

**The British Columbia Trapper Survey:  
Program Review**

**DRAFT**

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## Table of Contents

Introduction:.....	1
Methods: .....	4
Results:.....	7
Response Rate.....	7
Habitat Quality.....	9
Trapper Effort .....	12
Supplemental Species Trends .....	16
Discussion:.....	20
Conclusion: .....	27
References:.....	29
Appendix I: Sampling Summary by Ecoprovince and Year.....	<b>Error! Bookmark not defined.</b>
Appendix II: Return Rate by Ecoprovince and Year.....	<b>Error! Bookmark not defined.</b>
Appendix III: Surveyed Fur Bearer Population Trends by Ecoprovince and Year ...	<b>Error! Bookmark not defined.</b>
Appendix IV: Overall Habitat Quality by Ecoprovince and Year ...	<b>Error! Bookmark not defined.</b>
Appendix V: Habitat Decline by Ecoprovince and Year ...	<b>Error! Bookmark not defined.</b>
Appendix VI: Habitat Improvement by Ecoprovince and Year .....	<b>Error! Bookmark not defined.</b>
Appendix VII: Trends in Fur Bearer Prey by Ecoprovince and Year.....	<b>Error! Bookmark not defined.</b>
Appendix VIII: Overall Trapper Effort by Ecoprovince and Year..	<b>Error! Bookmark not defined.</b>
Appendix IX: Trapper Effort by Furbearer for Ecoprovince and Year ..	<b>Error! Bookmark not defined.</b>
Appendix X: Effect of Pelt Price on Trapper Effort by Ecoprovince and Year .....	<b>Error! Bookmark not defined.</b>
Appendix XI: Effect of Weather on Trapper Effort by Ecoprovince and Year .....	<b>Error! Bookmark not defined.</b>

Appendix XII: Perceived Trends in Cougar Abundance by Ecoprovince and Year . **Error!**  
**Bookmark not defined.**

Appendix XIII: Perceived Trends in Badger Abundance by Ecoprovince and Year **Error!**  
**Bookmark not defined.**

Appendix XIV: Number of Animals Trapped as Reported by Trappers by Ecoprovince  
and Year .....**Error! Bookmark not defined.**

## List of Figures:

Figure 1: Number of surveys returned, number of registered trappers (sampled population), and number of surveys sent between 1989 and 1997. ....	8
Figure 2: Return rate of British Columbia Trapper Survey between 1989 and 1997. ....	8
Figure 3: Return rate of British Columbia Trapper Survey summarised between 1989 and 1997 for all ecoprovinces. ....	9
Figure 4: Average number of trapper responses in each year indicating that overall fur bearer habitat has increased, decreased or remained unchanged between 1994 and 1997. ....	10
Figure 5: Proportion of trappers indicating each reason for habitat decline between 1994 and 1997. ....	11
Figure 6: Proportion of trappers indicating their perceived reason for habitat improvement between 1994 and 1997. ....	12
Figure 7: Average percentage of trappers indicating that their effort had increased, remained unchanged, or decreased. ....	13
Figure 8: Average percentage of trappers indicating that their effort had increased, remained unchanged, or decreased due to pelt price relative to the previous season. ....	14
Figure 9: Average percentage of trappers indicating that their effort had increased, remained unchanged, or decreased due to weather relative to the previous season. ....	14
Figure 10: The minimum, maximum, and average number years of trapping experience, as indicated by trappers, in each ecoprovince and provincially. ....	15
Figure 11: Average number years of trapping experience by year, as indicated by trappers provincially. ....	16
Figure 12: The average percentage of trappers indicating that more, the same, or less cougars were seen on their trapline relative to the previous year. ....	17
Figure 13: The average percentage of trappers indicating that more, the same, or less cougars were seen on their trapline relative to the previous year by ecoprovince. Data were averaged for the years 1993 through 1997. ....	17

Figure 14: The average percentage of trappers indicating that more, the same, or less badgers were seen on their trapline relative to the previous year. .... 18

Figure 15: The average percentage of trappers indicating that more, the same, or less badgers were seen on their trapline relative to the previous year by ecoprovince. Data were averaged for the years 1994 through 1997. .... 19

Figure 16: Average number of animals trapped in each year per trapline between 1989 and 1997, as indicated by trappers. Fox numbers are averaged from 1993 to 1997 and Squirrel numbers are averaged from 1994 to 1997..... 19

Figure 17: Average number of animals trapped in each year per trapline between 1989 and 1997 as reported in provincial fur harvest database. Fox numbers are averaged from 1993 to 1997 and Squirrel numbers are averaged from 1994 to 1997. .... 20

List of Tables:

Table 1: Definitions of British Columbia under Section 16 of the Wildlife Act (1990) and common names as listed in the British Columbia Hunting and Trapping Regulations Synopsis 2001/2002..... 3

## **Introduction:**

Trapping has long been a part of the culture and economy of British Columbia. Trappers played an important role in the exploration and settlement of British Columbia and trapping played an important role in the subsistence economies of aboriginal peoples before European settlement. Apart from its long tradition, trapping is currently an important source of income and recreation to many families and it plays an integral role in the management and monitoring of populations. Trappers with their unique lifestyles and experience can provide a rich source of information on the status of wildlife populations and wildlife habitats throughout the province. It is doubtful that anyone spends more time observing the status and change that occurs in the rural areas of British Columbia than BC's trapping community does. The British Columbia Trapper Survey is an attempt to access this rich and unique information source and to actively include trappers in the management process.

The initial survey was conducted for the 1989/90 trapping season. It consisted of a mail-out survey to a representative sample of trappers. The survey was an attempt to assess the relative status of furbearers, habitat, furbearer prey and trapping effort. The survey also included the trapping experience and effort of individual trappers. A mail-out survey was chosen because it was:

- less expensive than telephone or personal interviews
- a mail-out survey is relatively easy to administer
- there is little threat of interviewer bias (or at least the bias is consistent)
- there is a greater degree of trapper confidentiality
- a mail-out survey is less intrusive than telephone or personal interviews
- it is more convenient for trappers

Rollins 1989

The survey underwent numerous revisions over the years. The first changes occurred in the 1991/92 survey, when additions were made to the responses for habitat improvement or decline. These included: oil/gas exploration or development, habitat

improving/declining naturally, number of people living nearby, and natural population cycles. Changes in format of questions occurred concerning trapping effort due to low response rates and the appearance that the wording confused some trappers. Questions were added to the survey about how trappers felt weather affected trapping effort, how trappers felt about the level of trapping effort in their region, and trappers perceptions on the abundance of cougar. A response of 'did not trap last year' was added to the overall perceived effort question. For the 1992/93 survey, fox was added to the list of furbearer species, and a questions surveying the influence of pelt price and weather on overall trapper effort were added. Red squirrel was added to the list of furbearers for the 1993/94 survey and the relative abundance of badger was surveyed. Specific questions regarding trapping effort were also discontinued. As a result, catch per unit effort (CPUE) was no longer calculated. The BC Trapper Survey has remained relatively unchanged between the 1993/1994 and the 1997/1998 trapping seasons. In 1998, the program was discontinued pending review.



**Table 1: Definitions of British Columbia under Section 16 of the Wildlife Act (1990) and common names as listed in the British Columbia Hunting and Trapping Regulations Synopsis 2001/2002.**

Synopsis Furbearer Name	General Common Names	Scientific Names
fox	red fox, arctic fox, kit fox, grey fox	<i>Vulpes vulpes</i> , <i>Alopex lagopus</i> , <i>Vulpes macrotis</i> , <i>Urocyon cinereoargenteus</i>
beaver	beaver	<i>Castor canadensis</i>
marten	American marten	<i>Martes americana</i>
fisher	fisher	<i>Martes pennanti</i>
lynx	lynx	<i>Lynx canadensis</i>
bobcat	bobcat	<i>Lynx rufus</i>
mink	mink	<i>Mustela nivalis</i>
muskrat	muskrat	<i>Ondatra zibethicus</i>
river otter	river otter	<i>Lontra canadensis</i>
raccoon	raccoon	<i>Procyon lotor</i>
skunk	stripped skunk, spotted skunk	<i>Mephitis mephitis</i> , <i>Spilogale putorius</i>
northern flying squirrel	northern flying squirrel	<i>Glaucomys sabrinus</i>
squirrel	red squirrel, Douglas squirrel	<i>Tamiasciurus hudsonicus</i> , <i>Tamiasciurus douglasii</i>
weasel	short-tailed weasel long-tailed weasel, least weasel	<i>Mustela erminea</i> <i>Mustela frenata</i> , <i>Mustela nivalis</i>
wolverine	wolverine	<i>Gulo gulo</i>
wolf	grey wolf	<i>Canis lupus</i>
coyote	coyote	<i>Canis latrans</i>
black bear	black bear	<i>Ursus americanus</i>

In this paper, I will provide a review of the trapper survey program from 1989/90 to 1997/98. I also provide a basic summary of the yearly reports produced from 1989/90 to

1997/98 and make recommendations for the improvement and continuation of the program. The specific objectives of the British Columbia Trapper Survey Program are as follows:

- To measure trends of furbearers, as perceived by trappers;
- To collect trapper's perceptions of changes in furbearer habitat;
- To collect trappers perceptions of the changes in the abundance of furbearer prey sources;
- To collect trappers perceptions of changes in the abundance of other non-furbearing species;
- To collect information on the factors that influence trapping effort.

Rollins 1995

### **Methods:**

Rollins (1989a) developed methods for the survey of trappers. These consisted of a mail survey sent to a representative sample of trappers in the late spring or early summer of each year. Although the response rate of mail-out surveys were lower than other methods; such as personal interviews or telephone surveys, the mail-out surveys were seen as easily administered and a cost-effective means of surveying trappers knowledge (Rollins 1989b). They are also as less intrusive, insure a greater degree of confidentiality, and reduce potential survey bias (Rollins 1989). Attempts were made to personalize the survey to stimulate response following suggestions by Dillman (1978).

Each survey package consisted of the survey, a personalized cover letter, and a pre-addressed stamped envelope. Follow-up mail-outs were sent two weeks after the initial survey. The follow-up contained a revised cover letter, a replacement survey, and new return envelope. For the surveys conducted between 1989 and 1994, a third mail-out was sent three weeks later to remind trappers who failed to respond to the initial two mail-outs. The sample of trappers surveyed each year consisted of a selection of registered licensed trappers, randomly selected each of the province's 9 ecoprovinces. A single individual was selected to receive the mail-out if more than one name was associated with a single trapline.

Although changes occurred in the specific questions asked in each year, the basic format of the survey has remained unchanged. The 1997/98 Trapper Survey questions and comments appeared as follows:

The purpose of this survey is to collect information from trappers about the numbers of furbearing animals in the province, and the general conditions on your trapping areas, whether you trapped on CROWN LANDS OR PRIVATE PROPERTY. Please answer each question and return the questionnaire in the postage paid envelope enclosed.

Question 1:

Based on the animals you trapped, as well as the signs you observed on your trapline (tracks, dens, etc.), do you feel there are more, less, or the same number of these animals as last season (circle answer)?

Question 2:

In order to better understand the number of furbearers on your trapline, please indicate the total number of captured, including those you may have discarded because of damaged fur.

Habitat for Furbearers

The numbers of furbearing animals are influenced by changes in living conditions (changes created by such things as logging, forest fire, flood levels, mining activities, road construction, herbicide applications, and available food).

Question 3:

Thinking now about your trapline, would you say that habitat for furbearers is generally: improving, declining, or staying the same (circle answer)?

Question 4:

From the list below, please circle any reasons, which may have caused, in your view, any decline in habitats for furbearers on your trapline.

Question 5:

From the list below, please circle any reasons, which may have created any improvements in habitats for furbearers on your trapline.

Prey Animals for Furbearers

Question 6:

We are especially interested in your opinion regarding the amount of food available for these furbearers. For each of the following food sources, indicate if it has: increased, decreased, or stayed the same on your trapline (circle answer).

Trapper Effort

Question 7:

Please indicate if the effort you put into trapping each furbearer this season has: increased, decreased, or stayed the same (compared to last season).

Question 8:

As a result of pelt prices, has the time and effort you put into trapping: increased, decreased, or stayed the same (circle answer)?

Question 9:

As a result of weather (snow depth, temperature, etc.) has the effort you put into trapping: increased, decreased, or stayed the same (circle answer)?

Question 10:

All things considered, compared to last season, would you say that the time and effort you put into trapping this season has: increased, decreased, is unchanged, or you did not trap last year (circle answer)?

Question 11:

How many years have you been trapping in B.C.?

Question 12:

Finally, we are interested in knowing how the numbers of cougars and badger you have observed in your trapline (tracks, dens, etc.) this year compares to last year. Do you feel that there are: more, less, same, or you don't know (circle answer)?

Questions 1, 2 and 7 listed: Marten, Fisher, Lynx, Wolverine, Bobcat, Beaver, Otter, Coyote, Wolf, Weasel, Muskrat, Mink, Raccoon, Fox, and Red squirrel. Question 4 asked if: more logging, more forest fires, less food, more road building, the use of herbicides, more mining, more flooding or high water, oil/gas exploration and development, natural habitat decline, more people living nearby, and/or natural population cycles had a negative impact on fur bearer habitat. Question 5 asked whether:

more food, less road building, more mining, more flooding or high water, less flooding or high water, natural habitat improvement, and/or natural population cycles had a positive influence on fur bearer habitat. Trappers were also able to indicate other influences of habitat quality in questions 5 and 6. Hare, Porcupine, Flying squirrel, Mice/Voles, Grouse, Ptarmigan and food for Beaver were identified in Question 6 as fur bearer prey/food sources. Questions 1, 2, 6, and 7 where trappers were asked to indicate whether a species had increased, decreased or stayed the same, responses were coded as: increased = +1; decreased = -1; and stayed the same = 0. The actual number of responses to each possibility or the percent response was estimated for all other questions. Data from individual traplines was then averaged across each ecoprovince in an attempt to indicate the perceived direction of population change.

Analysis of the survey data consisted of yearly reviews that generally summarized a single year's data. They outlined basic methods and analyses and provided tables summarising the data for each question by ecoprovince. The summaries provided comments on yearly changes in population trends and recommendations for future years. The 1994 report summarized data from all previous years. I have used the data from these reports to assess the effectiveness of the survey and assess the direction of responses over all years and/or across ecoprovinces. Although the use of this summary data is not ideal, the raw data from the questionnaires were unavailable for further analysis. Results are presented for the trapping season, which began in the year indicated.

## **Results:**

### Response Rate

Response rate of trappers to surveys did not differ with the number of follow-up mail-outs used or ecoprovince sampled. A total of 995, of the 2,183 trappers registered in 1989, were surveyed (Figure 1). Of these, 684 returned usable surveys, which is a return rate of 69% (Figure 2). On average, 57% of all registered trappers were surveyed each year between 1990 and 1998. However, the number of registered trappers declined substantially in 1993 with no change in the number of surveys mailed out. Therefore,

since 1993, and average of 65% of registered trappers were surveyed. A return rate of 65% was achieved over all survey years.

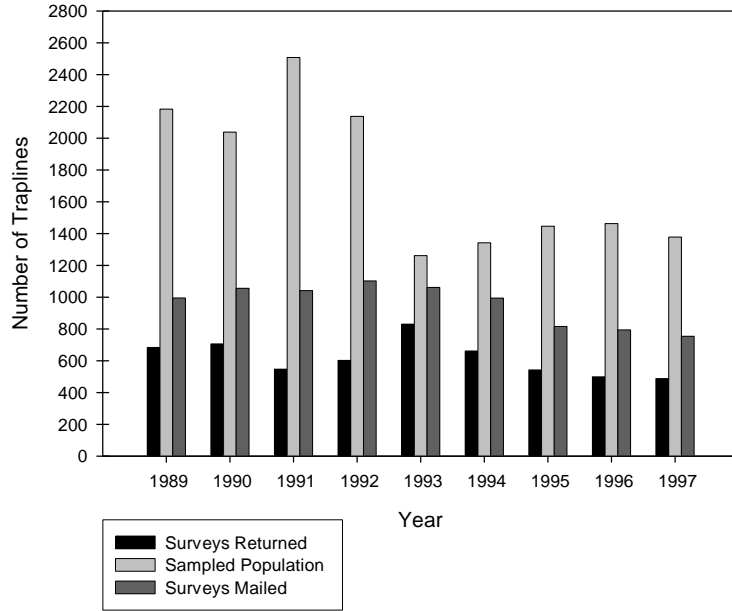


Figure 1: Number of surveys returned, number of registered trappers (sampled population), and number of surveys sent between 1989 and 1997.

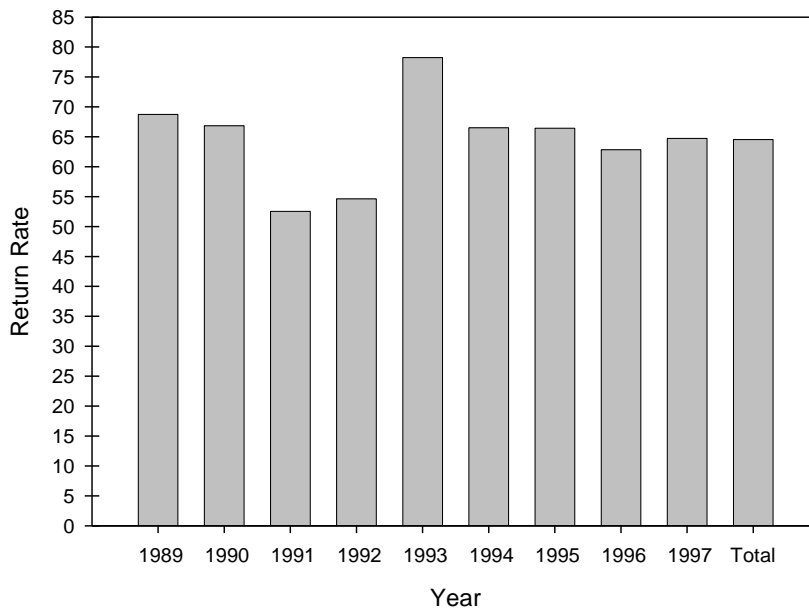
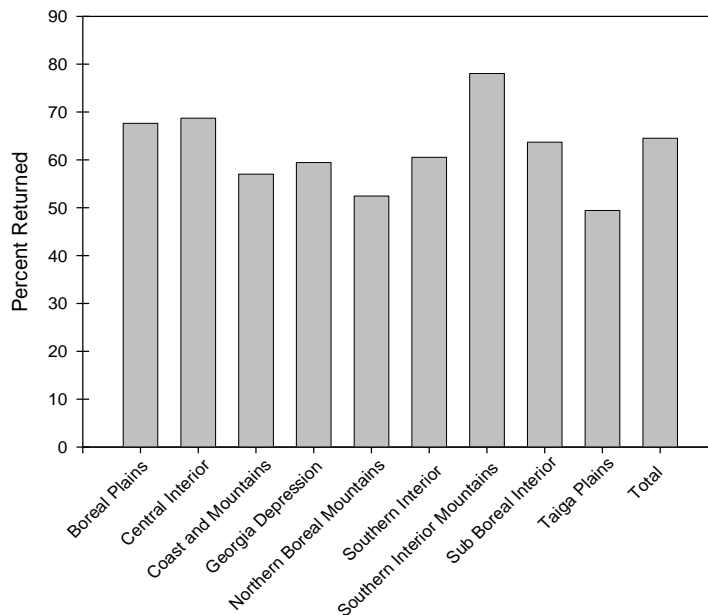


Figure 2: Return rate of British Columbia Trapper Survey between 1989 and 1997.

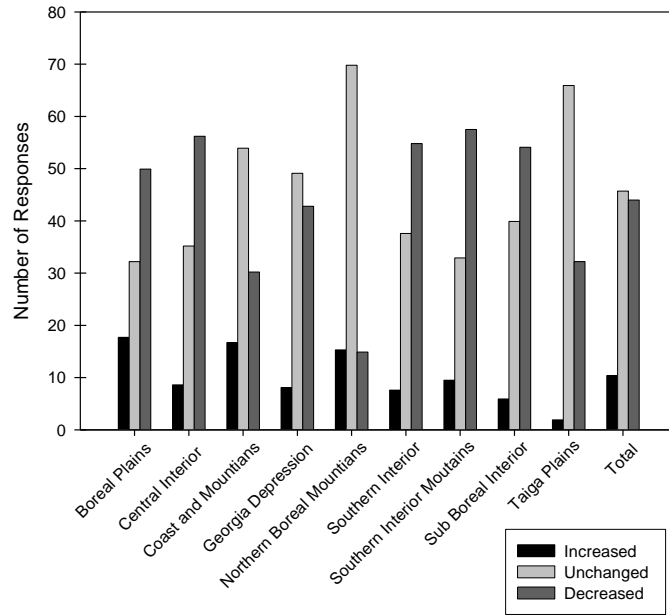
Although the rate of return was high for each year, an examination of returns by ecoprovince shows some discrepancies. The three ecoprovinces with the lowest return rates are those ecoprovinces comprising the northern regions of the province (Figure 3). The Taiga Plains, Northern Boreal Mountains, and Coast and Mountains ecoprovinces have the three lowest return rates.



**Figure 3: Return rate of British Columbia Trapper Survey summarised between 1989 and 1997 for all ecoprovinces.**

Habitat Quality

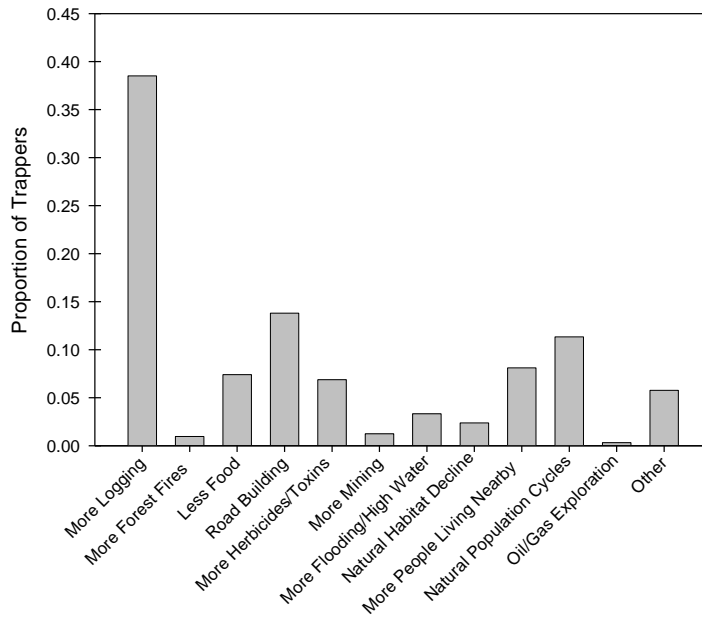
Trappers perceived that the overall quality of habitat on their traplines was either unchanged or decreasing from one year to the next (Figure 4). Few trappers perceived that the amount of furbearer habitat on their trapline was increasing. By ecoprovince, trappers indicated that habitat is decreasing in the Boreal Plains, Central Interior, Southern Interior, and Sub Boreal Interior. Trappers generally perceived that habitat is general unchanged in the Coast and Mountains, Georgia Depression, Northern Boreal Mountains, and the Taiga Plains ecoprovinces.



**Figure 4: Average number of trapper responses in each year indicating that overall fur bearer habitat has increased, decreased or remained unchanged between 1994 and 1997.**

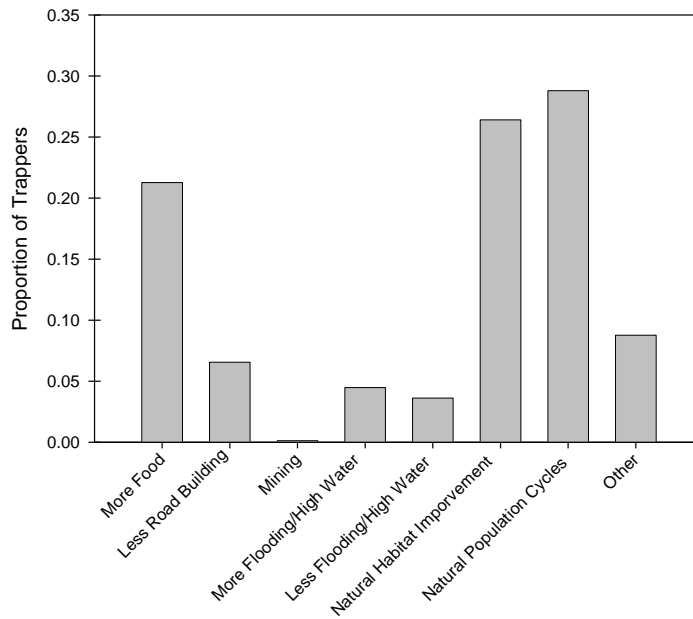
The most commonly cited reason trappers indicated for habitat decline was logging (Figure 5). Thirty-nine percent of trappers indicated that logging was a cause of furbearer habitat decline between 1994 and 1997. The second largest reason for furbearer habitat decline was road building; 14 percent of trappers indicated road building was as a reason for furbearer habitat decline. Eleven percent of trappers indicated that natural population cycles of prey species was the reason for habitat decline.





**Figure 5: Proportion of trappers indicating each reason for habitat decline between 1994 and 1997.**

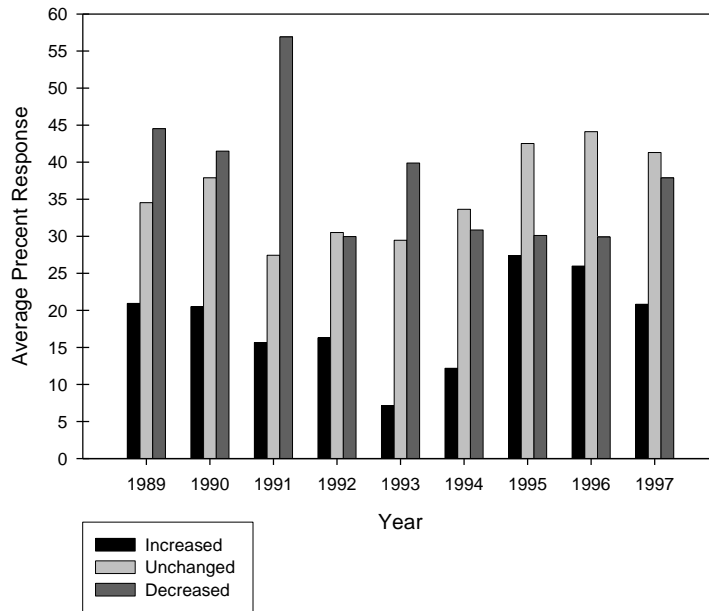
Trappers generally identified natural causes as the process for habitat improvements between 1994 and 1997 (Figure 6). Twenty-eight percent of trappers indicated natural population cycles, 26% indicated natural habitat improvement, and 21% suggested that there was more food for furbearers, although the source was not indicated.



**Figure 6: Proportion of trappers indicating their perceived reason for habitat improvement between 1994 and 1997.**

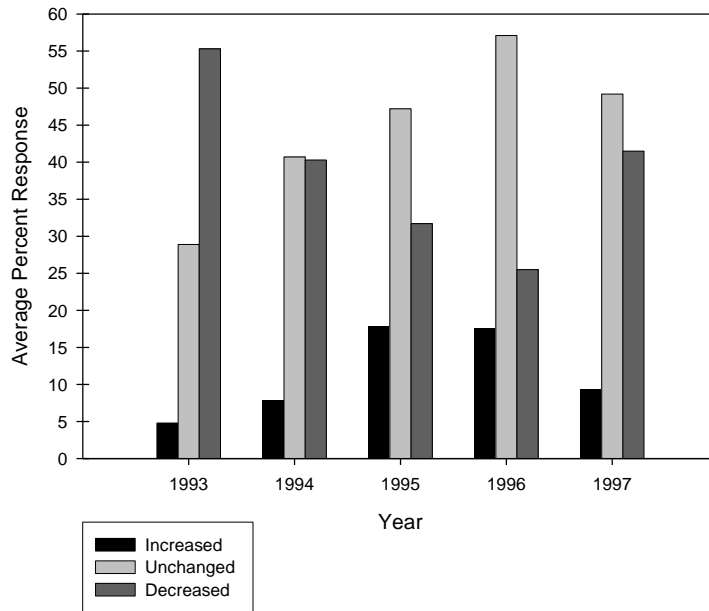
Trapper Effort

Trappers indicated that the overall effort they put into trapping generally declined from 1989 until 1994 (Figure 7). Between 1989 and 1993, consistently more trappers indicated that their effort had decreased rather than increased. Effort has remained relatively constant since 1994 with a similar number of trappers indicated that their effort had increased or decreased.

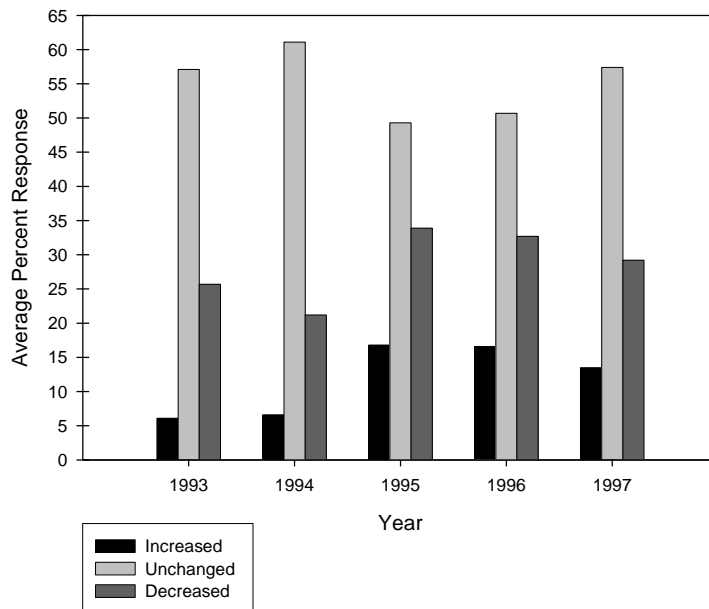


**Figure 7: Average percentage of trappers indicating that their effort had increased, remained unchanged, or decreased.**

The amount of effort that trappers expended trapping furbearers on their traplines was primarily affected by pelt price. Pelt price had a negative influence on effort with trappers indicating that their effort generally remained unchanged or decreased due to pelt price (Figure 8). Most trappers indicated that weather had little or no effect on the effort they put into trapping (Figure 9).

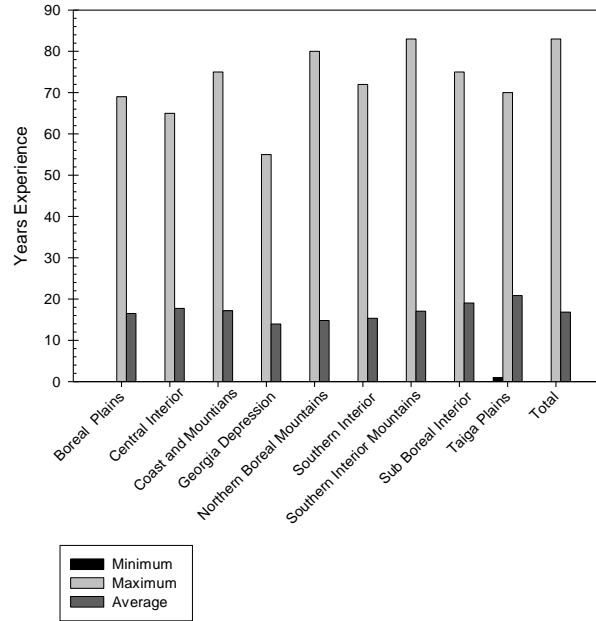


**Figure 8: Average percentage of trappers indicating that their effort had increased, remained unchanged, or decreased due to pelt price relative to the previous season.**

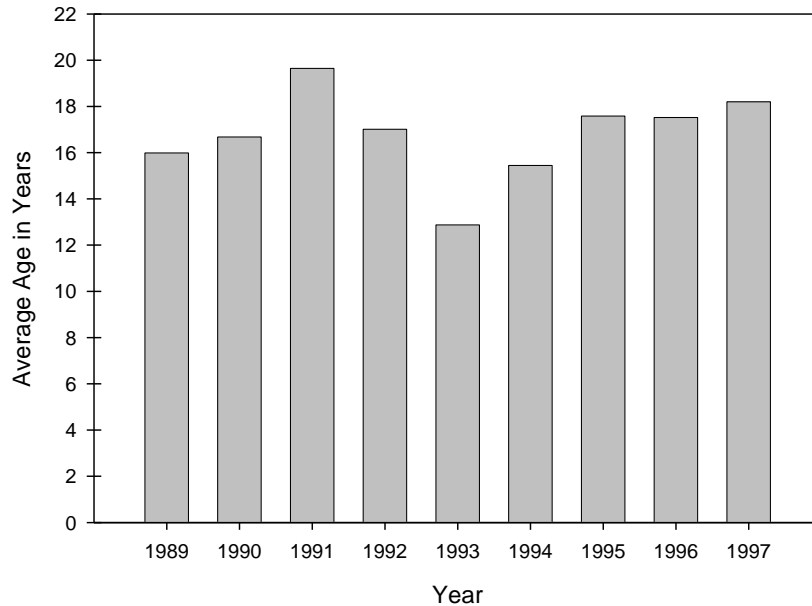


**Figure 9: Average percentage of trappers indicating that their effort had increased, remained unchanged, or decreased due to weather relative to the previous season.**

Trapper experience ranged dramatically between 0 and 83 years province wide. Trappers in British Columbia have an average of 16.8 years of trapping experience (Figure 10). The average number of years of trapping experience and the range of years of trapping experience did not vary substantially between ecoprovince.



**Figure 10: The minimum, maximum, and average number years of trapping experience, as indicated by trappers, in each ecoprovince and provincially.**



**Figure 11: Average number years of trapping experience by year, as indicated by trappers provincially.**

### Supplemental Species Trends

Two additional or supplemental species were also introduced to the survey in 1993. Trappers responded to questions regarding the relative abundance of cougar between 1993 and 1998. Trappers indicated that cougars were generally more prevalent, or that cougar numbers had remained unchanged on their traplines compared to the previous season (Figure 12). Few trappers indicated that cougars had declined over the previous season. An increasing prevalence of cougars was indicated on some traplines in the Northern Boreal Mountains, Taiga Plains, and Boreal Plains, areas where cougars are not known to occur (McTaggart Cowan and Guiguet 1973) (Figure 13).

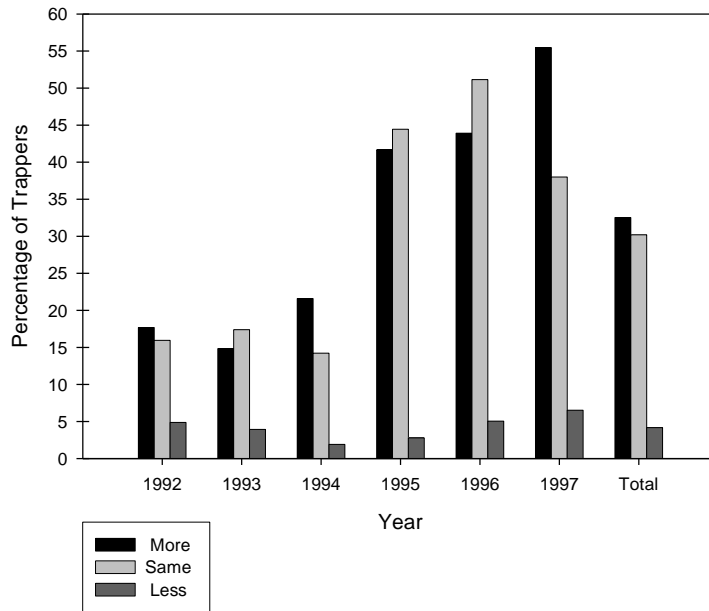


Figure 12: The average percentage of trappers indicating that more, the same, or less cougars were seen on their trapline relative to the previous year.

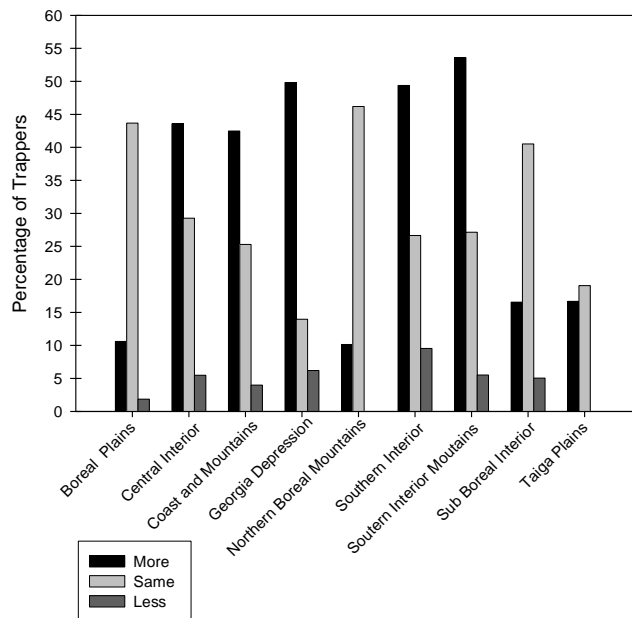
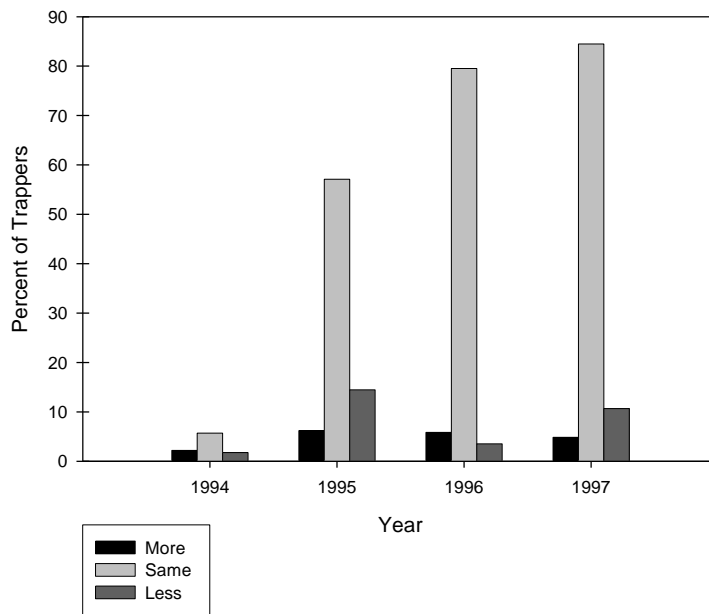


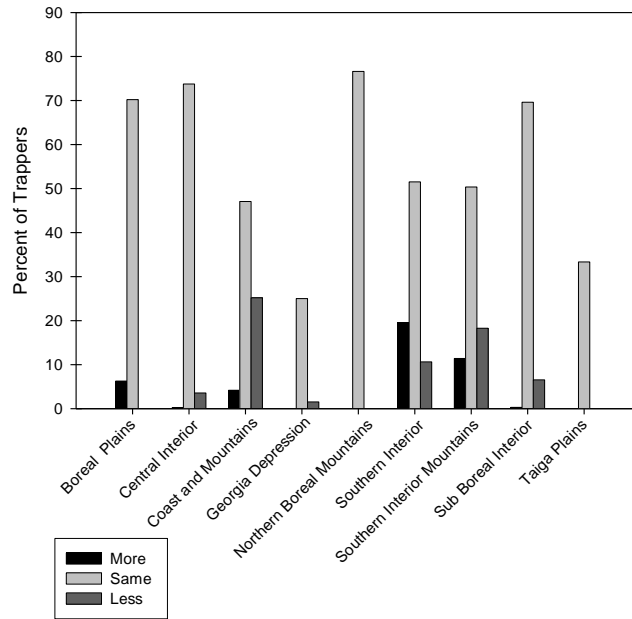
Figure 13: The average percentage of trappers indicating that more, the same, or less cougars were seen on their trapline relative to the previous year by ecoprovince. Data were averaged for the years 1993 through 1997.

The relative change in badger abundance between years was surveyed from 1994 to 1997 (Figure 14). The majority of trappers indicated that badger numbers had remained unchanged in most years. By far the majority of trappers indicated that badger prevalence had remained unchanged in each ecoprovince (Figure 15). However, the prevalence of badgers increased on some traplines in the Boreal Plains, and decreased on some traplines in the Coast and Mountains and Sub Boreal Interior ecoprovinces.

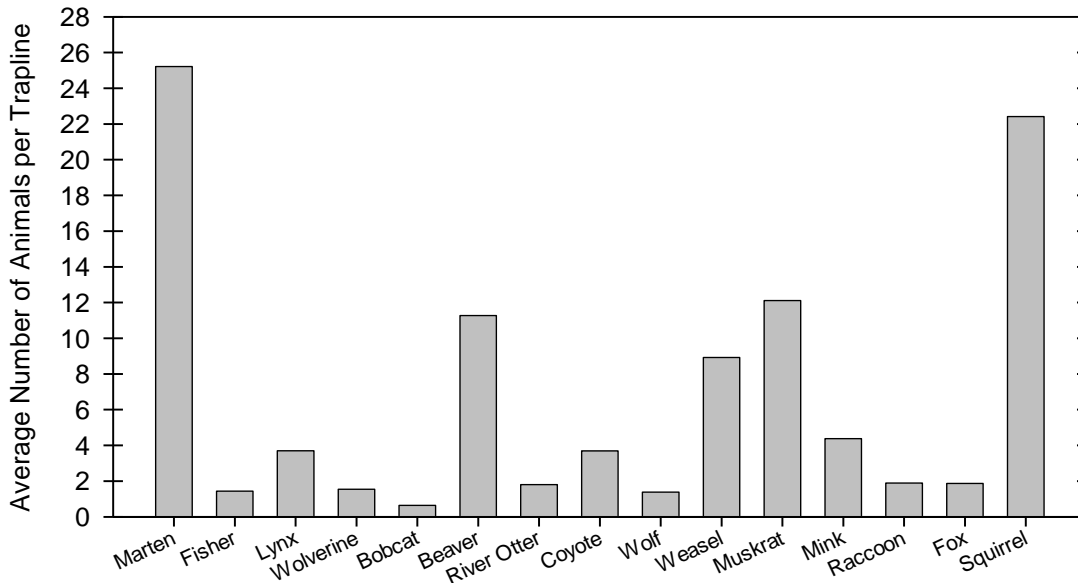


**Figure 14: The average percentage of trappers indicating that more, the same, or less badgers were seen on their trapline relative to the previous year.**





**Figure 15: The average percentage of trappers indicating that more, the same, or less badgers were seen on their trapline relative to the previous year by ecoprovince. Data were averaged for the years 1994 through 1997.**



**Figure 16: Average number of animals trapped in each year per trapline between 1989 and 1997, as indicated by trappers. Fox numbers are averaged from 1993 to 1997 and Squirrel numbers are averaged from 1994 to 1997.**

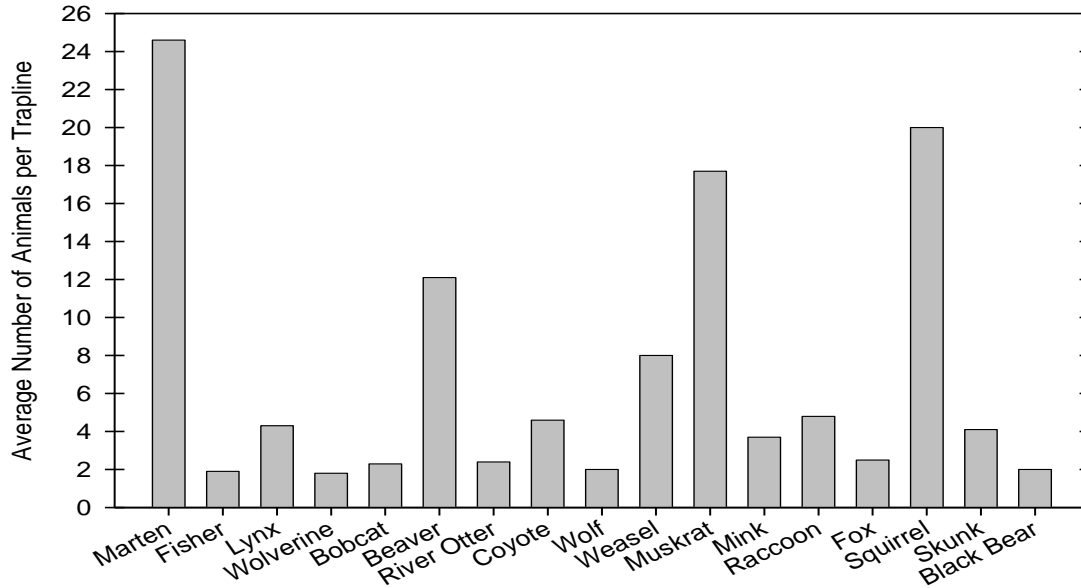


Figure 17: Average number of animals trapped in each year per trapline between 1989 and 1997 as reported in provincial fur harvest database. Fox numbers are averaged from 1993 to 1997 and Squirrel numbers are averaged from 1994 to 1997.

**Discussion:**

An essential component of effective furbearer management programs is the monitoring of furbearer population trends. Various methods are available to wildlife managers for assessing wildlife populations. Many of these methods use data collected from trappers or fur dealers, instead of collecting information on populations directly. Methods include; registration of pelts, fur dealer reports, export permits, trapper affidavits, and trapper surveys (Poole and Mowat 2001).

Each of these methods has distinct advantages and disadvantages. Registration of pelts provides accurate information on the number, date, and location of harvested animals. When combined with carcass collection, it may also provide useful biological information on furbearer populations (Poole and Mowat 2001). Likewise, fur dealer reports can also provide accurate information on pelts entering the fur market. Like pelt registration, this provides a measure of trapper success (Poole and Mowat 2001,

Strickland 1994, Slough 1999). Fur dealer reports may also include bias resulting from differential submission of pelts with changing pelt price (Poole and Mowat 2001), in addition to pelts sold privately or for traditional uses. Export permits collect similar information to pelt registration programs and fur dealer reports; however, they only include pelts that move across jurisdictional boundaries (Strickland 1994). Trapper affidavits and trapper surveys may provide the only means of assessing trapper effort (Poole and Mowat 2001, Strickland 2001, Slough 1999). Trapper affidavits are collected during the yearly licensing process or at the time of pelt submission. They can require trappers to submit information on number of days trapped, number of traps set, and number of animals captured. These data are used to determine trapper effort and success rates. Trapper surveys can collect similar information; however, they usually consist of mail-out or telephone surveys of a random sample of trappers. Both trapper affidavits and trapper surveys suffer from varying degrees of response bias (Poole and Mowat 2001, Raphael 1994, Strickland 1994, Slough 1999, Filion 1981).

In British Columbia, current assessments of provincial furbearer population trends are made from fur dealer reports and through the collection of trapper survey information (M. Badry, Ministry of Water, Land, and Air Protection). Fur harvest data reflects only trapper successes, and as such, it has many inherent biases and may not accurately reflect population trends (Poole and Mowat 2001, Raphael 1994, Strickland 1994, Slough 1999, Walters 1986). Although trapper success may remain high, population levels may decrease dramatically due to increases in trapping effort (Slough 1999, Walters 1986). Alternatively, trapper success rates may fall with stable population levels due to increases in the number of trappers (an unlikely case with BC management practices) or declining effort. Thus, a measure of effort is critical to the appropriate interpretation of changes in harvest rates over time and allows us to calibrate fur harvest data. Catch per unit effort (CPUE) may be the most effective means of monitoring population trends of harvested species (Poole and Mowat 2001, Raphael 1994, Strickland 1994, Slough 1999, Walters 1986).

The British Columbia Trapper Survey may be an effective tool for assessing provincial trends in furbearer populations, furbearer habitat, and trapper effort. The primary criticism of mail-out surveys has been the relatively low success rates observed (Rupp *et al.* 2000, Hatcher 1981, Fillion 1978). However, return rates for this type of survey in British Columbia are much higher than rates seen in other jurisdictions. Returns rates in ecoprovinces with the lowest rates still exceed published expected rates of return for other provinces and states. Although summary data is available for overall returns, the number of responses to each question should be tracked. A single follow-up mail-out seems to be sufficient to obtain high rates of return. However, it is recommended that the number of mail-outs should return to the numbers used before 1994 to ensure adequate sample sizes for all analyses. A third follow-up mail-out may also be needed in areas with low return rates.

The utility of the survey could be enhanced by several changes to the structure, wording, and questions posed in the questionnaire. Specifically, revisions to existing questions, the addition of several questions, and standardized procedures for data storage and analysis would greatly facilitate the effective use and application of this rich source of data. The first and probably simplest revision to the survey is that all British Columbia furbearer species should be added to the list of furbearer species surveyed. Black bears, flying squirrels, ermine and skunks are notable exceptions. Cougars and badgers should be added to all questions except questions asking for the number of each species trapped; since neither cougars or badgers are harvested as furbearers. However, adding them to furbearer species lists for the purposes of the trapper survey would negate the need for a separate set of questions. Specifically, adding cougar and badger to the list of species occurring on individual traplines would solve some confusion regarding trapper response for increasing numbers of certain species where the species does not occur in certain ecoprovinces.

Questions concerning the overall changes in furbearer habitat should remain in the survey. An individual trapper has intimate knowledge of their particular trapline. They observe both habitat and population changes over many years and are perhaps the best

individuals to comment on these reasons for habitat change. However, providing a specific list of reasons for habitat improvement or decline may bias responses (Filion 1981). A list of responses suggests that these are the only reasons for habitat change and the list must not be leading. The results may also be misleading. Reasons for habitat improvement and decline are similar, but contain important differences. Logging was indicated as a major source of habitat decline and natural habitat improvement as a major source of habitat improvement. However, successional stages that occur following logging may be a major source of 'natural' habitat improvement. More flooding or high water was listed as a reason for habitat improvement and both more and less flooding or high water is listed as a reason for habitat decline. Responses should be standardized to include both more and less flooding or high water in both types of habitat change. More or less food is also included as a reason for habitat improvement or habitat decline. It is unclear what this response indicates. Other responses suggest specific reasons for habitat change, but this response indicates only whether the variable itself has changed. This response should be omitted from future questionnaires. Efforts should be made to improve suggested responses to reasons for habitat change. This may be accomplished by the review of the questionnaire by a person trained in survey design and analysis. A professional review by a person trained in survey design would hopefully improve clarity and remove bias.

As describe above, the British Columbia Trapper Survey would be an effective means of assessing trapper effort. However, current questions regarding trapper effort are cursory and do not allow calculation of effort per trapline. It is impossible to estimate population trends without a detailed calculation of trapper effort.

Many factors may influence trapper effort. Population numbers, season length, trap type restrictions, pelt price, weather, socio-economic conditions, skill, motivation, transportation types, and access may all influence trapper effort in British Columbia (Poole and Mowat 2001, Raphel 1994, Strickland 1994, Slough 1999, Walters 1986). Although summary data does suggest a general decline in trapper effort due to changes in pelt price beginning in 1993, other factors may have influenced this decline.

Additionally, there has been no documentation of specific changes in effort. Trappers may not have set as many traps, may not have trapped particular species, or may not have trapped at all. The current line of questioning does not address these issues. Detailed accounting of why trappers have changed the effort they put into trapping may not be possible with the trapper survey. Information on pelt price, weather, etc. may be available from other more accurate sources (see Poole and Mowat 2001 for correlations with pelt price). Trapper experience should still be surveyed as surrogate for skill. CPUE (called CUE) was calculated on the 1989 through 1993 surveys. Questions allowing these analyses were removed from the 1994 and subsequent surveys. Due to problems with the accuracy of data, I have not included them in this report.

Revisions should include questions regarding: the number of traps set by each trapper, the types of trap used by each trapper, and the number of days each trap was set. The number of days trapped may be an effective alternative to the last questions since many trappers may not account for all traps at this level of detail. Some concerns arise with the accuracy of these types of data. However, trappers do account for the number of days they trapped and know the types of traps they use. A survey sent in May or June, immediately following the trapping season, should allow accurate reporting of a trapper's activities over the last season. There will also be various types of response and non-response bias with questions regarding effort. Bias may be more pronounced than with other questions on the survey.

There may also be a perception that the Province of British Columbia is 'checking up' on individual trappers. However, these types of bias exist with other questions and I feel that this already exists with the current questions regarding the number of animals trapped on each line. The benefits gained by questioning the specific activities of trappers are too great to ignore. Measures of trapper effort can be used not only to correct population trend information provided by survey data, but it may also be used to correct provincial fur harvest data.

One other minor revision to the survey should be made. Moose, elk, deer, goat species, and berries should be listed in the food sources for furbearers. Not only are these food source for furbearers they will provide another source of information on the populations trends of these species. It will also provide summary information of the yearly berry production across the province. Data collected on ungulates can be used as a double check on the accuracy of results. They can be cross-referenced with other surveys of ungulate populations.

The specific form of future surveys should be:

Question 1:

What is the status of each furbearer species on a specific trapline? Trappers should indicate: Common (animal is always present and seen on most days), uncommon (sign usually seen each year but not often), rare (occasionally present, but no sign seen in some years), very rare (species or sign are almost never observed), and absent (species never occurs).

Question 2:

What is the population status of furbearer species on specific trapline relative to the previous year? This question is identical to question 1 in previous questionnaires, but it should include all furbearers and cougars. Responses should be indicated as more, less or the same for each species. 'Squirrels' should be differentiated into flying and Red of Douglas squirrels.

Question 3:

What is the number of each individual species captured in the previous trapping season? This is the same as question 2 of previous surveys. The questions should include all furbearers.

Question 4:

What are the overall changes in furbearer habitat that have occurred on a specific trapline relative to the previous year? This is the same as the previous Question 3.

Question 5 and 6:

What are the reasons for habitat improvement or decline on a specific trapline relative to the previous year? The responses for this question should be standardized to include:

more/less logging, more/less road building, more/less mining, more flooding or high water, less flooding or high water, natural habitat improvement/decline, natural prey population cycles, and other. The response of 'other' should provide space for the trapper to describe the reason.

Question 7:

What are the changes in the food sources for furbearers on your trapline, relative to last year? This is the same as Question 6 in previous surveys. This should include all food sources previously listed, but the list should be expanded to include moose, elk, deer and berries. Squirrel species should not be included as the relative abundance of these species was surveyed in Question 2 above.

Question 8:

How has the amount of effort a trapper put into each species changed relative to last season? Responses should include: increased, decreased, unchanged, and did not trap. The species list should include all BC furbearers and cougar. Flying squirrels and tree squirrels should be differentiated.

Question 9:

What were the total numbers of days that traps were set for each species last season? Responses should include all BC furbearers.

Question 10:

What were the total numbers of traps usually set for each species last season? Responses should include all BC furbearers. 'Squirrels' should be differentiated into flying and Red of Douglas squirrels.

Question 11:

How many years has the individual trapper been trapping? This is the same as Question 11 in previous surveys.

The furbearers listed should include: martens, fishers, lynx, wolverines, bobcats, beavers, otters, coyotes, wolves, weasels, muskrats, minks, raccoons, foxes, red squirrels, flying squirrels, badgers, black bears, and cougars. Furbearer food sources should include: snowshoe hares, porcupines, mice/voles, grouse, ptarmigans, moose, elk, deer, goats, berries, and food for beavers.



Data analysis and management of survey information also requires substantial improvement. Currently, only summary information in the form of yearly reports is available. The raw data collected has been stored in poorly organized and unusable formats. Data should be entered yearly into a Microsoft Access database or similar format, and summary reports should use information from all available years. The Province of British Columbia should maintain and administer this database as part of their fur management responsibilities. Its status should be reviewed at the end of each year and the program updated to a current version at this time. The original surveys are also not available. Future surveys should be archived by the Province of British Columbia to ensure that the original data is always available.

In previous questionnaire summaries, substantial mistakes have occurred in the analysis of survey data. For three questions, ordinal data has been coded into numeric form, and these codes averaged to provide a general direction of population change, which is an invalid approach to the analysis of ordinal data (Zar 1984). This has rendered population trend, effort by furbearer, and trend in furbearer prey, data available from yearly summaries unusable. A different form of analysis should be developed along with the new survey. Both analysis and survey designs must be reviewed and this process continued over the long term. This will allow the comparison of a valid and accurate data set between years. With the lessons learned in previous years, a valid design and analysis should be forthcoming. This will produce the long-term data set needed by wildlife managers.

### **Conclusion:**

The British Columbia Trapper Survey is a potentially useful means of accessing the wealth of knowledge regarding the populations of many furbearing species possessed by trappers. However, some simple revisions in data collection and analysis are needed to enhance the utility of this information to wildlife managers. Survey questions should be clarified to remove sampling biases, questions allowing the calculation of trapping effort per trapline are needed, and data management and analysis protocols must be developed.

One cannot underestimate the usefulness of a new information source for fur managers. Population trends are generally estimated from fur harvest data without correction for harvesting effort. Research also provides valuable information, but population numbers are only estimated from information gained in small areas of the province. Extrapolation of this information to other areas may induce substantial inaccuracies. Therefore, some measure of provincial trapping effort is badly needed to calibrate harvest information with population trends. This will provide improved estimates of population trends.

Fur harvest data and trapper survey data should not be used in isolation. Other information sources such as track transects, export permits, trapper affidavits, and research information should be collected (Slough 1999). Only by correlating trend data from a variety of source can an accurate picture of furbearer populations be gained.

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