviews with trappers and personal observations, marten have attained historically high numbers and extent of distribution during the past 4 years; however, the population density declined 20-30% during this reporting period. Snowshoe hares and hare predators (e.g., great-horned owls, goshawks, and red foxes) have increased during this same time period. Long-term observations by trappers in eastern Alaska and the adjacent Yukon Territory suggested that marten have declined as numbers of hares and lynx have increased. I hypothesize that predators of

hares can actually control marten numbers. If this hypothesis is true and if numbers of predators continue to increase, I expect that marten will continue to decline.

The Northway-Tetlin Flats has been one of the most productive trapping areas for muskrats in Alaska, particularly in the vicinity of the villages of Northway and Tetlin. "Ratting" is traditionally a springtime activity, and muskrats are taken with traps in pushups before breakup and with .22 rifles after breakup. Muskrat populations have fluctuated in this area; recent highs occurred in the mid-1970's and mid-1980's.

Muskrat numbers peaked in 1976 and again in the mid-1980's in the Scottie Creek and Northway-Tetlin Flats areas. During the reporting period muskrats were at low levels, except in restricted areas where the trapping effort was high; e.g., near the villages of Northway and Tetlin. Muskrat population fluctuations in untrapped or lightly trapped marshes were attributed to periodic "eat-outs" of aquatic food sources and subsequent die-offs of associated muskrats.

Although red foxes remained abundant during the winter of 1988-89, they were not as abundant as they had been in the winter of 1987-88. Flooding conditions in the Northway-Tetlin Flats during the spring and summer of 1988 may have affected survival of newborn foxes and various prey species. While grouse numbers declined noticeably during this reporting period, hares increased. Continued red fox abundance is expected, as long as hares continue to increase.

Coyotes were present in Unit 12, but the status and trend of the population is not known. Beavers were moderately abundant in Unit 12 in suitable, lowland habitat, but the population trend is unknown. Otters were relatively scarce in Unit 12, and the population trend is unknown. The status and trend are unknown for mink and ermine in Unit 12. Red squirrels increased dramatically in the Tok area by late June 1989, in contrast to their scarcity during the winter of 1988-89.

Mortality

Hunting Seasons and Bag Limits:

Coyote	1 Sep-15 Apr	2 coyotes
Red Fox	1 Nov-15 Feb	2 foxes
Lynx	1 Nov-31 Mar	2 lynx
Squirrel	No closed season	No limit
Wolverine	1 Sep-31 Mar	1 wolverine

Trapping Seasons and Bag Limits:

Beaver	1 Nov-15 Apr	15 beavers
Coyote	1 Nov-28 Feb	No limit
Red Fox	1 Nov-28 Feb	No limit

Lynx	1 Nov-31 Jan	No limit
Marten	1 Nov-28 Feb	No limit
Mink/Weasel	1 Nov-28 Feb	No limit
Muskrat	20 Sep-10 Jun	No limit
Land Otter	1 Nov-15 Apr	No limit
Squirrel/Marmot	No closed season	No limit
Wolverine	1 Nov-28 Feb	No limit

Human-induced Mortality:

Because harvests of most furbearer species in Unit 12 have been relatively stable, they generally did not significantly affect their respective population dynamics; however, there were a few exceptions (Table 1). Harvests of lynx and wolverines may be having a depressing effect on populations at this time.

Based upon the reported harvest of only 70 lynx during the 1988-89 season, their abundance did not increase in Unit 12 during the reporting period. Trapping mortality may be responsible for the failure of the lynx population to increase, but snowshoe hare-habitat relationships may also be the major factor. In any event, if the tracking harvest strategy is to be implemented correctly, lynx harvests should be restricted until there are clear indications that hare and lynx numbers are increasing at reasonable rates.

The 1988-89 harvest of only 14 wolverines was the lowest recorded for the past 6 years. It was attributed to a conscious reduction of harvest by a couple of Alaska Range trappers, the recent prohibition of same-day-airborne trapping, and the 1-month reduction in the season. Although the reduced harvests are expected to benefit wolverines, I believe the relatively low numbers of ungulates and wolves, and hence biomass available to wolverines, is the ultimate factor controlling them in Unit 12.

After 4 consecutive years of increasing harvests (Table 1), the 1988-89 harvest declined to only 2 otters. Land otters are relatively uncommon in Unit 12, and annual harvests have been generally low.

Area trappers expended considerable effort toward marten in the winter of 1988-89, despite the decline in pelt prices (i.e., averages of $100 in 1987-88 and $80 in 1988-89). Interviews with proficient marten trappers indicated 20-30% declines in harvests and abundance. If hare and their predators, excluding marten, continue to increase, harvests of marten are expected to continue declining.

The overall trapping pressure has increased in recent years because of increased marten abundance and pelt value--a fortuitous combination for area trappers. Trappers using ski-equipped aircraft for access have distributed trapping pressure more widely, causing conflicts with trappers using snowmachines in some instances. I expect declines in marten distribution and

abundance will occur, followed by a reduction in overall trapping effort and conflicts.

The harvest of red foxes was low in 1988-89, primarily because of low pelt value, rather than lack of availability. Only "cross" color-phase pelts retained a modicum of value. Production of ranched pelts has the potential to reduce trapping pressure on wild fox populations in the foreseeable future.

Interest in beaver trapping remained low for the 2nd year in a row, despite a modest increase in pelt prices during the 1988-89 season. Low beaver trapping pressure may partially explain the low land otter harvest during this reporting period.

Natural Mortality:

Predation is the most likely explanation for the apparent decline in marten abundance during the winter of 1988-89. Long-term trapping records and recollections of individual trappers indicated an inverse relationship between marten and lynx populations has existed for the past 30 years in east-central Interior Alaska and adjacent Yukon Territory. When marten have been abundant, lynx and hares have been near the lows in their cycles. Conversely, as hares and lynx have increased, marten have decreased to extremely low numbers during past cycles.

Habitat Assessment and Enhancement

No quantified assessment of furbearer habitat was conducted. Subjectively, Unit 12 is characterized by diverse physiography, including rolling, timbered hills on the north; rugged, steep mountains on the south; and the broad, lowland Tanana Valley running southeast and northwest in the middle.

More than 30 years of successful wildfire suppression have resulted in an older, less-diverse habitat mosaic than would have existed today if most fires had not been successfully suppressed. The attempted exclusion of wildfire from Unit 12 for 30 years warrants elaboration. The continuous existence of the BLM Fire Guard Station at Tanacross and an ADNR, Division Of Forestry, facility in Tok for over 2 decades have assured nearly complete exclusion of wildfires from the upper Tanana Valley. Seral plant communities, which are highly productive hare forage resulting from wildfires, are nearly absent. Hares were most abundant along the edges of mature spruce forests, where disturbances maintain a variety of grasses, shrubs, and saplings. Hare density decreases throughout large expanses of spruce and mature aspen forests with sparse understory components. Hares faltered at low densities, failing to reach a high amplitude cyclic high in the early 1980's, and they are reacting similarly in the late 1980's. If hares fail to achieve cyclic high densities during this cycle, I believe that inadequate food resources may be at least partially responsible.

The Alaska Interagency Fire Management Plan for the Fortymile area went into effect in 1984. A great deal of the northern portion of Unit 12 was afforded full and modified protection from wildfires. Valley bottom areas of great importance to furbearers and prey species have been accorded mostly full and critical fire suppression status. Nearly all of the Wrangell-Saint Elias National Park and Preserve, the Tetlin National Wildlife Refuge, and State lands in southern Unit 12 have received limited suppression status, where a near-natural wildfire regime will be implemented.

Habitat enhancement in the future will depend largely upon escaped wildfire, prescribed fire, logging, mechanical wildlife habitat improvement techniques, and inadvertent disturbances of forest land by humans. To date, the acreage affected through these means has been minimal. Mechanical improvement of decadent willow communities has been accomplished on about 1,000 acres since 1982, and more projects are planned in the future as part of planned mitigation for a large USAF radar installation near Tok. Prescribed fire has been used to treat about 5,000 acres in the Northway-Tetlin Flats by the USFWS, and additional use of prescribed fire is planned. Logging on the Tanana State Forest in the Tanana and Tok River drainages has disturbed an estimated 500 acres, and more timber sales are planned. Even so, these disturbances are relatively insignificant, compared with the 2,000-3,000 mi^2 of lowland habitat present.

Game Board Actions and Emergency Orders

As noted previously, the Alaska Board of Game took action in March 1988 to align trapping season dates for most terrestrial furbearers, resulting in shortened (1 month) coyote and wolverine trapping seasons. The Board also prohibited same-day-airborne taking of red foxes and wolverines for the 1988-89 season. Overall, I expect these regulatory changes to benefit the management of furbearers, particularly wolverines, in Unit 12. The Board also aligned the lynx hunting and trapping seasons the 1989-90 season.

The ADF&G issued an Emergency Order in the fall of 1988, shortening the lynx trapping season by 1 month, thereby maintaining the 1 December-31 January trapping season that had been in effect during the 1987-88 season. It was previously agreed that this order would only be issued if 2 criteria had not been met during 1987-88: (1) stability or increase in the proportion of kittens in the harvest and (2) an increase in the harvest, reflecting growth in the lynx population. The 1st criterion was met, the second was not, and the Emergency Order was issued.

CONCLUSIONS AND RECOMMENDATIONS

One population objective (i.e., maintaining accurate annual harvest records based upon sealing documents) was achieved during the reporting period. No additional ones were developed, and given the demonstrated ability of the various species populations to satisfy the strategic human use goals, none are necessary.

Most furbearer populations are fluctuating well within historical extremes, based upon reported harvests and observations of abundance by long-time area trappers; the 2 possible exceptions may be lynx and wolverines. Because both species can reach low densities naturally, they are vulnerable to biologically significant levels of human-induced mortality through trapping. Recent trapping season reductions for both species are expected to maintain harvests at levels within safe biological limits.

LITERATURE CITED

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Table 1. Furbearer harvests in Unit 12, as determined by sealing certificates, 1984-88.

	1984	1985	1986	1987	1988	$\bar{x}$
Wolverine	19	23	30	19	14	21
Otter	1	2	4	10	2	4
Beaver	44	6	55	18	15	28
Lynx	82	73	80	74	70	76

STUDY AREA

GAME MANAGEMENT UNIT: 14A AND 14B (4,710 mi^2)

GEOGRAPHICAL DESCRIPTION: Upper Cook Inlet

POPULATION OBJECTIVES

To maintain an optimal harvests of furbearers, recognizing that populations will fluctuate in response to environmental factors.

To provide the greatest opportunity for participation in hunting and trapping of furbearers.

METHODS

Information on the distribution and relative densities of furbearers was obtained by (1) tabulating questionnaire responses from trappers who sealed furbearers; (2) analyzing sealing records, fur export permits, historical harvest data, population estimates, and environmental conditions; (3) noting tracks and other signs of furbearers while conducting big game surveys; and (4) conducting interviews with long-time trappers.

RESULTS AND DISCUSSION

Population Status and Trend

Beavers occur in moderate-to-high densities at elevations below 2,000 feet in Unit 14. In recent years, trapping of beaver has been relatively light, primarily because prices have been low. This trend is expected to continue, unless pelt prices rise enough to stimulate additional trapping pressure.

Most beaver trapping has been concentrated near areas readily accessible by road and/or snowmachine; a high percentage of beavers trapped near the road system are caught by part-time or "recreational" trappers. Even with the apparent concentration of trapping effort near roads and access points, beaver densities have remained relatively high near human developments. Each year 30-50 complaints are received about beavers causing damage to roads and property by damming culverts and other waterways.

Fifty-five percent of trappers who responded to a mail-out questionnaire listed coyotes as common in Subunits 14A and 14B; the remaining respondents listed them as abundant. Trappers reported that coyotes are most abundant in Subunit 14A and have increased in a northward direction up the Susitna Valley in Subunit 14B. Talkeetna residents reported an increase in coyotes in their area during the previous 2 years.

The present status and historical population trends of land otters in Unit 14 are not well documented; however, 67% of the respondents to the trapper questionnaire listed land otters as common or abundant. Most trappers believed that the land otter population had not changed significantly during the previous 2 years. Long-time residents of Unit 14 believe the population has remained relatively stable over the past 10 to 20 years.

Lynx were relatively common throughout Subunits 14A and 14B until the mid-1960s. Since that time, lynx numbers have steadily decreased. Over the past 2 hare cycles, lynx populations have not rebounded. Ninety-three percent of respondents to the trapper questionnaire reported that lynx remained scarce during the 1988-89 trapping season; 85% did not observe any change in lynx density from that of the preceding year.

In some areas of Subunits 14A and 14B, marten were less abundant than in the past. Relatively low population numbers may have been caused by increased harvests that had been stimulated by higher-than-usual pelt prices during the last 3 years. Some trappers expressed concern that increased trapping by some trappers severely depressed or temporarily eliminated marten from some areas. Other trappers working in more remote areas believed that declines in the food supply caused the population decreases observed in the past 2 years. The low number of kits taken on some traplines supports the latter explanation.

Muskrats occur in suitable wetlands throughout Unit 14. Although their abundance has not been well documented, population densities have remained relatively stable over the past 20 years. During this reporting period, environmental factors, such as thick ice and winter or spring flooding, have had much greater effects on muskrat numbers than trapping. Most trappers who responded to the questionnaire described muskrats as being common or abundant in Unit 14; 64% indicated they numbered the same as in the previous year, and the remainder indicated they had increased.

Long-time trappers and other observers in Subunit 14A reported that the red fox population has declined substantially, compared with densities 20 years ago. It is unlikely that the decrease in the population was primarily due to increased human settlement, since red foxes typically adapt quickly to living near humans. However, red foxes are displaced by coyotes, and the trend of decreasing densities coincides with a corresponding increase in coyotes throughout the same areas.

Wolverines were relatively common in Unit 14 prior to 1950; since that time, densities have declined. This trend will likely continue as people continue to encroach on their habitat. Seventy-three percent of trappers who responded to the 1988-89 questionnaire reported that wolverines were scarce. Sixty-two percent reported that the number of wolverines had remained the

same as the previous year, and the rest were evenly split as to whether wolverines had increased or decreased.

RESULTS AND DISCUSSION

Mortality

Hunting Seasons and Bag Limits:

Coyote	1 Sep-30 Apr	2 coyotes
Lynx	No open season	
Red Fox	1 Nov-28 Feb	2 foxes
Wolverine	1 Sep-31 Mar	1 wolverine

Trapping Seasons and Bag Limits:

Beaver	10 Nov-30 Apr	30 beavers
Coyote	10 Nov-31 Mar	No limit
Land Otter	10 Nov-31 Mar	No limit
Lynx	No open season	
Marten	10 Nov-31 Jan	No limit
Muskrat	10 Nov-10 Jun	No limit
Red Fox	10 Nov-15 May	No limit
Wolverine	10 Nov-28 Feb	No limit

Human-induced Mortality:

During the 1988-89 trapping season, 96 and 94 beavers were taken by 22 and 12 trappers in Subunits 14A and 14B, respectively (Table 1). The lower harvest per trapper in Subunit 14A reflected the greater numbers of recreational trappers and their tendency to trap readily accessible colonies.

Characteristics of beavers taken in the two subunits also indicated that trapping was more intense in portions of Subunit 14A than in Subunit 14B. Mature beavers ($\geq$60 in) represented only 45% of the harvest in Subunit 14A versus 67% in Subunit 14B (Table 2). Conversely, Subunit 14A had a slightly higher percentage of kits in the harvest than Subunit 14B; however, in neither subunit during the past 3 trapping seasons has the proportion harvest of kits in the harvest exceeded 20%, a level considered indicative of overharvesting. Likewise, the rapidity with which heavily harvested areas are recolonized by beavers year after year suggests that adjacent populations have remained highly productive. The strong immigration of two-year-olds into heavily trapped areas was also partially responsible for the high juvenile:adult ratio in the harvest (Table 2).

The combined harvest in Subunits 14A and 14B was 190 beavers, compared with a 5-year mean of 296. The lower harvests of the past 2 seasons have reflected the decreasing value of pelts, relative to the cost and effort of trapping. No change in this trend is anticipated, and the beaver population is expected to

remain at high densities. Heavy trapping will still occur near roads and human habitation; however, this condition is desirable because trapping will help control property damage by beavers.

Respondents to the 1988-89 questionnaire reported a harvest of 65 coyotes from Subunits 14A and 14B. Most trappers did not make specific sets for coyotes, because pelt prices have been low. Consequently, most coyotes were incidentally caught in sets for other species.

Four land otters each were taken in Subunits 14A and 14B, compared with the previous 10-year means of 15 and 9, respectively (Table 3). During the past 2 years, females have represented 50% of the harvest in Subunit 14A. In Subunit 14B the harvest of females has been 50% or greater for the past 4 years; however, because samples have been small, concern over the high female:male harvest ratio is probably not warranted.

Because the 1988-89 trapping season was closed, no lynx were reported harvested in Subunits 14A and 14B. The lynx harvest from 1978 to 1987 is provided in Table 4.

Respondents to the trapper questionnaire reported taking 117 marten in Subunits 14A and 14B; however, not all trappers were sent questionnaires. Forty percent of the respondents said fewer marten were present on their lines than in the previous winter, but 13% reported an increase.

Respondents to the trapper questionnaire reported that 723 muskrats were taken in Subunits 14A and 14B. Responses to the questionnaire indicated that muskrats were of substantial interest to local trappers. The total harvest was probably much larger than indicated. Respondents also reported a harvest of 34 red foxes.

The reported harvests in Subunits 14A and 14B were 7 and 3 wolverines, respectively (Table 5). The 11-year-mean harvest in these 2 subunits combined is 11 wolverines (i.e., 6 in 14A and 5 in 14B)

CONCLUSIONS AND RECOMMENDATIONS

Beaver and muskrat populations are at or near carrying capacity in Subunits 14A and 14B. This conclusion is supported by the trapper questionnaire response and observations of individuals of both species colonizing marginal habitats, where environmental conditions frequently prevent overwintering. Harvests of both species are believed to be below sustained yield.

Coyotes have continued to increase and expand their range, and annual harvests have apparently been below sustained yield. Harvest of land otters also appears to be below sustained yield, even though the harvest for the past 2 years has been considerably lower than the historical mean.

The red fox population has continued to decline, apparently as a result of increased competition from coyotes. It is unlikely that trapping has affected this trend.

Marten have recently decreased in abundance in some areas. Low prey densities may have contributed to the decline in some areas, but marten are easily trapped and vulnerable to overtrapping. For this reason and because high prices have stimulated interest in trapping them, it is particularly important that trappers properly space traplines and traps to avoid overharvesting of the species. Marten density is directly related to the availability of mature spruce habitat, and reductions in spruce cover as a result of clear-cut logging or road building will result in decreases in marten populations. If current trends of high pelt prices and reductions in densities continue into the 1989-90 trapping season, I recommend shortening the season by 52 days (i.e., 15 December-15 January). A shortened season should reduce the likelihood of overharvesting in heavily trapped areas.

Wolverine densities are low but stable, relative to the availability of remote habitat in Subunits 14A and 14B. For the past 11 years, the harvests have been relatively constant; the percentage of males in the harvest has also indicated that it has probably been below sustained yield in most areas. Recent increases in the Nelchina Caribou Herd have provided increases in carrion in the Talkeetna Mountains; an increase in food supply may enable wolverines to expand into wherever vacant habitat is available.

Lynx are still scarce throughout Subunits 14A and 14B. In most areas, snowshoe hares and ptarmigan populations have not rebounded enough to support substantially more lynx. Hunting and trapping seasons should remain closed until there are signs that lynx and their prey are increasing.

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Table 1. Beaver harvest in Subunits 14A and 14B, 1984-85 to 1988-89.

Subunit	Year	Total	% Kits[a]	Harvest chronology												Method of take				
				Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Unk.	Shot	Trapped	Snared	Other	Unk.
14A	84/85	151	30	0	0	0	0	1	3	79	46	20	0	0	2	0	96	55	0	0
	85/86	137	24	0	0	2	4	10	5	58	34	16	6	0	2	0	80	46	0	11
	86/87	158	15	0	0	0	0	0	0	42	62	46	6	0	2	1	80	70	1	6
	87/88	98	15	0	0	0	0	0	3	49	44	2	0	0	0	0	69	25	0	4
	88/89	96	17	2	0	2	13	6	10	20	36	7	0	0	0	0	79	16	1	0
14B	84/85	130	18	0	0	0	0	0	2	28	72	11	0	0	17	0	107	6	0	17
	85/86	314	17	0	0	0	0	8	0	126	145	24	1	1	9	0	209	89	0	16
	86/87	143	18	0	0	0	0	5	0	25	101	12	0	0	0	0	127	14	0	2
	87/88	159	9	0	0	0	0	0	15	61	72	1	0	0	10	0	105	34	0	20
	88/89	94	12	0	0	0	5	40	12	3	20	0	0	0	14	0	49	31	0	14
14A & 14B	84/85	281	24	0	0	0	0	1	5	107	118	31	0	0	19	0	203	61	0	17
Combined	85/86	451	18	0	0	2	4	18	5	184	179	40	7	1	11	0	289	135	0	27
totals	86/87	301	16	0	0	0	0	5	0	67	163	58	6	0	2	1	207	84	1	8
	87/88	257	11	0	0	0	0	0	18	110	116	3	0	0	10	0	174	59	0	24
	88/89	190	14	2	0	2	18	46	22	23	56	7	0	0	14	0	128	47	1	14
Grand total		1,480	--	2	0	4	22	70	50	491	632	139	13	1	56	1	1,001	386	2	90
$\bar{x}$		296	17	0	0	1	4	14	10	98	126	28	3	0	11	0	200	77	0	18

[a] Beavers whose hides had a combined length plus width of 52 inches or less were classified as kits.

Table 2. Percentage of beavers harvested by size class in Subunits 14A and 14B, 1984-85 to 1988-89.

Subunit	Season	Pelt size ≤52"	>52-59"	>59-64"	>64"
14A	84/85	30	22	29	19
	85/86	24	26	31	19
	86/87	15	28	34	23
	87/88	15	25	34	26
	88/89	17	38	25	20
14B	84/85	18	25	41	16
	85/86	17	16	39	28
	86/87	18	27	32	23
	87/88	9	28	37	26
	88/89	12	21	46	21

Table 3. Land otter harvest in Subunits 14A and 14B, 1978-79 to 1988-89.

Subunit	Year	Total	Sex			Harvest Chronology							Method of take				
			M	F	Unk	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Unk	Shot	Trapped	Snared	Other	Unk
14A	78/79	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0
	79/80	12	-	-	12	-	-	4	1	3	4	0	0	12	0	0	0
	80/81	16	10	5	1	0	3	1	4	8	0	0	0	15	0	0	1
	81/82	28	-	-	28	0	1	10	8	7	2	0	0	25	2	0	1
	82/83	8	4	3	1	0	2	0	3	0	3	0	1	7	0	0	0
	83/84	20	11	7	2	0	4	4	4	5	3	0	0	20	0	0	0
	84/85	26	10	11	5	0	8	10	1	2	1	4	0	25	0	0	1
	85/86	17	9	6	2	0	1	5	8	1	2	0	0	17	0	0	0
	86/87	20	9	7	4	0	1	8	2	7	0	2	0	18	0	0	2
	87/88	2	1	1	0	0	0	2	0	0	0	0	0	2	0	0	0
	88/89	4	2	2	0	1	1	1	0	0	1	0	0	3	0	1	0
14B	78/79	3	3	0	0	0	2	0	0	0	1	0	0	2	1	0	0
	79/80	6	-	-	6	0	1	1	1	2	1	0	0	5	0	0	1
	80/81	5	5	0	0	0	0	0	0	1	4	0	0	5	0	0	0
	81/82	2	-	-	2	0	0	2	0	0	2	0	0	0	0	0	0
	82/83	3	1	2	0	0	0	0	1	0	2	0	0	3	0	0	0
	83/84	9	4	4	1	0	2	2	0	5	0	0	1	8	0	0	0
	84/85	23	11	10	2	0	9	3	2	4	4	1	0	17	1	0	5
	85/86	18	8	9	1	0	1	3	9	5	0	0	17	1	0	0	0
	86/87	14	3	7	4	0	3	2	5	3	1	0	0	14	0	0	0
	87/88	4	2	2	0	0	1	1	2	0	0	0	0	4	0	0	0
	88/89	4	1	2	1	0	0	3	0	0	1	0	0	4	0	0	0

Table 3. Continued

Subunit	Year	Total	Sex			Harvest Chronology							Method of take				
			M	F	Unk	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Unk	Shot	Trapped	Snared	Other	Unk
14A &	78/79	4	3	1	0	0	3	0	0	0	1	0	0	3	1	0	0
14B	79/80	18	-	-	18	0	1	5	2	5	5	0	0	17	0	0	1
Combined	80/81	21	15	5	1	0	3	1	4	9	4	0	0	20	0	0	1
Totals	81/82	30	-	-	30	0	1	12	8	7	2	0	0	27	2	0	1
	82/83	11	5	5	1	0	2	0	4	0	5	0	1	10	0	0	0
	83/84	29	15	11	3	0	6	6	4	10	3	0	1	28	0	0	0
	84/85	49	21	21	7	0	17	13	3	6	5	5	0	42	1	0	6
	85/86	35	17	15	3	0	2	8	17	6	2	0	17	18	0	0	0
	86/87	34	12	14	8	0	4	10	7	10	1	2	0	32	0	0	2
	87/88	6	3	3	0	0	1	3	2	0	0	0	0	6	0	0	0
	88/89	8	3	4	1	1	1	4	0	0	1	0	0	7	1	0	0
Grand total		245	94	79	72	1	41	62	51	53	30	7	19	210	11	0	11
$\bar{x}$		22	-	-	7	0	4	6	5	5	3	1	2	19	0	0	1

Table 4. Lynx harvest in Subunits 14A and 14B, 1978-79 to 1988-89.

Subunit	Year	Total	Sex			Harvest Chronology							Method of take				
			M	F	Unk	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Shot	Trapped	Snared	Other	Unk
14A	78/79	4	--	--	4	0	0	0	3	0	1	0	1	3	0	0	0
	79/80	3	--	--	3	0	0	1	0	0	1	1	0	3	0	0	0
	80/81	2	--	--	2	0	0	0	2	0	0	0	0	2	0	0	0
	81/82	7	--	--	7	0	0	1	3	0	3	0	0	6	1	0	0
	82/83	16	--	--	16	2	1	1	2	5	5	0	4	11	1	0	0
	83/84	4	--	--	4	0	0	1	1	1	1	0	1	3	0	0	0
	84/85	8	--	--	8	0	0	2	0	3	3	0	0	7	0	0	1
	85/86	3	--	--	3	0	0	1	1	1	0	0	1	2	0	0	0
	86/87	6	1	3	2	0	0	0	2	4	0	0	0	3	3	0	0
	87/88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	88/89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14B	78/79	3	--	--	3	0	0	1	0	1	0	1	1	1	0	0	1
	79/80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	80/81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	81/82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	82/83	1	--	--	1	0	0	0	0	1	0	0	0	1	0	0	0
	83/84	1	--	--	1	0	0	0	0	1	0	0	0	1	0	0	0
	84/85	2	--	--	2	0	0	0	1	0	0	1	1	1	0	0	0
	85/86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	86/87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	87/88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	88/89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4. Continued.

Subunit	Year	Total	Sex			Harvest Chronology							Method of take				
			M	F	Unk	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Shot	Trapped	Snared	Other	Unk
14A & 14B	78/79	7	--	--	7	0	0	1	3	1	1	1	2	4	0	0	1
combined	79/80	3	--	--	3	0	0	1	0	0	1	1	0	3	0	0	0
totals	80/81	2	--	--	2	0	0	0	2	0	0	0	0	2	0	0	0
	81/82	7	--	--	7	0	0	1	3	0	3	0	0	6	1	0	0
	82/83	17	--	--	17	2	1	1	2	6	5	0	4	12	1	0	0
	83/84	5	--	--	5	0	0	1	1	2	1	0	1	4	0	0	0
	84/85	10	--	--	10	0	0	2	1	3	3	1	1	8	0	0	1
	85/86	3	--	--	3	0	0	1	1	1	0	0	1	2	0	0	0
	86/87	6	1	3	2	0	0	0	2	4	0	0	0	3	3	0	0
	87/88[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	88/89[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand total		60	1	3	56	2	1	8	15	17	12	3	9	44	2	0	2
$\bar{x}$		5	--	--	5	0	0	1	1	2	1	0	1	4	0	0	0

[a] Hunting and trapping seasons were closed.

Table 5. Wolverine harvest, in Subunits 14A and 14B, 1978-79 to 1988-89.

Subunit	Year	Total	Sex			Harvest Chronology								Method of take				
			M	F	Unk	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Unk	Shot	Trapped	Snared	Other	Unk
14A	78/79	4	2	2	0	2	0	0	1	0	1	0	0	2	2	0	0	0
	79/80	10	-	-	10	0	0	1	1	3	3	2	0	0	10	0	0	0
	80/81	7	4	3	0	2	0	0	2	1	2	0	0	2	5	0	0	0
	81/82	5	2	2	1	0	0	0	1	1	0	3	0	3	2	0	0	0
	82/83	5	3	1	1	-	-	-	-	-	-	-	5	-	-	-	-	5
	83/84	5	1	4	0	0	0	1	1	2	0	1	0	0	5	0	0	0
	84/85	4	1	2	1	0	0	0	1	2	0	1	0	0	4	0	0	0
	85/86	8	6	2	0	0	0	2	2	1	1	2	0	0	6	2	0	0
	86/87	8	1	0	7	0	0	0	1	0	0	0	7	0	1	0	0	7
	87/88	3	1	2	0	0	0	0	1	1	0	1	0	0	0	0	0	3
	88/89	7	3	3	1	0	0	0	1	0	6	0	0	0	6	0	0	1
14B	78/79	6	2	4	0	0	0	4	0	1	1	0	0	2	4	0	0	0
	79/80	6	-	-	6	0	0	0	2	1	1	2	0	0	5	1	0	0
	80/81	1	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0
	81/82	3	2	1	0	0	0	0	0	1	2	0	0	3	0	0	0	0
	82/83	7	5	2	0	-	-	-	-	-	-	-	7	-	-	-	-	7
	83/84	7	1	5	1	0	0	0	2	2	1	2	0	2	5	0	0	0
	84/85	7	5	2	0	0	0	0	1	1	3	2	0	3	4	0	0	0
	85/86	6	2	2	2	0	0	1	2	1	1	1	0	1	5	0	0	0
	86/87	6	3	3	0	0	0	0	2	0	4	0	0	1	4	1	0	0
	87/88	5	3	1	1	0	0	0	2	0	1	2	0	0	0	0	0	5
	88/89	3	2	1	0	0	0	0	0	1	2	0	0	0	3	0	0	0

Table 5. Continued.

Subunit	Year	Total	Sex			Harvest Chronology								Method of take				
			M	F	Unk	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Unk	Shot	Trapped	Snared	Other	Unk
14A &	78/79	10	4	6	0	2	0	4	1	1	2	0	0	4	6	0	0	0
14B	79/80	16	-	-	16	0	0	1	3	4	4	4	0	0	15	1	0	0
Combined	80/81	8	5	3	0	2	0	0	3	1	2	0	0	2	6	0	0	0
Totals	81/82	8	4	3	1	0	0	0	1	2	2	3	0	6	2	0	0	0
	82/83	12	8	3	1	-	-	-	-	-	-	-	12	-	-	-	-	12
	83/84	12	2	9	1	0	0	1	3	4	1	3	0	2	10	0	0	0
	84/85	11	6	4	1	0	0	0	2	3	3	3	0	3	8	0	0	0
	85/86	14	8	4	2	0	0	3	4	2	2	3	0	1	11	2	0	0
	86/87	14	4	3	7	0	0	0	3	0	4	0	7	1	5	1	0	7
	87/88	8	4	3	1	0	0	0	3	1	1	3	0	0	0	0	0	8
	88/89	10	5	4	1	0	0	0	1	1	8	0	0	0	9	0	0	1
Grand total		123	50	42	31	4	0	9	24	19	29	19	19	19	72	4	0	28
$\bar{x}$		11	5	4	3	0	0	1	2	2	3	2	2	2	7	0	0	3

STUDY AREA

GAME MANAGEMENT UNIT: 14C (1,190 mi^2)

GEOGRAPHICAL DESCRIPTION: Anchorage area

POPULATION OBJECTIVES

To maintain furbearer populations that will sustain 5-year-mean annual harvests of 20 beavers (less than 25% kits), 2 otters, and 1-2 wolverines.

To increase lynx densities by reducing or eliminating harvests.

To avoid harvesting coyotes beyond sustainable levels.

To maintain populations of mink, weasels, muskrats, red foxes, and marten that will sustain historical harvest levels.

METHODS

Furbearer harvests were monitored through pelt-sealing process. Personal interviews were conducted and a questionnaire was sent to all trappers in Subunit 14C.

RESULTS AND DISCUSSION

Population Status and Trend

Beavers were found throughout the lowland areas and several upland river valleys of Subunit 14C; they were most abundant in the Twentymile River drainage, Girdwood Valley, and the Ship Creek drainage. Sealing records have been available since 1971. All of Subunit 14C northwest of Girdwood (Glacier Creek), including Chugach State Park, is closed to beaver trapping.

Land otters were most abundant in the Twentymile River drainage, and they were occasionally found in the undeveloped portions of the local military reservations and the southern portion of Chugach State Park. Otter trapping is closed within Chugach State Park, the Anchorage management area, and the Anchorage Coastal Wildlife Refuge.

Wolverines occurred in low numbers in the undeveloped portions of the subunit. Trapping occurred in the Lake George and Twentymile River drainage. Chugach State Park is closed to wolverine trapping.

Lynx occurred throughout the subunit at or below timberline. During the reporting period they were near the low point in their

cycle of abundance. Trapping and hunting is closed throughout the subunit.

Information on unsealed furbearers was received from trappers, park rangers, and ADF&G staff. Coyotes and weasels were abundant throughout the subunit in brushy and second-growth areas below timberline. Mink were common in wooded, riverine habitat. Red foxes were very uncommon, although they were occasionally seen in the area from the Eagle River drainage north to the Knik River. Marten were uncommon from Ship Creek south to the Twentymile River and scarce to absent in drainages to the north. Muskrats were common in lowland marshy areas. Muskrat numbers fluctuate substantially, because cold winters with little snow cover periodically cause die-offs. The mountainous nature of the area and the lack of extensive lake and riverine habitat preclude large numbers of riparian species such as otters, beavers, and mink.

RESULTS AND DISCUSSION

Low-to-moderate numbers of furbearers, access restrictions, and extensive closed areas result in low annual furbearer harvests. Over the past decade an average of 16 beavers have been harvested annually (Table 1). The average annual take of otters, wolverines, and lynx over the past decade has been one, one, and two, respectively (Tables 2, 3, 4). Harvest records are not available for mink and weasels. Coyotes were trapped in low numbers on Fort Richardson and in the Twentymile River drainage. Areas with numerous coyotes near Anchorage and Eagle River are closed to trapping. Moderate muskrat harvests occurred southeast of Glacier Creek and from Fort Richardson north to the Knik River. Some red foxes may be taken along the Knik River, although closed areas and low numbers of foxes precluded substantial harvests. Low numbers of marten were taken from Ship Creek southeast to the Twentymile River, excluding the Anchorage management area which is closed to all trapping.

Mortality

Hunting Seasons and Bag Limits:

Lynx	No open season	
Wolverine	1 Sep-31 Mar	1 wolverine
Coyote	1 Sep-30 Arp	2 coyotes
Red Fox	1 Nov-15 Feb	2 foxes

Trapping Seasons and Bag Limits:

Beaver	1 Feb-31 Mar	20 beavers
Land Otter	10 Nov-28 Feb	No limit
Lynx	No open season	
Wolverine	10 Nov-28 Feb	No limit
Coyote	10 Nov-28 Feb	No limit

Red Fox	10 Nov-28 Feb	1 fox
Marten	10 Nov-31 Jan	No limit
Mink and Weasel	10 Nov-31 Jan	No limit
Muskrat	10 Nov-15 May	No limit

CONCLUSIONS AND RECOMMENDATIONS

Beaver harvests have varied according to fur prices, conditions that affect access, and fluctuations in beaver populations. Over the past 10 years, harvests have ranged between zero and 45.

Opportunities to trap otters were limited because large portions of the area were closed to trapping and otter densities were low in areas outside the Twentymile River drainage. The wolverine harvest has declined over the past 5 years, indicating a decline in the population. However, the best wolverine habitat in the subunit is closed to wolverine trapping. Because wolverines range over considerable distances, they probably move between closed and open areas.

Lynx densities were low throughout Subunit 14C. Lynx trapping and hunting are currently prohibited. Coyotes have adapted well to the mixed-timber and brushy habitat found in both the lightly developed and undeveloped portions of the subunit. Harvests levels are unknown, although they were presumed low.

Mink were the most sought-after furbearer in the subunit. Substantial numbers of mink are taken from riverine habitats during years of light snow accumulation; however, harvest figures are unknown. Weasels are abundant in the portions of Subunit 14C where trapping is permitted. Harvest levels are unknown. Muskrats are relatively common in freshwater wetlands below elevations of 500 feet and most abundant in the Anchorage management area and the Anchorage Coastal Wildlife Refuge. Both of these areas are closed to trapping. Red foxes are uncommon, particularly south of Peters Creek where coyotes are common. The fox harvest is unknown, although it was probably very low.

Subunit 14C supports a small population of marten that could be subject to overexploitation by trappers because of the value of their fur. Harvest levels are unknown. Some method of determining harvest should be devised.

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Table 1. Beaver harvest[a] in Subunit 14C, 1971-72 to 1988-89.

Year	Glacier Creek	Twentymile River	Total
1971-72	0	11	11
1972-73	0	1	1
1973-74	0	14 (5)	14 (5)
1974-75	0	3 (3)	3 (3)
1975-76	0	21 (7)	21 (7)
1976-77	0	3 (1)	3 (1)
1977-78	0	3 (2)	3 (2)
1978-79	0	13 (0)	13 (0)
1979-80	0	27 (7)	27 (7)
1980-81	9 (1)	36 (5)	45 (6)
1981-82	0	4 (2)	4 (2)
1982-83	0	0 (0)	0 (0)
1983-84	0	0 (0)	0 (0)
1984-85	4 (0)	6 (2)	10 (2)
1985-86	2 (0)	16 (2)	18 (2)
1986-87	10 (1)	28 (9)	38 (10)
1987-88	4 (1)	5 (0)	9 (1)
1988-89	0	6 (3)	6 (3)

[a] Kit harvest in parentheses.

Table 2. Land otter harvest in Subunit 14C, 1978-79 to 1988-89.

Year	Male	Female	Unknown	Total
1978-79	0	0	0	0
1979-80	0	0	0	0
1980-81[a]	--	--	--	--
1981-82[a]	--	--	--	--
1982-83	0	0	0	0
1983-84	0	1	2	3
1984-85	1	0	0	1
1985-86	2	0	1	3
1986-87	0	0	0	0
1987-88	0	0	1	1
1988-89	0	0	0	0

[a] No harvest data available.

Table 3. Wolverine harvests in Subunit 14C, 1972-73 to 1988-89.

Year	Male	Female	Unknown	Total
1972-73	6	8	0	14
1973-74[a]	--	--	--	--
1974-75[a]	--	--	--	--
1975-76	0	2	0	2
1976-77	0	0	1	1
1977-78	2	1	0	3
1978-79[a]	--	--	--	--
1979-80	0	1	0	1
1980-81	0	0	0	0
1981-82	3	3	0	6
1982-83	0	1	0	1
1983-84	0	0	0	0
1984-85	0	0	0	0
1985-86	0	2	0	2
1986-87	0	0	0	0
1987-88	0	0	0	0
1988-89	0	0	0	0

[a] No harvest data available.

Table 4. Lynx harvests in Subunit 14C, 1978-79 to 1988-89.

Year	Male	Female	Unknown	Total
1978-79	0	0	0	0
1979-80	0	0	2	2
1980-81	0	0	0	0
1981-82	0	0	0	0
1982-83	4	2	0	6
1983-84	1	0	0	1
1984-85	2	3	0	5
1985-86	1	4	0	5
1986-87	0	0	0	0
1987-88[a]	0	0	0	0
1988-89[b]	0	0	0	0

[a] Closed 30 Nov 1987 by Emergency Order.

[b] No open season.

STUDY AREA

GAME MANAGEMENT UNIT: 16 (12,250 mi^2)

GEOGRAPHICAL DESCRIPTION: West Side of Cook Inlet

BACKGROUND

Unit 16 is largely undeveloped, except in the area of the Parks Highway, Petersville Road, Beluga, and Tyonek. Although numerous private cabins support seasonal activities, few are used as permanent residences. With its proximity to the Kenai Peninsula, Anchorage area, and Matanuska Valley, Unit 16 receives heavy recreational use by residents of these areas. Wildlife habitat remains largely unaltered, and most furbearer populations are controlled by natural factors. Although a few local residents use trapping to supplement their winter income, trapping tends to be more of a recreational activity than an economic one.

POPULATION OBJECTIVES

To maintain furbearer populations capable of providing sustained-yield harvests.

METHODS

Harvest data for beavers, land otters, lynx, and wolverines are obtained through sealing of pelts. Additionally, incidental observations by staff, local residents, and trappers provide information on the status of furbearers.

RESULTS AND DISCUSSION

Population Status and Trend

Beavers are abundant, occupying virtually all areas of suitable habitat. Public complaints of beavers blocking salmon streams or impacting areas near recreational cabins are common.

Land otter sign is regularly observed along waterways during the winter, and trappers do not consider them scarce. Lynx are currently in the low phase of their population cycle and few tracks have been observed by staff or trappers. Marten numbers have declined according to trappers, and areas where they are abundant are restricted to a few small pockets. Wolverines are not abundant and occur most commonly in remote, mountainous areas. Other furbearers, particularly coyotes, are considered common in suitable habitat.

Hunting Seasons and Bag Limits:

Lynx	No open season	
Wolverine	10 Nov-15 Feb	1 wolverine
Coyote	1 Sep-30 Apr	2 coyotes
Fox, Red	1 Nov-15 Feb	2 foxes

Trapping Seasons and Bag Limits:

Beaver	10 Nov-30 Apr	30 beavers
Land Otter	10 Nov-31 Mar	No limit
Lynx	No open season	
Wolverine	10 Nov-28 Feb	No limit
Coyote	10 Nov-31 Mar	No limit
Fox, Red	10 Nov-28 Feb	No limit
Marten, Mink, and Weasel	10 Nov-31 Jan	No limit
Muskrat	10 Nov-10 Jun	No limit

Human-induced Mortality:

Sealing data for beavers, land otters, lynx, and wolverines are presented in Table 1. Harvest data for other species were not collected. Early deep snows that persisted through the seasons (i.e., 1988-89 and 1987-88) made access to water sets for species like beavers, land otters, and mink difficult. In Subunit 16A, the number of beavers sealed in 1988-89 was 149, compared with 116 in 1987-88; however, it represented only 55% of the harvest (269) for 1986-87. This area has the best road access and receives extensive recreational use by nonlocal trappers. In Subunit 16B where more trapping by local residents occurred, the harvest (199 beavers) was 72% of that for the 1987-88 season (278 beavers). The decreased harvest in both subunits was caused by the reduced effort of recreational trappers.

Snowmachines (79%) and a combination of dog teams and snowshoes (11%) were the most common transportation methods reported by trappers for Subunit 16A. In Subunit 16B snowmachines (49%), dog teams and snowshoes (31%), and aircraft (15%) were the primary means of transportation. In both subunits, approximately two-thirds of the beaver harvest was attributable to traps; the remainder was taken with snares.

The harvest of otters in Subunit 16A was nearly the same (11 otters) as for 1987-88 (13 otters). In Subunit 16B the harvest also remained stable at 36 otters, compared with 38 in 1987-88. Trapping conditions were similar to the previous year: early, deep snows persisting throughout much of the winter. The sex ratio of the harvest was 25 males, 13 females, and 9 unidentifieds. Forty otters were trapped, four were taken by unspecified means, and three were snared. In Subunit 16A, dog teams and snowshoes (73%) and snowmachines (18%) were the primary transportation means used by trappers. For Subunit 16B dog teams and snowshoes (39%), snowmachines (39%), and aircraft (22%) were

the primary methods. No lynx were harvested because the seasons were closed.

Thirteen wolverines were harvested in Subunit 16B and two were harvested in Subunit 16A. Most of the wolverines in Subunit 16(A) live in areas now included in Denali National Park. The 1987 harvest (25 wolverines) reflected snow conditions that allowed trappers good access by either snowmachine or aircraft. Ten wolverine were trapped, one was shot, and one was snared. This year's reduced harvest reflected the recent prohibition of land-and-shoot trapping for wolverine as well as reduced numbers. Three persons failed to report the method of take. Aircraft transportation was used to take 5 wolverines, two were taken with dog teams/snowshoes, and four with snowmachine. Four persons did not report their method of transportation. Females outnumbered males in the harvest 9 to 5.

CONCLUSIONS AND RECOMMENDATIONS

Trapping pressure in Unit 16 is largely recreational, and it is concentrated in areas close to roads or associated with aircraft or snowmachine transportation. Only a few local residents seriously supplemented their income by trapping. Conflicts between these individuals and recreational trappers are growing because of increasing "trespass" onto established trap lines by nonlocal residents. Recreational trapping pressure is not as influenced by economic gain as "professional trapping", but it does respond to conditions that affect access or actual trapping difficulty. Although high pelt prices may encourage trapping of certain species, favorable winter conditions influence recreational trappers to extend their efforts across a broader area. In addition to competing for fur on established traplines, recreational trappers have been accused of overharvesting some species (e.g., primarily lynx, marten, and wolverines) and reducing the species' ability to sustain harvest in future years. This season's low wolverine harvest, despite good-to-excellent snow conditions, may illustrate this point. Because data are lacking on the status of furbearer populations, it is difficult to separate the biological and sociological aspects of this controversy.

Snow conditions during the reporting period provided good-to-excellent access for snowmachines and airplanes and aided trapping for coyotes, marten, and wolverines. Local trappers reported that marten populations were low and that the remaining areas of concentration were often trapped by several individuals in response to high pelt prices. Many supported a management approach similar to lynx that would close the season during population lows to protect breeding stock. Local trappers supported the elimination of land-and-shoot wolverine trapping in 1988, while many nonlocals were upset by that Game Board action.

Because habitat in Unit 16 has remained basically unaltered and the effects of harvest on most species has been limited to accessible areas, furbearer populations tend to be regulated by natural factors. Lynx seasons should remain closed until staff and public observations indicate the population cycle is well into its increasing phase. Seasons and bag limits for other species should continue to reflect the preferences of the public.

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Table 1. Furbearer harvest[a] in Unit 16, 1983-84 to 1988-89.

Year	Beaver	Land Otter	Lynx	Wolverine
1983/84	371	27	10	39
1984/85	389	33	1	21
1985/86	444	41	2	13
1986/87	651	68	6	36
1987/88	394	51	0	25
1988/89	370	49	0	15

[a] Harvest statistics based on sealing records.

STUDY AREA

GAME MANAGEMENT UNIT: 17 (18,770 mi^2)

GEOGRAPHICAL DESCRIPTION: Northern Bristol Bay

BACKGROUND

Beavers have historically been the most important furbearer in the northern Bristol Bay area. They are currently abundant throughout most portions of Unit 17. Intensive trapping and adverse weather conditions in late fall and winter are the most significant mortality factors on this species. Season closures in portions of the unit have been imposed on several occasions since 1900 to allow populations to recover. Aerial cache surveys have been flown in most years since 1968 to provide an index of abundance in the more heavily trapped portions of the unit. Harvest data and trapper interviews during the sealing process are also used to manage this species.

The red fox is the second most commonly trapped furbearer. Fox populations in Unit 17 have fluctuated widely during the past 10 years. They peaked in 1979-80 and declined sharply the following year because of an outbreak of rabies. Increases have been noted in recent years, and during the reporting period the populations were high.

Land otter populations have increased steadily during the 1980's. They are common in Subunit 17A and are abundant in Subunits 17B and 17C. Otters are mot commonly trapped in February during the beaver trapping season.

Lynx are rare to uncommon in Subunits 17A and 17C. The lynx population fluctuates in Subunit 17B, depending upon hare abundance; however, they are generally found in low-to-moderate densities during their peak. They were at the bottom of their cycle in Unit 17 during the reporting period.

Wolverines occur throughout Unit 17, but they are most common in Subunit 17B. This population was fairly stable, and harvest levels have remained relatively constant since 1976.

Marten were uncommon in most of Unit 17 prior to 1970. Most of their habitat occurs along the Wood-Tikchik Lake system. Marten trapping was popular during the 1930's and 1940's in the area; subsequently, it had been nearly nonexistent until prices peaked in very recent years. The population was low during the reporting period, although high pelt prices have maintained trapping interest in this species.

Long-term residents of Dillingham reported that muskrats were common along the lower Nushagak River and on the Nushagak

Peninsula in the 1920's and 1930's. During the reporting period they were scarce throughout Unit 17.

POPULATION OBJECTIVES

To increase beaver populations in Subunit 17A to a level sufficient to maintain an average stream density index of 1 cache per mile by 1995.

To maintain beaver populations throughout Subunits 17B and 17C through FY95 at a level sufficient to sustain an average stream density of 1.2 caches per mile.

To maintain a population of land otters in Unit 17 capable of sustaining an average annual harvest of 200 animals through 1995.

To maintain a population of red foxes in Unit 17 capable of sustaining an average annual harvest of 400 foxes through 1995.

To maintain a population of wolverines in Unit 17 capable of sustaining an average annual harvest of 50 wolverines through 1995.

To obtain sufficient data to develop measurable population objectives by 1995.

METHODS

Harvest data were collected during the sealing process for all beavers, wolverines, lynx, and otters presented for sealing. Fur acquisition reports provided additional harvest data for those species not required to be sealed. A trapper questionnaire designed to provide an index of population status of various furbearer speicies was sent to 26 trappers throughout the unit. One aerial survey was conducted during the beaver trapping season to determine trapping pressures and trapper distribution.

RESULTS AND DISCUSSIONS

Population Status and Trend

Most furbearer populations appear to be stable at moderate-to-high densities; however, harvest information and responses to the trapper questionnaires indicated that lynx and marten were at low densities and beaver in Subunit 17A were at lower-than-normal levels. Red foxes increased to near-record-high levels, and snowshoe hares were increasing throughout Unit 17.

No aerial beaver cache surveys were conducted in Unit 17 during this reporting period. Trappers reported generally lower populations of beavers than those during the previous season.

Mortality

Hunting Seasons and Bag Limits:

See Trapping and Hunting Regulations No. 29.

Human-induced Mortality:

Harvest data for species sealed are presented in Table 1. Trapping conditions were poor during this reporting period, and harvest levels of most species reflected this. A total of 965 beaver was sealed in Unit 17 this season. This harvest represented the lowest one recorded since 1979, because of deep snow and extremely cold temperatures throughout the trapping season. The percentage of kits in the harvest was 18.8, which compared favorably to previous years.

Otter harvests have remained relatively stable. The 1988-89 take of 142 (66 males, 57 females, and 19 unknowns) was below the previous 10-year average of 170 otters.

Forty-three wolverines were taken, a harvest similar to previous years. Because the land-and-shoot method of harvesting wolverines was initially prohibited during the reporting period, a reduced harvest had been expected.

Lynx are at the bottom of the cycle in Unit 17, and for the second consecutive year only 1 lynx was taken in the unit. Fur acquisition reports indicate that 430 red foxes and 204 martens were taken by trappers from Unit 17. The red fox population was very abundant in early winter, but a rabies epidemic drastically reduced their numbers. By the end of this reporting period, indications were that the fox population was quite low.

Game Board Actions and Emergency Orders

Although seasons for both lynx and martens were shortened by the Board of Game for the 1988-89 trapping season, the effects were minimal. Board of Game actions eliminated the land-and-shoot method as a legal means for taking foxes, wolves, and wolverines beginning with the 1988-89 this regulatory year.

CONCLUSIONS AND RECOMMENDATIONS

Record snow depths and cold temperatures during most of January through March kept trapping activity to a minimum. The low beaver and otter harvests did not reflect population abundance. While most furbearer populations have remained at levels capable of sustaining high harvests, lynx and martens were exceptions.

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Table 1. Sealed harvests of beavers, otters, lynx, and wolverines in Unit 17, 1970-89.

Regulatory year	Beaver		Otter				Lynx			Wolverine			
	% Kits	Total	Male	Female	Unk	Total	Young	Adult	Total	Male	Female	Unk	Total
1969-70	22.6	1,190											
1970-71	27.5	824											
1971-72	20.5	762											
1972-72	23.9	1,849	10	5	6	21							
1973-74	23.9	1,681	27	18	0	45							
1974-75	15.8	929[a]	14	7	1	22							
1975-76	22.2	637[a]	50	25	3	78							
1976-77	17.7	766[a]	37	12	2	51							
1977-78	23.5	802[a]	52	49	7	108	4	32	36	32	14	3	49
1978-79	20.5	959	70	54	9	133	8	22	30	26	14	3	43
1979-80	27.7	1,478	68	62	9	140	8	17	25	28	19	0	47
1980-81	20.0	1,673	82	80	0	160	15	25	40	30	10	0	40
1981-82	20.9	1,693	94	83	1	179	2	15	17	28	10	0	38
1982-83	12.8	1,824	100	72	31	204	3	22	25	34	17	1	52
1983-84	18.7	1,360	94	63	3	165	1	11	12	10	4	0	14
1984-85	22.9	1,661	105	94	20	219	8	21	29	39	16	2	57
1985-86	15.9	1,452	49	46	6	101	1	7	8	13	8	2	23
1986-87	20.1	2,817	87	91	0	178	3	11	14	36	10	0	46
1987-88	21.8	3,021	133	133	0	226	0	1	1	22	20	2	44
1988-89	18.8	965	66	57	19	142	0	1	1	21	15	7	43

[a] Beaver trapping season closed in Subunits 17A and 17C.

STUDY AREA

GAME MANAGEMENT UNIT: 18 (41,160 mi^2)

GEOGRAPHICAL DESCRIPTION: Yukon-Kuskokwim Delta

BACKGROUND

Furbearers were abundant in all areas of suitable habitat in Unit 18. Large numbers of aquatic (i.e., beavers, otters, mink, and muskrats) and terrestrial species (i.e., red foxes) were produced in Unit 18. In recent years up to one-third of all furbearers sealed in Alaska have been harvested from Unit 18. Production of unsealed furbearers (i.e., mink, muskrats, and red foxes) was also very high, although well below the historical levels of the 1930's. Boreal forest species (i.e., lynx, marten, and wolverines) were limited to the eastern portion of Unit 18, because most of the Yukon-Kuskokwim Delta is composed of lowland tundra and aquatic habitats.

POPULATION OBJECTIVES

To maintain viable furbearer populations and provide for a sustained-yield harvest.

METHODS

Information concerning furbearers in Unit 18 was collected by interviewing local residents, trappers, fur buyers, and ADF&G biologists. Harvest statistics were obtained from sealing certificates and fur acquisition reports submitted by fur buyers. Incidental observations were compiled during field work directed at other species.

RESULTS AND DISCUSSION

Population Status and Trend

Beavers continued to expand and colonize new habitats, particularly in coastal regions. Beaver densities remained high throughout Unit 18, and they were highest southeast of the Kuskokwim River in the Kilbuck Mountain and in the Johnson River areas southwest of Bethel. Beaver densities were increasing in the treeless expanse of delta lowland adjacent to the Bering Sea, including Nelson Island. Fur buyers reported increasing incidences of bite scars on beaver pelts purchased during the last 3 years, suggesting that increased intraspecific strife and pressure has been occurring within the beaver population.

River otters and mink were abundant throughout the delta lowlands north and west of the Kuskokwim River. Muskrats had rebounded from the previous population declines of 1983-84. Muskrat distribution extended from the eastern riparian habitats to coastal marshes.

Red foxes remained common, although their numbers have declined from the population high observed last year. Their distribution includes boreal, riparian, and tundra habitats. Microtines, an important prey species, have declined in number although snowshoe hares and ptarmigan have increased and remained common, respectively. A rabies outbreak in 1988 and extreme weather conditions in early 1989 reduced peak red fox population densities. Recently trapped foxes appeared more lean than those observed in 1987-88. White foxes remained common in coastal and tundra regions of Unit 18. Their population appeared unaffected by the rabies outbreak and extreme weather conditions that reduced red fox numbers in 1988-89.

Lynx populations increased because snowshoe hares, their main prey species, were 7 years into a 10-year cycle. Even at peak densities, Unit 18 has supported relatively few lynx in brushy riparian habitats and in isolated mountainous areas, such as Kusilvak between Mountain Village and Scammon Bay; however, sightings of lynx and their tracks have become more common. Lynx were most common in Unit 18 in revegetating mine tailings along the upper Tuluksak River. Marten numbers have increased slowly in the limited riparian forest habitats. Wolverine population densities were stable in the mountainous regions of northern and eastern Unit 18.

Mortality

Hunting Seasons and Bag Limit:

Arctic Fox	1 Sep-30 Apr	2 foxes
Red Fox	1 Nov-15 Feb	2 foxes
Lynx	1 Nov-31 Mar	2 lynx
Wolverine	1 Sep-31 Mar	1 wolverine

Trapping Seasons and Bag Limits:

Beaver	1 Nov-10 Jun	No limit
Arctic Fox	10 Nov-31 Mar	No limit
Red Fox	10 Nov-31 Mar	No limit
Lynx	10 Nov-31 Mar	No limit
Marten	10 Nov-31 Mar	No limit
Mink	10 Nov-31 Jan	No limit
Weasel	10 Nov-31 Jan	No limit
Muskrat	10 Nov-10 Jun	No limit
River Otter	10 Nov-31 Mar	No limit
Wolverine	10 Nov-31 Mar	No limit

Human-induced Mortality:

Sealing certificate data indicated that the beaver harvest in 1988-89 dropped substantially from that in 1987-88 (4,686 beavers). Extremely cold weather in late January and early February 1989 led to cessation of trapping activity for nearly a month. Thick ice hindered trapping activity for the remainder of the season. Although beaver prices declined approximately 10% during the season, they were still relatively good. Trapping effort for beaver has risen in recent years because of increased availability of beavers and low prices for most other furbearers.

The harvest of beavers in the Kuskokwim River drainage of Unit 18 increased from 1,419 pelts sealed in 1987-88 to 1,909 pelts sealed in 1988-89. The harvest in the Yukon River drainage declined from 1,614 pelts sealed in 1987-88 to 817 pelts sealed in 1988-89. The lower Johnson River drainage accounted for the largest number of beaver harvested during both seasons. The upper and lower Johnson River combined (867 pelts) accounted for 45% of the Kuskokwim harvest and 29% of the overall harvest in 1988-89. The Gweek and Kisaralik/Kwethluk River drainages were the second and third most heavily trapped drainages in the Kuskokwim River drainage during 1988-89.

Beaver harvests in the Yukon River drainage was more evenly distributed than in the Kuskokwim River during 1988-89. The Black River, the immediate area adjacent to the Yukon River between Marshall and Mountain Village, and the Kokechik River accounted for most of the beaver harvest in the Yukon River drainage during 1988-89.

An estimated 25% and 10% of smaller- and larger-sized beavers, respectively, in Unit 18 probably did not reach the market and thus were not sealed. Beavers that are used domestically or made into handicrafts are usually not sealed. A lack of local knowledge and experience in handling beavers, especially in coastal regions, may have resulted in lower prices and discouraged some trappers from having their furs sealed and sold. In addition, a general increase in domestic skin-sewing activities, particularly of beaver hats, may have prevented some pelts from reaching the commercial market. Thus the number of beavers sealed does not represent the actual harvest; an estimated 10-25% of the pelts were retained for domestic and handicraft use.

River otter harvests have usually been influenced by fall and winter weather conditions and trapper access, rather than the abundance of otters. Most river otters were caught incidentally by trappers engaged in beaver and mink trapping. The number of otters reported sealed (505) in 1988-89 was above average levels. River otter prices have risen approximately 10% recently, but prices were still not sufficiently high to completely reverse the demand for domestic use. Fur buyers estimate that 15% of river otters were retained for use in parkas and mukluks. Conversely,

many otters that had been sealed in Unit 18 were resold locally as tanned skins for use in parkas and trim.

The mink harvest has fluctuated around several thousand per year in recent years, and in 1988-89 it was not exceptional. These harvest figures were well below historical harvests that range from 6,000 to 30,000 mink. Peak harvests were achieved during the 1930's when up to 30,000 mink were taken during a season, and average harvests have fluctuated at approximately 16,000 mink. Fur buyers estimate that 95% of the mink taken in Unit 18 reach the commercial market, because the cash value of the world-class Kuskokwim mink is high; however, with alternative sources of income available, the number of active mink trappers was far lower than that observed 50 years ago when trapping was the only source of cash income available during the winter months. Recently, the Unit 18 mink resource has been underutilized.

The 1988-89 muskrat harvest was similar in size to the 1987-88 harvest because of an accelerated harvest early in the season; however, thick ice and a late break-up hindered the spring harvest. Fur buyers purchased over 10,000 muskrats during the reporting period.

Over 2,000 red foxes were purchased by fur buyers during 1988-89, a decline of approximately 500 from those purchased in 1987-88. Although red foxes were abundant throughout the unit, their prices were low and falling. Prices for white foxes were very low during the reporting period, and most were used as parka lining or sold to individuals who do not report purchases; e.g., tourists. Fur buyers purchased over 400 white foxes; they estimated that 35% of white foxes and 20% of red foxes harvested in Unit 18 were retained for domestic use.

The harvest of lynx increased from 10 in 1987-88 to 15 in 1988-89, reflecting increased availability. Lynx prices, however, continued to fall. Only a few experienced individuals regularly trapped lynx in Unit 18. These trappers concentrated the same amount of effort in the same locations each year; however, falling lynx prices have not reduced harvest, because the pelts were still relatively valuable. Because of their value, domestic use of lynx pelts was low, and most pelts probably reached the commercial market. Lynx harvests will probably increase during the next few years as lynx and snowshoe hare densities climb.

The number of marten harvested in Unit 18 and purchased by fur buyers increased from previous years to approximately 75 pelts. Marten skins were frequently used for handicrafts, and many did not reach the market. The actual harvest may have approached 200 marten during 1988-89.

Five wolverines were sealed in Unit 18 in 1987-88 and six in 1988-89. Prices remained stable during the reporting period. More than any other species, wolverines are used domestically,

and most pelts were not sealed. Fur buyers believe that only 25% of the wolverines taken in Unit 18 were sealed.

Transport Methods. Essentially, the entire furbearer harvest in Unit 18 was conducted using snowmachines.

Natural Mortality:

The abundance of furbearers in Unit 18 appears more related to weather and disease than to trapping mortality. Muskrat and beaver populations in marginal habitats are subject to heavy winter mortality during conditions of thick ice, cold temperatures, and little snow. Fox, muskrat, and lynx abundance appears highly cyclic. Fox populations, in particular, are subject to drastic declines caused by epizootics of distemper and rabies. The combination of rabies and extreme weather conditions for 3 weeks in early 1989 caused considerable red fox mortalities; fur buyers reported an abrupt drop in the number of foxes offered for sale after that time and throughout the remainder of the season.

Habitat Assessment

Unit 18 contains vast amounts of lowland tundra, ponds, streams, sloughs, and rivers, accounting for tremendous production in aquatic furbearers. Boreal, montane, and Interior habitats are relatively limited, and species such as lynx and marten are relatively uncommon.

CONCLUSIONS AND RECOMMENDATIONS

Furbearers were abundant in all areas of suitable habitat in Unit 18. Aquatic species such as mink, beavers, otters, and muskrats were common in vast amounts of lowland tundra ponds, sloughs, rivers, and marshes. Forested, boreal habitat is limited, and far fewer lynx, wolverines, and marten were harvested. All furbearer habitats are relatively undisturbed. Trapping pressure appears to effect furbearer densities only in the vicinity of towns and villages. Furbearer populations fluctuate in response to natural cycles: weather, disease, and changes in prey abundance. No changes are recommended in seasons or bag limits.

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SUBMITTED BY:

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STUDY AREA

GAME MANAGEMENT UNIT: 19 (36,490 mi^2)

GEOGRAPHICAL DESCRIPTION: All drainages of the Kuskokwim River upstream of the village of Lower Kalskag

BACKGROUND

Furbearers have historically played an important role in the history of Unit 19. Several species were essential to the welfare of Native groups in the area. The first outside influences in the area resulted from early Russian exploration and the developing fur trade. Furbearers still provide a strong link in the lifestyle of most area residents. Domestic uses of furbearers include garments, food, and craft items. In addition, considerable monetary benefits are realized; e.g., during the 1988-89 fur-trapping season, area trappers grossed an estimated $387,000. Recent activities by animal rights activists and antitrapping factions may be affecting international fur prices, resulting in smaller returns to area trappers.

MANAGEMENT OBJECTIVES

To annually determine current status and trends of furbearers and their primary prey species, assess trapper effort and distribution, obtain harvest estimates for unsealed furbearer species, maintain accurate harvest records for sealed species, and maintain open communications with area trappers.

To maintain a mean pelt size >50 inches and <25% kits in the annual beaver harvest.

To maintain a mean density of not less than 1 active beaver colony per 2 miles of waterway, as determined during annual fall cache surveys.

To maintain >50% males in the annual marten harvest and a minimal ratio of 2 young-adult females in the annual harvest.

To maintain >50% males in the annual wolverine harvests.

METHODS

Harvest statistics for beavers, land otters, lynx, and wolverines were gathered from sealing documents. During the course of sealing, information was obtained on specific locations and dates of harvest, sex of the animals, and estimates of age. Rough harvest trends of 7 additional furbearer species were gathered from Fur Acquisition and Fur Export Reports.

In addition to the annual trapper questionnaires distributed by the statewide furbearer management program, more specific questionnaires were sent to an additional 131 trappers who had operated in Unit 19 and Subunits 21A and 21E. Names of trappers were obtained from sealing documents. Questionnaires were distributed in April 1989, and 64 trappers responded (49% response). Trappers were asked to determine the number of animals of each species they had harvested as well as the population trend (increasing, decreasing, or stable) and level (high, moderate, or low) for each species. Increasing, stable, and decreasing populations were assigned values of nine, five, and one, respectively. All responses were lumped, and a mean was calculated for each species. These mean values will be referred to as the Trend Index (TI) and Abundance Index (AI) (Table 1). In analyzing the TI, mean values between 4.51 and 5.49 were assumed to represent stable trends; values $\leq$ 4.50 and $\geq$ 5.50 represented decreasing and increasing trends, respectively. For the AI, values $\leq$4.50 were assumed to represent low populations, values between 4.51 and 5.50 were moderate, and those >5.50 represented relatively high population levels.

Because of concerns regarding marten populations in Units 19 and parts of Unit 21, carcass collections were continued. Two hundred seventy-two marten carcasses or skulls donated by 9 local trappers were examined. Sex and age estimates of the harvested segment of the marten population were gathered. A gross examination of digestive tracts was conducted to determine food items consumed and incidence of macro parasites. Skulls, femurs, bacula, and uteri were collected for research into aging techniques. Several teeth were extracted from marten whose ages were questionable; these teeth were sent to Matson's (Missoula, MT) for age determination.

I attempted to determine sex and age class of marten through the use of a variety of criteria. In addition to the sagittal muscle closure method (Whitman 1978), I collected femurs. The length of cleaned femurs can be used to distinguish between males and females (i.e., $\leq$72 mm and >72 mm for females and males, respectively); the presence or absence of the suprasesamoid tubercle can be used for separating the adults from young-of-the-year, respectively. This quick and accurate method makes it easy for trappers to collect and transport large numbers of samples.

Small mammals were snap-trapped during June through September in various habitats to obtain a density index in selected areas of Unit 19. There were from 18 to 250 trap nights (i.e., 1 trap set for 24-hour period) on each of 17 transects, totalling 2,215. Captured animals were weighed, and standard measurements were recorded. A density index was calculated for each species. An importance rating was calculated by multiplying the mean weight of the species by the density index.

RESULTS AND DISCUSSION

Population Status and Trend

Beaver:

Beaver populations were high throughout Unit 19, particularly where optimal habitat exists. Habitat is generally more restricted in Subunits 19B and 19C, and beaver colonies there inhabit virtually all suitable habitat. Beaver habitat is more favorable in Subunits 19A and 19D, where populations appear to be high and healthy.

Based on sealing documents, 1,064 beaver were harvested during the 1988-89 season. This value is comparable to the previous 10-year annual average of 1,135. I suspect that counts of original sealing certificates represent a close approximation of actual harvests in Unit 19. When Fur Acquisition and Fur Export Reports for Unit 19 beavers were combined, a total of 835 beavers were recorded. For the 1988-89 season, a conversion factor of 1.27 (1,064/835) can be calculated for these 2 values. The comparable value for the 1987-88 season was 1.38 (1,402/1,013).

Subunits 19A and 19D provided the majority (90%) of the harvest (Table 2), reflecting available habitat and access. The moderate harvest during this reporting period was probably due to declining pelt prices (Table 3) that provided little incentive for trappers.

Eighty-five trappers reported taking 1,064 beavers, an average of 12.5 beavers per trapper. Snowmachines were the most common mode of transportation used by beaver trappers (77%), and snaring was the most common method of capture (89%). Of 1,064 beaver pelt measurements recorded on sealing documents, 127 (11.9%) were judged to be kits ($\leq$52 inches) and 448 (42.1%) were large adults ($\geq$65 inches). The chronology of the harvest (i.e., 1,033 beavers) was as follows: November, 59 (5.7%); December, 42 (4.1%); January, 83 (8.0%); February, 122 (11.8%); March, 596 (57.7%); and April, 131 (12.7%).

Respondents to the 1988-89 trapper questionnaire indicated that beaver abundance was higher (AI = 7.05, n = 39) than last year's levels (TI = 6.38, n = 29). With the exception of red foxes, beavers received the highest overall AI.

Because of moderate pelt prices and continually expanding beaver populations, regulations concerning bag limits were further liberalized during the 1988-89 season. Trappers were allowed to take 50 beavers per year, rather than 40. Because only 3 trappers harvested their allowable limits during 1987-88, the increased bag limit has not substantially affected the annual harvest.

Mean prices for beaver pelts declined slightly during the 1988-89 season. Prices paid on the international market declined 2.4% (i.e., from $40.86 during 1987-88 to $39.88 during 1988-89).

River Otter:

Average pelt prices for otters remained low (Table 3), providing little incentive for trappers to target on this species. The reported 1988-89 harvest of 54 otters was lower than the 10-year mean annual harvest of 71, representing the lowest reported catch during that time period. The harvest of river otters in Unit 19 was largely incidental to beaver trapping. Low prices resulted in decreased effort on beavers, decreasing the incidental harvest of otters. The harvest was distributed from November through April. Consistent with most previous years, Subunit 19A provided 41% of the unitwide harvest (22 of 54) (Table 2). During the reporting period the method of harvest was distributed between snaring (67%) and trapping (33%); 57% of the trappers used snowmachines, and 43% used dogsleds, skis, or snowshoes.

Three of the 54 otters harvested (6%) were pups (i.e., combined length and width <39 inches). Mean pelt size for all harvested otters was 46.4 inches Twenty-three trappers harvested otters, yielding an average take of 2.4 otters per successful trapper. The Unit 19 questionnaire results indicated that river otter populations were moderate (AI = 5.11). The trend of the population was thought to be stable (TI = 5.15).

Lynx:

Six trappers harvested a total of 23 lynx from Unit 19 during the 1988-89 season (3.8 lynx/successful trapper), compared with the 37 harvested in 1987-88, indicating the current population was still quite low. Nearly half of all harvested lynx came from Subunit 19C; the remainder was equally distributed among the other subunits (Table 2). Residents of Unit 19 accounted for most of them. Of 23 sealed pelts where month of harvest was known, 16 (70%) were taken in January, four (17%) in December, and one each in November, February, and March (4% each). Most lynx were harvested with traps (19 of 20, 95%), and the most common means of trapper transportation were walking or dogteams (10 of 19, 53%), followed by snowmachines (8 of 19, 42%).

Based on responses from the trapper questionnaire, lynx populations were low (AI = 2.33). The overall trend in the population was thought to be stable (TI = 4.69). In addition, the questionnaire asked trappers to give relative abundance and trend of snowshoe hare populations in their respective areas. Overall abundance was listed as moderate to high (AI = 5.50), with an increasing trend over last year's levels (TI = 6.71). Lynx densities are highly dependent on snowshoe hare densities; therefore, the increasing trend in hare densities may lead to an increase in lynx densities during subsequent years.

Wolverine:

Sound biological data concerning wolverine densities are nonexistent; however, mandatory sealing of pelts has provided an account of harvests since 1971-72. Numerous factors, such as weather- or land-ownership-related access, pelt prices, and value of alternate species undoubtedly affect the harvest. In the absence of more quantifiable information, harvest data provide an indication of population trend.

Wolverine harvests in Unit 19 remained relatively stable during mandatory sealing (1971-72 to 1987-88); however, the 1988-89 harvest of 26 was less than half of the previous 10-year annual mean of 59, reflecting the change in legal methods and means, not a decline in the wolverine population. Same-day-airborne shooting was prohibited. Wolverine harvests were distributed throughout Unit 19 (i.e., 19A, 3; 19B, 14; 19C, 4; 19D, 5). Twenty-one trappers were responsible for the harvest of the 26 wolverines, yielding a mean catch of 1.2 wolverines per trapper. The majority of wolverines were taken by residents of Unit 19. Consistent with previous years, the harvest was weighted toward males (55%). Trapping accounted for the greatest single capture method (n = 17, 65% of total); ground shooting (n = 7, 27%) and snaring (n = 2, 8%) accounted for the remainder. Most wolverines were harvested in March (8 of 26, 31%). The trapper questionnaire respondents indicated low abundance (AI = 4.28, n = 39) and a slightly increasing trend (TI = 5.62, n = 26).

Marten:

Marten populations throughout Unit 19 have been declining for several years (Whitman 1989). Pelt prices were relatively low until 4 or 5 years ago, and trapping pressure was modest; however, more recently the price of marten pelts (i.e., $100) has stimulated trapping. Marten contribute the vast majority of the income generated by local trappers; therefore the welfare of the marten populations is of great local interest. Over 4,300 marten were harvested from Unit 19 during the 1986-87 season, and approximately 3,879 were harvested in 1987-88.

Parasite loads were again examined, but they did not affect marten densities (Whitman 1989). Parasitic roundworms were recorded in a total of 16.7% of the stomachs examined (23 of 138); prevalence was higher in adults than in juveniles (32.1% and 7.1%, respectively). An additional ascarid was found in a single stomach during 1988-89 necropsies, but it was not identified. Four external parasites were identified from a single host: 2 different fleas and 2 sucking lice. In no cases were these parasites thought to be debilitating to individual marten.

Parasite loading, food shortages, natural cycles, predation, and overharvesting were all examined during 1987-88 (Whitman 1989) in an attempt to explain the population decline. No strong

conclusions were developed. Marten harvests still may reflect the general trend of the population, although harvest levels are due mainly to the previous years' food availability. Although high abundance of microtine rodents leads to high natality and subsequent survival of young that are then reflected in the harvest, they cannot be predicted with preciseness from year to year.

Strickland and Douglas (1988) suggested that age (number of juveniles per adult female) and sex ratios can be used to evaluate harvest intensity. They reported that a harvest ratio of more than 3 juveniles:1 adult female represented an acceptable harvest level. In 1987-88 when 263 marten were harvested (Table 4), juvenile:adult female ratio was 0.5:1, 6 times lower than the 3:1 ratio recommended by Strickland and Douglas (1988). Based on the 1988-89 carcass examinations ($\underline{n}$ = 272), the juvenile:adult female ratio increased to 4.34:1, well within the acceptable levels described by Strickland and Douglas (1988).

Several authors (Yeager 1950, Quick 1953, Soukkala 1983, Archibald and Jessup 1984) agreed that sex ratios in the harvest reflect trapping pressures. Nearly equal sex ratios in the harvested cohort indicate overharvesting. The sex ratio in the 1987-88 harvest was nearly equal (53.8% males, 1.1:1), further suggesting overharvesting. The percentage of males in the harvest increased to 57.7 during the 1988-89 season (Table 4).

Trappers in 1987-88 indicated that marten populations were low (AI = 3.87, $\underline{n}$ = 62) and had declined substantially in relation to that for the previous year (TI = 2.84, $\underline{n}$ = 50). Because of these perceived declines, the marten season was shortened by Emergency Order in 1988-89. Responses to the trapper questionnaire indicated an increase, compared with those for the previous year (TI = 5.97, $\underline{n}$ = 29). Because of the drastic changes in these 3 indicators, the 1989-90 marten season will revert back to 1 November to 28 February.

Mink:

Relatively low market demand for wild-caught mink has resulted in moderate pelt prices (Table 3). As a result, trappers expended minimal effort. The combined Fur Export Reports and Fur Dealer Acquisition Reports indicated that 266 mink had been harvested.

Responses to the trapper questionnaire revealed that the abundance index for mink was 4.06, indicating a relatively low population. The trend index was 5.33, signaling a slight increase in the perceived trend of mink populations.

Muskrat:

The muskrat harvest remained low. Only about 50 muskrats were harvested during 1988-89. Prices remained low, so there was little incentive for trappers to exert much effort on this

species. Results of the questionnaire indicate a slight upward trend in muskrat populations (TI = 5.47). Even with this increasing trend, most trappers considered muskrat populations to be low (AI = 4.00, n = 20).

Coyote:

Viable coyote populations in Unit 19 were largely restricted to areas in or near the Alaska Range. They are expanding their range into other areas of the unit, but are not common anywhere. The estimated harvest of coyotes in Unit 19 remained extremely low, reflecting the low population density and relatively low pelt prices. Approximately 5 coyotes were harvested during 1988-89. Results of the trapper questionnaire show an AI of 1.89 and a TI of 5.25. Coyote numbers will continue to increase over the next several years.

Red Fox:

Although red fox populations appear to be well established in all areas of Unit 19, there is little trapper interest in harvesting them. During 1988-89 there was a population explosion over much of the unit, and harvests increased substantially. Although 275 foxes were taken, few trappers specifically targeted foxes because of low market demand, and most were incidentally caught in sets made for other species.

The mean unitwide abundance index for red foxes was 7.11, depicting a fox population that was perceived to be extremely high. The indicated trend was increasing at 7.25. Fox populations will decline following this increase.

Weasel:

Short-tailed weasels are often caught incidentally in traps set for other species, notably marten. Little or no trapper effort was directed toward weasels because of low market demands. Respondents to the trapper questionnaire indicated weasel populations were relatively high (AI = 6.50, n = 24), and the trend was stable (TI = 4.76, n = 33).

In addition to monitoring status and trend of the furbearer species, I have made attempts to monitor population status and trends of major prey species available to those furbearers. According to questionnaire responses, major prey populations were doing well. Tree squirrels, snowshoe hares, grouse (spruce, ruffed, and sharptail), ptarmigan (mainly willow ptarmigan), and "mouse" (see next paragraph) populations are currently high (i.e., AI's from 5.50 to 7.00) and increasing (i.e., TI's from 5.52 to 7.00).

Trapping success rates for small mammals ranged from zero percent to 22.4% on the 17 transects. Masked shrews were the most commonly trapped species, followed by northern red-backed voles

(Table 5). An index to small mammal importance in the diets of furbearers (mainly marten and red fox) was determined by multiplying relative abundance times mean weight. The resulting values clearly depicted red-backed voles as the single-most important small mammal for furbearer prey (Table 6).

CONCLUSIONS AND RECOMMENDATIONS

Beaver populations were high, and catches will probably vary in response to market demands. Because current prices are relatively low, the harvest was limited. I recommend that individual bag limits be removed in an attempt to encourage harvests. Land otter harvest occurs incidentally to beaver harvests, because little effort is specifically directed toward otters. No changes in seasons or bag limits are recommended. The lynx harvest was low. With the increase in hare populations, lynx populations should increase. A somewhat shortened season or methods and means restrictions should be considered if lynx populations (as reflected in the harvest) do not rebound. Based on relative abundance of hares and percentages of kittens in the harvests, I predict an increase in the harvest for the 1989-90 season.

Wolverine populations were stable throughout Unit 19. The harvest declined substantially because of restrictions on same-day-airborne shooting. Because of those restrictions, wolverine harvests will probably remain low. At this time, no changes in season length, bag limits, or methods and means are recommended.

Mink populations are apparently moderate and stable. Harvests remained low because of weak market demand. No changes are recommended. High prices are being offered for marten pelts, leading to intense trapper effort for this species. Efforts should continue to document population trends. Carcass analyses to document sex and age ratios in the harvest should continue.

Weasels and red foxes also appear to be widespread, but little intentional harvest occurs. Coyote populations will probably continue to expand. Population densities of red foxes and coyotes appear to be inversely related. To maintain viable fox populations, coyote trapping regulations should remain liberal. Because of low market value, muskrat populations were lightly affected, and no changes are recommended.

LITERATURE CITED

Archibald, W. R., and R. H. Jessup. 1984. Population dynamics of the pine marten (Martes americana) in the Yukon Territory. Pages 81-97 in R. Olson, R. Hastings, and F.

Table 1. Furbearer population status and trends during the 1988-89 seasons based on trapper questionnaire mail returns from Unit 19.

Species	Abundance Index	Trend Index	Trend and status
Coyote	1.89	5.25	Stable at low
Lynx	2.33	4.69	Stable at low
Red fox	7.11	7.25	Increasing to high
Marten	4.80	5.97	Increasing to moderate
Muskrat	4.00	5.47	Stable at low
Mink	4.06	5.33	Stable at low
Beaver	7.05	6.38	Increasing to high
Wolf	5.22	6.04	Increasing to moderate
Wolverine	4.28	5.62	Increasing but low
Otter	5.11	5.15	Stable at moderate
Ermine	4.76	6.50	Increasing to moderate
Red squirrel	6.50	5.52	Increasing to high
Hare	5.50	6.71	Increasing to high
Grouse	6.41	6.28	Increasing to high
Ptarmigan	6.30	7.00	Increasing to high
Mice	7.00	6.68	Increasing to high
Owls and hawks	5.50	5.70	Increasing to high

[a] Values $\leq$4.50 depict low or declining populations; values from 4.51 to 5.49 reflect moderate and stable populations; values $\geq$5.50 reflect high or increasing populations. Sample was based on 64 returned questionnaires.

Table 2. Estimated numbers of furbearers harvested in Unit 19 during the 1988-89 trapping season.

Species	Subunit 19A	19B	19C	19D	Total
Beaver[a]	488	78	31	467	1,064
Land otter[a]	22	15	1	16	54
Lynx[a]	4	5	11	3	23
Wolverine[a]	3	14	4	5	26
Marten[b]	--	--	--	--	4,096
Mink[b]	--	--	--	--	266
Muskrat[b]	--	--	--	--	50
Red fox[b]	--	--	--	--	275
Coyote[b]	--	--	--	--	5
Weasel[b]	--	--	--	--	50
Red squirrel[b]	--	--	--	--	62
Total					6,081

[a] Data from sealing certificates.

[b] Data from fur exports and fur acquisition reports.

Table 3. Estimated total catch and value of all furbearers harvested in Unit 19 during the 1988-89 season.

Species	Estimated total harvest[a]	Estimated mean price/pelt[b]	Total value
Beaver	1,064	$ 39.88	$ 43,432
Land otter	54	38.87	2,099
Lynx	23	220.48	5,071
Wolverine	26	153.89	4,001
Marten	4,096	73.55	301,261
Mink	266	41.64	11,076
Muskrat	50	1.73	87
Red fox	275	12.86	3,537
Coyote	5	42.65	213
Red squirrel	62	.49	30
Weasel	50	2.01	101
Total	5,971		$370,908

[a] Estimated harvest was obtained from sealing documents for beaver, otter, lynx, and wolverine. For the remaining species, an estimate was obtained by comparing questionnaire results and Fur Acquisition and Export Reports.

[b] Estimated mean price per pelt was determined from 1988-89 Canadian fur sales.

Table 4. Sex and age ratios of harvested sample of marten from Unit 19 during the 1987-88 and 1988-89 trapping seasons.

Age class/sex	1987-88		1988-89	
	n	%	n	%
Adult males	122	46	53	20
Juvenile males	20	8	104	38
Adult females	101	38	41	15
Juvenile females	20	8	74	27
All adults	223	85	94	35
All juveniles	40	15	178	65
All males	142	54	157	58
All females	121	46	115	42
All total	263	100	272	100
Juvenile:adult female	0.40:1		4.34:1	

Table 5. Small mammal population indices (relative abundance) depicted as captures/100 trap nights on 17 index lines in Unit 19, west-central Alaska, 1989.

Trapline number	Masked shrew	Dusky shrew	Arctic shrew	Jumping mouse	Meadow vole	Red-backed vole	Captures	Trap nights	% Success
1	--	--	--	--	--	3	3	99	3.0
2	6	--	--	1	1	--	8	100	8.0
3	--	--	--	--	--	--	0	75	0
4	--	--	--	--	--	--	0	75	0
5	1	--	--	--	--	--	1	150	0.7
6	1	--	--	--	--	--	0	100	0
7	1	--	--	--	--	--	1	200	0.5
8	1	--	1	--	--	5	7	200	3.5
9	12	1	4	--	1	13	31	200	15.5
10	17	--	4	--	8	3	32	143	22.4
11	--	--	--	--	--	4	4	18	22.2
12	7	--	2	--	1	4	14	132	10.6
13	8	1	2	1	1	2	15	114	13.2
14	2	--	--	--	--	--	2	99	2.0
15	1	--	--	--	--	2	3	110	2.7
16	10	--	--	--	1	14	25	250	10.0
17	--	--	--	--	--	23	23	150	15.3
Total	67	2	13	2	13	73	169	2,215	7.63

Table 6. Relative abundance and importance of small mammals on 17 transects in Unit 19, west-central Alaska, 1989.[a]

Species	Abundance Index	X	Mean weight	=	Importance Index
Masked shrew	3.02		4.21		12.7
Red-backed vole	3.30		21.79		71.9
Meadow vole	0.59		24.71		14.6
Arctic shrew	0.72		7.52		5.4
Jumping mouse	0.11		17.65		1.9
Dusky shrew	0.11		5.25		0.6

[a] Importance is based on relative abundance and mean weight of sampled animals.

STUDY AREA

GAME MANAGEMENT SUBUNITS: 20A, 20B, 20C, 20F, and 25C (44,760 mi^2)

GEOGRAPHICAL DESCRIPTION: Central and lower Tanana Valley and middle Yukon River drainage

BACKGROUND

Within this study area, furbearers are valued for a variety of reasons. They provide an important source of income and livelihood for many trappers, especially in remote areas where alternative sources of income are limited. Trapping also provides an important source of recreation in the more accessible, road-connected areas. Furthermore, the importance of nonconsumptive uses of furbearers should not be overlooked. Many people enjoy watching furbearers or finding evidence of their activities. Continued use of furbearers will require conservation and continued support and acceptance of the fur industry.

Although the fur trade is one of Alaska's oldest industries, relatively little is known about factors limiting furbearer populations. Most furbearers are difficult to study because of their secretive nature; therefore, information on furbearers has come primarily from harvest data. Trapper questionnaires have also been issued annually since 1965. Furbearer investigations in the last 20 years in Interior Alaska have included research on lynx population dynamics (Nava 1970, Berrie 1973, O'Connor 1984, Stephenson 1988), beaver population ecology (Boyce 1974, 1981), the effects of fire on furbearers (Stephenson 1984, Magoun and Vernam 1986), and development of techniques to survey furbearer populations using track counts (Golden 1987, Schwartz et al. 1988, Stephenson 1988).

Demands for trapping opportunities have caused congestion and overlapping of traplines in some easily accessible areas, resulting in conflicts among users and prompting concern for the possible overtrapping of lynx populations during the low phase of their cycle. The Board of Game responded by adopting a "tracking harvest" strategy for lynx management in 1987, in which trapping regulations become restrictive during the low phase of the cycle and more liberal when lynx are abundant. Human-wildlife conflicts have also resulted from beaver activities (e.g., cutting trees, building dams) that cause property damage along waterways where beaver densities are high.

POPULATION OBJECTIVES

To maintain an annual fall population density of <0.5 beaver colonies/km and mitigate problems arising from their activities.

To produce a leaflet by 1991 that will promote opportunities for public viewing and/or photographing beavers.

To maintain <20% kits in the annual harvest when it exceeds 50 beaver.

To determine the status of the lynx population in 1988-89 by examining carcasses for age and reproductive information.

To determine the accuracy of using lynx pelt measurements to monitor annual changes in recruitment.

To maintain furbearer trapping seasons during periods of peak pelt primeness.

To establish species-specific management objectives by 1992.

METHODS

Beaver populations in the lower Chena River in Subunit 20B (i.e., downstream from the confluence with the Little Chena River and Badger Slough) were estimated by means of cache surveys conducted on 5 October 1988 from a boat. Noyes Slough was surveyed on foot on 16 October 1988.

Lynx carcasses were collected from Subunits 20A and 20B, which are the most intensively trapped portions of the study area, to determine the age structure, reproductive status, prevalence of trichinosis, and genetic variability in the harvest. Trappers provided information on the harvest date and location and were paid $15/carcass. Staff took standard measurements and collected samples from carcasses. To determine the age of each lynx, a canine tooth, skull, radius, and ulna were collected from each carcass. Matson's Laboratory (Milltown, Mont.) sectioned, examined, and assigned ages to the canine teeth, and the sections were read independently to confirm age determination. Canines with open tooth roots were considered kittens and were not sectioned. Leg bones were retained to check ossification of epiphyses on any lynx whose age, based on tooth sections and skull measurements, was in question. Reproductive status of female carcasses was determined by slicing open the uteri to count placental scars, hardening the ovaries in 10% formalin, and then sectioning ovaries to macroscopically count corpora lutea.

Samples from the masseter muscle and diaphragm were sent to D. Worley (wildlife parasitologist, Montana State University, Bozeman) to test for prevalence of trichinosis. Tissue samples of the muscle, heart, liver, and kidney were sent to C. Noll (Ph.D. student, University of New York, Syracuse) for a study of lynx genetics.

Harvests were estimated from the required sealing documents for beavers, lynx, otters, and wolverines. Sealing data provide minimum harvest estimates, because some pelts are used domestically and not reported. The proportion of kits in the harvest was estimated for beavers and lynx using pelt measurements from the sealing certificates. Although overlapping exists between pelt lengths of kits and yearlings, beaver pelts <53 inches (length plus width) (Buckley and Libby 1955) and lynx pelts <35 inches long (Stephenson 1988) were considered to be kits. Other harvest data were available from trapper export reports and fur acquisition reports. Average pelt prices were estimated by a local fur dealer (J. Mattie, pers. commun.). Population status and trend for all furbearers was assessed from trapper questionnaires.

RESULTS AND DISCUSSION

Environmental Conditions Affecting Trapping

According to the National Weather Service the lower Tanana Valley and middle Yukon River areas had relatively early snow with 4 inches more than normal by October 1988. October and November temperatures were colder than usual; i.e., 7-8°F below normal. December was warm and dry; temperatures were 10-14°F above normal. January was extremely cold; temperatures were 8-12°F below normal. February temperatures were 6-8°F above normal, and snowfall was 30-50% above normal. Snowfall in March and April was 25-30% below normal. Snowpack for the winter was 33% above average and 50% above 1987-88 values. Maximum snow depth was 30 inches in February, which is slightly above normal.

Population Status, Trend, and Mortality

Beaver:

According to trapper questionnaires, beavers were common in the study area and populations were at about the same level as last year (Table 2). During cache surveys in October 1988, beaver density in the lower Chena was estimated at 0.7 colonies/km (Table 3). This value is 40% higher than our management objective of <0.5 colonies/km. Boyce (1981) concluded that 0.5 colonies/km is a saturation density for Interior Alaska. Density was highest (1.4 colonies/km) in the section of river through Fort Wainwright. Using a mean of 5 beavers/colony (Boyce 1974) and considering gravel pits and other waterways within the lower Chena River, the population in the lower Chena River is estimated to be 200-250 beavers. In 1988 there were at least 15 complaints of property damage by beavers within this area. Conflicts were resolved by landowners fencing trees or property when possible; beavers were also removed when necessary. Four nuisance permits for the lower Chena River were issued to trappers for removal of 18 beavers. Additionally, 8 nuisance permits issued for areas other than the lower Chena River, and 11 beavers were harvested.

The lower Chena River area was open to beaver trapping for the first time since 1969 during the reporting period to help reduce the population to <0.5 colonies/km. In early February 1989 announcements were made in the media regarding this registration season. Permits were issued to the first 7 applicants beginning 0800 hours on 13 February 1989 at the ADF&G office. Permittees were (1) assigned to 1 of 3 zones, (2) allowed to trap from 15 February to 15 March, and (3) limited to 5 beavers/trapper. Permittees were required to return a harvest report by 20 March 1989. Trapping was prohibited in the Chena River areas within the Fairbanks city limits and Fort Wainwright. Fourteen beavers were harvested by 3 permittees; 3 additional permittees were unsuccessful, and one did not trap. Pelts of harvested beavers averaged 68 inches, and no kits were taken.

In 1988-89, 1,046 beavers were harvested throughout Subunits 20A, 20B, 20C, 20F, and 25C, a lower amount than had been harvested during the previous 3 years (Table 4, Fig. 1). Most beavers were taken in Subunit 20B, and 49% of the beavers harvested were taken in March. Pelt price decreased slightly from an average of $35-45 in 1987-88 to $30-40 in 1988-89.

Our management objective for maintaining an annual harvest of beavers that includes <20% kits in each subunit was met; i.e., 14% in Subunit 20A, 7% in 20B, 8% in 20C, and 14% in 20F. The average number of beavers taken by each trapper ranged from four in Subunit 20A to 11 in Subunit 20C. No beavers were reported taken in Subunit 25C during the last 2 years.

Lynx:

Lynx remained scarce throughout the Tanana River basin. Population trends were stable or increasing (Table 2). Most trappers thought that snowshoe hares were common and increasing in numbers.

Although this year's harvest of 224 lynx (Table 4, Fig. 2) was the highest of the last 5 years, it was still much lower than those from previous years; e.g., 1982-83, 798 lynx were sealed. Harvest trends do not necessarily reflect population trends; thus they should be interpreted with caution. Because season lengths have been changed several times in recent years, trappers were encouraged not to reduce their harvests during the low phase of the cycle. Average pelt price for lynx declined from $400 in 1987-88 to approximately $225 in 1988-89, and it is expected to be even lower ($100-150) during 1989-90.

The proportion of kittens in the Subunit 20A and 20B harvests were estimated by determining cementum ages from teeth and using pelt measurements listed on sealing certificates. Twelve trappers provided us with 29 lynx carcasses from Subunit 20A and 16 from Subunit 20B. These carcasses represented 54% and 28% of the reported harvest from these subunits, respectively. Based on

tooth cementum, 46% (13/28) of the Subunit 20A carcasses were kittens; however, none (0/15) of the Subunit 20B carcasses were kittens. It is not known whether this discrepancy in the kitten cohorts is an artifact of sampling or whether there is a wide variation in productivity between areas. To increase sample sizes, data from the 2 areas were combined. Thirty percent (13/40) of the combined Subunit 20A and 20B carcasses were kittens, and 80% (36/41) were kittens or yearlings. By any standards, these estimates represented a very young age structure. If recruitment continues to be high, the lynx population will peak within the next 2 years, as snowshoe hares swing out of the low phase of their cycle.

Detecting changes in recruitment is important for managing lynx by means of a tracking harvest strategy. Carcasses provided the opportunity to determine age structure of the harvested cohorts. Because carcass collections can be expensive and time consuming to process, alternative methods of assessing productivity, such as using pelt measurements, have been explored (Quinn and Gardner 1984, Stephenson and Karczmarczyk 1989). During the reporting period, we counted the number of lynx pelts <35 inches to estimate the proportion of kittens in the harvest; 11% (24/220) of the lynx harvested in the study area had pelts <35 inches, a decline from the 19-22% reported for the 3 previous years.

We need to determine whether pelt length indices will consistently reflect actual changes in age structure. Interpreting pelt measurement data is difficult for several reasons. For instance, the range of pelt lengths associated with a particular age class may not be consistent. Differences in (1) trapping seasons (2) pelt-stretching techniques, and (3) nutrition may influence pelt lengths. The degree of overlapping between age classes also may not be consistent from year to year. Changes in the age structure of the harvest (e.g., more yearlings) could result in a higher proportion of pelts in the overlapping range. Estimates of the proportion of kittens in the harvest were lower using the <35-inch pelt length criteria than the ones based on the sample of carcasses we collected. In Subunits 20A and 20B combined, only 12% (13/109) of the pelts sealed were <35 inches; however, 39% (13/40) of the carcasses were kittens. Therefore, if the carcass collection was representative of the harvest, most of the kittens had pelts ≥35 inches. To further explore the usefulness of using pelt size as an index to lynx productivity, we will collect carcasses again next winter. Trappers will be asked to mark each lynx's pelt and carcass with a unique number so that pelt sizes for known-age lynx can be obtained.

Skull measurements indicated a fairly clear separation between kittens and older lynx. However, the overlapping of skull measurements for yearlings and adults (and the small sample size of nonkittens) was too great to allow us to distinguish between these 2 age classes based on skull measurements alone.

Data from female reproductive tracts also suggested that lynx recruitment was high. When hares are scarce, many yearling females do not ovulate (O'Connor 1984). All 8 yearling females in our current sample had corpora lutea, as did all adult females. Numbers of corpora lutea ranged from 5 to 11 per female.

Testing for the incidence of trichinosis in lynx carcasses has not yet been completed. However, a preliminary report from a sample of 20 lynx collected in Subunit 25A during this reporting period indicated that Trichinella larvae were found in 9 of 20 masseters and 10 of 20 tongues (R. Zarnke memo to Scranton, 14 Sep 1989). Although prevalence was high, intensities of infection (larvae/g) were low. This information will be used to inform trappers of the importance of thoroughly cooking lynx meat for human consumption.

Land Otter:

According to results of trapper questionnaires, otter densities ranged from scarce to common in 1988-89, and populations were stable or slightly lower than those in 1987-88 (Table 2). Fifty-eight otters were reported harvested in 1988-89, similar to recent annual harvests (Table 4, Fig. 3). Sex ratios favored males (18 male, 12 female, 28 unknown). Because of the high proportion of pelts for which sex was reported as "unknown," fur sealers will be given additional information on how to correctly determine gender of otter pelts.

Otters were taken throughout the 5.5-month season. Historically, most otters are taken incidentally to beaver trapping in March. In 1988-89 only 24% of the otter harvest occurred in March, compared with 46% in 1987-88. Nearly half of the otter harvested in Subunit 20B were taken in November and December. This may indicate a shift away from incidental catch as the demand for trapping opportunities in the Fairbanks vicinity increases. It may also reflect the recent shift in opening dates for beaver trapping from February to November. Trapping pressure on otters may continue to be relatively low because of low pelt prices (average about $30/pelt); however, prices are expected to increase because of the stronger market for short-haired furs.

Wolverine:

Wolverine densities were rated as scarce by 20 of 27 trappers responding to the trapper questionnaire. Wolverines were considered to be less abundant or the same as in 1987-88 (Table 2). Although the 1988-89 reported harvest of 32 wolverines was the lowest of the last 5 years (range = 38-40 wolverines/year) (Table 4, Fig. 4), the trapping season has been 1 month shorter during the last 2 years. Three wolverines from Subunit 20A were reported harvested by hunters in the fall.

A 74% male (23/31) of the harvest is consistent with a population that has not been overharvested. Because male wolverines have larger home ranges than females (Gardner 1985, Magoun 1985), they are more susceptible to trapping. Correlations between sex ratios and overharvesting have not been established; however, we will consider actions to reduce the harvest if the percentage of males consistently falls below 60%.

Large ungulates are the primary food resource for wolverines during the winter (Magoun 1985). Most ungulate biomass is probably available to wolverines by means of wolf kills. Ungulate populations in this area were stable or increasing, thus wolverine populations should be stable or slightly increasing. If pelt prices remain at about $200-250, trapping pressure will probably remain fairly stable.

Magoun (1985) stated that factors responsible for long-term wolverine population declines include (1) widespread declines in food resources, particularly the demise or range shift of large ungulate populations; (2) widespread habitat destruction; or (3) heavy harvests over large areas. None of these factors appeared to be jeopardizing wolverine populations in the study area.

Marten:

In Unit 20 during 1988-89, more than 2.5 times more marten were reported sold to fur buyers than all other furbearers combined (Table 7). Respondents to the trapper questionnaire rated marten as common, with stable or increasing populations (Table 2). Interest in marten trapping has remained high because of high pelt prices that averaged $70 in 1988-89. There are no sealing requirements for marten pelts, so the harvest is estimated from fur dealer and export reports. During this reporting period, 5,141 marten pelts from Unit 20 were sold to fur dealers; another 2,175 pelts were exported by trappers.

The impact of different harvest rates on marten populations is unknown. Strickland and Douglas (1987) suggested a ratio of 3 juveniles:adult female as an indicator of possible overharvesting. This numerical relationship needs more investigation. A field technique for sexing and aging marten (Magoun et al. 1988) could be used for collecting baseline data in areas of interest.

Other Furbearers:

Trapper questionnaire results indicated that in 1988-89 populations of coyotes and muskrats were scarce; mink were scarce-to-common; red foxes, grouse, and mice were common; and red squirrels and snowshoe hares were common-to-abundant. Respondents also suggested that, compared with 1986-87, hare populations had increased, foxes and ptarmigan were the same or had increased, and population levels of other species had not changed. Coyote populations in the Alaska Range in Subunits 20A

and 20D appeared to be increasing. During a helicopter flight in March 1989, 6 coyotes were seen in the Wood River drainage.

Seasons and Bag Limits:

See Tables 1a and 1b.

Method of Take and Transportation. Snares were the most common method of harvesting beavers (88%), and traps were the most common method of harvesting lynx (80%), wolverines (66%), and otters (59%) (Table 8). Snowmachines were the most commonly used method of transportation (77%) for harvesting these 4 species.

Economic Use

Nearly 10,000 furbearers from Unit 20 reportedly entered the fur trade in 1988-89. Eighty-five percent of these were marten (Table 7). For unsealed furbearer species, a minimum harvest estimate may be obtained by adding the number of pelts exported by trappers to the number of pelts purchased by fur dealers. This value would still underestimate the harvest, because some pelts do not enter the fur trade or are not reported on these forms. It is difficult to calculate a correction factor for the harvest because of variability among years and among species. For example, in Unit 20 during 1988-89, the proportion of pelts that were sealed and also entered the fur trade ranged from 75% for lynx to 39% for otters. Although we do not have an accurate count of the number of trappers in the study area, according to fur acquisition reports for Unit 20, dealers purchased furs from approximately 500 different trappers in 1987-88.

Game Board Actions and Emergency Orders

The Board of Game discussed furbearer regulations in November 1987. Actions taken at that meeting became effective on 1 July 1988. Decisions affecting furbearers in this study area included (1) opening the lower Chena River to a permit trapping season for beavers, (2) raising the bag limit in Subunit 20F from 25 to 50 beavers, (3) endorsing a "tracking strategy" for lynx regulations for areas where trapping intensity was highest, (4) reducing the lynx trapping and hunting seasons (effective 30 November 1987 by Emergency Order), (5) shortening the wolverine trapping season by 1 month, and (6) prohibiting the land-and-shoot method of harvesting wolverines in this area (excluding Subunit 25C).

CONCLUSIONS AND RECOMMENDATIONS

The beaver population in the lower Chena River is currently higher than our management objective of <0.5 colonies/km. Although these high densities provide for ample viewing opportunities, they also result in frequent conflicts with humans. A registration permit trapping season implemented in 1988-89 to reduce this population was a moderate success, and it

will be continued in 1989-90. The section of river through Fort Wainwright had densities nearly 3 times higher than our objective, and it will be included in next year's permit area. Lower beaver densities should result in fewer human-beaver conflicts. We will continue to work with property owners and agency personnel to minimize problems, such as blocked culverts, flooded land, and felled trees. Beaver harvests in the remainder of the study area have met our management objective of <20% kits in the harvest.

Favorable conditions should result in higher lynx populations during the next few years. Snowshoe hares, the lynx's primary prey, were common and increasing. Lynx recruitment was high, according to data from carcasses collected in Subunits 20A and 20B. Average lynx pelt prices have declined from nearly $600 in 1986-87 to $250 in 1988-89, and they are expected to be as low as $100 in 1989-90. This factor should reduce some of the trapping intensity. Lynx trapping seasons have been restricted for 4 years. In accordance with the tracking harvest strategy adopted by the Board of Game in 1987, we will recommend liberalizing lynx regulations in this area for the 1990-91 trapping and hunting seasons.

During the next reporting period, the discrepancy in estimates of lynx recruitment based on carcass and pelt measurement data will be investigated by obtaining pelt measurements for known-age lynx carcasses. I recommend establishing long-term studies of lynx and snowshoe hares to determine population indices and develop methods of anticipating changes in the magnitude and timing of cycles. The effectiveness of our harvest-tracking strategy depends on this information.

For other furbearer species, we have not detected any problems requiring changes in management. We will continue to monitor harvest and establish criteria for evaluating status of the populations. Trappers will continue to be an important source of information. Communication with the trappers should be improved by expanding the trapper questionnaire (i.e., include more trappers or send reminder letters to increase response), visiting traplines, writing articles about furbearer research projects for the Alaska Trapper's Association Magazine, soliciting input regarding management issues, and trying to keep trappers informed about issues affecting them.

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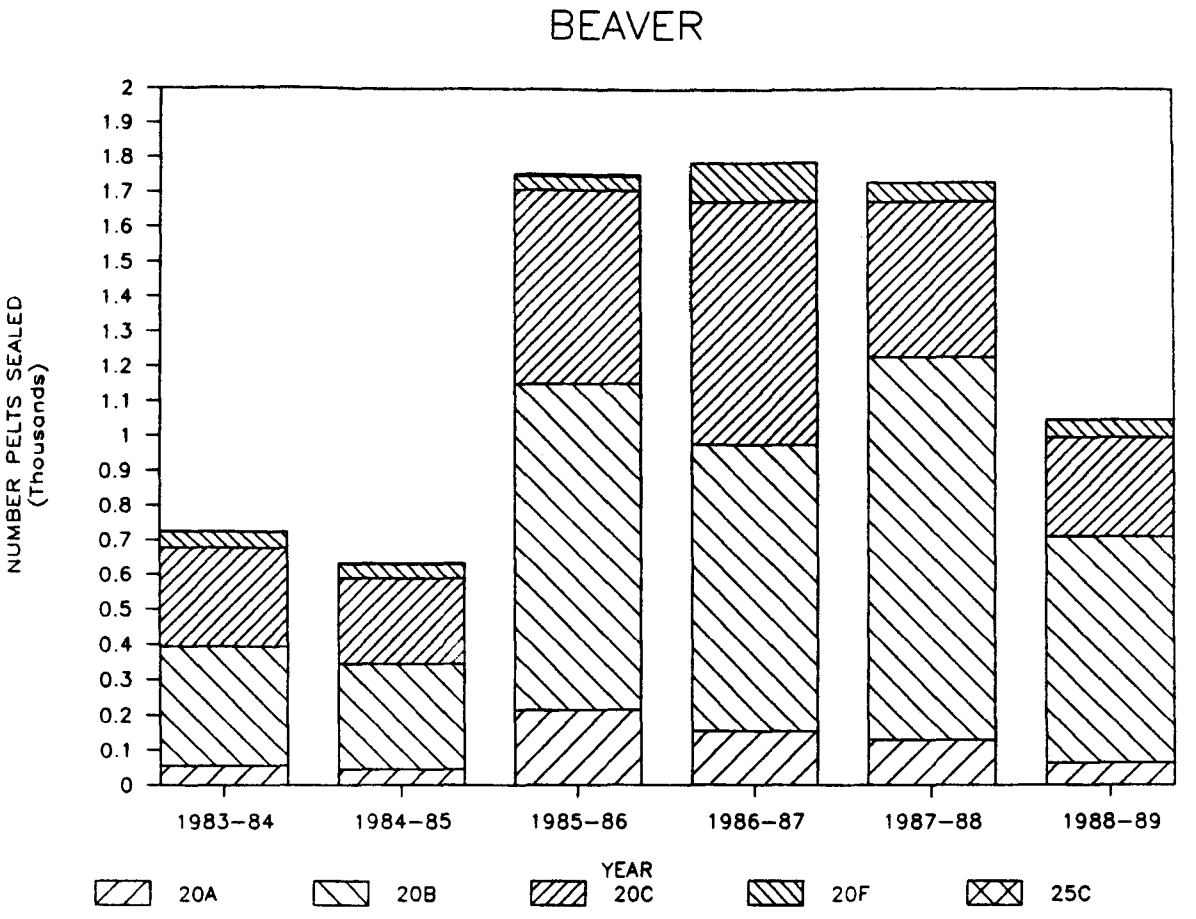

Figure 1. Distribution of beaver pelts sealed in Unit 20 (except 20D and 20E) and Subunit 25C, 1983-84 to 1988-89 (See Table 1 for season changes during this period).

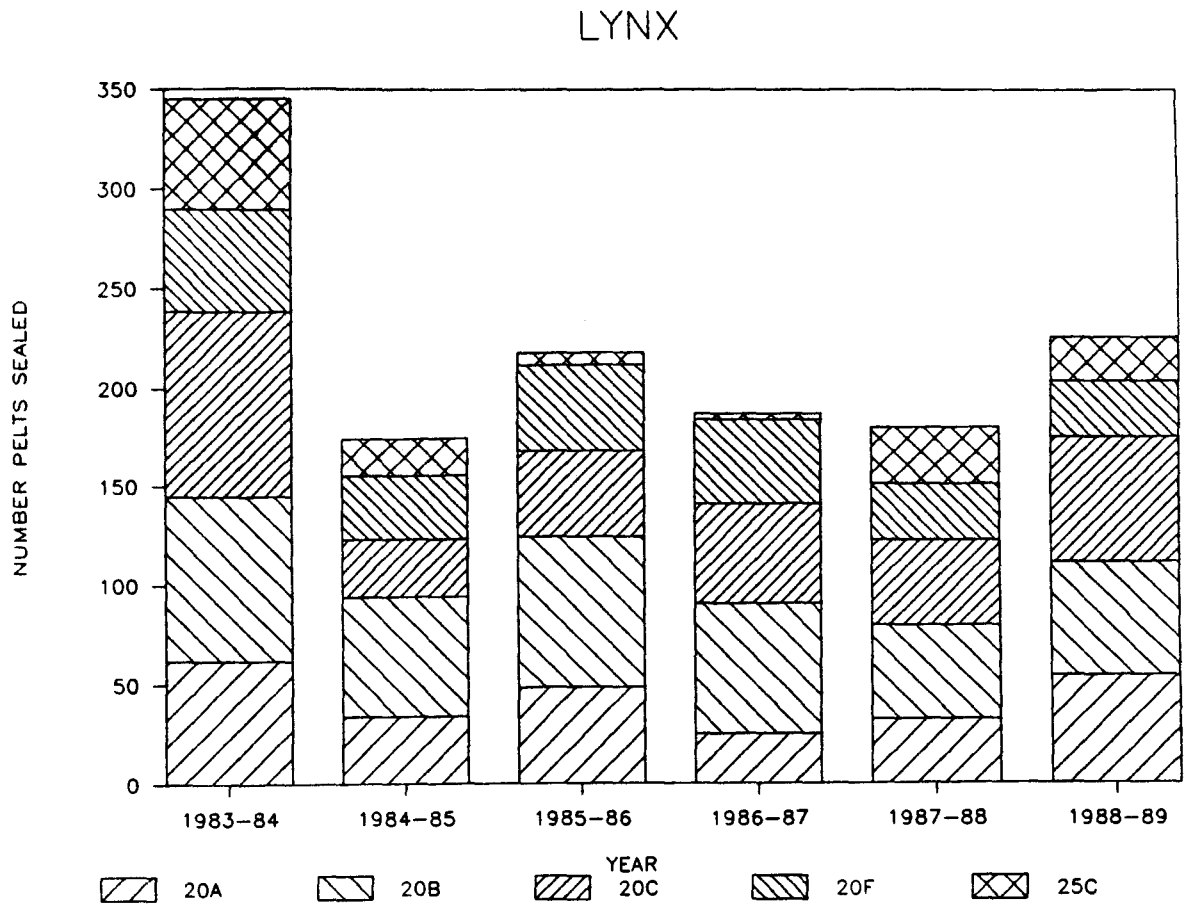

Figure 2. Distribution of lynx pelts sealed in Unit 20 (except 20D and 20E) and Subunit 25C, 1983-84 to 1988-89 (See Table 1 for season changes during this period).

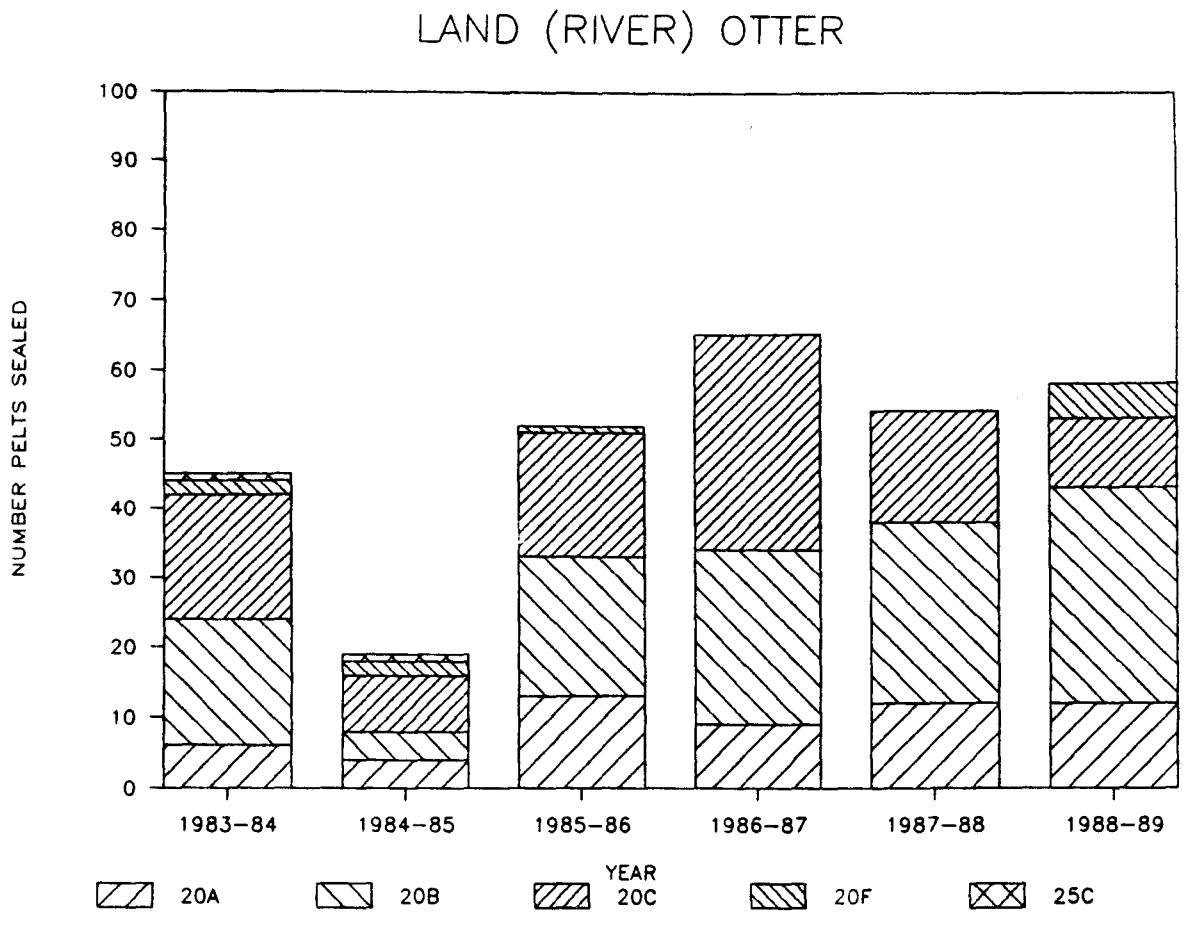

Figure 3. Distribution of otter pelts sealed in Unit 20 (except 20D and 20E) and Subunit 25C, 1983-84 to 1988-89 (See Table 1 for season changes during this period).

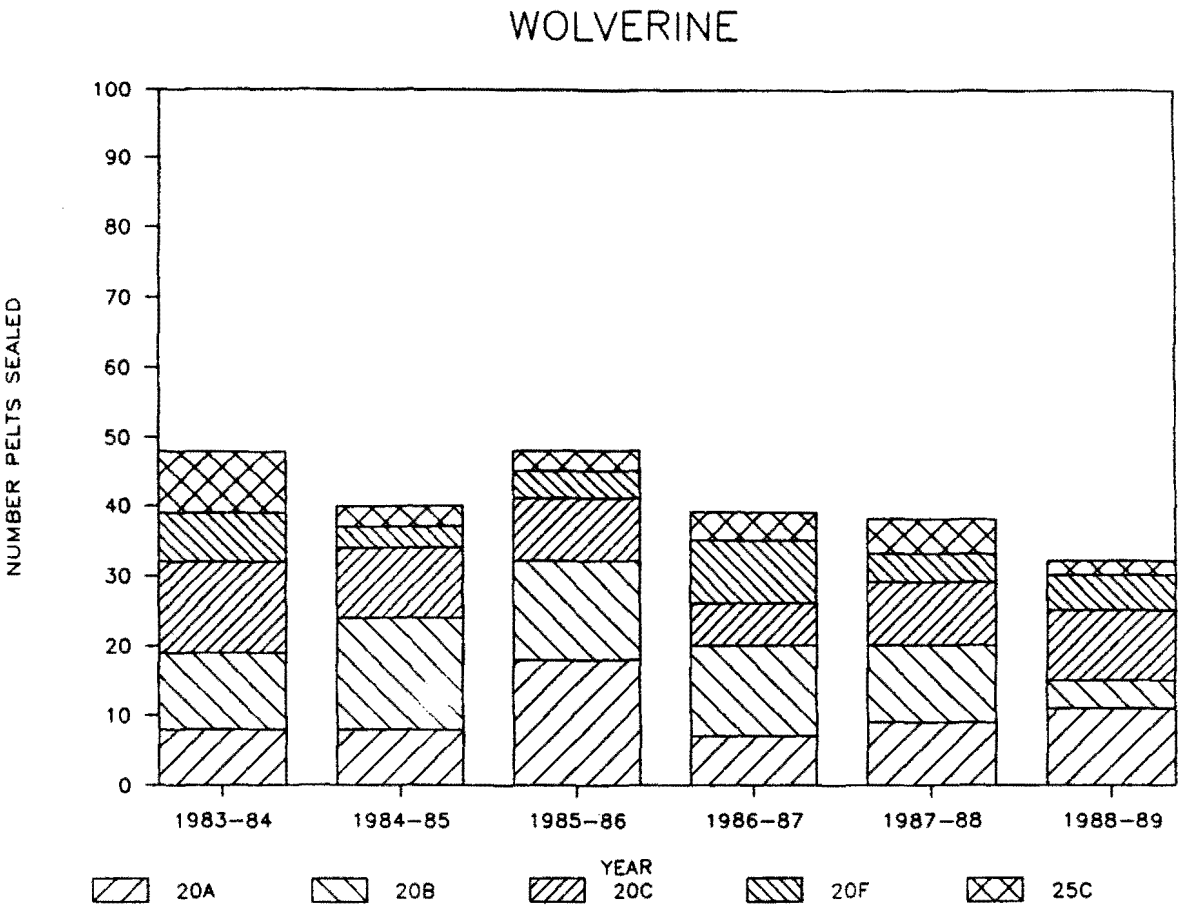

Figure 4. Distribution of wolverine pelts sealed in Unit 20 (except 20D and 20E) and Subunit 25C, 1983-84 to 1988-89 (See Table 1 for season changes during this period).

Table 1a. Trapping seasons and bag limits for selected furbearers in portions of Units 20 and 25, 1983-84 to 1988-89.

Species	Bag limit	Unit	1983-84 1984-85	1985-86 1986-87	1987-88[a]	1988-89
Beaver	25 (except 50 beaver in Subunit 20F in 1988-89)	20A	1 Feb-15 Apr	1 Feb-15 Apr	1 Feb-15 Apr	1 Feb-15 Apr
		20B[b]	Closed	Closed	Closed	15 Feb-15 Mar
		20B[c]	1 Feb-15 Apr	1 Nov-15 Apr	1 Nov-15 Apr	1 Nov-15 Apr
		20C,F;25C	1 Nov-15 Apr	1 Nov-15 Apr	1 Nov-15 Apr	1 Nov-15 Apr
Lynx	No limit	20A,B,C,F;25C	1 Nov-15 Mar	1 Dec-31 Jan	1-31 Dec(20A) 1 Dec-15 Jan(20B,C,F,25C)	15 Dec-15 Jan
Land otter	No limit	20, 25	1 Nov-15 Apr	1 Nov-15 Apr	1 Nov-15 Apr	1 Nov-15 Apr
Wolverine	No limit	20, 25	1 Nov-31 Mar	1 Nov-31 Mar	1 Nov-28 Feb	1 Nov-28 Feb
Coyote	No limit	20, 25	1 Nov-31 Mar	1 Nov-31 Mar	1 Nov-31 Mar	1 Nov-31 Mar
Marten, Mink, Weasel, Red fox	No limit	20, 25	1 Nov-28 Feb	1 Nov-28 Feb	1 Nov-28 Feb	1 Nov-28 Feb
Muskrat	No limit	20, 25	1 Nov-10 Jun	1 Nov-10 Jun	1 Nov-10 Jun	1 Nov-10 Jun

[a] Changes for lynx and wolverine were effective 30 November 1987 by Emergency Order.

[b] That portion of the Chena River downstream from its confluence with the Little Chena River, and Badger (Piledriver) Slough downstream from Plack Road. Season in 1988-89 open by registration permit.

[c] The remainder of Subunit 20B.

Table 1b. General hunting seasons and bag limits for furbearers and wolverines in Subunits 20A, 20B, 20C, 20F, and 25C, 1983-84 to 1988-89.

Species (bag limit)	1983-84 through 1986-87	1987-88	1988-89
Lynx[a] (2)	1 Nov-31 Mar	1 Nov-31 Dec (20A) 1 Nov-15 Jan (20B,C,F, 25C)	15 Dec-15 Jan
Wolverine (1)	1 Sep-31 Mar	1 Sep-31 Mar	1 Sep-31 Mar
Red fox (2)	1 Nov-15 Feb	1 Nov-15 Feb	1 Nov-15 Feb
Coyote (2)	1 Sep-30 Apr	1 Sep-30 Apr	1 Sep-30 Apr
Squirrel (no limit)	No closed season	No closed season	No closed season

[a] 1987-88 seasons changed by Emergency Order effective 30 November 1987.

Table 2. Responses to 1988-89 Trapper Questionnaire[a] for Subunits 20A, B, C, F, and 25C.

	The animals on my trapline were				Compared with 1987-88, the number of animals on my main trapline were		
	Normally not present	Scarce	Common	Abundant	Fewer	Same	More
Beaver	7	6	13	4	3	20	3
Coyote	15	11	4	1	2	16	2
Lynx	1	26	4	1	3	14	11
Marten	1	8	16	6	1	16	9
Mink	2	11	16	2	6	17	4
Muskrat	7	17	5	0	2	19	1
Red fox	0	6	18	6	6	11	10
Land otter	5	12	10	2	6	17	0
Wolf	1	18	12	1	5	18	6
Wolverine	3	21	7	0	12	13	1
Red squirrel	1	0	17	13	2	23	3
Snowshoe hare	0	5	16	10	1	5	23
Grouse	0	5	20	4	6	16	5
Ptarmigan	2	10	12	4	5	11	9
Mice/Rodents	0	3	23	3	5	15	6

[a] Trappers were asked to rate these species in one of the 4 abundance categories and in one of the 3 trend categories. This table shows the number of trappers rating an animal in each category.

Table 3. Status of the beaver population in the Chena River downstream from the confluence with the Little Chena River and Badger Slough, October 1988.[a]

	Linear stream distance (km)	No. live colonies[b]	No. beaver if 5/colony	Density (colonies/km)
Within Fairbanks city limits excluding Fort Wainwright:				
Chena River	10.3	5	25	0.5
Noyes Slough	8.5	6	30	0.7
Total	18.8	11	55	0.6
Fort Wainwright:				
Chena River	11.0	15	75	1.4
Outside Fairbanks city limits:				
Chena River upstream from city limits	9.0	5	25	0.6
Chena River downstream from city limits	10.1	3	15	0.3
Badger Slough	13.2	7[c]	35	0.5
Total	32.3	15	75	0.5
Total of all areas	62.1	41	205	0.7

[a] No data for gravel pits and other waterways.

[b] Lodges with food caches.

[c] Not surveyed, estimate from local resident, Terry Andrews.

Table 4. Number of pelts sealed[a] from selected furbearers in portions of Unit 20 and in Subunit 25C, 1984-85 to 1988-89.

Species	Subunit	1984-85	1985-86	1986-87	1987-88	1988-89[a]	% of statewide harvest
Beaver	20A	44	214	153	129	63	
	20B	303	935	823	1,095	648	
	20C	244	557	697	445	286	
	20F	39	42	113	55	49	
	25C	3	4	0	0	0	
Total		633	1,752	1,786	1,724	1,046	6
Lynx	20A[b]	34	48	25	32	54	
	20B	60	76	65	47	57	
	20C	29	43	50	43	63	
	20F	32	44	43	28	28	
	25C	19	6	3	29	22	
Total		174	217	186	179	224	22
Land otter	20A	4	13	9	12	12[c]	
	20B	4	20	25	26	31	
	20C	8	18	31	16	10	
	20F	2	1	0	0	5	
	25C	1	0	0	0	0	
Total		19	52	65	54	58	2
Wolverine	20A	8	18	7	9	11	
	20B	16	14	13	11	4	
	20C	10	9	6	9	10	
	20F	3	4	9	4	5	
	25C	3	3	4	5	2	
Total		40	48	39	38	32	6

[a] Data from S&I reports prior to 1987-88 and from original sealing certificates since 1987-88. See Tables 1a and 1b for changes in season length.

[b] Due to a lynx research project, 1 active lynx trapper did not trap lynx from 1984-85 through 1986-87 and most of 1987-88.

[c] This includes 1 mortality due to Sport Fish research activities.

Table 5. Percentage of lynx kittens[a] in the harvest from Subunits 20A, 20B, 20C, 20F, and 25C, 1983-84 to 1988-89.

Year	Subunit	No. pelts measured	No. kittens	% kittens in harvest
1983-84	20A	59	0	0
	20B	72	15	21
	20C	88	5	6
	20F	52	2	4
	25C	62	3	5
	Total	333	25	8
1984-85	20A	30	2	7
	20B	59	10	17
	20C	25	3	12
	20F	30	1	3
	25C	19	0	0
	Total	163	16	10
1985-86	20A	48	11	23
	20B	76	14	18
	20C	43	8	19
	20F	44	7	16
	25C	6	1	17
	Total	217	41	19
1986-87	20A	25	1	4
	20B	59	16	27
	20C	50	15	30
	20F	42	6	14
	25C	3	0	0
	Total	179	38	21
1987-88	20A	30	6	20
	20B	48	6	12
	20C	43	10	23
	20F	28	7	25
	25C	29	10	34
	Total	178	39	22
1988-89	20A	53	7	13
	20B	56	6	11
	20C	61	7	11
	20F	28	1	4
	25C	22	3	14
	Total	220	24	11

[a] Pelt length <35 inches.

Table 6. Summary of data from lynx carcasses collected 15 December 1988-15 January 1989.

No.	Sex	Subunit	Location	Length (cm)				Age				Reproduction	Comments
				Total	Tail	Neck	Chest	Cemen.	Legbone	CB[a]	ZW[a]	No. CL	
89-16	F	20A	Gold King area	77.0	9.2	15.8	25.2	kit[b]	--	11.2	7.8	immature	
89-17	M	20A	Wood River (half way to Buttes)	94.7	12.0	--	--	1		13.0	8.8	--	Very good condition, lots of fat
89-26	M	20A	Gold King area	--	--	--	--	--[c]	kit	--	--	--	No fat-very thin
89-27	F	20A	Gold King area	--	--	--	--	--[c]	--	--	--	11	Very little fat Considered older than kit because of CL
89-31	M	20A	Gold King area	83.6	11.3	16.5	30.0	kit[b]		11.5	8.2	--	Inguinal fat, lots of mesenteric fat
89-33	M	20A	Tanana Flats across from Salcha	96.3	10.8	22.3	38.0	1		13.6	9.2		Very fat
89-35	F	20A	Crooked Creek-Tanana Flats	81.6	9.7	16.1	29.7	kit[b]		11.2	7.8		
89-37	F	20A	Tanana Flats across from Salcha	97.1	13.0	18.8	--	1		12.6	8.9	7	Not very fat
89-38	M	20A		--	10.9	--	33.1	--[c]		--	--	--	Heart fat, no kidney or mesenteric fat
89-40	F	20A		78.9	10.3	15.9	29.0	kit[b]		11.2	8.0	immature	Very little heart fat little mesenteric fat
89-41	M	20A	Gold King area	86.0	11.6	16.5	30.9	kit[b]		12.1	8.5	--	Above average fat
89-42	Unk	20A	Tanana Flats across from Salcha	--	--	18.8	33.3	1		12.5	8.7	--	Limited kidney fat, moderate heart fat
89-44	M	20A	Gold King area	84.2	10.4	17.0	29.9	kit[b]		11.6	8.3	--	Moderate kidney and heart fat
89-45	M	20A	Gold King area	96.2	10.1	20.8	38.9	1		13.3	9.0	--	Abundant fat
89-46	M	20A	Gold King area	101.1	12.2	21.3	35.9	1		13.3	9.3	--	Minimal fat
89-47	F	20A	Gold King area	89.4	11.4	18.5	32.3	1		12.3	8.6	6	Below average fat

Table 6. Continued.

No.	Sex	Subunit	Location	Length (cm)				Age				Reproduction	Comments
				Total	Tail	Neck	Chest	Cemen.	Legbone	CB[a]	ZW[a]	No. CL	
89-48	M	20A	Gold King area	96.2	12.2	19.7	34.1	1		12.5	8.9	--	Below average heart fat, some kidney fat
89-49	F	20A	Gold King area	94.7	11.1	19.2	34.8	1		12.1	8.6	7	Minimal fat
89-50	F	20A	Gold King area	92.6	10.4	18.4	36.9	6		12.4	8.8	7	Radio-collared(Renee) excellent nutritional condition
89-51	M	20A	Gold King area	95.5	11.7	21.0	35.3	1		13.4	9.1	--	No fat
89-52	F	20A	Tanana Flats across from Salcha	95.0	13.6	20.4	33.8			12.5	8.7	11	Slightly below average fat
89-53	M	20A	Gold King area	85.1	9.6	17.7	30.8	kit[b]		11.5	8.2	--	Abundant fat
89-54	M	20A	Gold King area	81.6	11.4	14.9	24.0	kit[b]		11.7	8.1	--	Emaciated
89-56	M	20A	Bonnifield Trail	102.2	9.5	21.0	38.9	3		13.1	9.5	--	Extremely fat (zyphoid fat-60.8g)
89-57	F	20A	Bonnifield Trail	81.3	10.2	13.4	25.0	kit[b]		11.6	7.9	0	Very emaciated
89-58	M	20A	Bonnifield Tail	90.5	8.3	17.3	31.8	kit[b]		12.1	8.4	--	
89-59	F	20A	Bonnifield Trail	86.4	10.3	13.2	23.5	kit		11.4	8.1	0	Emaciated
89-60	M	20A	Bonnifield Trail	108.3	11.7	16.2	28.9	ad3		13.6	9.6	--	Emaciated
89-65	F	20A		78.6	10.6	14.5	27.3	kit		11.3	8.1	0	No internal fat
89-18	F	20B	Chatanika River (above Shovel Creek)	94.5	11.0	--	--	1		12.3	8.7	4	
89-19	M	20B	Chatanika River (above Shovel Creek)	102.0	13.8	20.2	34.0	1		13.3	9.1	--	
89-20	Unk	20B	Between Tatalina River and Big Minto Lake	--	--	--	--	1		13.1	9.3		Chewed up
89-22	M	20B	Between Tatalina River and Big Minto Lake	104.6	12.3	--	--	1		13.1	9.2	--	Considerable fat
89-23	F	20B	Between Tatalina River and Big Minto Lake	≈95.5	11.1	99	99	1		--	--	5	Vertebra protruding

Table 6. Continued.

No.	Sex	Subunit	Location	Length (cm)				Age				Reproduction	Comments
				Total	Tail	Neck	Chest	Cemen.	Legbone	CB[a]	ZW[a]	No. CL	
89-24	M	20B	Between Tatalina River and Big Minto Lake	95.1	11.6	21.2	33.8	1		12.8	9.0	--	Very fat
89-25	M	20B	Between Tatalina River and Big Minto Lake	97.3	15.0	21.0	35.5	1		13.0	9.1	--	
89-28	M	20B	Tatalina River near TAPS	106.0	12.2	21.6	37.7	2		13.4	9.5	--	Very fat
89-29	M	20B	Tatalina River near TAPS	104.1	12.7	22.1	37.6	1		13.3	9.1	--	Exceptionally fat
89-30	F	20B	Tatalina River near TAPS	97.3	14.0	17.9	30.5	1		12.3	8.36	7	No fat
89-32	M	20B	Between Tatalina River and Big Minto Lake	95.2	12.5	22.8	37.3	1		13.0	9.3	--	Very fat
89-34	F	20B	Between Tatalina River and Big Minto Lake	96.9	13.8	15.8	31.9	2		12.6	8.7	10	
89-36	F	20B	Tatalina/Chatanika drainage	--	12.4	--	34.2	1[c]		13.0	8.9	8	
89-39	F	20B	Bonanza Creek	--	13.2	19.8	34.3	1		12.2	8.6	5	Little fat
89-43	M	20B	Tatalina/Chatanika drainage	99.2	10.6	18.7	34.4	1		12.9	9.1	--	No kidney fat, minimal heart fat
89-55	M	20B	Murphy Creek and Chatanika River	--	12.0		32.5	--[c]		--	--	--	Stomach empty

[a] Condylobasal length and zygomatic width. Skulls measured wet after soaking overnight.

[b] Determined by open tooth root.

[c] Skull missing from carcass.

Table 7. Number of furs from Unit 20 reported sold to fur dealers[a] or exported[b] from Alaska in 1988-89.

Species	No. pelts sealed	Pelts sold to fur dealers		Pelts exported by trappers		Total sold or exported	
		No.	% of sealed	No.	% of sealed	No.	% of sealed
Beaver	1,081	558	52	215	20	773	72
Coyote		10		2		12	
Cross fox		64		29		93	
Red fox		175		123		298	
Silver fox		25		5		30	
Lynx	237	153	65	24	10	177	75
Marten		5,141		2,175		7,316	
Mink		281		90		371	
Muskrat		93		71		164	
Otter	64	11	17	14	22	25	39
Red squirrel		362		0		362	
Weasel		129		62		191	
Wolf	109	42	39	19	17	61	56
Wolverine	46	18	39	7	15	25	54
Total		7,062		2,836		9,898	

[a] From fur acquisition forms.

[b] From fur export reports from trappers.

Table 8. Method of take and transportation used to harvest furbearers from Subunits 20A, 20B, 20C, 20F, and 25C, 1988-89.

Species	Method of take				Method of transportation			
	Ground shooting	Trapping	Snaring	Other/ unk.	Airplane	Dog sled/ snowshoe/skis	Snow-machine	Other/ unk.
Beaver	0	98	919	29	15	65	825	141[a]
Land otter	0	34	17	7	3	2	46	7
Lynx	2	180	41	1	17	25	163	19
Wolverine	3	23	8	1	3	6	18	5

[a] Includes 64 beavers from trappers using highway vehicles.

STUDY AREA

GAME MANAGEMENT UNIT: 20D (5,640 mi^2)

GEOGRAPHICAL DESCRIPTION: Central Tanana Valley near Delta Junction

BACKGROUND

Furbearers are an important natural resource in Subunit 20D. The 12 furbearers in the area include beavers, coyotes, lynx, martens, mink, muskrats, otters, red foxes, red squirrels, weasels, wolverines, and wolves. Wolves are discussed in a separate survey-inventory report. Both recreational and commercial trappers operate in Subunit 20D. Competition for traplines and furbearers is increasing in direct proportion to the human population.

METHODS

Harvest data for beavers, lynx, otters, and wolverines were collected from furbearer sealing documents. Information collected at the time of sealing included name of trapper; location of harvest; date of harvest; pelt measurements for beavers, lynx; and otters; sex of the furbearer, except for beaver and lynx; method of harvest; and method of transportation utilized by the trapper. The annual trapper questionnaire was sent to selected trappers in Subunit 20D through the statewide furbearer management program.

RESULTS AND DISCUSSION

Population Status and Trend

Lynx numbers are thought to be low and stable or slightly increasing. Coyotes are thought to be increasing. Red foxes are thought to be decreasing, perhaps in response to increasing coyote populations.

Mortality

Seasons and Bag Limits:

Subunit 20D furbearer trapping and hunting seasons and bag limits are listed in Table 1.

Human-induced Mortality:

Estimates of harvest are available only for those species that must be sealed. Reported harvest of beavers declined significantly from 85 in 1987-88 to 34 in 1988-89 (Table 2).

Harvest of lynx also declined to only 10 (Table 2). Six otters were harvested in 1988-89, compared with three in 1987-88 (Table 2). Harvest of wolverines increased significantly from six in 1987-88 to 15 in 1988-89 (Table 2).

Trapper Effort. Fewer people trapped beavers during 1988-89 than in previous years (Table 3); however, the harvest of 6.8 beavers per trapper was similar to 1987-88 rates (Table 3). The reduction in the number of beaver trappers may be solely responsible for the reduction in beaver harvest during 1988-89.

The number of trappers harvesting lynx increased from seven in 1987-88 to eight in 1988-89 (Table 3). The number of lynx harvested per trapper declined from 2.4 in 1987-88 to 1.3 in 1988-89. The number of otters harvested per trapper increased from 1.0 in 1987-88 to 2.0 in 1988-89. Three trappers harvested otters in 1987-88 and 1988-89 (Table 3). The number of trappers harvesting wolverines increased significantly from three in 1987-88 to 10 in 1988-89 (Table 3). Harvest declined slightly to 1.5 wolverines per trapper in 1988-89.

Harvest Chronology. During the 1988-89 season, 65% of all harvested beavers (22 of 35) were taken during the months of February and March. Harvests of lynx, otters, and wolverines occurred throughout the season, but they were focused in the middle portion (Table 4).

Transport Means. Snowmachines were the most commonly used means of transportation for beaver, lynx, otter, and wolverine trappers in Subunit 20D (Table 5). During 1988-89, snowmachines were used for 72% of all reported furbearer harvests.

Harvest Method. Snares were the most commonly used method for catching beavers; 62% of all beavers were captured in snares during 1988-89 (Table 6). Traps were the most common method of capturing lynx, otters, and wolverines.

CONCLUSIONS AND RECOMMENDATIONS

Furbearer investigations have received little attention in Subunit 20D. More intensive management will be required as competition increases for furbearer resources. Goals and objectives for furbearers in Subunit 20D will be developed during the next reporting period.

The most urgent furbearer management need is for an assessment of lynx population trends. In order to accomplish this goal, lynx track transects will be established and counted during the next reporting period.

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Table 1. Trapping and hunting seasons and bag limits for furbearers in Subunit 20D, 1988-89.

Species	Trapping season	Bag limit	Hunting season	Bag limit
Beaver	Nov 1-Apr 15[a]	25	No open season	
	Feb 1-Apr 15[b]	15		
Coyote	Nov 1-Mar 31	None	Sep 1-Apr 30	2
Lynx	Dec 15-Jan 15	None	Nov 1-Mar 31	2
Marten	Nov 1-Feb 28	None	No open season	
Mink	Nov 1-Feb 28	None	No open season	
Muskrat	Nov 1-Jun 10	None	No open season	
Otter	Nov 1-Apr 15	None	No open season	
Red fox	Nov 1-Feb 28	None	Sep 1-Mar 31	2
Red squirrel	No closed season	None	No closed season	None
Weasel	Nov 1-Feb 28	None	No open season	
Wolverine	Nov 1-Feb 28	None	Sep 1-Mar 31	1

[a] That portion of Subunit 20D draining into the north bank of the Tanana River, including islands of the Tanana River.

[b] That portion of Subunit 20D draining into the south bank of the Tanana River.

Table 2. Reported take of furbearers sealed in Subunit 20D, 1986-87, 1987-88, and 1988-89.

Species	No. pelts sealed 1986-87	1987-88	1988-89
Beaver	69	85	34
Lynx	20	17	10
Otter	6	3	6
Wolverine	6	6	15

Table 3. Number of trappers reporting harvest of furbearers.

Species	1986-87 Number trappers	1987-88 Number trappers	1988-89 Number trappers
Beaver	14 (4.8)[a]	13 (6.4)	5 (6.8)
Lynx	11 (1.6)	7 (2.4)	8 (1.3)
Otter	6 (1.0)	3 (1.0)	3 (2.0)
Wolverine	5 (1.0)	3 (2.0)	10 (1.5)

[a] Values in parentheses are animals per trapper reported for furbearers sealed in Subunit 20D from 1986-87, 1987-88, 1988-89.

Table 4. Harvest chronology for furbearers sealed in Subunit 20D during the 1986-87, 1987-88, and 1988-89 seasons.

Species	Year	Nov	Dec	Jan	Feb	Mar	Apr	Other
Beaver	1986-87	1	8	4	11	39	6	0
	1987-88	2	24	1	3	38	13	4
	1988-89	0	4	0	6	16	3	5
Lynx	1986-87	0	10	10	0	0	0	0
	1987-88	0	12	5	0	0	0	0
	1988-89	0	4	4	1	1	0	0
Otter	1986-87	0	0	3	2	1	0	0
	1987-88	0	1	0	0	3	0	0
	1988-89	0	0	4	1	1	0	0
Wolverine	1986-87	0	1	2	1	1	0	1
	1987-88	0	0	4	2	0	0	0
	1988-89	1	5	7	1	0	0	1

Table 5. Means of transportation for trappers who harvested furbearers sealed in Subunit 20D, 1986-87, 1987-88, and 1988-89.

Species	Year	Method of transportation						
		Airplane	Dogsled/skis/ snowshoes	Boat	ORV/ 3- or 4- wheeler	Snowmachine	Highway vehicle	Other/ unk
Beaver	1986-87	0	13 (19)[a]	4 (6)	13 (19)	30 (43)	4 (6)	5 (7)
	1987-88	0	2 (2)	5 (6)	0	42 (49)	27 (32)	9 (11)
	1988-89	0	0	9 (26)	0	20 (59)	4 (12)	1 (3)
Lynx	1986-87	2 (10)	0	0	1 (5)	17 (85)	0	0
	1987-88	0	1 (6)	0	0	14 (82)	2 (12)	0
	1988-89	0	0	0	0	8 (80)	2 (20)	0
Otter	1986-87	0	0	0	0	5 (83)	1 (17)	0
	1987-88	0	0	0	0	3 (100)	0	0
	1988-89	0	0	0	0	6 (100)	0	0
Wolverine	1986-87	1 (17)	2 (33)	0	1 (17)	2 (33)	0	0
	1987-88	0	0	0	0	6 (100)	0	0
	1988-89	0	0	0	0	13 (87)	2 (13)	0

[a] Values in parentheses are percentages.

Table 6. Harvest methods for furbearers sealed in Subunit 20D, 1986-87, 1987-88, and 1988-89.

Species	Year	Ground shooting	Trapping	Snaring	Other/ unk
Beaver	1986-87	0	30 (44)	34 (49)	5 (7)
	1987-88	3 (4)[a]	33 (39)	42 (49)	7 (8)
	1988-89	0	4 (12)	21 (62)	9 (26)
Lynx	1986-87	0	11 (55)	9 (45)	0
	1987-88	0	11 (65)	6 (35)	0
	1988-89	2 (18)	6 (55)	3 (27)	0
Otter	1986-87	0	5 (83)	1 (17)	0
	1987-88	1 (33)	2 (67)	0	0
	1988-89	0	6 (100)	0	0
Wolverine	1986-87	1 (17)	3 (50)	2 (33)	0
	1987-88	0	6 (100)	0	0
	1988-89	0	14 (93)	1 (7)	0

[a] Values in parentheses are percentages.

STUDY AREA

GAME MANAGEMENT UNIT: 20E (10,680 mi^2)

GEOGRAPHICAL DESCRIPTION: Fortymile, Ladue, and Charley River drainages

BACKGROUND

Since the turn of the century, the Fortymile area has been known as an important placer mining area. Placer mining is a seasonal endeavor. Historically, many people in the mining district also trapped during winter. Reports from long-term area residents indicates that trapping pressure in the Fortymile area was much greater during the 1920's than it has been recently. For example, thousands of gold miners in the Chicken area actively trapped after summer mining seasons ended. As the gold played out, miners moved out of the area and trapping pressure declined. Fewer than 250 people have wintered in the area over the past decade. Including winter residents of Subunit 20E and trappers from Tok, only about 50 trappers are active in the area each winter.

Marten and lynx have been the most economically important furbearers over the years because of their abundance and relatively high value. Trappers with nearly 30 years experience in the area have reported that lynx and marten abundance are negatively correlated; when lynx have been abundant marten have been scarce, and when lynx populations have declined marten have increased. Other furbearers such as wolverines, wolves, foxes, and beavers are available but not trapped as intensively as marten and lynx.

POPULATION OBJECTIVES

To develop specific population objectives for furbearers.

METHODS

Furbearer management in Subunit 20E is based largely upon annual harvest estimates. Sealing of pelts is mandatory for wolves, wolverines, lynx, land otters, and beavers. During the course of sealing pelts, information is obtained from trappers on location and date of take, method of take, sex of the animals, and estimates of age (young-of-the-year or adult). Additionally, pelts of all furbearers exported from Alaska must be enumerated, attributed to a specific game management unit, and reported to ADF&G on the Raw Fur Skin Export Report. Unit-specific estimates of harvests based upon the mandatory sealing data are more accurate than estimates based upon the fur export reports.

Informal discussions with trappers and fur buyers familiar with Subunit 20E served as subjective assessments of furbearer abundance in the area. Documentation of similar responses by statewide staff through the annual trapper questionnaires also served as a subjective assessment of furbearer abundance.

RESULTS AND DISCUSSION

Population Status and Trend

Based upon the accepted correlation between population levels and harvest data, lynx achieved a low-amplitude cyclic high in the winter of 1982-83, subsequently declining to a cyclic low from 1985 to 1988. Although during the reporting period the lynx harvest more than doubled from that of the previous season (Table 1), the absolute number of lynx trapped remained low, indicating a low population density. Kittens composed 36% (9 of 25) of the harvest, based upon pelt lengths $\leq$35 inches; thus the population appeared to be poised for further increase. The amplitude and timing of the next lynx high will depend upon continued growth and spatial expansion of the area's snowshoe hare population.

Wolverine numbers in Subunit 20E were noticeably lower than they were in the 1960's, when ungulate biomass in the area was greater. The wolverine population may be characterized best as moderately low and stable. Numbers of both caribou and moose were increasing in the area, and recent restrictions on wolverine trapping may provide for increased numbers of wolverines.

After reaching a population high in the winter of 1987-88, marten declined noticeably throughout most of Subunit 20E during this reporting period. Further decline in marten abundance is expected if snowshoe hare predators (e.g., lynx) continue to increase. Increasing predation on marten by hare predators causes marten numbers to decline. Conversely, marten are expected to increase after populations of hare predators decline.

Numbers of red foxes continued to increase during this reporting period, while prey populations (i.e., grouse) declined; however, snowshoe hares apparently increased, thus expanding the prey base for red foxes. Fox densities are greatest in open habitats in sedge-hummock bottomlands and above timberline in Subunit 20E. Foxes are expected to remain abundant until hare numbers decline.

Beaver numbers apparently increased significantly in the early 1980's in areas where wolf control had been conducted. Beaver numbers were moderate and stable to decreasing slowly. Beaver trapping was of little interest to Subunit 20E trappers.

Otters were uncommon. Mink status and trend are unknown. Weasels fluctuate from year to year, but they were considered to be common overall.

Coyotes are uncommon in Subunit 20E, but they are still expanding their range into portions of this area. Coyote abundance and distribution are negatively correlated with wolf abundance and distribution because of interspecific intolerance.

Mortality

Hunting Seasons and Bag Limits:

Coyote	1 Sep-30 Apr	2 coyotes
Red Fox	1 Nov-15 Feb	2 foxes
Lynx	1 Nov-31 Mar	2 lynx
Squirrel	No closed season	No limit
Wolverine	1 Sep-31 Mar	1 wolverine

Trapping Seasons and Bag Limits

Beaver	1 Nov-15 Apr	25 beavers
Coyote	1 Nov-28 Feb	No limit
Red Fox	1 Nov-28 Feb	No limit
Lynx	1 Dec-31 Jan	No limit
Marten	1 Nov-28 Feb	No limit
Mink/Weasel	1 Nov-28 Feb	No limit
Muskrat	20 Sep-10 Jun	No limit
Land Otter	1 Nov-15 Apr	No limit
Squirrel/Marmot	No closed season	No limit
Wolverine	1 Nov-28 Feb	No limit

Human-induced Mortality:

The 1988-89 lynx harvest increased noticeably from the low harvests of 1986-87 and 1987-88 (Table 1) because of an influx of lynx from the Yukon Territory. Further increases in annual harvests are expected, if snowshoe hare numbers continue to increase in Subunit 20E.

The wolverine harvest during the reporting period represented a noticeable decline from those of previous years. Long-time trappers in the area maintained that wolverine numbers were at far lower levels than they had been in the 1960's and 1970's. The recent 1-month reduction in the season and land-and-shoot prohibitions may restrict harvests sufficiently to allow some increase in the population. Restoration of historical levels of wolverine abundance will depend upon continued significant increases in the number of moose and caribou in the area.

According to trapper interviews, the marten harvest declined by about 25-30% from the 1987-88 harvest; a natural decline in marten abundance is believed to be responsible. Marten pelt values declined in value from a $100 average in 1987-88 to about $80 in 1988-89; however, the trapping effort for marten remained high. If abundance and pelt values continue to decline, trapping pressure and harvests will also decline. Economics will reduce

effort by long-line and airplane trappers on all furbearer species, unless lynx increase sufficiently to offset the loss of revenue from marten trapping.

Trappers took very few red foxes, red squirrels, or beavers in Subunit 20E during 1988-89 because of low pelt values, compared with those for marten. Populations of these species will remain high during the next few years, and harvests are expected to remain low because of low pelt values.

Habitat Assessment and Enhancement

Virtually all of Subunit 20E from the 6,500-foot elevation of Mount Harper to the Mosquito Flats lowlands constitutes habitat for some species of furbearers. Subalpine habitat is extensive in the northern and western portions of the area. Wetland habitat is limited in extent throughout the area. Spruce forest is the most extensive habitat, punctuated by seral stages resulting from wildfires. Noteworthy areas of early to mid-seral habitat types include (1) the 1966 Chicken Fire (225,000 acres); (2) the 1969 Ladue Fire (125,000 acres); and (3) burned areas on the south side of the Yukon River downstream from Eagle. Over 30 years of successful wildfire suppression has resulted in an older, less-diverse, less-productive habitat mosaic than would have existed under a natural fire regime.

The Alaska Interagency Fire Management Plan for the Fortymile Area went into effect in 1984, replacing the 1979 plan. Most of Subunit 20E is now afforded limited suppression status. This approach should result in the restoration of a more natural fire regime and eventual improvement of habitat heterogeneity. To the detriment of furbearer populations, human development in the area will ultimately warrant higher levels of fire suppression.

Game Board Actions and Emergency Orders

The Alaska Board of Game shortened the lynx trapping season from 4-1/2 to 2 months during the 1985-86 season. This change was intended to reduce lynx harvests during the low phase of their population cycle. The Board's action represented a decision to implement a tracking harvest strategy for lynx in Alaska. The Board subsequently approved a 1-month extension for the 1988-89 season, provided harvest levels and the percentage of kittens increased during the 1987-88 season. Because of the low harvest of 9 lynx during that 1987-88 reporting period the Department issued an Emergency Order to retain the 2-month season for the 1988-89 period. The Board took action to align lynx hunting and trapping seasons during the reporting period. Additionally, the harvesting of wolves, wolverines, and red foxes by the land-and-shoot method was prohibited during the 1988-89 season.

CONCLUSIONS AND RECOMMENDATIONS

Lynx, red fox, and coyote populations are expected to increase in response to increasing numbers and distribution of snowshoe hares. Harvests of lynx are also expected to increase. Anticipated low pelt values for foxes and coyotes are expected to keep trapping efforts for these 2 species low.

At this time, only lynx and marten are sufficiently valuable to warrant much trapping effort. Marten numbers and harvests are expected to continue to decline for the next few years, if hare predators increase. Unless lynx become very abundant and retain high pelt value, overall trapping pressures on all furbearers are expected to decline.

I foresee difficulties in implementing a truly responsive, tracking harvest strategy for lynx. For this reason, I recommend that the Board establish a 4- or 5-month lynx season for all areas of the state subject to change by the Department through the use of Emergency Orders. In this manner, timely Board action would not be required to tailor appropriate season lengths to rapid changes in lynx populations. Such management latitude will be important in preventing overutilization or underutilization of lynx populations because of lag time in adopting appropriate seasons for lynx trapping.

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Table 1. Furbearer harvests as determined by sealing cetificates, Subunit 20E, 1984-88.

	1984	1985	1986	1987	1988
Wolverine	7	8	10	7	1
Otter	0	0	0	0	0
Beaver	0	6	5	3	1
Lynx	20	18	11	9	25

STUDY AREA

GAME MANAGEMENT UNIT: 21 (43,930 mi^2)

GEOGRAPHICAL DESCRIPTION: Yukon River drainage above Paimiut to Tozitna River including Koyukuk River to Dulbi Slough

BACKGROUND

Furbearers have traditionally been an important resource within Unit 21, supplying food, clothing, and trade items. With the arrival of Euro-Americans, furbearers also became an item of commerce. While fur populations have always been sufficient to meet local demand, they have been subject to cycles of abundance. In order of their economic importance, marten, beavers, lynx, red foxes, wolverines, wolves, mink, river otters, and muskrats are found in Unit 21. The presence of coyotes are rare, and weasels are a common, nontargeted species.

POPULATION OBJECTIVES

To sustain furbearer populations at levels high enough to provide for maximum consumptive and nonconsumptive uses.

METHODS

Harvest was monitored by means of sealing records, fur export and fur acquisition reports, and personal interviews. A mail-out questionnaire was used in Subunit 21A and 21E only. Throughout the remainder of Unit 21, some trappers were interviewed on furbearer abundance, and incidental data were gathered during surveys of other species. Small mammal abundance was measured using snap and pitfall traps on annual census lines.

RESULTS AND DISCUSSION

Population Status, Distribution, and Trend

Beavers and river otters are found throughout the unit where suitable habitat occurs. Their populations were high and increasing. Muskrats were declining in the area, probably because of loss of habitat as a result of pond succession. Where muskrats occurred, they were numerous. Lynx were in the low phase of their 10-year cycle, but they are expected to start to increase over the next few years. Red foxes were numerous throughout the unit in all habitats, and they appeared to be increasing.

The marten population abundance was moderate throughout most of the northern half of the unit. There were local pockets of lower and higher marten numbers, but the population trend appeared stable. During the trapping season most trappers reported periods of marten absence. These apparently temporary absences were caused by either (1) local migrations or (2) very restricted movement of the marten. In Subunits 21A and 21E, responses to the trapper questionnaire indicated low marten populations that were continuing to decline.

Trapping Conditions and Prey Species

Heavy snowfall during December limited some trappers by covering up sets and causing rivers and streams to overflow. Temperatures were mild for most of the trapping season until mid-January, when extreme cold temperatures of -60° to -80°F occurred for 3 weeks. Freezing rain fell in February, ending most trapping. Overall trapping conditions were poor for area trappers, and catches were lower than normal.

Voles were less numerous in open black spruce and in riparian balsam poplar habitats, compared with those in previous years; however, they increased in grassland meadows (Table 1). Hare populations were beginning to increase throughout the unit, based upon track densities. Responses from the Subunits 21A and 21E trapper questionnaire also revealed an increase in snowshoe hare numbers. Willow ptarmigan and grouse populations were high in most of the unit.

Mortality

Trapping Seasons and Bag Limits:

Beaver	1 Nov-15 Apr	50 beavers
Coyote	1 Nov-31 Mar	No limit
Red fox	1 Nov-28 Feb	No limit
Marten	1 Nov-28 Feb	No limit
Mink & Weasel	1 Nov-28 Feb	No limit
Muskrat	1 Nov-10 Jun	No limit
River otter	1 Nov-15 Apr	No limit
Wolverine	1 Nov-31 Mar	No limit

Human-induced Mortality:

During the reporting period, 1,095 beavers were trapped and sealed (Table 2). Subunit 21D had a harvest of 605 beavers; only 180 animals were trapped in the Kaiyuh Flats. This harvest represents a decline of 60% from that occurring from 4 years ago in this area. The harvest on the Kaiyuh Flats continued to be mainly older animals; only 3% were kits. The low kit harvest is mainly due to the trapping techniques employed by local trappers. They use snares with large-diameter openings and place their sets on the outside of the food cache away from the lodge. The harvest in Subunit 21E was down slightly to 304 beavers, despite

a liberalized season. The overall catch represented only a fraction of the harvestable population, and the harvest continued to decline as pelt prices declined.

Harvest data indicated that lynx populations throughout the unit (Table 2, 3) have reached their lowest point of the 10-year cycle. They are expected to slowly increase during the next 2 years. Although otters are abundant in the unit, the harvest remained relatively low and stable (Table 2). Pelt prices for Interior otters were low; therefore, trapping effort was minimal. Otters are often incidentally taken in beaver sets.

Trapper harvests of wolverines were below normal (Table 2) because of restrictions on land-and-shoot hunting. During aerial wolf surveys in late March 1989, numerous wolverine tracks were seen, indicating that only harvests and not population levels have decreased. Marten numbers were moderate in the northern part of the unit. Based on fur acquisition and export reports, 3,201 marten were sold.

Fox populations continued to be very high; however, pelt prices were very low. Therefore, trappers had little incentive to pursue this species; only 126 foxes were sold. Coyotes were common only within the immediate vicinity of Galena, and a few are caught each year. Wolves were abundant within the unit. Interspecific strife between wolves and coyotes keeps coyote numbers low. Mink continued to be a minor furbearer in the unit; however, few trappers actively sought them. The pelt price for wild-caught Interior mink was very low.

Game Board Actions and Emergency Orders

Prior to the spring of 1981 Unit 21 was divided into 2 subunits. During the past 10 years trapping seasons and bag limits have remained the same for marten, coyotes, foxes, mink, muskrats, otters, and wolverines. In 1985 the Board of Game adopted a recommendation from the Middle Yukon Fish and Game Advisory Committee to shorten the lynx season by 2 weeks. There was concern that the quality of lynx pelts declined by early March and were not in prime condition. When the Board restricted aerial trapping for wolves they also restricted the land-and-shoot method of havesting foxes and wolverines. This restriction is reflected in the decline of the wolverine harvest.

The bag limit for beavers has been increased by the Board 3 times, in response to proposals submitted by the Department. The bag limits for beavers in all of the subunits were not uniform. The regulatory changes affecting bag limits from 1979 to 1988 are presented in Table 4.

During 1987 the Grayling/Anvik/Shageluk/Holy Cross Fish and Game Advisory Committee submitted a proposal to the Board to shorten the marten trapping season. The Board took no action on the proposal, but they asked the Department to monitor the situation.

Further declines in marten numbers were perceived in Subunits 21A and 21E. Therefore, an Emergency Order was issued to shorten the marten trapping season to 1 November to 15 January during the 1988-89 season.

CONCLUSIONS AND RECOMMENDATIONS

With the exception of coyotes and lynx, furbearer populations throughout the unit were stable or increasing at moderate-to-high levels. We are aware of no areas where excessive harvests occurred. The primary recommendation is to continue the present seasons and bag limits, except for beavers. There should be no bag limit imposed on beavers. Beavers are an abundant resource; prices and trapping techniques limit harvest more than regulations do. Based on trapper questionnaire results, discussions with local Fish and Game Advisory Committees, and incidental trapper interviews, marten seasons should be reviewed annually and adjusted according to local population fluctuations.

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Table 1. Number of small mammals caught in 3 habitats from August 1984 to August 1989 in Subunit 21D.

Species	Open black spruce					Balsam poplar					Grass meadow				
	1984	1985	1987	1988	1989	1984	1985	1987	1988	1989	1984	1985	1987	1988	1989
Microtus xanthognathus	0	0	0	0	0	0	2	0	0	0	11	0	0	3	0
Microtus pennsylvanicus	0	1	0	3	1	0	0	0	1	0	1	19	38	16	52
Clethrionomys rutilus	7	21	3	41	13	35	33	18	12	4	3	0	2	1	0
Synaptomys borealis	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Zapus hudsonicus	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
Sorex sp.	22	6	12	31	12	28	5	7	9	11	20	6	7	17	8
Total	29	28	16	75	26	63	40	20	22	16	36	25	47	37	60

[a] The results are from 90 trap-nights and no data were available for 1986.

Table 2. Furbearer harvests in Unit 21, 1983-84 to 1988-89.[a]

Species	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89
Beaver	984	700	1,802	1,838	1,717	1,095
Lynx	121	123	162	62	71	33
Otter	103	68	52	62	67	44
Wolverine	32	57	55	30	34	23

[a] Values generated by statistics section Anchorage.

Table 3. Lynx harvest by subunit in Unit 21, 1983-84 to 1988-89.[a]

Subunit	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89
21A	2	2	20	6	5	11
21B	5	13	31	4	7	15
21C	0	1	4	4	7	1
21D	86	82	86	41	40	4
21E	21	25	21	7	12	3
Total	114	123	162	62	71	34

[a] Values generated by hand-count of certificates in Galena.

Table 4. Regulatory changes to beaver bag limits by subunit, Unit 21, 1979-80 to 1988-89.[a]

Year	21A	21B	21C	21D	21E
1979-80[a]	15	15	15	15	15
1980-81[a]	15	15	15	15	15
1981-82	40	30	30	20	20
1982-83	40	30	30	20	20
1983-84	40	40	40	40	20
1984-85	40	40	40	40	20
1985-86	40	40	40	40	40
1986-87	40	40	40	40	40
1987-88	40	40	40	40	40
1988-89	50	50	50	50	50

[a] Unit was only divided into 2 subunits.

Table 5. Abundance and trend data from Subunits 21A and 21E for the 1988-89 trapping season as reflected on trapper questionnaire returns from 19 area trappers.

Species	Abundance index	Trend index	Trend and abundance
Coyote	1.00	5.00	Stable at low
Lynx	1.77	4.23	Declining to low
Red fox	7.75	8.29	Increasing to high
Marten	6.13	6.50	Increasing to high
Muskox	5.55	6.33	Increasing to high
Mink	5.00	5.00	Stable at moderate
Beaver	7.71	6.18	Increasing to high
Wolf	7.11	6.25	Increasing to high
Wolverine	4.56	5.25	Stable at moderate
Otter	6.33	6.00	Increasing to high
Ermine	5.80	5.62	Increasing to high
Squirrel	5.67	5.27	Stable to high
Hare	5.86	7.00	Increasing to high
Grouse	7.00	7.63	Increasing to high
Ptarmigan	6.53	7.13	Increasing to high
Mice	6.20	5.31	Stable at high
Owls	5.88	6.60	Increasing to high

[a] Values from 1 to 4.49 indicate scarce and declining populations, from 4.50 to 5.49 indicate moderate and stable populations, and values from 5.50 to 9.00 indicate abundant and increasing populations.

STUDY AREA

GAME MANAGEMENT UNIT: 22 (25,230 mi^2)

GEOGRAPHICAL DESCRIPTION: Seward Peninsula and that portion of the Nulato Hills draining westward into Norton Sound

BACKGROUND

Furbearers were most abundant in Subunits 22A and 22B, where spruce and riparian willow vegetation tend to be more abundant than in the remainder of Unit 22. Some furbearer densities and harvests have fluctuated in past years. Because data are lacking or are imprecise, it is not known with certainty whether these fluctuations were caused by hunting mortality or natural factors. Although hunting and trapping pressure has at times noticeably reduced furbearer and other small game numbers in areas adjacent to some communities in Unit 22, major fluctuations in furbearer numbers have most likely been caused by natural factors.

When furbearer densities are high, the number of active hunters or trappers have also been high. There were very few local residents whose sole winter occupation was trapping. Most individuals harvested furs recreationally or on an opportunistic basis.

POPULATION OBJECTIVES

To maintain and/or increase viable furbearer populations consistent with environmental conditions, legal mandates, and public desires.

To minimize adverse interactions of furbearers with the public.

METHODS

Evaluations of the population status of furbearers in Unit 22 have never been conducted. Limited data on furbearer distribution and densities were gathered from field observations reported by the staff, general conversation with residents, and responses to the trapper questionnaire. Harvest information was obtained from sealing records, the trapper questionnaire, and fur acquisition reports submitted by fur buyers (Tables 1, 2, and 3).

In an attempt to expand distribution of the trapper questionnaire, a letter requesting a response was sent to all post office boxholders residing in Subunits 22A and 22B. Thirty-five questionnaires were sent to respondents and those who sealed furs but had failed to respond. Twenty individuals (57%) filled out and returned the questionnaire; reminder letters were not sent. A summary of questionnaire results was mailed back to all

respondents. Letters were also sent to those individuals who had expressed a concern or had specific questions dealing with current regulations.

RESULTS AND DISCUSSION

Population Status and Trend

Based on observations reported by staff and the public and results of the trapper questionnaire, densities of beavers, otters, wolverines, mink, marten, and red foxes appear to have increased or remained stable in Unit 22. Lynx, white fox, and muskrat numbers were still low, but they appear to have increased slightly in some drainages.

Mortality

Trapping Seasons and Bag Limits:

Beaver		
(22A,22B)	1 Nov-10 Jun	No limit
(Remainder of unit)	1 Nov-15 Apr	50 beavers
Fox, Arctic	1 Nov-15 Apr	No limit
Fox, Red	1 Nov-15 Apr	No limit
Lynx	1 Nov-15 Apr	No limit
Marten	1 Nov-15 Apr	No limit
Mink	1 Nov-31 Jan	No limit
Muskrat	1 Nov-10 Jun	No limit
Otter	1 Nov-15 Apr	No limit
Wolverine	1 Nov-15 Apr	No limit

Hunting Seasons and Bag Limits:

Fox, Arctic	1 Sep-30 Apr	2 foxes
Fox, Red	1 Nov-15 Feb	2 foxes
Lynx	1 Nov-31 Mar	2 lynx
Wolverine	1 Sep-31 Mar	1 wolverine

Human-induced Mortality:

Accurate harvest data are lacking for all furbearer species taken in Unit 22, and major discrepancies are apparent when comparing information from sealing certificates, trapper questionnaires, and fur acquisition records. Because of these inconsistencies and the fact that many furs used domestically are not sealed, the harvest data depicted in Tables 1-5 represent minimal estimates.

Because adverse weather conditions (i.e., extreme cold temperatures and excessive snow fall) during much of the 1988-89 winter proved to be among the worst on record, interest in

harvesting furbearers was minimal. Many trappers were reluctant to venture out, particularly because densities of many furbearers were low. Because harvest data on some furbearer species in Unit 22 are imprecise and/or lacking, I have provided information below only for those that were sealed. Limited data from the trapper questionnaire responses and fur acquisition reports for other species are summarized in Table 1.

Fourteen beavers were sealed during the reporting period. Sex composition of the harvest was not available, because all were recorded as sex unknown. Five, 7, and 2 beavers were harvested from Subunits 22A, 22B, and 22C, respectively.

Sealing records indicated that 3 lynx (1 male and 2 unknown) were harvested during the reporting period (Table 2). Two lynx were taken in Subunit 22B; the other one, from Subunit 22D. No river otters were sealed during the reporting period.

Twelve wolverines (8 males, 3 females, and 1 unknown) were taken during the reporting period (Table 3). Wolverine pelts are highly desired in Unit 22, because they are used extensively in the local manufacture of winter garments. Most wolverines harvested in Unit 22 were used for making clothing and were not sealed. The annual harvest of wolverines is probably greater than 11 but probably less than 25. Five, 4, and 3 wolverines were reported from Subunits 22B, 22C, and 22D, respectively.

Hunter Residency and Success. With few exceptions, individuals taking furbearers in Unit 22 were local residents. Success rates are difficult to measure accurately, because most furbearers in the unit were taken on an opportunistic basis by individuals engaged in other activities.

Transport Methods. Snowmachines were used almost exclusively by trappers. With the exception of 1 lynx and 1 wolverine that had been taken using a highway vehicle, all furbearers sealed during the reporting period were taken using snowmachines.

CONCLUSIONS AND RECOMMENDATIONS

Recently, the size of most furbearer populations in Unit 22 has been low. Because there appears to be a direct relationship between the number of individuals afield and the abundance of game, activities revolving around harvesting furbearers has also been low. Most furbearers harvested in the last several years were taken recreationally, rather than by individuals attempting to make a living by trapping. Little is known of the impact of trapping on furbearer populations in Unit 22. Although our current regulations may at times impact species within close proximity of some villages, it is doubtful that these impacts were significant.

The accuracy of harvest data remains one of the more pressing management problems in Unit 22. Although fur sealing agents are available in all of the communities, a significant portion of the harvest is not sealed or sold; rather, it remains unsealed and eventually is made into garments and handicrafts. Many village residents don't understand why furs need to be sealed, particularly if they are to be utilized locally. Continued public contact by biologists and enforcement personnel is needed to explain the importance of sealing requirements.

No changes in the Unit 22 furbearer trapping and hunting regulations are recommended at this time.

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Table 1. Furbearer harvest information for Unit 22 obtained from responses to the trapper questionnaire and fur acquisition reports[a] submitted by fur buyers during the period.

Species	Fur acquisition reports	Trapper questionnaire
Beaver	2	5
Arctic Fox	1	8
Cross/Red Fox	22	77
Lynx	0	1
Marten	17	1
Mink	0	0
Muskrat	0	3
Otter	0	1
Wolverine	0	8

[a] When interpreting those data recorded from the fur acquisition reports, be aware these numbers indicate the number of pelts sold to buyers during the reporting period and not necessarily the year in which they were taken.

Table 2. Historical lynx harvest[a] in Unit 22, 1977-78 to 1988-89.

Year	Sex				Subunit					
	M	F	U	Total	A	B	C	D	E	Unk
1977-78	70	70	28	168	9	144	0	4	0	11
1978-79	100	100	38	238	39	199	0	0	0	0
1979-80	110	114	36	260	29	220	0	0	0	11
1980-81	43	28	15	86	2	78	0	0	0	6
1981-82	245	215	19	479	168	311	0	0	0	0
1982-83	426	323	71	820	377	442	0	0	1	0
1983-84	255	134	54	443	311	132	0	0	0	0
1984-85	62	70	24	156	101	47	0	2	6	0
1985-86	9	12	2	23	12	7	0	4	0	0
1986-87	10	7	1	18	9	8	0	1	0	0
1987-88	2	1	0	3	0	3	0	0	0	0
1988-89	1	0	2	3	0	2	0	1	0	0

[a] Data based on information obtained from sealing certificates.

Table 3. Historical harvest chronology of lynx in Unit 22, 1977-78 to 1988-89.

Year	Harvest chronology[a]							
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk
1977-78	0	7	21	34	35	65	0	6
1978-79	0	24	36	41	61	76	0	0
1979-80	0	10	42	57	57	67	8	19
1980-81	0	6	8	13	13	31	13	2
1981-82	0	17	45	90	119	163	29	16
1982-83	0	45	190	151	178	197	59	0
1983-84	0	27	79	130	109	73	25	0
1984-85	1	20	28	40	30	22	9	6
1985-86	1	0	1	7	8	6	0	0
1986-87	0	1	4	3	6	3	1	0
1987-88	0	0	0	0	0	0	3	0
1988-89	0	1	0	0	2	0	0	0

[a] Data based on information obtained from sealing certificates.

Table 4. Historical wolverine harvest[a] in Unit 22, 1978-79 to 1988-89.

Year	Sex				Harvest chronology							
	M	F	Unk	Total	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk
1978-79	10	6	2	18	0	0	2	7	3	6	0	0
1979-80	9	8	1	18	0	0	2	7	4	4	1	0
1980-81	11	2	1	14	0	3	1	1	2	6	1	0
1981-82	6	4	0	10	0	2	1	2	1	4	0	0
1982-83	11	3	0	14	1	1	2	1	2	7	0	0
1983-84	19	12	4	35	2	0	7	6	7	6	7	0
1984-85	11	9	1	21	1	4	4	2	5	3	2	0
1985-86	20	16	4	40	1	3	6	13	10	7	0	0
1986-87	16	10	1	27	0	1	3	3	9	6	5	0
1987-88	13	14	1	28	0	5	4	8	4	6	1	0
1988-89	8	3	1	12	1	0	2	0	3	3	3	0

[a] Data based on information obtained from sealing certificates.

Table 5. Historical wolverine harvest[a] in Unit 22 from 1978-79 to 1988-89

Year	Subunit					Harvest method[b]					
	A	B	C	D	E	1	2	3	4	5	Unk.
1978-79	5	11	1	1	0	6	12	0	0	0	0
1979-80	10	7	1	0	0	2	14	1	0	1	0
1980-81	2	6	2	4	0	7	6	0	0	1	0
1981-82	1	7	1	1	0	2	7	1	0	0	0
1982-83	3	7	2	2	0	4	9	0	0	1	0
1983-84	16	16	1	2	0	4	31	0	0	0	0
1984-85	8	8	3	1	1	8	12	0	1	0	0
1985-86	11	14	11	4	0	6	27	4	0	3	0
1986-87	19	6	1	0	1	8	19	0	0	0	0
1987-88	9	17	2	0	0	10	15	3	0	0	0
1988-89	0	5	4	3	0	10	2	0	0	0	0

[a] Data based on information obtained from sealing certificates.

[b] 1 = Ground shot
2 = Trapped
3 = Snared
4 = Shot from aircraft
5 = Unknown

STUDY AREA

GAME MANAGEMENT UNIT: 23 (43,420 mi^2)

GEOGRAPHIC DESCRIPTION: Kotzebue Sound and western Brooks Range

BACKGROUND

Furbearer species occurring in Unit 23 include lynx, beavers, marten, mink, muskrats, river otters, red foxes, white or arctic foxes, and wolverines. Many residents support themselves seasonally by trapping. Furbearers are harvested in Unit 23 by subsistence, recreational, and professional trappers to generate cash income to provide materials for fur garments manufactured locally and food. Most furbearers are harvested opportunistically by local residents engaged in other activities.

POPULATION OBJECTIVE

To maintain healthy furbearer populations throughout the unit.

METHODS

Most information regarding the population status and harvest of lynx, wolverines, river otters, and beavers was gathered from an annual trapper survey and fur-sealing records. The status of other furbearer populations and their prey was determined from opportunistic observations of animals and their tracks by Department personnel, the trapper survey, and conversations with local residents. Although sealing data provided some information on the relative abundance and distribution of furbearers in Unit 23, many furs used locally were not sealed. Therefore, sealing data only provides a minimum estimate of harvest. Also, the geographic distribution of harvest, as determined from sealing data, is probably not a good indicator of spatial abundance of furbearers because regional differences exist among trappers in their willingness and ability to have furs sealed. In addition to sealing data, opportunistic sightings of foxes, river otters, wolverines, and lynx were recorded during big game and beaver cache surveys.

Prior to 1985 only 2 aerial beaver cache surveys had been conducted in Unit 23. Since 1985 beaver cache surveys have been conducted annually in a trend count area using a Piper PA-18 with 1 observer. The 139-mi^2 (356 km^2) trend count area extends south from the confluences of the Selawik, Kugarak, and Tagagawik Rivers. Total numbers of active and inactive lodges (discerned by the presence of fresh feed caches) were recorded, and the location of each lodge was mapped on U.S. Geological Survey 1:63,360 topographic maps. Although some evidence suggested that the number of active caches in an area is not always a good

indicator of the size of the beaver population (Payne 1981, Swenson et al. 1983), we believe this technique provided adequate information on population trends in the unit.

After the 1988-89 regulatory year had ended, 206 questionnaires were sent to selected residents of Unit 23. The mailing list included individuals who recently sealed furs and others who in the past had demonstrated knowledge of furbearer populations. This trapper survey solicited residents' opinions regarding the size and status of furbearer and prey populations and asked for comments on furbearer regulations. Sixty people (29%) returned completed questionnaires; of these, 17 indicated they had trapped during the 1988-89 season. Indices of abundance (Brand and Keith 1979) for the last 4 regulatory years were calculated from this and previous trapper surveys for furbearers and some prey species. These indices provided a systematic method of summarizing qualitative estimates of abundance (e.g., low, intermediate, and high) and enabled us to examine changes in abundance over time.

RESULTS AND DISCUSSION

Population Status and Trend

No track counts for wolverines were conducted in Unit 23 during 1988-89. During the last 2 years, concern has been expressed by some local residents that wolverine numbers were low in the area surrounding Kotzebue. As in 1987-88, trapper reports indicated that this area extended to at least the Kivalina and Wulik River drainages. In the remainder of the unit, trappers reported that wolverine populations were stable and moderately abundant.

For the second year, beavers were reported to be colonizing the Noatak River drainage. Beaver numbers were reported to be low on the northern Seward Peninsula and high in the Kobuk and Selawik River drainages. Because most residents who commented on beaver abundance resided in the Kobuk and Selawik River drainages, this accounts for the high index of abundance for beavers in those areas during 1988-89 (Table 1).

Results of aerial beaver cache surveys suggested that the beaver population level may have stabilized in the Selawik Flats (Table 2); however, in 1985-86 results of cache surveys also suggested that beaver numbers had stabilized but that densities had increased during subsequent years (Table 2), suggesting that beaver populations may grow intermittently in this portion of the unit.

In the Selawik Flats and northern Seward Peninsula, we observed new dams and lodges in extremely small tundra streams with few riparian willows. Beaver densities in optimal habitat may be at or near saturation levels in some areas of Unit 23, and portions of the population were expanding into marginal habitat.

Observations reported by Department personnel and trappers indicated that lynx densities remained extremely low during 1988-89. The snowshoe hare population was still low, but it was increasing in portions of the unit (Table 1). Therefore, we anticipate a corresponding increase in lynx numbers during the next few years.

Most trappers reported that mink and marten densities remained low in Unit 23 during 1988-89 (Table 1). With 1 exception, trappers throughout the unit reported high numbers of red foxes (Table 1). The 1 exception was from the Wulik/Kivalina River area where red fox densities were at intermediate levels but increasing. Opportunistic observations of red foxes by Department personnel agreed with reports from trappers.

During the reporting period rabies was verified in 6 of 11 red fox heads sent to the state virology laboratory. We received additional reports of red foxes that were probably rabid; however, they were not verified.

Arctic fox numbers were reported to be low south of and including the Kobuk River drainage. High numbers were reported in the Wulik, Kivalina, and Noatak River drainages where population densities appeared to be increasing. In general, arctic foxes were more abundant during 1988-89 than during the previous 3 years (Table 1).

Trappers reported that muskrats were abundant in the Selawik River drainage in 1988-89 (Table 1). In the remainder of the unit, muskrat numbers were at medium-to-low levels. Muskrats appear to be increasing in abundance.

Mortality

Hunting Seasons and Bag Limits:

Wolverine	1 Sep-31 Mar	1 wolverine
Red fox	1 Nov-15 Feb	2 foxes
Arctic fox	1 Sep-30 Apr	2 foxes
Lynx	1 Nov-31 Mar	2 lynx

Trapping Seasons and Bag Limits:

Wolverine	1 Nov-15 Apr	No limit
Red fox	1 Nov-15 Apr	No limit
Arctic fox	1 Nov-15 Apr	No limit
Lynx	1 Dec-15 Jan	3 lynx
Marten	1 Nov-15 Apr	No limit
Mink	1 Nov-31 Jan	No limit
Muskrat	1 Nov-10 Jun	No limit
River otter	1 Nov-15 Apr	No limit

Beaver (Kobuk and Selawik drainage)	1 Nov-10 Jun	50 beavers
(Remainder of Unit 23)	1 Nov-10 Jun	30 beavers

Human-induced Mortality:

Thirty beavers were sealed during 1988-89. Although it represents a substantial decrease from the 56 beavers sealed in 1987-88, it is within the range of harvests reported for previous years. Of the 30 beavers sealed, seven were taken from the Selawik River drainage and 23 were from the upper Kobuk River area. During 1988-89 as in previous years, a substantial number of beaver were shot during breakup; many of these were not sealed.

As reported in 1987-88, no lynx from Unit 23 were sealed during 1988-89 (Table 3). Seven river otters were sealed during 1988-89, approximately half the number that had been sealed in 1986-87 and 1987-88 (Table 3).

Thirty-nine wolverines (22 males, 16 females, 1 unknown) were sealed during 1988-89 (Table 3). This is considerably lower than the record 64 wolverines sealed during 1986-87, but it is nearly identical to the harvest reported for 1987-88 (Table 3). All wolverines sealed were taken by local residents. Eight wolverines (20%) were shot, and 31 (80%) were trapped. Thirty-eight wolverines (97%) were taken using snowmachines as transportation, and the other one was taken using a 3- or 4-wheeler (Table 4). In addition to the reported harvest, we are aware of at least 3 additional wolverines that were taken during 1989 but not sealed; at least one of these was shot using a snowmachine as transportation.

CONCLUSIONS AND RECOMMENDATIONS

Sealing data alone are inadequate for managing wolverines. The Department should develop a technique to quantitatively estimate population sizes or, at least, evaluate population trends. In particular, the size and status of the wolverine population near Kotzebue needs to be assessed.

Some local trappers have suggested closing the wolverine trapping season in March, because pelts are not prime in April and mating begins before mid-April. During the mating season, wolverines travel more widely than during other seasons, and they sometimes occur in pairs, thus increasing their vulnerability to overharvesting. If wolverine densities near Kotzebue are low, the Department should consider closing the season prior to 15 April; however, public input should be solicited before making any formal recommendations to change either the hunting or trapping seasons.

The Department should continue to solicit the opinions of resident hunters and trappers regarding lynx population status through visits to communities and the trapper survey. Department personnel should also conduct annual track surveys to monitor lynx population levels when lynx and hare numbers are extremely low or high. Delineating one or more trend count areas for lynx track surveys should enable us to make annual comparisons of abundance. The northern Seward Peninsula, Kobuk River drainage, and Selawik River drainages are potential areas for establishing trend count areas. As hare and lynx populations increase, information from these areas will be necessary for adjusting hunting and trapping regulations.

Currently, there is no biological need for a bag limit on beaver in the Selawik and Kobuk River drainages. In these drainages beaver densities have remained high, despite the bag limit increase from 30 to 50 beavers per regulatory year that went into effect in 1987-88. If the beaver population remains high for another year, the Department should consider eliminating the bag limit on beaver in the Kobuk and Selawik River drainages.

No changes in seasons or bag limits are recommended at this time.

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Table 1. Indices of abundance (I_A)[a] for furbearer and prey species derived from the trapper survey data in Unit 23, 1985-86 to 1988-89.[a]

Species	Season			
	1985-86	1986-87	1987-88	1988-89
Beaver	59.5	55.0	56.8	66.7
Lynx	5.1	17.6	1.6	6.1
Marten	26.2	31.2	13.9	29.6
Mink	23.2	26.1	22.9	33.3
Muskrat	21.1	34.1	58.9	62.1
Otter	46.7	39.6	50.0	52.6
Red fox	36.5	35.7	43.0	76.1
Arctic fox	4.2	8.3	14.6	30.3
Wolverine	36.8	41.1	36.8	39.8
Mice/voles	--	--	--	72.4
Ptarmigan	--	--	--	94.7
Hares	--	--	--	14.4
Surveys sent	174	200	204	206
Surveys returned	54	50	56	60
No. who trapped	46	18	20	17

[a] $I_A = [(\ R_i - \underline{n})/2\underline{n}] \times 100$

where: R_i = the numerical value assigned to the ith response (R_i = 1 when population level reported to be low, 2 when population level reported to be intermediate, or 3 when population level reported to be high)

$\underline{n}$ = Number of trappers who responded.

Abundant when $I_A > 50$; Intermediate when $20 \leq I_A \leq 50$; Scarce when $I_A < 20$.

Table 2. Results of aerial beaver cache surveys in a 139-mi^2 trend-count area, Selawik River drainage, 1981-89.

Year	Survey time (min.)	Active caches	Inactive caches	Density of active caches (cache/mi^2)
1981[a]	--	52	25	0.37
1982[a]	75	37	41	0.27
1985	195	73	42	0.53
1986	238	72	41	0.52
1987	239	84	72	0.60
1988	226	120	53	0.86
1989	213	116	51	0.85

[a] Data not collected from the established trend count area.

Table 3. Chronology and location of take of lynx, river otters and wolverines sealed in Unit 23, 1977-78 to 1988-89.

Species	Total harvest	Chronology							Area[a]				
		Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Unk.	1	2	3	4	5
Lynx													
1977-78	230	11	28	60	67	61	0	3	0	31	166	27	6
1978-79	385	12	48	81	117	127	0	0	0	117	147	120	1
1979-80	407	19	53	96	110	110	13	6	1	128	139	136	3
1980-81	306	30	45	62	72	80	17	0	1	17	128	143	14
1981-82	483	23	68	77	145	148	19	3	1	77	133	238	34
1982-83	277	24	36	39	69	70	34	5	4	5	34	149	83
1983-84	98	9	23	25	25	10	5	1	0	10	14	27	42
1984-85	26	3	8	2	4	7	2	2	1	8	8	4	5
1985-86	45	4	5	12	12	9	3	3	2	4	18	12	9
1986-87	16	0	7	3	2	4	0	0	0	2	4	7	3
1987-88	0	0	0	0	0	0	0	0	0	0	0	0	0
1988-89	0	0	0	0	0	0	0	0	0	0	0	0	0
Otter													
1977-78	12	0	4	5	1	2	0	0	0	1	4	3	4
1978-79	15	0	12	2	0	1	0	0	0	5	1	8	1
1979-80	19	5	9	2	1	2	0	0	0	4	2	13	0
1980-81	29	21	4	2	0	0	2	0	0	3	6	20	0
1981-82	9	5	0	1	3	0	0	0	0	0	4	4	1
1982-83	7	4	1	1	0	1	0	0	0	2	2	2	0
1983-84	8	3	3	2	0	0	0	0	0	1	5	1	0
1984-85	5	2	2	1	0	0	0	0	1	1	1	1	1
1985-86	5	1	1	1	2	0	0	0	0	0	3	0	2

Table 3 (continued)

Species	Total harvest	Chronology								Area[a]				
		Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Unk.	1	2	3	4	5
Otter (continued)														
1986-87	12	0	4	2	2	0	2	2	0	0	1	9	0	2
1987-88	13	0	5	3	0	1	2	2	0	0	1	12	0	0
1988-89	7	0	5	1	1	0	0	0	0	0	0	7	0	0
Wolverine														
1977-78	75	0	9	8	29	17	12	0	0	4	10	40	15	6
1978-79	45	0	4	4	13	7	17	0	0	2	8	18	2	6
1979-80	26	0	2	4	4	6	9	0	1	2	8	10	4	2
1980-81	18	0	3	6	1	1	5	2	0	0	10	5	3	0
1981-82	48	0	2	3	8	7	23	5	0	1	28	14	5	0
1982-83	37	0	3	2	3	13	12	4	0	2	21	6	3	5
1983-84	46	0	2	8	17	7	5	3	4	0	23	9	6	7
1984-85	37	0	1	5	7	3	13	7	1	0	15	11	5	6
1985-86	35	0	0	4	10	5	12	4	0	0	15	14	1	5
1986-87	64	0	4	8	4	9	28	8	3	8	35	16	3	2
1987-88	40	0	1	5	9	13	7	5	0	4	14	14	5	3
1988-89	39	1	1	4	3	15	7	8	0	3	21	12	3	0

[a] 1 = Pt. Hope-Kivalina (drainages west of Noatak R. drainage), 2= Noatak R. drainages, 3 = Kobuk R. drainages, 4 = Selawik R. drainages, 5 = Buckland R. drainages and northern Seward Peninsula drainages.

Table 4. Sex composition and method of take reported for lynx, river otters, and wolverines sealed in Unit 23, 1977-78 to 1988-89.

Species	Total harvest	% male	Harvest method			
			Shot	Trapped	Snared	Unknown
Lynx						
1977-78	230	55	0	223	5	2
1978-79	385	53	2	341	3	39
1979-80	407	54	14	378	3	12
1980-81	306	60	3	254	1	41
1981-82	483	54	7	444	0	32
1982-83	277	--	6	265	1	5
1983-84	98	--	3	93	0	2
1984-85	26	61	3	23	0	0
1985-86	45	51	7	37	0	1
1986-87	16	62	2	13	1	0
1987-88	0	0	0	0	0	0
1988-89	0	0	0	0	0	0
Otter						
1977-78	12	--	1	11	0	0
1978-79	15	--	2	13	0	0
81979-80	19	--	10	9	0	0
1980-81	29	--	0	27	2	0
1981-82	9	--	0	9	0	0
1982-83	7	--	1	5	0	1
1983-84	8	--	1	7	0	0
1984-85	5	--	0	5	0	0
1985-86	5	--	1	4	0	0

Table 4. (continued)

Species	Total harvest	% male	Harvest method			
			Shot	Trapped	Snared	Unknown
Otter (continued)						
1986-87	12	--	0	12	0	0
1987-88	13	--	1	12	0	0
1988-89	7	--	0	7	0	0
Wolverine						
1977-78	75	67	26	49	0	0
1978-79	45	73	9	34	0	0
1979-80	26	63	12	14	0	0
1980-81	18	76	11	7	0	0
1981-82	48	75	13	35	0	0
1982-83	37	67	16	20	1	0
1983-84	46	59	17	27	1	1
1984-85	37	61	19	15	2	2
1985-86	35	77	7	27	1	0
1986-87	64	56	28	28	1	7
1987-88	40	72	11	28	1	0
1988-89	39	56	8	31	0	0

STUDY AREA

GAME MANAGEMENT UNIT: 24 (26,060 mi^2)

GEOGRAPHICAL DESCRIPTION: Koyukuk River drainage above Dulbi River

BACKGROUND

Furbearers have always been an important resource within Unit 24, supplying food, clothing, and trade items. With the arrival of Euro-Americans, furbearers also became an item of commerce. Although furbearer populations have been sufficiently abundant to meet local demands, they have been subject to fluctuations in abundance. In order of their economic importance, marten, beaver, lynx, red foxes, wolverines, wolves, mink, river otters, and muskrats are found in Unit 24. Coyotes are rare, and weasels are common but not often sold.

POPULATION OBJECTIVES

To maintain populations at high enough levels to provide for maximum consumptive and nonconsumptive uses.

METHODS

Harvests were monitored through sealing records, fur export and fur acquisition reports, and personal interviews. Distribution and abundance surveys were conducted by the National Park Service within the Gates of the Arctic National Park and Preserve (GAAR) (Golden 1988). Trappers were interviewed regarding furbearer abundance. Incidental data were gathered during surveys of other species. Snap-trap collections of small rodents were conducted in small areas for short intervals.

RESULTS AND DISCUSSION

Population Status and Trend

Marten and red fox populations were moderately high and increasing in GAAR (Golden 1988). Wolverines were low but stable. Beavers and river otters were increasing in the southern portion of the unit and were high and increasing within GAAR. Muskrats were still on a long-term decline; the reason for the decline was not determined. Large areas of former habitat have dried up because of natural succession, and this decline in the muskrat population may have been a result of habitat loss. Lynx were in the low part of their cycle, but they are expected to increase in the next few years. They were low in GAAR (Golden

1988) but moderate in a few pockets in the eastern portion of the unit.

Distribution:

Most species are found throughout the unit; however, some species reach the northern limits of their ranges in the upper areas of the southern Brooks Range. Marten, mink, river otters, beavers, and muskrats occur only on the slopes of the Brooks Range.

Trapping Conditions and Prey Species

The weather was mild for most of the trapping season. Heavy snowfall during December limited some trappers by covering up sets and causing rivers and streams to overflow. Extreme cold temperatures of -60 to -80°F occurred for 3 weeks in January. Freezing rain fell in February. This brought an end to most trapping. Overall, trapping conditions were poor for area trappers and catches were lower than those for previous season.

Based on the snap-trap collections, vole populations in the southern part of the unit were higher than those for the previous 2 years. Hare populations were still low throughout the unit, except in a few isolated willow communities along the major rivers. The hare population is thought to be increasing based upon a perceived increase in the density of tracks. Golden (1988) found that hares were highest around Norutak Lake, the Jack White Range, and in a few drainages of the Dietrich River, but low elsewhere. Golden (1988) also thought that grouse and ptarmigan were at low-to-moderate densities and increasing within GAAR.

Mortality

Trapping Seasons and Bag Limits:

Beaver	1 Nov-15 Apr	50 beavers
Coyote	1 Nov-31 Mar	No limit
Red fox	1 Nov-28 Feb	No limit
Marten	1 Nov-28 Feb	No limit
Mink & weasel	1 Nov-28 Feb	No limit
Muskrat	1 Nov-10 Jun	No limit
River otter	1 Nov-15 Apr	No limit
Wolverine	1 Nov-31 Mar	No limit

Human-induced Mortality:

Three hundred seventeen beavers from 38 trappers (about 8 beavers/trapper) were sealed within the unit (Table 1). This harvest level was low, considering the liberal bag limit of 50 beavers. However, prices have always determined the harvest more than bag limits established by the Board of Game. Less than half of the harvest (129) was taken in the southern part of the unit around Huslia, which normally has a harvest 3 or 4 times higher.

The harvest from this area was down by 50% from that of the previous year, and it was composed mainly of adults. The low harvest of kits (60%) was mainly due to the techniques employed by local trappers. They typically used snares with large-diameter openings and placed their sets on the outside of the food cache away from the lodge.

Harvest data indicated that lynx throughout the unit had reached the low point in their 10-year cycle; they are expected to slowly increase over the next 2 years (Table 1). Golden (1988) examined carcasses and found a relatively low proportion of juveniles, indicating a low level of productivity.

Although otters are abundant the harvest was very low, compared with those of past years (Table 1). With prices low for Interior otters, trapping effort was minor. Occasionally, otters are incidentally taken in beaver sets.

The reported wolverine harvest was low (Table 1), but the actual harvest may be higher because furs that are used for subsistence purposes are seldom sealed. Golden (1988) found only 1 set of wolverine tracks during his surveys. I have observed tracks often enough to consider the unit population to be at a low-to-moderate density.

Fox populations remained high, but low prices elicited little trapper interest, and only 42 were sold. Marten, the mainstay of the trapper's catch, were in moderate numbers in the southern part of the unit. Based upon track densities, marten populations were highest around the Jack White Range and moderate within the southern preserve (Golden 1988). Based on fur acquisition and export reports, 2,634 marten were sold, representing an increase of 478 pelts (22%) over that for the previous year.

Game Board Actions and Emergency Orders

During the past 10 years trapping seasons and bag limits have remained the same for marten, coyotes, foxes, mink, muskrats, otters, and wolverines. In 1987 the Board of Game shortened the lynx season by 2 weeks, because lynx pelts in early March were not in prime condition. When the Board restricted aerial trapping for wolves, they also restricted the land-and-shoot method of harvesting foxes and wolverines. The bag limit for beavers has been increased by the Board 3 times after proposals submitted by ADF&G; the bag limits from 1981 to 1985 and 1986 to 1988 were 25 and 40, respectively.

CONCLUSIONS AND RECOMMENDATIONS

Furbearer populations were in good condition throughout the unit. Golden's (1988) conclusions can be expanded for the entire unit:

It was apparent from interviews with trappers that they were very aware of furbearer population changes and that they responded accordingly to prevent overharvest of any particular species. The current known distribution of trappers in and near GAAR seems to be compatible with the ability of populations to withstand the pressure. This situation is not likely to change significantly given the density of trappers, their conscientious efforts, and their access to suitable areas.

The primary recommendation is to continue the present seasons and bag limits, with the exception of bag limits for beaver. There should be no limit for beavers in the unit. Beavers are an abundant resource; prices and trapping techniques limit the harvest more than the regulations do. When prices were relatively high during the spring of 1987 because of selective trapping, the harvest of 554 beaver in the Huslia area contained only 4% kits.

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Table 1. Furbearer harvest in Unit 24, 1982-88.

Species	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89
Beaver	508	236	595	904	468	317
Lynx	430	162	203	127	89	76
Otter	28	19	13	22	25	9
Wolverine	36	19	38	20	22	23

STUDY AREA

GAME MANAGEMENT UNITS: 25A, 25B, 25D, 26B, and 26C (73,760 mi^2)

GEOGRAPHICAL DESCRIPTION: Eastern Interior, eastern Brooks Range, and central and eastern Arctic Slope

BACKGROUND

The portion of the eastern Interior centered around the Yukon Flats has an abundant fur resource that includes most species found in Alaska. Lynx, marten, and beavers are the most important species to trappers, and densities range from moderate to high. A significant part of the local economy depends on the fur trade. In contrast, the eastern Brooks Range and Arctic Slope have relatively few furbearer species, and densities are low. Wolves, wolverines, and foxes are the most important species for use as clothing or for cash.

POPULATION OBJECTIVES

To determine the relative annual abundance of lynx, marten, snowshoe hares, and beavers by 1991.

To determine annual age and sex ratios of harvested lynx and marten by 1991.

To develop accurate estimates of annual furbearer harvests by 1991.

To identify trapper use patterns by 1991.

To determine marten habitat use and dispersal by 1992.

To determine habitat use, movements, and densities of lynx in relation to successional vegetation stages following wildfire from 1991 through the lynx population peak.

METHODS

Furbearer information comes from (1) pelt sealing records for beavers, lynx, land otters, and wolverines; (2) fur acquisition and export reports; and (3) trapper questionnaires. Beaver populations have been surveyed annually in the Yukon Flats National Wildlife Refuge (YFNWR) through enumeration of active lodges (McLean 1986). Furbearers were also surveyed in the YFNWR through track counts in the snow in 1985 and 1986 (Golden 1987).

Surveys of beaver lodges and food caches in the YFNWR by U.S. Fish and Wildlife Service (USFWS) biologists were conducted in FY

1988. Harvest data from ADF&G sealing certificates, fur acquisition reports, and fur export reports were analyzed. Incidental observations by trappers were also evaluated.

RESULTS AND DISCUSSION

Population Status and Trend

Beaver, marten, and red fox populations have been consistently high in the Yukon Flats for the past several years. Beaver populations increased markedly between 1983 and 1987, and they have begun to stabilize. Marten were uncommon on the Flats in the 1950's; however, they became sufficiently abundant to be a staple for trappers. Red foxes have increased to a high level across the Flats. Although furbearer species, including mink, land otters, and wolverines, were typically common, they were not abundant in Subunits 25A, 25B, and 25D. Red and arctic foxes were common in Subunits 26B and 26C and seemed to be increasing in number. Wolverines occurred at low densities throughout the study area.

Relative Abundance:

Aerial surveys of beaver lodges and food caches in 3 areas of the YFNWR during 1988 indicated that populations were stable (USFWS files). The number of active lodges was higher in 2 survey areas and lower in 1 area during 1988, compared with those in 1987. Beavers remained abundant in the refuge. Data from the last 6 years indicated that lodge use is cyclic in the Yukon Flats; lodges may be occupied one year, vacant the next, and then reoccupied the following year.

Aerial track counts were used as indices of furbearer abundance in the YFNWR in 1985 and 1986 (Golden 1987). Tracks/km ranged from zero to 1.96 for red foxes, zero to 3.78 for marten, and zero to 0.64 for lynx. Track densities were highest for red foxes in the central lake flats. Marten track densities were highest in mature coniferous forests, mixed coniferous-deciduous forests, and in a 7- to 9-year-old burn. Track densities for lynx were highest in midsuccessional forests with diverse habitat and plentiful snowshoe hare tracks.

Mortality

Seasons and Bag Limits:

The hunting seasons in Units 25 and 26 were 1 September-30 April for coyotes and arctic foxes, 1 November-15 February for red foxes, 1 November-31 March for lynx, and 1 September-31 March for wolverines. Bag limits were 2 coyotes, arctic foxes, red foxes, and lynx and 1 wolverine.

The trapping seasons in Unit 25 were 1 November-28 February for red foxes, lynx, marten, mink, and weasels; 1 November-31 March for coyotes and wolverines; 1 November-15 April for beavers and land otters; and 1 November-10 June for muskrats. There was no open season for arctic foxes. The trapping seasons in Unit 26 were 1 November-31 January for mink and weasels; 1 November-15 April for coyotes, arctic foxes, red foxes, lynx, marten, land otters, and wolverines; and 1 November-10 June for muskrats. There was no open season for beavers. There was no bag limit on furbearer species in Units 25 and 26, except for a limit of 50 beavers in Unit 25.

Human-induced Mortality:

Beaver. Trappers took fewer beavers in Unit 25 in 1988-89 than in 1987-88, except in Subunit 25B (Table 1). This was the 2nd consecutive year of an overall decline in harvest. I do not believe this decline reflects a population change; rather, unusually cold weather of January and February 1989 and the continued low price of pelts may have played the larger roles.

The percentage of kits in the 1988-89 harvest was higher in all subunits than that for 1987-88 (Table 2). The percentage of kits in Unit 25 were generally higher than those reported for other areas of North America (Novak 1987).

Beaver were harvested most frequently in the Coleen River drainage in Subunit 25A; Little Black River and Black River drainages in Subunit 25B; and Black River, Birch Creek, Chandalar River, and Christian River drainages in Subunit 25D. Harvest patterns were about the same in 1988-89 as those for 1987-88.

Lynx. The harvest in Unit 25 rose by 176 lynx in 1988-89, a 34% increase from that in 1987-88 (Table 1). Subunits 25B and 25D accounted for 44% and 47%, respectively, of the 1988-89 harvest. The harvest in Subunit 25B was 135% higher than the one for the preceding year, while Subunit 25D's harvest was only 18% higher. The harvest in Subunit 25A declined by 50% from that for 1987-88 and was about equal to the 1985-86 take. These data and trapper reports suggest that lynx populations continued to increase in Unit 25; Subunit 25B led the rise as usual. Harvests may have been even higher if severe cold weather in December and January had not restricted trapping activity. Although the price for lynx pelts was lower in 1988-89 ($200) than in 1987-88 ($334), it was still high enough to represent a good incentive for trappers to pursue them, and it probably did not affect their effort.

The percentage of kittens in the harvest increased in Subunits 25A and 25B, but it dropped slightly in Subunit 25D (Table 3). Subunit 25A again had the highest percentage of kittens in the study area in 1988-89. Sixty-four percent of the kittens harvested in Unit 25 were harvested in the Christian, Coleen, Black, Little Black, and Porcupine River drainages.

Overall, lynx were taken most frequently in the Middle Fork Chandalar and Christian River drainages in Subunit 25A; in the Little Black River, Black River, Grayling Fork, upper Porcupine River, and Salmon Fork drainages in Subunit 25B; and in the Beaver Creek, Black River, Chandalar River, Christian River, Dall River, Porcupine River, and Yukon River drainages in Subunit 25D. Traplines were in the same general locations as previous years, but they seemed to be longer and more extensive.

Land Otter and Wolverine. The 1988-89 otter harvest was the lowest it has been in the last 4 years (Table 1). No otters were taken in Subunit 25A during the reporting period. The wolverine harvest was typically low in the study area, and the population seemed stable (Table 1). Only 1 wolverine was reported taken in Subunit 26C. I believe sealing records substantially underestimated the wolverine harvest, particularly in Unit 26, because many people use pelts for clothing and neglect to have them sealed.

Unsealed Species. Based upon data from fur acquisition and fur export reports, harvests of coyotes, white foxes, red foxes, and marten were about the same this year as those in 1987-88 (Table 4). Harvests of mink, weasels, and red squirrels increased 28%, 175%, and 350%, respectively. The muskrat harvest dropped 42% from that of the preceding year.

Trappers harvested more marten than any other furbearer in Unit 25. Pelt prices continued to provide good incentive, averaging $75 per marten but going as high as $150. Marten populations seemed to be moderate to high in most areas of Unit 25, but some trappers noted a declining trend. Although red foxes were fairly abundant, they received little effort from trappers because of low pelt prices. Several years ago, muskrats were very abundant in the Yukon Flats and were trapped heavily; their numbers and harvest have since declined substantially. This apparent population decline is hypothetically due to the gradual drying of water bodies in the area.

Trapper Effort. Lynx trappers outnumbered beaver, otter, or wolverine trappers in the study area by at least 48%. This relationship comes as no surprise, considering the high price of lynx pelts and their relative ease of capture (Table 5). Chalkyitsik, Fort Yukon, Stevens Village, and Venetie had the most lynx trappers from within the study area. Chalkyitsik and Fort Yukon had the most beaver trappers. Fort Yukon had the most wolverine trappers. Trappers from outside the study area appeared to take mostly lynx and wolverines. There were no trappers from Arctic Village who reported taking any of the above 4 species (Table 5).

Harvest Chronology. Fifty-three percent of beavers harvested in the study area were taken in March, and about 38% were caught in November, December, and February (Table 6). Most lynx were harvested from December through February. All otters and most

wolverines were taken during December and February. Harvest of all species declined in January, primarily because of the extreme cold weather (ranging from -40F to -75F) that persisted for most of the month.

Harvest and Transport Methods. Beavers were snared more often than they were trapped, whereas more lynx, otters, and wolverines were trapped than snared (Table 7). In previous years, the latter 3 species were trapped or snared with nearly equal frequency. Method of transportation for most trappers was by snowmachine, although some individuals used aircraft to take beaver, and aircraft, dog sleds, skis, or snowshoes to take lynx (Table 7).

Game Board Actions and Emergency Orders

At the Department's request, the Board of Game extended the lynx season in Unit 25 from 2 months in 1987-88 (1 December-31 January) to 4 months in 1988-89 (1 November-28 February). The original reduction of the season was a response to low lynx populations and a desire by the Department to adopt a "tracking strategy" for lynx management that would restrict harvests during cyclic population lows. This approach was believed to be unnecessary in Subunits 25A, 25B, and 25D because of the relatively high lynx populations and light trapping pressure. Harvest of lynx and other furbearers is largely self-regulated in this area.

CONCLUSIONS AND RECOMMENDATIONS

Although progress was made toward improving estimates of furbearer harvest in the area; the scope of work will be expanded next year to better meet our objectives. In cooperation with the USFWS and the National Park Service (NPS), aerial track surveys will be evaluated as a method for determing population trends of lynx, marten, and snowshoe hares.

A local trapper questionnaire will be used to assist in documenting (1) furbearer population trends, (2) trapper catch and effort, and (3) trapper use patterns. Lynx carcasses and marten skulls collected from trappers will be used to assess age and sex ratios and reproductive success.

I recommend the Department establish cooperative projects with the USFWS, the NPS, and the Bureau of Land Management to determine the movements and habitat uses of lynx and marten, particularly in relation to wildfire and vegetation successional stage. I also recommend that marten and land otter seasons be eliminated in Subunits 26B and 26C, which are north of either species' usual range. Animals that occur there are probably transients or are in the process of establishing new territories. A change to closed seasons for marten and otter would be consistent with that for beavers in Subunits 26B and 26C.

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Table 1. Furbearer harvest in Units 25 and 26, 1984-85 to 1988-89.

Species/Year	Subunit 25A	25B	25D	26B	26C	Unk	Total
Beaver							
1984-85	8	130	193			0	331
1985-86	7	166	302			0	475
1986-87	24	171	333			0	528
1987-88	23	136	287			0	446
1988-89	9	175	129			0	313
Lynx							
1984-85	73	203	322			0	598
1985-86	57	104	346			0	507
1986-87	77	124	282			0	483
1987-88	117	127	278			0	522
1988-89	65	308	325			0	698
Land otter							
1984-85	0	7	3			0	10
1985-86	4	4	7			0	15
1986-87	3	1	6			0	10
1987-88	3	0	2			0	5
1988-89	0	2	2			0	4
Wolverine							
1984-85	8	28	23	0	1	0	60
1985-86	15	13	14	0	0	0	42
1986-87	16	19	19	0	0	0	54
1987-88	13	11	14	1	1	0	40
1988-89	13	10	21	4	1	0	49

[a] Data are for sealed species and include animals taken by hunting and trapping.

Table 2. Beaver harvest by pelt size category[a] in Unit 25, 1984-89.

Subunit/ Year	0-52	53-59	60-64	≥65	Unk	Total	% Kit	% Adult
25A								
1984-85	1	3	3	1	0	8	13	87
1985-86	0	1	4	2	0	7	0	100
1986-87	3	4	9	5	3	24	13	75
1987-88	1	7	9	6	0	23	4	96
1988-89	3	0	4	2	0	9	33	67
25B								
1984-85	17	19	40	54	0	130	13	87
1985-86	38	16	49	65	0	168	23	77
1986-87	29	21	51	69	1	171	17	82
1987-88	24	18	36	58	0	136	18	82
1988-89	38	24	51	62	0	175	22	78
25D								
1984-85	49	28	57	59	0	193	25	75
1985-86	46	41	88	112	15	302	15	80
1986-87	47	64	63	123	37	334	14	75
1987-88	41	46	95	100	5	287	14	84
1988-89	26	19	28	56	0	129	20	80
Totals								
1984-85	67	50	100	114	0	331	20	80
1985-86	84	58	141	179	15	477	18	79
1986-87	79	89	123	197	41	529	15	77
1987-88	66	71	140	164	5	446	15	84
1988-89	67	43	83	120	0	313	21	79

[a] Pelt size (length + width) in inches; kit <53, adult ≥53.

Table 3. Percentage of known kitten[a] (K) and adult (Ad) lynx in harvest (N) in Subunits 25A, 25B. amd 25D, 1984-89.

Year	25A			25B			25D			Total		
	K	Ad	N	K	Ad	N	K	Ad	N	K	Ad	N
1984-85	15.1	84.9	73	4.4	95.6	203	6.2	93.8	322	6.7	93.3	598
1985-86	10.5	89.5	57	3.8	96.2	104	10.7	89.3	346	9.3	90.7	507
1986-87	26.0	74.0	77	9.7	90.3	124	24.1	75.9	282	20.7	79.3	483
1987-88	33.0	67.0	117	12.6	87.4	127	20.5	79.5	278	21.5	78.5	522
1988-89	38.5	61.5	65	27.3	72.7	308	15.7	84.3	325	22.9	77.1	698

[a] Lynx were considered kittens if their pelts were ≤35 inches long.

Table 4. Harvest of unsealed furbearer species in Unit 25 (including Subunit 25C) 1984-85 to 1988-89.

Report/Year	Coyote	Fox					Marten	Mink	Weasel	Muskrat	Red squirrel
		White	Red	Silver	Cross	Total					
Acquisition											
1984-85	0	1	203	19	121	343	2,584	63	64	53	52
1985-86	0	0	163	21	143	327	3,279	98	44	969	0
1986-87	0	0	241	13	187	441	5,228	207	56	1,843	5
1987-88	0	2	112	20	84	216	3,857	53	18	874	22
1988-89	0	0	102	19	77	198	3,476	72	87	657	53
Export											
1986-87	0	0	11	5	7	23	479	4	4	517	1
1987-88	0	0	32	11	27	70	1,229	27	37	267	9
1988-89	0	0	26	4	23	53	1,480	30	64	1	89
Total											
1986-87	0	0	252	18	194	464	5,707	211	60	2,360	6
1987-88	0	2	144	31	111	286	5,086	80	55	1,141	31
1988-89	0	0	128	23	100	251	4,956	102	151	658	142

[a] Data are based on fur acquisition and fur export reports submitted to ADF&G.

Table 5. Numbers of known trappers per village or town who trapped beavers, lynx, land otters, and wolverines in Units 25 and 26, 1988-89.

Village or town	Beaver	Lynx	Land otter	Wolverine
Arctic Village	0	0	0	0
Beaver	2	7	0	1
Birch Creek	1	0	0	0
Chalkyitsik	5	16	1	2
Circle	2	7	0	2
Eagle	1	2	0	1
Fort Yukon	14	43	2	11
Kaktovik	0	0	0	1
Stevens Village	0	11	0	1
Venetie	0	18	0	4
Other	2	28	1	13
Unknown	0	2	0	0
Total	29	134	4	36

[a] Data were based on pelt sealing certificates.

Table 6. Chronology of furbearer harvest in Units 25 and 26, 1984-85 to 1988-89.

Species/year	Nov	Dec	Jan	Feb	Mar	Apr	Unk
Beaver							
1984-85	51	34	57	77	72	8	35
1985-86	15	11	27	86	313	25	2
1986-87	44	37	51	84	286	13	13
1987-88	32	23	50	55	234	52	0
1988-89	33	27	6	60	165	16	6
Lynx							
1984-85	116	195	151	86	66	1	2
1985-86	0	295	208	1	2	0	7
1986-87	1	273	196	2	1	0	14
1987-88	1	267	247	2	2	0	3
1988-89	77	268	137	184	0	0	20
Land otter							
1984-85	5	5	0	1	0	0	0
1985-86	3	3	3	1	5	0	0
1986-87	0	6	3	1	1	0	2
1987-88	1	1	3	0	0	0	0
1988-89	0	3	0	1	0	0	0
Wolverine							
1984-85	7	17	14	15	9	0	0
1985-86	6	12	15	5	7	0	0
1986-87	4	16	20	5	9	0	4
1987-88	2	14	15	5	3	1	0
1988-89	5	15	8	16	5	0	0

Table 7. Method of take and transportation of furbearers in Units 25 and 26, 1984-85 to 1988-89.

Species/ year	Method of take[a]					Method of transportation[b]							
	1	2	3	4	5	1	2	3	4	5	6	7	8
Beaver													
1984-85	0	64	222	48		No Data							
1985-86	0	52	427	0	0	111	36	0	0	300	0	0	32
1986-87	0	59	461	8	0	3	40	0	0	475	0	0	10
1987-88	0	35	409	2	0	26	16	0	0	400	0	0	4
1988-89	0	29	284	0	0	24	0	0	0	289	0	0	
Lynx													
1984-85	0	456	152	9		No Data							
1985-86	0	280	231	2	0	9	32	0	0	288	0	0	184
1986-87	1	241	243	2	0	14	38	0	0	423	0	0	12
1987-88	2	279	231	10	0	18	51	0	0	439	0	0	9
1988-89	0	505	268	4	4	87	45	7	0	538	0	0	9
Land otter													
1984-85	0	6	5	0		No Data							
1985-86	0	5	10	0	0	1	1	0	0	9	0	0	4
1986-87	0	10	2	1	0	0	1	0	0	10	0	0	2
1987-88	0	3	2	0	0	0	1	0	0	4	0	0	0
1988-89	0	4	0	0	0	1	0	0	3	0	0	0	
Wolverine													
1984-85	5	47	13	0		No Data							
1985-86	5	27	12	1	0	7	6	0	0	25	0	0	7
1986-87	1	32	20	5	0	7	9	0	0	40	0	0	2
1987-88	4	20	16	0	0	4	7	0	0	27	0	1	1
1988-89	1	39	5	2	2	4	4	0	0	33	0	3	6

[a] Method of take: (1) ground shooting, (2) trapping, (3) snaring, (4) other, (5) unknown.

[b] Method of transportation: (1) airplane; (2) dog sleds, skis, or snowshoes; (3) boat; (4) 3- or 4-wheeler; (5) snowmachine; (6) other ORV; (7) highway vehicle; (8) unknown.

STUDY AREA

GAME MANAGEMENT UNIT: 26A (53,470 mi^2)

GEOGRAPHIC DESCRIPTION: Western North Slope

BACKGROUND

Red foxes, arctic foxes and wolverines are the only furbearers commonly found in Subunit 26A. Because of limited habitat, boreal forest species such as lynx and marten are normally found only in the southern portion of the subunit. Indigenous residents of the North Slope have harvested furbearers extensively for use in the domestic manufacture of garments. Local hunters and trappers in Subunit 26A still harvest furbearers for domestic and handicraft use as well as for sale to the commercial fur market. Although the number of furbearers harvested from Subunit 26A has been considerably lower than those harvested in neighboring units to the south, the value placed on furbearer resources by local residents is considerable, particularly wolverines.

POPULATION OBJECTIVES

To maintain productive populations and to allow harvest opportunities within sustained-yield limits.

METHODS

Surveys for assessing the status of furbearer populations in Subunit 26A were not conducted during the reporting period. Incidental observations of furbearer activity were recorded during surveys conducted for other species. Harvest data for species requiring sealing (e.g., wolverines) were summarized from sealing certificate records.

RESULTS AND DISCUSSION

Population Status and Trend

No population information was available for lynx in Subunit 26A. Normally, lynx are found only in the southern portion of the subunit, and densities reported in past years have never been high. Because densities in Units 23 and 24 were still low, in Subunit 26A they were probably low as well.

The population status of wolverines in Subunit 26A was not known with certainty. Magoun (1984) estimated a fall population size of 821 wolverines for Subunit 26A, assuming that an overall density of 1 wolverine/54 mi^2 was valid for the entire subunit.

Wolverines are very vulnerable to hunters using snowmachines and aircraft in treeless, tundra habitats, and Trent (1988) believed that excessive harvest of the wolverine populations in Subunit 26A could occur, particularly on the population in the coastal plain north of the Brooks Range.

Mortality:

Hunting Seasons and Bag Limits:

Red Fox	1 Nov-15 Feb	2 foxes
Arctic Fox	1 Sep-30 Apr	2 foxes
Lynx	1 Nov-31 Mar	2 lynx
Wolverine	1 Sep-31 Mar	1 wolverine

Trapping Seasons and Bag Limits:

Red Fox	1 Nov-15 Apr	No limit
Arctic Fox	1 Nov-15 Apr	No limit
Lynx	1 Nov-15 Apr	No limit
Wolverine	1 Nov-15 Apr	No limit

Human-induced Mortality:

No lynx from Subunit 26A were sealed during the reporting period. Because lynx normally occur only in the southern portion of the subunit, harvest opportunities for local residents have been limited. Most residents dwell along the coast, and only individuals from Anaktuvuk Pass have much opportunity to harvest lynx.

Only 1 wolverine was harvested from Subunit 26A during 1988-89, substantially less than the 18 wolverines reported for 1987-88. During 1987 the Board of Game enacted statewide regulations prohibiting the taking of wolverines using firearms and aircraft on the same day. Because most wolverines had been harvested in past years using this technique (i.e., land-and-shoot), the observed reduction in harvest is not surprising. The actual harvest is certainly larger than 1 wolverine. Compliance with sealing requirements by local residents who mostly hunt with snowmachines is poor, and most of their harvest is not reported. In addition, the absence of sealing agents in many communities in Subunit 26A complicates the problem considerably. Trent (1988) believed that local residents harvested approximately 100 wolverines from Subunit 26A. He assumed that each of the communities located in the subunit accounted for approximately 15-20 wolverines. Magoun (1984) estimated that in some years less than 10% of the wolverines harvested in Subunit 26A were sealed and only rarely were more than 50% sealed.

CONCLUSIONS AND RECOMMENDATIONS

One of the most pressing management needs in Subunit 26A is to obtain accurate harvest information for all wildlife species, including furbearers. Establishing sealing agents in every community would help alleviate the problem, but it probably would not solve it. Most rural residents will only have their furs sealed if they are being sold to fur buyers or sent out for commercial tanning. Furs used in the domestic manufacture of garments and handicrafts usually are not sealed. Additional efforts informing local residents of the need for sealing information are recommended.

The population status of wolverines needs to be monitored more closely. Because of their vulnerability and desirability to local hunters, overharvesting is possible. Magoun (1984) estimated that Subunit 26A could sustain an annual harvest of 300 wolverines under certain conditions. She assumed this high harvest rate would be sustainable only if less than 90 females were harvested and the reproductive rate observed at the Driftwood study area was applicable to the entire subunit. If Magoun's estimate of population size and productivity are still valid and Trent's (1988) harvest estimate of 100 wolverines is accurate, overharvesting is probably not occurring. However, additional assessment of density, productivity, and harvest are needed to properly monitor the population.

No changes in seasons and bag limits are recommended at this time.

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