An Update on the Use of Subsistence-Caught Fish to Feed Sled Dogs in the Yukon River Drainage, Alaska

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Cover Photographs

Split and scored salmon drying in Manley
Photo by D. Andersen

Fort Yukon sled dog
Photo by D. Andersen

Dog team harnesses hanging in Manley
Photo by D. Andersen

Trap line team rests 30 miles north of Tanana
Photo courtesy Stan Zuray

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ABSTRACT

This study was designed as an update of a 1991 survey by the Alaska Department of Fish and Game which quantified the use of locally-caught fish as a source of food for sled dogs in the Yukon River drainage. Between 1991 and 2008 the number of sled dogs and the number of people involved in dog mushing in rural Yukon River communities has declined by more than 50%. A complex set of economic and social changes in rural communities has eroded the ability of many rural dog mushers to adhere to the lifestyle required to keep sled dogs. Data on the use of dogs show a general increase in the use of dogs for sprint racing in 2008 compared to 1991, and an overall decrease in the use of dogs for utilitarian purposes such as trap line transportation. Rural dog teams in 2008 remain highly reliant on locally-caught fish, particularly chum salmon, for food. Survey data suggest that, drainage-wide, mushers harvest more than 1.2 million pounds of locally caught fish annually to feed sled dogs. While this represents a decline from 1991, it underscores the critical and continuing linkages between dog mushing and fisheries in the Yukon River drainage.

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INTRODUCTION

The use of dogs for transportation has a long and colorful history throughout Alaska. Along the open and treeless arctic coast, archeological evidence suggests that the use of dogs to pull sleds developed with the early Thule culture about 1000 A.D. (Alaska Geographic Society 1987; McGhee 1978). Adoption of dog traction has been a more recent development in the wooded interior where an extensive trail network was required to make dog traction practical. Interior Athabascan groups are known to have utilized dogs traditionally for hunting and as pack animals, but throughout most of the Yukon River drainage, the use of dogs to pull sleds appears to have spread gradually inland from neighboring coastal areas; a process that was greatly accelerated during the early western contact and fur trade era of the mid 19th century (Hosley 1981; Osgood 1970, 1971; Slobodin 1981;Townsend 1981).

By the 1840s Russian traders had penetrated the lower Yukon River region from the east, reaching as far inland as the Koyukuk River (Zagoskin 1967). The Canadian-based Hudson's Bay Company entered the upper Yukon from the east and established a post at Fort Yukon by 1847. The lucrative trade in furs provided significant incentives for improved winter transportation methods and the establishment and expansion of new trail networks as the indigenous population modified their seasonal round to emphasize the harvest of furs and access distant trading posts. Across the North, the expanded use of dogs for winter transportation after 1850 and the availability of western commodities such as twine for making durable fishnets led to another important modification in the traditional seasonal round—an increased emphasis on summer fishing to provide dog food (Osgood 1971; Gillespie 1981). These adaptations and the abundant salmon runs of the Yukon River combined to allow dog traction to take hold and flourish in Alaska's interior.

The Klondike gold rush in the 1890s was a watershed event that brought enormous social and cultural change to Alaska's Interior as the once remote inland reaches of Alaska were inundated with EuroAmerican gold seekers. Settlements sprang up around mining camps and trading posts. Sled dogs were at the very center of commerce, offering the most practical means of moving

Fig. 1. Nineteenth century social changes associated with increased western contact, the fur trade, and the Klondike gold rush greatly expanded the use of dogs for winter transportation across Alaska's interior. UAF Rasmuson Library Alaska and Polar Regions Collection, Walter W. Hodge Papers #2003-63-273.

people and goods during the winter months and the web of winter trails was greatly expanded throughout the Yukon drainage. At the height of the Klondike gold rush during the winter of 1897-98, working dogs were selling at Dawson for $250 to $400 apiece and salmon dried as dog food was commanding a dollar a pound (Wells 1900). By 1900 the epicenter of gold mining activity had shifted to Nome and sled dogs there were sold for as much as $1,000 (Alaska Geographic Society 1987). This, at a time when a pair of farm oxen cost less than $100 in the American Midwest, and a skilled union mine worker in the U.S. drew a salary of about $400 a year (Crichton 1998).

The period 1900 to 1940 encompasses the peak of the sled dog era in the Yukon River drainage. The frenzied boom and bust pace of the gold rush gradually slowed to a more sustainable pace of settlement and development as gold camps, trailheads, and trading posts evolved into permanent communities. Commercial dog teams were utilized as the primary means of moving passengers, freight, and mail between settlements, and virtually every family maintained a small number of sled dogs used for a variety of winter subsistence activities and general transportation. The

Fig. 2. The early 20th century saw the rise of commercial dog teams for the winter movement of freight, passengers, and mail throughout the Yukon River drainage. **UAF Rasmuson Library Alaska and Polar Regions Collection, Lockyear Papers #2005-92-13.**

harvest and drying of summer and fall chum salmon (*Oncorhynchus keta*) for use as dog food evolved into a local industry and bales of dried salmon, bundled 50 fish to the bale, became a standard of trade at trading posts and stores with a value of about ten cents a pound. A 1918 survey of the Yukon River by the U.S. Bureau of Fisheries estimated that one million salmon were utilized each year to feed an estimated 6,000 working dogs in the drainage (U.S. Bureau of Fisheries 1920). In addition to the utilitarian use of dogs for transport, dog racing began to emerge as an organized sport prior to 1910. The success and popularity of the first officially sanctioned dog race "The All Alaska Sweepstakes" held in Nome in 1908 prompted the establishment of organized kennel clubs and dog racing events throughout Alaska. Today's premier dog racing events such as the North American Open and the Iditarod can trace their origins to these early races (Alaska Geographic Society 1987).

In the 1930s airplanes began to replace commercial dog teams for the movement of freight and mail but sled dogs continued to provide the bulk of winter transportation for individuals and families throughout the Yukon River drainage. In the 1960s mechanical alternatives to dog sleds

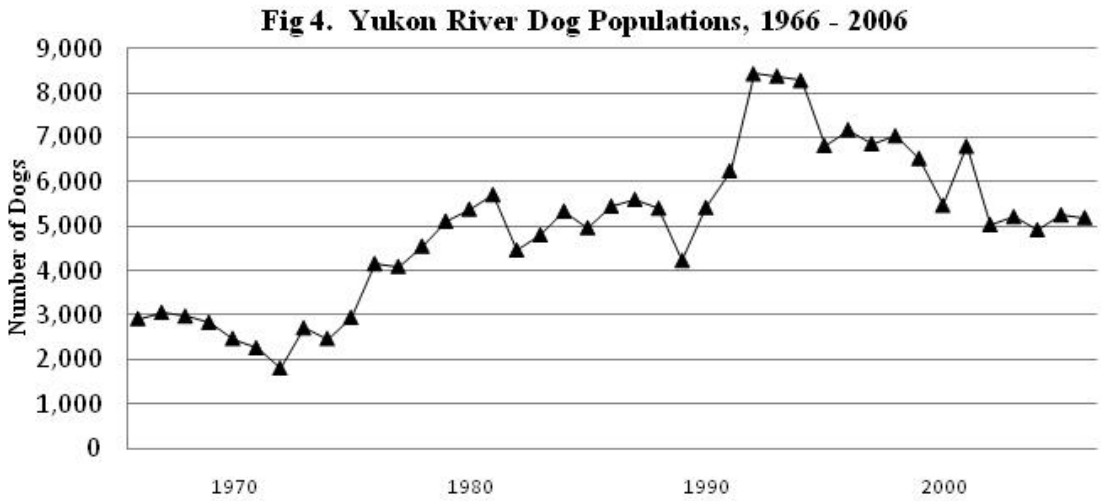
Fig. 3. Dried Yukon River chum salmon evolved as the dog food of choice to support sled dog operations and became a standard of trade at Yukon River trading posts. These photos taken nearly a century apart show how little things have changed. Top photo from UAF Rasmuson Library Alaska and Polar Regions Collection, Candace Waugaman collection #2003-183-11. Bottom photo by the author, 2008.

were introduced and popularized for individual use. For serious back-country hunters and trappers, the expense and unreliability of early snowmobiles made the transition from dogs to snowmobiles a gradual one. But with improvements in reliability, the snowmobile had largely replaced the ubiquitous family dog team by the early1970s. Dog populations along the Yukon declined but did not disappear. In most rural communities, a small number of individuals retained the use of dogs out of preference or because of limitations associated with snowmobiles in certain terrain conditions. One Fort Yukon musher remembered this transition period this way:

> "By about '69 them sno-gos had really made in-roads, lots of people had 'em but people still kept their dogs……not everyone got rid of their dogs but they started to use 'em different……you know, training 'em for spring carnival races where they could make some money and using the new snow-gos for most of the utility work. For the guys who still had dogs and liked having dogs, racing became a bigger and bigger focus." (KR03, Fort Yukon)

While village dog racing had long been part of community spring carnival events along the Yukon River, the increased interest in racing gave rise in the 1970s to organized village racing associations. Increases in prize money available to local mushers and the establishment of high profile distance race events such as the Iditarod and Yukon Quest continued to fuel the resurgence in dog mushing and sled dog numbers in Yukon River communities rebounded.

Since the late 1960s, the Alaska Department of Fish and Game has conducted annual post-season salmon harvest surveys in all Yukon River salmon fishing communities (Fig. 4). These surveys



Source: ADF&G Historic Subsistence Salmon Database

provide estimates of the total number of dogs in each survey community. While these dog numbers make no distinction between sled dogs, household pets, adult dogs, and puppies, they are the best available source for tracking general dog numbers and trends across the drainage. This data set shows relatively low dog numbers in the late 1960s followed by growing numbers of dogs through the 1970s and a dog population holding relatively stable at about 5,000 dogs through the early 1990s. A spike in dog numbers in the mid 1990s is followed by a sustained downward trend in dog numbers to the present that generally coincides with a period of declining salmon numbers.

This report describes the results of a two year research effort to gain a current assessment of the quantities of fish used to feed sled dogs in the Yukon River drainage. A 1991 study by the Alaska Department of Fish and Game, Division of Subsistence (Andersen 1992) produced a data set that provided history and background on the use and feeding of sled dogs, as well as (then current) estimates of dog numbers and the quantities of fish being used to feed them. The issue prompting that study was a proposal to the Alaska Board of Fisheries to prevent commercial dog teams from being fed subsistence-caught fish. Sponsors of the proposal alleged that large dog yards supported by huge harvests of salmon and involved primarily with racing activities constituted commercial enterprises that did not meet the legal definition of subsistence use. However, the customary and traditional maintenance of dog teams for transportation is specifically allowed under both state and federal definitions of subsistence.

The 1991 research effort was designed to provide the Alaska Board of Fisheries with basic background on the history of dog traction in Alaska's Interior region and the traditions that have evolved surrounding the use of fish to feed sled dogs. Using information gathered from surveys with 95 active mushers that study concluded that:

- Subsistence-caught fish represented a traditional and important source of food for most village dog teams.
- An estimated 5,000 sled dogs were being maintained to varying degrees using subsistence-caught fish in rural Yukon River communities.
- The most common fish species used for dog food were summer chum, fall chum, and coho salmon, referred to collectively as "small salmon."

- With subsistence harvests of Yukon River small salmon typically ranging between 400,000 and 500,000 fish (1984-1988 harvest figures) the number of Yukon River small salmon used to feed dog teams likely exceeded 250,000 fish annually.
- Most village dog yards tended to be small with 15 dogs or less.
- In general, the larger the dog yard the smaller the percentage of the diet that was contributed by fish.
- Virtually all village dog teams were used for multiple purposes, some of which, such as local racing events and trapping, resulted in cash proceeds and might potentially be defined as commercial activities.

In the end, based on information and public testimony presented to the Board, the 1991 proposal to restrict the use of subsistence-caught fish to dog teams involved in certain activities was rejected by the Board of Fisheries.

Beginning in the mid-1990s Yukon River salmon runs began experiencing declines. In response, State and Federal conservation measures and management actions have gradually imposed increased fishing restrictions, and in some cases, fishing closures. For fisherman living along the Yukon, the net result of lower salmon numbers and more restrictive management actions has been declines in the number of salmon harvested for subsistence use. In 2000, for example, the total subsistence harvest of Yukon River small salmon (for all uses) was estimated at less than 100,000 fish, with an estimated 21,000 salmon utilized for dog food (Busher and Hamazaki 2005). If these data are accurate, village dog mushers in 2000 were utilizing less than 10% of the salmon estimated by Andersen (1992) a decade earlier. Until this study, the effects of these changes on the size and number of dog teams maintained in rural communities had not been specifically examined. How had mushers coped? It seems improbable that dog team owners heavily reliant on salmon to feed their dogs could deal with significant reductions in salmon harvests for a period of years without reducing kennel size or altering long-standing feeding practices, or both. And while declines in the availability of salmon may have provided incentives for some mushers to reduce dog numbers, the rapidly rising costs of purchasing and operating mechanized alternatives to dog-teams may have provided others with incentives to retain or return to the use of sled dogs. The baseline data set collected in 1991 provided a rare opportunity

to examine the dynamics of one of the more significant uses of subsistence-caught fish in interior Alaska during a time of unprecedented change. This study was designed as an update to the 1991 data set using the same methodology, researcher, and study communities, in order to understand what changes have occurred with regard to village dog teams and the strategies mushers utilize to feed them.

OBJECTIVES

The study objectives as outlined in the investigation plan are as follows:

1. Estimate the number of sled dogs in rural Yukon River communities.
2. Describe contemporary uses of dog teams in Yukon River communities.
3. Assess the extent to which subsistence-caught fish (salmon and non-salmon) are used to feed dogs.
4. Compare these data with data gathered in 1991 to assess changes and evaluate implications for subsistence management.

METHODOLOGY

Sample communities and overall methodology mirrored those utilized in the 1991 study in order to achieve a comparable data set and assess specific changes. The seven study communities are Fort Yukon, Huslia, Kaltag, Manley Hot Springs, Russian Mission, St. Mary's, and Tanana (Fig. 5). Together, these communities are thought to represent the diversity of the Yukon River drainage in terms of geography, Native cultures, fishery resources, and participation in dog mushing activities. Study communities were informed of project funding and provided with a project description in 2007. In advance of fieldwork, village and/or tribal councils were contacted by the researcher to coordinate the timing of field visits, obtain a tentative list of local dog mushers, and seek input regarding possible local assistants.

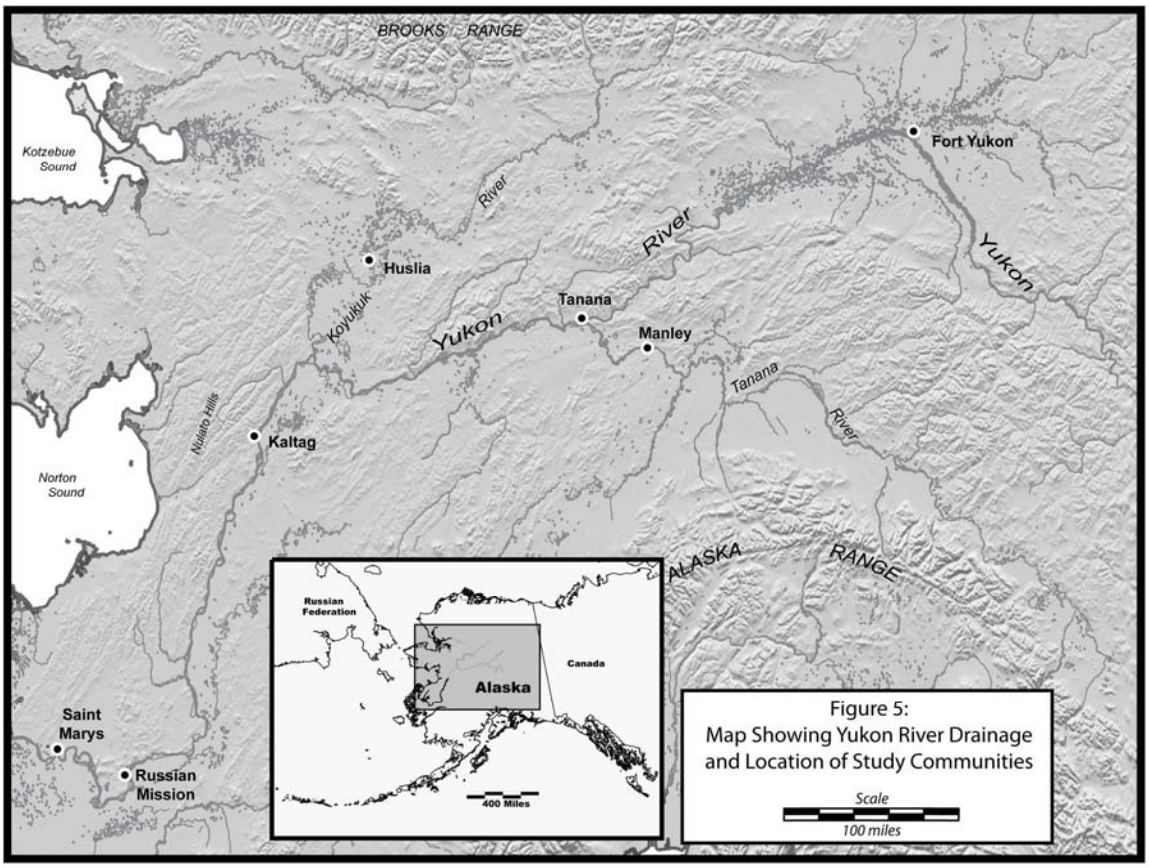


Figure 5: Map Showing Yukon River Drainage and Location of Study Communities

Standard ethnographic research methods were utilized to collect data, including face-to-face surveys conducted with all available dog-team owners in each study community, and key respondent interviews with a small subset of current and former mushers. Surveys and interviews were conducted by the principal investigator. In each community, paid local assistants were utilized to compile a list of local mushers, arrange interviews, and facilitate introductions. In some cases the local assistant accompanied the researcher to observe the data collection process. Each surveyed musher and key respondent was given a small honorarium for their participation.

During the period May through December 2008 data collection trips were made to all seven study communities. Table 1 shows the dates of survey trips and the number of mushers surveyed in each study community. With input from tribal councils and local assistants, a total of 42 active mushers were identified in the seven study communities and surveys were completed with 32 of them for an overall contact rate of 76%. For the 10 mushers who were unable to be surveyed,

Table 1. Survey Sequence, Survey Dates and Contact Rates by Community, 2008

Study Community	Survey Dates	Number of Mushers	Number of Mushers Surveyed	Contact Rate
Tanana	5/27/08 - 5/29/08	11	9	82%
Fort Yukon	6/24/08 - 6/26/08	10	9	90%
Kaltag	7/30/08	0	0	N/A
Manley	8/28/08 - 8/29/08	8	6	75%
Huslia	10/1/08 - 10/2/08	5	3	60%
Russian Mission	11/5/08 - 11/7/08	5	3	60%
St. Mary's	12/10/08 - 12/12/08	3	2	67%
Totals		42	32	76%

most were away from the community at the time of the visit. Several mushers declined to participate in the survey. For each of the 10 unsurveyed mushers, dog numbers were obtained by speaking with other household members or by the researcher personally observing the dog-yards and counting the dogs. Thus, the number of mushers and the number of adult sled dogs is thought to accurately reflect community totals at the time of the survey.

The 2008 musher survey (Appendix A) was organized in two parts. Questions 1-11 were taken largely from the 1991 survey in order to allow data comparisons between survey years. These questions were designed to collect a core set of information on dog numbers, dog uses, quantities of fish harvested for dog food, and other food items used to feed dogs. These questions were asked of all 32 survey respondents. Questions 9 (strategies for dealing with low salmon years) and 11 (the affect of high gas prices on mushing involvement) were added specifically to the 2008 survey and do not have 1991 counterparts.

The “Focus on Change” questions 12-14 are also unique to the 2008 survey. These questions were asked of respondents with 10 or more years of mushing involvement. Twenty three of the 32 mushers surveyed (72%) met this criterion. This group of mushers would have been the most

likely group to have experienced and been affected by declines in Yukon River salmon numbers and the fishing restrictions imposed by management agencies. Questions 12-14 were designed to gather information and comments on if and how declines in salmon runs had affected the number of dogs kept, the way they used their dogs, or the way their dogs were fed.

In addition to survey work, key respondent interviews were also conducted during community visits. A total of nine interviews were carried out with current and former mushers identified as particularly knowledgeable about dog mushing. These relatively free-ranging discussions were intended to provide additional history and context to the survey data that would assist in providing a more complete picture of the current status of dog mushing in the Yukon drainage. Recordings were made of seven of the interviews. An equipment malfunction caused one interview to go unrecorded and one respondent agreed to be interviewed but asked that it not be recorded. Backup hand-written notes were used to capture information from both of the unrecorded interviews.

Responses to survey questions were subjected to a double data entry procedure to assure accuracy. Survey data consist of both quantitative and qualitative data. Quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS) and provide the core data set for comparison with the information collected in 1991. Qualitative data consisting of written responses to open ended survey questions and selective tape transcripts of key respondent interview recordings have been compiled and categorized and appear either as direct quotes in the narrative below or have been used to provide context to the quantitative data set.

In adherence to accepted confidentiality standards, verbatim comments from respondents that are included in the narrative below do not identify individuals by name. Comments taken from survey respondents are identified by household (HH) number and community. Interview excerpts are identified by key respondent (KR) number and community.

RESULTS

Community Size, Mushing Households, and Sled Dog Numbers

Study communities have undergone population changes since the 1991 study was completed. Table 2 presents population data for 1990, 2000, and 2008 that show general demographic trends. Overall, there were slightly more people residing in the seven study communities in 2008 than there were in 1990. However, the 2008 population represents an overall decline from the number residing in those communities in 2000. Between 1990 and 2008 the lower Yukon River communities of Russian Mission and St. Mary's appear to have steadily increased in size while communities in the upper portion of the drainage have mostly declined, some significantly so, such as Tanana, where the population has declined by nearly 27%.

In 1991 there were 95 mushing households in the seven study communities. In 2008 the number of mushing households had dropped to 42, a decline of 56%. As shown in Table 2, the number of mushing households declined in all seven communities and was not regionally concentrated. Emblematic of this decline was the community of Kaltag which had 11 mushing households and 113 sled dogs in 1991 and had no active mushers or sled dogs in 2008. For this reason, Kaltag has been omitted from the community listings on most subsequent 2008 data tables.

Table 2. Population, Number of Mushing Households, and Number of Sled Dogs in Surveyed Communities 1991 and 2008

Study Community	Community Population			Number of Mushing Households		Number of Sled Dogs	
	1990	2000	2008	1991	2008	1991	2008
Fort Yukon	580	647	587	22	10	245	135
Huslia	207	293	227	11	5	153	83
Kaltag	240	230	188	11	0	113	0
Manley	96	74	77	9	8	234	114
Russian Mission	246	296	362	10	5	100	74
Saint Mary's	441	537	541	9	3	91	28
Tanana	345	305	252	23	11	427	237
Total	2,155	2,382	2,234	95	42	1,363	671

Source for Population Data: U.S. Census and Alaska Department of Labor

The 32 mushers surveyed in 2008 ranged in age from 17 to 70 years old and averaged 49 years of age. In response to the survey question "How long have you been involved in mushing dogs?" the average musher reported 28 years of mushing experience. In 1991 the average age of surveyed mushers was 41 and the years of mushing experience averaged 19 years. These data indicate that the current mushing population, on average, is older and more experienced than the mushing population in 1991 and suggests a general lack of new and younger mushers entering the ranks of village dog mushers to replace aging mushers. Table 3 shows the average age of surveyed mushers in each community for both study years. These data show that the average age of mushers has increased in every community except Russian Mission where it has declined by two years. The increase in the average age of mushers is particularly striking in Huslia where the average age of surveyed mushers there in 1991 was 30 years of age and by 2008 the average age of mushers had increased to 54. Similarly, in Fort Yukon, the average age of surveyed mushers in 1991 was 40 and in 2008 had increased to an average age of 54.

Table 3. Average Age of Respondents (Mushers), 1991 and 2008

Study Community	Average Age of Respondent	
	1991	2008
Ft. Yukon	40	54
Huslia	30	54
Manley	43	53
Russian Mission	37	35
St. Mary's	40	48
Tanana	43	45
All Communities	41	49

Table 4 shows the average years of involvement in dog mushing in each community for both study years. These data show that the average years of mushing experience increased in all communities except Manley where several relatively new residents had only recently become involved in dog mushing. While the average years of mushing involvement for Tanana was

Table 4. Average Years Dog Mushing, 1991 and 2008

Study Community	Average Years Dog Mushing	
	1991	2008
Ft. Yukon	17	35
Huslia	6	29
Manley	28	17
Russian Mission	6	28
St. Mary's	15	25
Tanana	27	28
All Communities	19	28

similar in 1991 and 2008, the increases in average years of mushing involvement in the four remaining communities is significant.

Survey question 1 asked mushers "How many sled dogs do you currently have?" The answer to this question is more complicated than one might suspect. As dogs age, are retired, or die, they are replaced through planned litters or by purchasing replacement dogs. At any give time, mushers may have one or more litters of puppies in various stages of development that may or may not be eventually kept as part of their dog yard. Mushers typically look for specific qualities in puppies depending on how their dogs are used and a litter of six or eight puppies might eventually yield one or two dogs that meet those requirements and are retained. The comment of one musher with a dog yard of 14 dogs was typical as he described the structure of his kennel:

> "I like to have a mix of old and young dogs…..or lets put it this way…….a mix of experienced and younger dogs, and I don't like my team to get too old. I'll usually have one litter of five or six pups…..one litter a year, and if I get two pups out of that litter I'm lucky. Running them behind a sno-go when they're three months old I can usually get rid of half that litter—so I can safely get rid of three pups right off the bat, and then the next three you want to keep them for a good part of the winter to see how they pan out." (KR01 Tanana)

Thus, the total number of dogs for any given kennel at a given time is variable but tends to revolve around a certain number of adult dogs that each musher has settled on as the ideal to meet their needs. Mushers tend to structure their dog yards and gauge their winter food requirements around a certain number of adult dogs. For this reason, puppies were excluded from dog numbers on both the 1991 and 2008 musher surveys. Surveyed mushers were specifically asked to report the number of adult dogs; those nine months old or older. All dog numbers reported below reflect this criterion.

In 1991 the total number of sled dogs owned by mushing households in the seven study communities was estimated at 1,363 dogs (Table 2). The 2008 survey found just 671 sled dogs in the seven communities, a decline of 692 dogs or 51%. The decline in the number of sled dogs was not region specific and occurred in all surveyed communities. Dog kennels or dog yards maintained by mushers in 2008 ranged in size from 4 to 80 dogs (Fig. 6). A majority of surveyed mushers (63%) reported having less than 15 adult sled dogs. Only four of the 32 mushers surveyed (13%) maintained dog yards of 30 dogs or more. This distribution of kennel sizes was nearly identical to those reported in 1991 where a similar majority of mushers (57%) reported having less than 15 dogs and just 10% of mushers reported having kennels with 30 dogs or more. These data suggest that the decline in mushing between 1991 and 2008 has involved mushers across all kennel sizes.

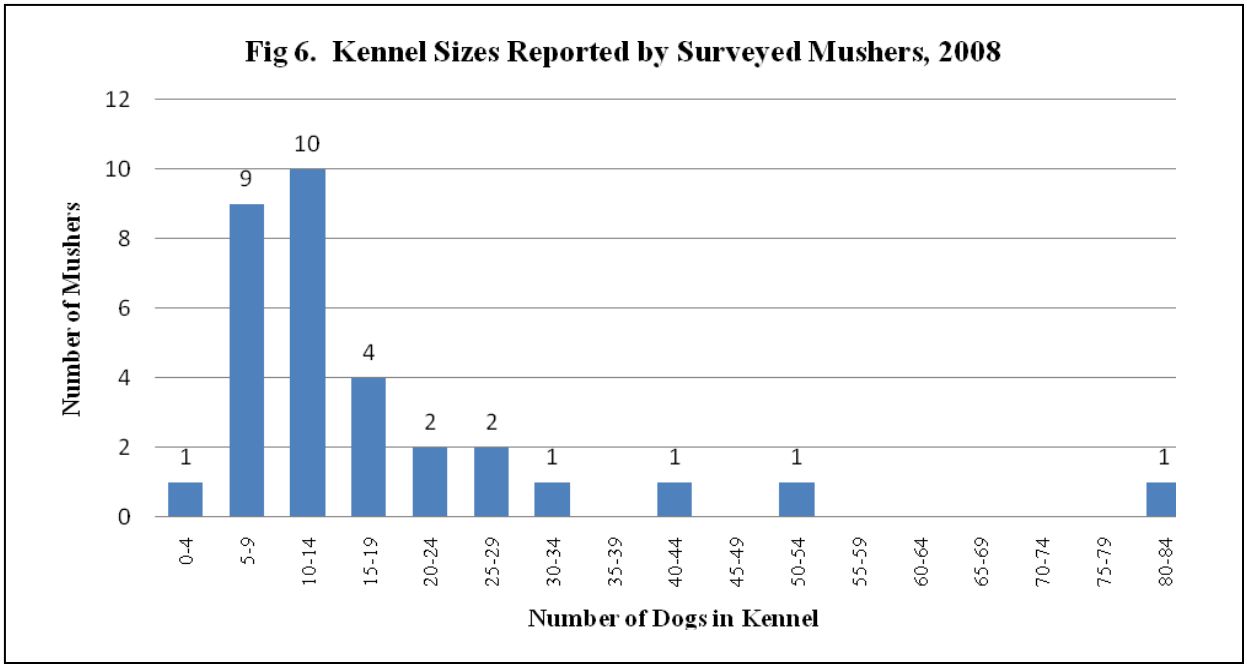


Fig 7. The largest dog-yard among surveyed mushers (above) contained 80 adult sled dogs. A majority of surveyed mushers (63%) reported having less than 15 dogs. Photo courtesy Caroline Brown, ADF&G.

Among the seven surveyed communities, the upper Yukon River communities of Fort Yukon, Manley, and Tanana stand out as those that are most involved in dog mushing activity. These three communities account for 29 or 69% of the 42 identified mushing households and 486 (72%) of the 671 sled dogs owned. All of the mushers reporting dog yards with more than 25 dogs resided in Manley or Tanana.

How Sled Dogs are Used

Survey question 2 asked mushers to select use categories that described how they used their dogs. In both 1991 and 2008, few dog teams were described as being used for a single purpose. Most teams had multiple uses which frequently included a mix of both racing activities and utilitarian transportation. The median number of use categories identified by mushers in 1991 was four. In 2008, the median number of use categories identified by surveyed mushers was three. The use of sled dogs by category of activity is presented in Table 5.

Table 5. Use of Sled Dogs by Use Category, 1991 and 2008, With Surveyed Mushers Able to Identify Multiple Uses.

Use Category	Percentage of Surveyed Mushers	
	1991	2008
Transportation / Camping / Recreation	82%	63%
Hauling (wood, water, etc.)	56%	66%
Sprint Racing	54%	69%
Trapping	44%	22%
Watch Dog / Guard Dog / Bear Dog	44%	34%
Household Pets / Scrap Dogs	29%	6%
Distance Racing	28%	13%
Breeding Dogs for Sale	27%	16%
Rent or Lease Dogs or Teams	21%	19%
Other Uses	13%	19%

For both 1991 and 2008, the three use categories with the highest percentage of mushers remained the same. In both study years, the categories of general transportation, hauling, and sprint racing were the only use categories selected by 50% or more of surveyed mushers. The 2008 data show an increase in the percentage of mushers using their dogs for hauling wood and water, and for sprint racing. The 2008 data show decreases in all other use categories. The most significant decrease was in the use of dogs for trapping. In 1991 44% of surveyed mushers identified trap line transportation as one of the ways they used their dogs. In 2008 only 7 of 32 mushers (22%) reported using their dogs for trap line transportation. Trap line use was reported by mushers in Fort Yukon (2), Huslia (1), Manley (1), and Tanana (3). In general the use of dogs for utility purposes such as hauling and trapping was more common among mushers in upper Yukon communities. All of the surveyed mushers (100%) in Fort Yukon reported using their dogs for utility hauling, including those teams that were involved in racing.

Fig. 8. Sled dogs are still used by mushers for utility purposes. Twenty two percent of surveyed mushers reported using their dogs for trap line transportation (left) and 66% of surveyed mushers used dogs for hauling wood and water (right). Photos courtesy of Stan Zuray, Tanana.

The use of dogs for distance racing declined from 28% in 1991 to 13% in 2008. The 2008 data also show a drop in the percentage of mushers using dogs for general transportation/ camping/recreation, and in the percentage that regard their dogs as pets or "scrap dogs." The term "scrap dog" is commonly used on the middle and lower Yukon River to refer to dogs that are retained for the purpose of consuming camp and household table scraps. In the catch-all category "Other Uses" a small number of mushers listed using dogs for winter hunting transportation, commercial tourism trips, checking winter fish nets, and pack dogs.

The use category showing the largest increase in 2008 was sprint racing. Sixty nine percent of the mushers surveyed in 2008 identified sprint racing as one of the ways their dogs were used, the highest percentage of all the use categories. While some village mushers retain sponsors and are competitive in regional or statewide racing events, involvement in racing for most mushers was generally limited to participation in local village spring carnival races. Sled dog races remain a focal point of spring carnival activities in many Yukon River communities and serve to involve whole communities in the traditions surrounding dog mushing. Local mushing associations raise prize money through raffles and other fund raising activities and surrounding

communities tend to stagger the timing of their carnivals so teams can travel between communities to compete in multiple races. In communities where dog racing remains active, race categories are structured to involve both men and women and all age groups, and range from short, single-dog "fun runs" to highly competitive multi-day events. Prize-money from local races offers mushers the opportunity to defray some of their kennel expenses. A first place finish in a spring carnival race might pay the winner several hundred to several thousand dollars.

Several mushers commented that sled dog racing was now the major force in keeping mushing alive in their community and that snowmobiles had virtually taken over the utility tasks formerly done with dogs. In this way snowmobiles appear to have played a role in turning the focus of village dog mushing to racing and this has, over time, changed the genetic make-up of village dogs.

> "Snowmachines made it so much easier for haulin' and trappin', you know, actually they're better, really, cheaper and easier than dogs. Dogs are a lot of work. That's the main thing……the guys that have 'em now are just the very few die-hards that like dogs and dog racin'. The villages used to have the best dogs…..Huslia especially, Tanana, and down that area. They had the best dogs there was and they'd win all the races. Then these guys from outside come up and start buying these dogs……they'd buy whole teams just to get a couple good dogs that they wanted. And they took that breed and the villages have lost it now. Then I think it was the Europeans that brought the hound into it…..Sprint racing now has become so competitive that local village racers have no where to go up the ladder because the next rung up is an elite level they can't compete in. " (KR04, Fort Yukon)

> "Village dogs today are all bred for speed. Sprint racing is keeping mushing going in most the villages I visit. Because the emphasis is now on racing, most dogs are not really much good as work dogs. For one thing, when they are in harness all they want to do is pull hard and go fast. Work dogs need to be trained to listen, stop, and go slow and steady. Work dogs, like trap line dogs take dogs with a different personality than the average sprint dog. The race dogs now all got hound in 'em that changes the breed…….they don't tolerate the cold as well as the old village dogs used to. A couple of my dogs have to wear coats all winter long….even when they run races. "(KR05, Russian Mission)

For decades, village sled dogs, known generally as "village huskies" were characterized by a large to medium build and thick coats and were known more for endurance than speed. Mushers commented that it was difficult to find dogs with these qualities any more. Over the years, various hound, pointer, and shorthair strains have been bred into sled dogs by major breeders in

Fig. 9. Racing sled dogs remains a central part of spring carnival activities in most Yukon River communities. Sixty nine percent of mushers surveyed in 2008 reported participating in sprint races, the highest percentage of any use category. Photos courtesy of Kevin Solomon, Fort Yukon.

order to increase speed. Offspring of these dogs find their way into village kennels, and through interbreeding, hound characteristics are now common in many village dogs. As a result, the average village sled dog today is of smaller build, and has a thinner coat than was common 15 or 20 years ago. The introduction of hound strains has also affected the personality of dogs. These changes have necessitated changes in both dog care and dog handling according to several mushers. In the words of one respondent " We'll be in a world of hurt if we ever have to go back to using real working dogs….them kind are getting few and far between" (KR02 Tanana). Additional comments pertaining to changes in the genetic make-up of village sled dogs include the following:

> "This hound strain they got in the dogs now has changed the dogs in more ways than just speed. They got different personality, and the buggers are just high maintenance……actually they are four times the maintenance of a regular husky…….you got to give 'em twice the bedding, three times the food, and about four times the water……the liquids. You got to be worried about them freezin' all the time." (KR03 Fort Yukon)

> "Old days….the dogs didn't even need dog houses. My old man had dog houses but them days you didn't really need em 'cause the dogs had fur. But now, these dogs got so much mixed breed in 'em…..started to change about 20 years ago. I don't think anyone has traditional dogs left now…..they got no coats!...just short hair. " (KR07 St. Mary's)

> "The hound in the dogs now has ruined the breed for what we used to do with dogs. At first it was just the sprint dogs and the distance dogs were more like the old breed. Now its everywhere, even the Iditarod dogs that come through here got it in 'em. Old days, dog didn't even need booties because they spend all summer runnin' up and down the gravel beach down there and got tough paws. " (KR08 Kaltag)

> "These days dogs are different. Them hounds…..not like old days. These dogs nowadays, you holler at them and they won't work for you. They won't work hard. If I go back there, talk nice to them, pet them, play with them, then they'll go fast when I hook them up. The old breed……I really train them hard and if anybody is catching me in a race I just pop the whip and they take off faster. But these ones now…..if I pop the whip they just get mad at me and quit. Different dogs nowadays……them hounds is just a whole different training strategy." (KR09 Huslia)

Survey question 4 asked mushers how many working snowmobiles were owned by the household. The purpose of this question was to determine if mushing households tended to rely solely on dogs for winter transportation. In 2008 the number of snowmobiles owned by the mushing household ranged from 0 to 4 and averaged 1.5 per household. Only two surveyed mushers (one in Fort Yukon and one in St. Mary's) reported that they did not currently have a

working snowmobile. These data might be somewhat misleading in that one indicated that his snowmobile was currently being repaired and the other reported that he tended to use 4-wheelers for transportation around the village instead of a snowmobile. In 1991 the number of snowmobiles owned by mushing households ranged from 0 to 8 and averaged 1.6 per household. Comparing 1991 and 2008 survey data regarding snowmobile ownership is complicated by the general shift toward using 4-wheelers for transportation within communities. Four-wheelers have the advantage of being able to be used year-round and have largely replaced the use of snowmobiles for in-village transportation. Snowmobiles are still essential for most households involved with back-country travel, hunting, and hauling. The survey data pertaining to snowmobile ownership do illustrate that there are very few mushers that rely solely on dogs for winter transportation. Most mushing households are using sled dogs for specific activities such as racing or general trail use, and use mechanized transportation for others activities such as trail-breaking or transportation within the community.

How Sled Dogs are Fed

Overview of Fish Harvest, Preservation and Preparation Methods

Prior to presenting survey results on the quantities of fish fed to dogs, it may be useful to briefly review some of the common practices involved in fishing to feed sled dogs. Strategies related to fishing for dog food, timing of fishing activities, gear used, preservation methods, and the fish species targeted, vary between mushers based largely on geographic location. Despite these variations, the goal of mushers across the drainage is basically the same as it has been for generations: to make the best utilization of locally harvested fish resources to support their dog mushing activities. To that end, there are some drainage-wide commonalities that characterize the year-round effort and lifestyle that is involved with the practice of feeding fish to sled dogs. Some of the basic elements with regard to feeding strategies, species utilized, gear types and preservation methods are briefly described below.

Fish species commonly used for dog food. In general, mushers seeking fish to feed sled dogs will use almost any fish species as dog food. However, some species are preferred or specifically targeted over others because they are available in abundance and can thus be harvested in large quantities relatively efficiently, or because they are recognized as being an

especially good quality or nutritious food, or both. Salmon are perhaps most closely associated with the practice of feeding sled dogs, and as described above, the use of salmon to feed sled dogs in the drainage has a rich history and tradition. Yukon River salmon runs are targeted by mushers throughout the drainage as those runs pass their fishing locations. Chinook or king salmon (*Onchorhynchus tshawytscha*), which ascend the Yukon River in early summer, are almost universally regarded as human food, but the cutting scraps and entrails associated with the processing of king salmon for human use are commonly utilized by mushers and can represent a significant source of dog food during the early fishing season. Summer and fall runs of chum salmon (*O. keta*) and coho salmon (*Onchorhynchus kitsutch*), known collectively as "small salmon" are a major source of food for both humans and sled dogs. While they are recognized as distinct runs by managers and fishers, salmon runs commonly overlap and harvests frequently consist of multiple species. Summer chum are reported by many mushers to be less desirable than fall chum and coho.

> "We don't really like the summer chums…..sorry, they're just worthless. I mean……you can throw them in the dog cooker and feed 'em but as far as cutting them they just shrivel up, they get maggots, they're really a pain…..so we're not really excited about 'em." (KR06, Manley)

Overall body condition and quality of harvested fish can vary depending on species and proximity to spawning streams. Fishers commonly make decisions about how fish will be used as they are removed from gear, with prime quality fish processed and saved for human use and lesser quality fish relegated for dog food.

Mushers make significant use of non-salmon fish species as well. Salmon fishing activities, whether one is fishing for human use or for dog food, typically produce incidental harvests of other fish such as sheefish (*Stenodus leucichthys*), northern pike (*Esox lucius*), burbot (*Lota lota*), longnose sucker (*Catostomus catostomus*), and several species of large and small whitefish (*Coregonus sp.*). These incidentally-caught species are utilized for both human use or dog food, depending on circumstances. Larger concentrations or runs of non-salmon species such as sheefish, whitefish, arctic lamprey (*Lampetra japonica*) or "eels," and Alaska blackfish (*Dallia pectoralis*) are available to fishers in certain locations and may be specifically targeted as sources of food for both people and sled dogs. While chum salmon is recognized as the predominant

source of food for sled dogs across the drainage, non-salmon species represent the majority of fish harvested for dog food in certain locations. This is discussed in more detail below.

***Harvest Methods and Gear*:** Gill nets of various mesh sizes and fish wheels are the primary gear types used by fishers along the Yukon River. Set gill nets strung from the shore and anchored at fixed fishing sites, and drift gill nets deployed by fishers from open skiffs drifting with the river current are the predominant salmon fishing methods in the lower half of the Yukon River. Set gill nets and river-bank-anchored fish wheels are the predominant salmon fishing methods in the middle and upper Yukon River region. Net fishermen can vary the mesh size of nets used to more-or-less target fish of a certain species or size. Fish wheels utilize wire mesh baskets that are less discriminating. Bycatch of non-targeted species is common with both fishing methods.

On the lower Yukon, large hoop dipnets are commonly used to take oil-rich lamprey, which ascend the Yukon under the ice in early winter. In tundra ponds where Alaska blackfish are concentrated, wire mesh funnel traps set vertically under the ice provide thousands of pounds of blackfish for mushers in some locations. On the upper Koyukuk River, fine-mesh beach seines are used in the fall by fishermen to target concentrations of whitefish and sheefish which are major supplements and alternatives to salmon in that Yukon River tributary.

Fig. 10. Fish wheels are one of the primary harvest methods for taking salmon on the middle and upper Yukon River. A large wheel is readied for deployment in Tanana (left) and a new wheel under construction in Fort Yukon, 2008.

Across the drainage, small mesh gill nets set under the ice are tended throughout the winter by some mushers and can provide a mixed daily harvest of resident fish species such as northern pike, whitefish, and burbot to feed dogs.

Fish Preservation Methods: All species of fish harvested for use as dog food that are not utilized immediately must be preserved. Due to the large quantities of fish involved in feeding dogs, mushers naturally gravitate to the most simple and efficient preservation method they can. The annual supply of fish that most mushers work to obtain does not generally refer to a calendar year period of 365 days. Mushers typically attempt to stockpile a supply of fish that will support their mushing activities during the active mushing season — a seven to eight month span that roughly corresponds to the snow-covered period of October through mid-May. During the remaining summer months, the food demands of sled dogs are less due to inactivity and warm temperatures, and dog teams can generally be maintained with relatively small harvests of fresh fish from nets, or cutting scraps and incidental harvests associated with the summer harvest and processing of fish for human use.

Three primary methods of preservation are utilized by mushers residing in the Yukon River drainage to stockpile fish for the mushing season: summer drying, fall cribbing, and winter freezing.

Summer Drying: Preservation methods for fish (all species) caught during the height of summer typically involve the splitting and drying of fish on open-air racks. While labor intensive, the drying of fish has long been recognized as the most practical way of dealing with abundant fish runs that occur during early and mid-summer months. Mushers noted that “split fish” are light weight and result in a dog food that can be easily transported.

Fall Cribbing: Fish caught after the onset of cooler weather in September and early October are frequently preserved using a process known as “cribbing” whereby whole fish are arranged in cribs or bins, or simply laid on the cold ground or snow and allowed to freeze gradually. The process of slowly freezing over a period of days or weeks results in a slightly fermented product that mushers say is attractive to dogs and highly nutritious. Cribbed fish are

heavy, however, and thus less suitable for transport or trail use. The use of cribbed fish is most common along the middle and upper Yukon River where the run timing of major fall chum and coho salmon runs typically coincides with the onset of cooler weather.

Fig. 11. Split and scored salmon, dried on open air racks, is the traditional method of preserving Yukon River salmon and continues to be one of the primary ways of preserving fish for use as dog food.

Fig. 12. Fall chum salmon used for dog food are "cribbed" on the river bank in the community of Tanana. Cribbed fish are kept whole and allowed to sour slightly as they undergo a slow process of natural freezing. Photo courtesy of Stan Zuray, Tanana.

Winter Freezing: Fish caught after local streams have frozen over are simply allowed to freeze naturally as they are pulled from the water. As described above, mushers utilize several under-the-ice methods to harvest a variety of fish species throughout the winter months. Where they are abundant, Alaska blackfish and arctic lamprey are attractive alternatives to salmon for mushers because they are both rich in oil content and are available at a time of year when they can be preserved using this simplest of preservation methods—natural freezing. The mixed species harvests from under-ice gill nets are also generally preserved in this way.

Depending on the size of a musher's dog yard and the extent to which they rely on fish for dog food a musher may be able to supply their dog food needs using only one of the methods described above or they may utilize a combination of all three methods and be involved in fishing on a year-round basis.

Fig. 13. Winter-caught fish are a major source of dog food for some mushers and can be preserved by natural freezing. Under-ice nets (left) set at key locations can provide daily catches of non-salmon species through the winter months. (Right) An early winter run of oil-rich arctic lamprey is harvested by fishers in the lower reaches of the Yukon River. Photos courtesy of Caroline Brown, ADF&G.

Fish Preparation Methods. Regardless of what species of fish is being utilized or how it is preserved, mushers report that they generally prepared the fish for their dogs by cooking it. A common feature of dog yards throughout the drainage is a cooking location marked by an outdoor fire pit and one or more large "dog pots" typically made by cutting down 55-gallon drums. Fish and other food items are mixed with water and cooked into a broth and fed to dogs. While cooking for dogs on a daily basis requires significant time and a large fuel supply, mushers report several significant benefits to cooking for their dogs—cooking kills harmful parasites that might be in fish or game cutting scraps, it allows a smaller number of fish to feed a large number of dogs, the resulting broth allows for the easy addition of supplements and commercial foods, and the soupy liquid serves to hydrate dogs, which can otherwise be difficult in sub-freezing temperatures.

Fig. 14. Locally-caught fish are typically prepared for feeding sled dogs by cooking in large outdoor dog pots. Cooking kills parasites and the resulting "soup" hydrates dogs and allows for the easy addition of commercial foods, bulk grains, and nutritional supplements.

Quantities of Fish Fed to Sled Dogs

Data gathered from mushers in 2008 shows that the diet of sled dogs in Yukon River villages continues to be comprised largely of locally harvested fish. Thirty one of the 32 surveyed mushers (97%) reported using fish to some extent to feed their dogs and 25 mushers (78%) reported that fish comprised half or more of their dog's annual diet. Thirteen mushers (41%) said that locally-caught fish made up 75% or more of their dog's diet, and one musher reported that their dogs ate nothing but locally-caught fish.

Surveyed mushers were asked to list, by species, the quantities of fish they had used to feed sled dogs during the 12 months preceding the survey. Estimates for most fish species were given as numbers of fish, while harvest quantities for cutting scraps, blackfish, and arctic lamprey were given in pounds. For consistency, fish quantities were converted to round weights (pounds) for analysis using standard conversion factors provided by ADF&G, Division of Subsistence (see Appendix B). Surveyed mushers were also asked if the annual quantities of fish they listed represented "less fish than usual", "more fish than usual", or "about average" (survey question 8). Eighty one percent of respondents described the listed fish quantities as "about average."

Table 6 shows the quantities of each species of fish harvested for dog food by surveyed mushers in 2008. Overall, an estimated 492,465 pounds (round weight) of fish were harvested for dog food by mushers in the six study communities. Chum salmon, alone, contributed, almost 65% of

Table 6. Pounds of Fish Used as Dog Food in Surveyed Communities, 2008

Resource Name	Lbs. Harvested By Surveyed Mushers	Estimated Lbs. Harvested by All Mushing HH	Percentage of Total Pounds that Each Species Represents
All Fish	386,947	492,465	
Salmon	279,629	353,060	71.7%
Chum Salmon	250,776	316,360	64.2%
Coho Salmon	21,735	27,926	5.7%
King Salmon	0	0	0.0%
King Salmon Scraps	6,750	8,222	1.7%
Pink Salmon	368	552	0.1%
Non-Salmon Fish	107,318	139,405	28.3%
Arctic Lamprey	1,500	2,500	0.5%
Blackfish	2,600	4,233	0.9%
Burbot	3,390	4,212	0.9%
Pike	11,142	16,760	3.4%
Sheefish	9,298	11,887	2.4%
Small Whitefish (Cisco)	23,189	28,578	5.8%
Large Whitefish (Broad and Humpback)	56,199	71,235	14.5%

this total. The second largest contributor was large whitefish, making up 14.5% of the overall harvest, followed by small whitefish (5.8 %) and coho salmon (5.7 %). These four species made up 91% of the fish harvested for dogs. Of the remaining 9%, northern pike, sheefish, and king salmon scraps were the largest contributors. Burbot, blackfish, arctic lamprey, and pink salmon each contributed less than 1% of the overall pounds of fish fed to sled dogs overall, but can constitute a significant portion of the dog food in some communities and for some mushers.

Table 7 presents 2008 harvest estimates by community and shows some distinct regional differences in fishing patterns and predominant species used to feed dogs. While mushers in all communities incorporated a mix of fish species in the harvest used to feed dogs, mushers in different areas rely more heavily on certain species of fish. Looking first at the use of salmon vs.

Table 7. Estimated Pounds of Fish Harvested for Dog Food by Mushing Households in Sampled Communities, 2008

	Ft. Yukon		Huslia		Manley		Russian Misson		St. Mary's		Tanana		All Communities	
	Lbs	%	Lbs	%	Lbs	%	Lbs	%	Lbs	%	Lbs	%	Lbs	%
Salmon	82,511	92.1	42,000	87.1	56,365	96.2	10,800	37.3	4,133	25.3	157,251	62.7	353,060	71.7
Chum	80,400	89.8	42,000	87.1	41,952	71.6	10,800	37.3	1,728	10.6	139,480	55.6	316,360	64.2
Coho	0	0.0	0	0.0	12880	22.0	0	0.0	1553	9.5	13493	5.4	27,926	5.7
King Scraps	2,111	2.4	0	0.0	1,533	2.6	0	0.0	300	1.8	4,278	1.7	8,222	1.7
Pink	0	0.0	0	0.0	0	0.0	0	0.0	552	3.4	0	0.0	552	0.1
Non-Salmon	7,060	7.9	6,224	12.9	2,255	3.8	18,150	62.7	12,187	74.7	93,529	37.3	139,405	28.3
Arctic Lamprey	0	0.0	0	0.0	0	0.0	2500	8.6	0	0.0	0	0.0	2,500	0.5
Blackfish	0	0.0	0	0.0	0	0.0	3333	11.5	900	5.5	0	0.0	4,233	0.9
Burbot	667	0.7	0	0.0	48	0.1	150	0.5	495	3.0	2853	1.1	4,212	0.9
Pike	1,217	1.4	3,500	7.3	164	0.3	5,500	19.0	4,590	28.1	1,789	0.7	16,760	3.4
Sheefish	511	0.6	892	1.8	457	0.8	0	0.0	1605	9.8	8422	3.4	11,887	2.4
Sm. Whitefish	1,127	1.3	212	0.4	253	0.4	0	0.0	1,459	8.9	25,526	10.2	28,578	5.8
Lg. Whitefish	3,538	3.9	1,620	3.4	1,333	2.3	6,667	23.0	3,138	19.2	54,940	21.9	71,235	14.5
All Fish	89,571		48,224		58,621		28,950		16,320		250,780		492,465	
Number of dogs	135		83		114		74		28		237		671	
Avg. Lbs. Per dog	663		581		514		391		583		1,058		734	

non-salmon, the data show that several communities are heavily reliant on salmon as their major source of dog food. In the communities of Manley, Fort Yukon, and Huslia, salmon comprised 96.2%, 92.1 % and 87.1 % of the fish fed to dogs respectively. The salmon harvest in Huslia was made up entirely of chum salmon, with no other salmon species reported being used as dog food.

Of the 11 species or categories of fish listed by mushers, only three species categories; chum salmon, large whitefish, and pike were utilized by mushers in all six communities. The mix of species reported by mushers reflects differences in species distribution, timing and season of availability, and personal preferences. Mushers in the lower Yukon River communities of Russian Mission and St. Mary's are much more dependent on non-salmon species as a source of dog food than communities in the middle and upper Yukon. This same pattern was noted in the 1991 study. In 2008 non-salmon fish comprised 74.7% of the harvest fed to dogs in St. Mary's and 62.7% of the harvest fed to dogs in Russian Mission. Mushers residing in St. Mary's reported the largest number of species used (10), and pike contributed a larger proportion of the fish fed to dogs than all four salmon species combined. The reliance on non-salmon species in the lower river is due to two major factors, 1) major salmon runs occur in the lower river during early summer when weather conditions are not always favorable for drying large numbers of fish, and 2) non-salmon species such as blackfish and arctic lamprey offer abundant late-season alternatives for dog food.

With the significant decline in the number of sled dogs between 1991 and 2008, the amount of fish being utilized for dog food has also declined. In 1991 the total quantity of fish utilized for dog food in the seven study communities was estimated at 1,211,907 pounds (round weight). The 2008 estimate of 492,465 pounds represents a decline of 719,442 pounds or 59%. This decrease is measurably higher than the 51% decline in the number of sled dogs, suggesting that the diet of sled dogs in 2008 contained slightly less fish than the diet fed to sled dogs in 1991.

Table 8 presents data on the pounds of fish harvested per sled dog in each survey community in 1991 and 2008. In 2008 the amount of fish harvested per sled dog ranged from 391 pounds per dog in Russian Mission to 1,058 pounds of fish per dog in Tanana and resulted in an average of

Table 8. Pounds of Fish Harvested per Sled Dog, 1991 and 2008

Community	1991 Survey			2008 Survey		
	Number of Dogs	Total Pounds of Fish	Pounds per Dog	Number of Dogs	Total Pounds of Fish	Pounds per Dog
Fort Yukon	245	178,872	730	135	89,571	663
Huslia	153	155,579	1,017	83	48,224	581
Kaltag	113	249,032	2,204	0	0	0
Manley	234	84,732	362	114	58,621	514
Russian Mission	100	36,473	365	74	28,950	391
St. Mary's	91	48,484	533	28	16,320	583
Tanana	427	458,734	1,074	237	250,780	1,058
All Communities	1,363	1,211,907	889	671	492,465	734

734 pounds of fish per dog. Fish harvests in 1991 ranged from 362 pounds per dog in Manley to 2,204 pounds per dog in Kaltag, resulting in an overall average of 889 pounds per dog. The 1991 data for Kaltag are somewhat misleading in that it includes thousands of chum salmon carcasses resulting from a localized commercial roe fishery that were processed for dog food and distributed to mushers throughout the larger middle Yukon region. Kaltag had no active dog mushers or sled dogs in 2008. If the 1991 numbers for Kaltag are removed and the six remaining communities compared, the average pounds of fish per dog in 1991 is reduced to 770 pounds, a figure that is only slightly higher than the 2008 average of 734 pounds per dog.

Comparing 1991 and 2008 harvests for individual communities, the pounds of fish used per dog in 2008 declined by 67 pounds in Fort Yukon, declined by a significant 436 pounds in Huslia, and increased by 152 pounds per dog in Manley. In the remaining communities of Russian Mission, St. Mary’s, and Tanana the pounds of fish used per dog was relatively consistent between the two survey years and varied by less than 10%.

Table 9 compares the percentage of fish harvested by mushers that is made up of salmon and non-salmon for the two study years. Overall, these data show a small but significant increase in the use of non-salmon species by mushers in 2008. While salmon comprised a significant

majority of the fish fed to dogs in both study years, the proportion of the fish harvest contributed by non-salmon species more than doubled from 13.3% in 1991 to 28.3% in 2008. If the anomalous 1991 data for Kaltag are removed (for the reasons described above) the non-salmon fish proportion in 1991 rises only slightly to 14.6%—still roughly one-half of the proportion reported by mushers in 2008. The use of non-salmon by mushers increased in all survey communities except Huslia and St. Mary's where the data show very small declines.

Table 9. Pounds of Salmon vs. Non-Salmon Fed to Dogs, 1991 and 2008

	1991 Survey					2008 Survey				
	All Fish	Salmon		Non-Salmon		All Fish	Salmon		Non-Salmon	
Community		Pounds	%	Pounds	%		Pounds	%	Pounds	%
Fort Yukon	178,872	175,763	98.3	3,109	1.74	89,571	82,511	92.1	7,060	7.9
Huslia	155,579	130,460	83.9	25,119	16.1	48,224	42,000	87.1	6,224	12.9
Kaltag	249,032	228,501	91.8	20,531	8.24	0	0	0	0	0
Manley	84,732	83,813	98.9	920	1.09	58,621	56,365	96.2	2,255	3.8
Russian Mission	36,473	17,794	48.8	18,679	51.2	28,950	10,800	37.3	18,150	62.7
St. Mary's	48,484	10,759	22.2	37,725	77.8	16,320	4,133	25.3	12,187	74.7
Tanana	458,734	403,315	87.9	55,419	12.1	250,780	157,251	62.7	93,529	37.3
All Communities	1,211,907	1,050,405	86.7	161,502	13.3	492,465	353,060	71.7	139,405	28.3

Non-Fish Food Items

As important as fish are as a source of food for village sled dogs, virtually all dog team owners supplement fish with purchased foods and non-fish food sources. Only one surveyed musher with a small team of 9 dogs reported no use of purchased foods or supplements. This mushing household was also the only household to categorize its use of dogs as strictly recreational. While mushers were not asked to quantify their use of non-fish food items, they were asked to itemize them. The list of non-fish food items commonly fed to dogs included rice and other bulk grains, commercially manufactured dry dog food, dog-grade chicken, beef, and lamb meat products, furbearer carcasses and wild game cutting scraps, and various fat, vitamin, and nutrient

supplements. Beaver carcasses and black bear meat were common sources of wild meat mentioned as dog food by mushers.

The extent to which dogs are fed fish as opposed to commercially manufactured foods is an individual preference that varies between mushers depending largely on how the dogs are being utilized, and individual economic circumstances. Mushers involved in dog racing tended to place greater emphasis on the use of commercial food items. For many racers, the use of fish is relegated to an off-season maintenance diet for their dogs. As the race season approaches, race teams are taken off a fish diet and placed on a diet consisting of higher quality commercial food products. Some mushers report that fish, particularly those with high oil content such as blackfish and lamprey, might continue to be part of the mix fed to competitive dogs during the race season, but they are used largely as supplements or to enhance the flavor of commercial food products to make them palatable for the dogs.

Focus on Change Survey Section

Five survey questions (questions 9, 11, 12, 13, and 14) had no 1991 counterpart for comparison and were included to specifically address the potential impacts of low salmon runs and high gas prices on rural dog mushers. Survey question 9 asked mushers what strategy(ies) they use to cope with years of low salmon returns. Mushers were given four choices of possible strategies that were thought to encompass the reaction of most mushers to low salmon returns: 1) Fish salmon harder/longer, 2) increase use of other fish, 3) buy more commercial food, 4) decrease the number of dogs. Mushers were free to circle all strategies they had used, and space was provided for them to describe any other coping strategies they had utilized. Most mushers described a multi-pronged approach to dealing with low salmon runs and circled several of the listed strategies. Table 10 summarizes the results of this survey question. Overall, the option of buying more commercial food was selected as a strategy by 59% of respondents, making it the most selected strategy. Increasing the use of other fish was selected by 38% of respondents, making it the second most selected strategy, and 28% said that they respond to low salmon runs by fishing longer or harder to get the salmon they need. Decreasing the number of dogs was selected by the fewest mushers (19%). Mushers commented on their reluctance to decrease the number of dogs by explaining that they were already maintaining the absolute minimum number

Table 10. Strategies Used to Feed Dogs in Years of Low Salmon Runs

Strategies	Fort Yukon	Huslia	Manley	Russian Mission	Saint Mary's	Tanana	Total
Fish Salmon Longer, Harder	33%	33%	50%	0%	0%	22%	28%
Increase Use of Other Fish	33%	33%	17%	67%	100%	33%	38%
Buy More Commercial Food	44%	100%	100%	67%	0%	44%	59%
Decrease # of Dogs	0%	0%	17%	33%	0%	44%	19%
Other Strategy Used	11%	0%	17%	33%	0%	44%	22%

of dogs they needed for the ways they used their dogs. Any reduction in the number of dogs would make it difficult for them to use dogs at all. For these mushers, maintaining kennel size was described as an all-or-nothing proposition. The fact that the decline in dog numbers tracks the decline in mushing households confirms that the general decline in dog mushing is largely the result of mushers making the decision to get completely out of mushing rather than mushers choosing to reduce the number of sled dogs they have.

Twenty-two percent of respondents utilized the "other" category to offer comments or mention other strategies. Other strategies included 1) the use of "disaster relief" or "emergency relief" fish and dog food that had been provided to some communities in some years by a variety of agencies and organizations, and 2) increasing the use of beaver carcasses to make up for lower salmon numbers. Several comments received served as a reminder that in some portions of the drainage salmon were not a critical part of the diet for sled dogs—comments from St. Mary's and Russian Mission included the following:

> HH4 Russian Mission--My dogs eat other fish, not salmon. I fish after freeze-up.
> HH1 St. Mary's--We have lots of fish options here besides salmon.
> HH3 St. Mary's--Salmon is only a small part of the dog's diet and would be replaced with other fish.

Survey question 11 asked mushers if they thought the high price of gasoline in 2008 had increased the number of people using sled dogs. High gas prices were making national headlines at the time this survey was conducted. Village Alaska was being hit particularly hard by high gas prices and the ripple affects of increased heating and electric bills. In 2008, the price of

gasoline in the seven survey communities averaged $6.36 per gallon and ranged from $5.30 per gallon in Manley to $7.78 per gallon in Fort Yukon. The survey asked for a yes or no response to question 11 and offered space for any comments relating to the price of gas and its impact on mushing. Table 11 summarizes the response to this question.

Table 11. Effect of Gas Prices on Use of Sled Dogs, 2008

Have recent gas prices increased the number of people using sled dogs?	No		Yes	
	#	%	#	%
Fort Yukon	3	33%	6	67%
Huslia	3	100%	0	0%
Manley	4	67%	2	33%
Russian Mission	3	100%	0	0%
Saint Mary's	1	50%	1	50%
Tanana	6	67%	3	33%
Total	20	63%	12	38%

Overall, a majority of respondents (63%) thought high gas prices had not increased the number of people using sled dogs. Typical comments accompanying this viewpoint include the following:

> HH7 Fort Yukon—People may talk about it but when it comes right down to it they are too spoiled with the easy life.
> HH9 Fort Yukon—Dogs are too much work.
> HH 4 Manley—it takes a while and lots of cash to gear up for dogs. Dogs are not a money saving venture.
> HH4 Russian Mission—nobody is going backwards!
> HH1 St. Mary's—I doubt they will really go back to dogs. We are too spoiled and dogs are too much work.
> HH1 Tanana—What people are doing now is just less travel and combining trips for multiple purposes.

While question 11 was designed as a yes-or-no question, an interesting middle ground emerged. Some of the 63% responding "no" to this question thought that it was simply too soon and that if

gas prices stayed high or continued to go up it would likely lead to a future increase in the use of dogs:

> HH5 Fort Yukon—Not yet but I think it will increase if the prices keep going up. People are thinking about it.
> HH4 Huslia—Not yet, but soon if it keeps going up.
> HH 3—Manley—Not yet, but it probably will soon.
> HH9 Tanana—Not yet, maybe by next year.

Thirty eight percent of mushers answered "yes' to survey question 11 indicating that they thought that high gas prices had caused more involvement with dog mushing. A sample of comments accompanying this viewpoint includes the following:

> HH2 Fort Yukon—People who were just about ready to get out of it have reconsidered and hung on to their dogs.
> HH6 Fort Yukon—People are all starting to haul wood with their dogs.
> HH 7 Manley—Fuel prices did factor in to my decision to get into dogs.
> HH3 St. Mary's –It won't make lots of people return to dogs but it is a factor for a few.
> HH6 Tanana—It is going to happen more and more.
> HH10 Tanana—knows several people back into dogs, even to run trapline (in Ruby)

Survey questions 12, 13, and 14 were only asked of those that had been involved with dog mushing for more than ten years. Twenty three of the 32 surveyed mushers met this criterion and provided responses to these questions. This reduction in sample size makes individual community comparisons difficult as the sample size is reduced to two or less in three of the communities. For this reason, collective responses are reported.

Question 12 asked mushers how the size of their dog yard now compared to the size of their dog yard 10 or 15 years ago. Responses to this question showed no discernable trend with nearly identical numbers of mushers indicating "more dogs now" (35%), fewer dogs now (30%), and "no real change" (35%). Comments explaining an increase in dogs were as follows:

> HH1 Fort Yukon—I used to have only 7 or 8 dogs, but dogs are different now—they are smaller and weaker--You need more dogs now to do what we used to do with smaller teams.
> HH3 Fort Yukon—My son has gotten into racing the last few years and I have doubled the size of the dog yard.
> HH9 Fort Yukon—I have slowly been building up the kennel to get more serious about distance racing.

HH2 Huslia—I have a better job now and can afford more dogs. But I will probably decrease the size of the dog yard soon because the cost of food and freight is just too much and money needs to go to fuel oil and other costs.
HH1 Russian Mission—I got more competitive into racing. I place high enough now to almost break even—about $16,000 last year—and the last 6 or 7 years I've begun to take racing seriously.
HH2 Tanana—I have taken dogs from other mushers who were leaving town or getting out of mushing and this has bumped up the size of the dog yard.
HH3 Tanana—I'm more into racing now. I need more dogs to go faster.
HH9 Tanana- I had a family to take care of back then and had to have fewer dogs. Now I have more time to dedicate to dogs.

Responses to question 12 explaining a decrease in the number of dogs were as follows:

HH2 Manley—Economics! The cost of everything is increasing—food, gas for fishing……I got out of racing because the economics of maintaining and transporting a competitive team and having pups has just gotten out of hand.
HH3 Manley—It has nothing to do with fish runs. It mostly has to do with the increasing age of the mushers. We are gradually scaling down the yard.
HH5 Manley—The cost of maintaining dogs increased. Wage employment means less time for the dogs, and old age makes it hard on the body!
HH3 St. Mary's—In recent years I have tried to average about 12 dogs. Last year several dogs were injured and had to be put down. Now I like having a few less dogs and have decided to keep about 9 and compete in the 7-dog races.
HH 5 Tanana—I used to do more racing and took out tourists. Now I work carpentry and have less time to dedicate to dogs. Fishing season conflicts with my busy work season.
HH8 Tanana—I'm getting older now and can't handle 20 dogs in harness any more. I used to have kids around to run a few of the dogs.
HH10 Tanana—I don't raise as many pups—pups take more food than adults. I have about the same number of adult dogs but just choose to have and keep fewer pups.

Question 13 asked mushers if the way they used their dogs was different now than it was 10 or 15 years ago. If a change was indicated, mushers were asked to provide comments on that change. Forty three percent of respondents indicated they used their dogs in the same way now that they did 10 or 15 years ago. A majority of respondents (57%) indicated they had changed the way they use their dogs. Comments relating to these changes were as follows:

HH3 Fort Yukon—More racing now. Twenty years ago the dogs were used to haul and trap.
HH 5 Fort Yukon—When I first got into it 10 years ago I was more into recreation and using dogs for hauling wood and water. Gradually I got into racing, which is what I do most now.
HH8 Fort Yukon—I'm getting more serious now about sprint racing. I'm keeping track of dog bloodlines and working on getting into the competitive arena.
HH10 Fort Yukon—I used to do more trapping with them.

HH2 Manley—Thirty years ago it was my only transportation for trapping and hauling. Then from about 1990 to 2006 I was involved in spring racing which I no longer do.
HH3 manley—No real change right now….but we are just now considering the option of getting into tours and tourism with the dogs. We will probably try this in the next year or two.
HH5 Manley—We used to use them for all our hauling—wood, water and general transportation….even community ambulance.
HH1 Russian Mission—I first used dogs for utility stuff like checking traps. Now it is strictly racing and my dogs are too valuable to risk injury.
HH2 Russian Mission—Way back in the 1960s with my Dad's dogs we trapped and hauled with dogs, but since I got my own dogs it has just been a hobby.
HH2 Tanana—Dogs used to be our only transport. Now they are more recreational and family dogs.
HH3 Tanana—I used to trap more. Now I have to work a wage job for money and I race the dogs.
HH5 Tanana—I used to use them more for spring camp and hunting activities. Now I just keep a few for local races and recreation.
HH6 Tanana—I'm going away from hounds and racing dogs and using more sturdy work dogs for hauling and trail use.
HH8 Tanana—I used to race more.
HH9 Tanana—I used to work the dogs harder back then—lots more hauling and trapping. Now my use of dogs for heavy hauling and trapping is less.
HH10 Tanana—Racing has gotten expensive. Dog food is $60 a bag. I will soon get out of racing and get into dog tours. I want to remain connected to dogs.

Survey question 14 asked mushers how their use of salmon to feed dogs now compared to their use of salmon 10 or 15 years ago. A large majority of respondents (70%) indicated no change in their use of salmon, 17% indicated that they use less salmon now and 13% reported using more salmon now. Comments relating to the use of more salmon were as follows:

HH3 Fort Yukon—We have more dogs now.
HH5 Fort Yukon—I have learned how to fish for dogs over time. I did not fish much before I had dogs. The more I learn to fish and cut fish, the more I have come to rely on fish for most of my food.
HH8 Tanana—I used to buy more commercial and fat when I played around with racing. Now these trail dogs eat mostly fish.

Comments explaining the use of less salmon now were as follows:

HH9 Fort Yukon—I used to use 500 fish for the family dog yard. Now we are using more and more high- octane race food.
HH5 Manley—We used to use 2000 fish when our kennel was at 20+ dogs. Now we just have a few semi-retired dogs.
HH3 St. Mary's—Prior to becoming a competitive racer I could keep my dogs on a diet of strictly fish. Now I am competing at a higher level and they need more commercial food and supplements to stay in race-shape.
HH5 Tanana—I used to need 1000 salmon to feed dogs in the fall because I had more dogs. Now the yard is down to just a few dogs.
HH10 Tanana—I've come to rely more on whitefish to fill out the fall catch.

DISCUSSION

In rural Yukon River communities, the maintenance of sled dogs has been and remains inextricably linked with fishing. Fishing to feed dogs typically occurs as an extension of other subsistence or commercial fishing activities for families along the river. Fish represent an indispensable local source of good quality, low cost food for dog teams. Dogs, in turn, are used for winter transport and to support various subsistence, recreational, and racing activities. It is the availability of low cost food through fishing that makes the keeping of sled dogs in rural communities practical and possible. The connections between village sled dogs and fish are deeply rooted in both history and tradition, and the decision to have sled dogs in rural communities involves the full-time, year-round commitment to a lifestyle that is centered on fishing and dogs.

Clearly there are fewer and fewer people who can afford or are willing to embrace that lifestyle. Comparisons of musher survey data between 1991 and 2008 show that the use of sled dogs in Yukon River communities has dramatically declined. Between 1991 and 2008 the number of sled dogs in the seven study communities declined by 51%, a loss of almost 700 dogs, and the number of mushing households in those communities declined by 56%. These statistics suggest that the decline in village mushing has come about through large numbers of mushers making the decision to get out of dogs altogether rather than through mushers simply reducing the size of their dog yards. These declines are not regionally concentrated but occurred in all sampled communities, including one community (Kaltag) which in 2008 no longer had any active mushers or dog teams. Demographic changes between 1990 and 2008 cannot begin to explain declines of this magnitude.

The apparent exodus from mushing, and the extent of it, was unanticipated, and was one of the early surprises to emerge from data collection. Fully understanding it would require the systematic inclusion of former mushers in the survey sample and was beyond the scope of this project. The 2008 data set does, however, provide more than inference and speculation in this regard. Remarks from surveyed mushers, as well as comments from key respondent interviews,

which included both current and former mushers, shed significant light on probable causes for the broad-based decline in village mushing.

Factors Contributing to the Decline in Village Mushing

Musher comments point to the spiraling cost of living in rural communities in general, and increases in the costs associated with having sled dogs in particular, as the primary reasons that so many mushers have made the decision to get out of dogs. The extremely high cost of fuel in rural communities is symptomatic of the large and rapid rise in cost of living and has ripple effects that go well beyond the direct cost of operating a snowmobile or outboard motor. Home heating and electric bills have skyrocketed because of increases in fuel prices. Passenger and freight rates on local air carriers, the primary movers of people and goods into and out of these rural communities, have also increased because of fuel costs. Mushers reported that the cost of commercial dog food has become untenable. Worldwide disruptions in grain supplies have doubled the price of many premium brand corn and rice-based dog foods over the past eight to ten years. With the addition of inflated freight rates to ship purchased food to the villages, some mushers can no longer afford the vital supply of commercial feed required to supplement fish for their dogs. Comments relating to general economic stress and the increasing cost of dog mushing include the following:

> "It's the cost of everything now…….you can't feed the dogs fish year-round, you know, and freight is a dollar a pound, so you buy a bag of dog food its an automatic fifty-dollar bill just to get it here……so it's the costs, not only the feed, but the vet bills and the travel…….if you're gonna race from here you gotta travel and that costs." KR04, Fort Yukon.

> "As the price of gas started to go up, you know these big dog trucks….they are so expensive to run that all of a sudden it was costing me so much money to just go in to Fairbanks to race, that all of a sudden it was costing me more than I could reasonably expect to win by racing. I mean, you need to move around to race. And I wasn't at a point where I had sponsors. If you really get in to this racing business you're out searching for sponsors……you're getting lots of help." (KR06 Manley)

> "What made me get out of it was……well, for one thing it was my age…..but then the cost….If you want to have a successful team you got to put money in to it…….you gotta have that good commercial food, medicine, vitamins, commercial meat……and now they charge over two dollars a pound for freight. I bought five bags of food last time I race……and each of those bags cost me sixty dollars landed here in Huslia…….it would be even more right now! And I bought chicken and that was 12.50 a pound landed here….corn oil, rice……even rice went up to forty dollars

> a bag. I was spendin' over five thousand dollars a year to keep them good dogs." (KR09, Huslia)

> "Economics! The cost of everything is increasing—food, gas for fishing……I got out of racing because the economics of maintaining and transporting a competitive team and having pups has just gotten out of hand." (HH2 Manley)

> "The cost of maintaining dogs increased. Wage employment means less time for the dogs, and old age makes it hard on the body!" (HH5 Manley)

> "I have a better job now and can afford more dogs. But I will probably decrease the size of the dog yard soon because the cost of food and freight is just too much and money needs to go to fuel oil and other costs." (HH2 Huslia)

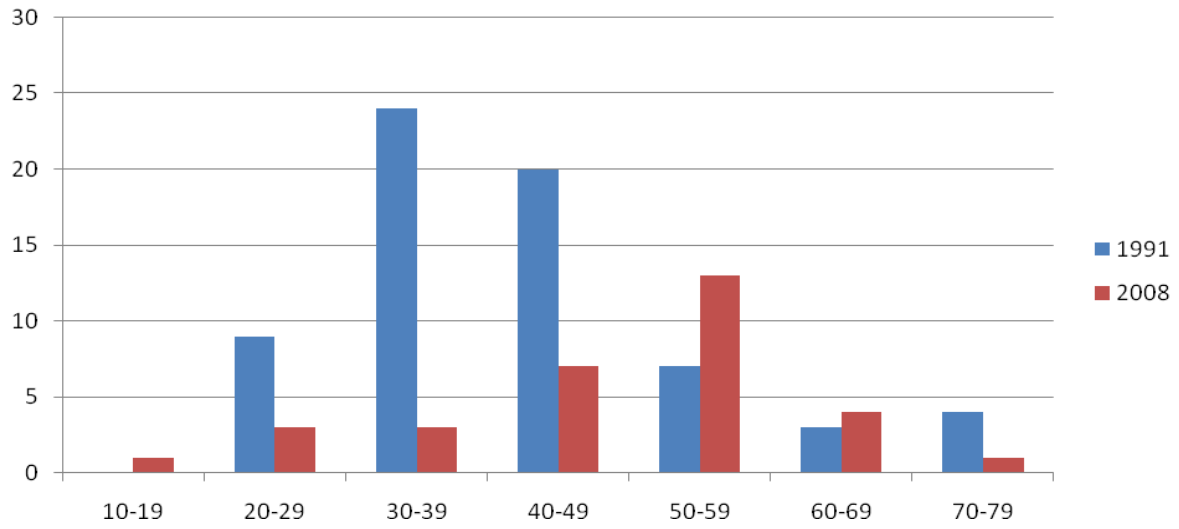
Economic pressures have pushed many residents to increase and prioritize sources of wage employment in order to make ends meet. Reliable wage jobs in most rural communities are scarce, and for many households the need for higher incomes has forced residents to take jobs that interfere with their traditional summer fishing activities or seek jobs outside the village resulting in family members or whole families leaving their home communities on a seasonal or full-time basis. For mushers, wage employment opportunities that conflict with critical fishing activities or require large blocks of time away from the community inevitably mean they have less time to dedicate to feeding, using, and caring for their dogs. It is at this point that mushers typically weigh their options and make the difficult decision on whether or not to keep their dogs.

Low salmon numbers that have characterized Yukon River salmon runs since the mid-1990s have almost certainly added to these other economic stresses, especially for mushers. What had for decades been a relatively stable source of both food and income was suddenly marked by uncertainty. For upriver residents the impacts of low salmon numbers have come in the form of lower subsistence catches or the need to fish longer to get the fish they need. In the lower and middle Yukon River, where connections to commercial fishing are strong, the impacts of low salmon numbers come largely in the form of lost incomes. Mushers counting on supporting their mushing activities with incomes provided by commercial fishing activities, or with fish caught in conjunction with commercial fishing, would be particularly hard-hit by disruptions in these fisheries. Likewise, attempts by mushers to compensate for lost fishing incomes by turning to employment sources that might interfere with their ability to fish for their dogs would also be adversely impacted. While no surveyed or interviewed musher specifically cited connections

between lower dog numbers and lower commercial fishing incomes, the loss of commercial salmon fishing income is understood to be a key component in the overall economic strain currently being felt by residents of many Yukon River villages.

In addition to economic factors, survey data and musher comments also suggest that a lack of young people coming in to mushing to replace older mushers is contributing to the downturn in village mushing through attrition. Surveyed mushers in 2008 ranged in age from 17 to 70 and averaged 49 years of age. In 1991 surveyed mushers ranged in age from 21 to 73 and averaged 41 years of age. While at first glance these statistics might suggest only a slight aging of the mushing population, looking at musher's ages categorized by ten-year age groups (Fig. 15) is more suggestive of the change that has taken place. More than one-half (56%) of surveyed mushers in 2008 were 50 years old or older with the largest number of mushers falling in the age category of 50-59 years of age. Less than one quarter (22%) of surveyed mushers in 2008 were less than 40 years old. These data contrast with the age data for surveyed mushers in 1991 where the highest number of mushers fell into the age category of 30-39, and one half (49%) of the mushers were less than 40 years old. The impact of mushers growing older and making the decision to get out of dog mushing is apparently compounded by a lack of younger mushers

Fig 15. Age of Mushers in 10 Year Increments, 1991 and 2008



interested in entering the mushing ranks to replace them. Musher comments pertaining to advancing age and a lack of young people entering mushing include the following:

> "The future of dog mushin' don't look too bright to me unless these younger generation make up their mind……..there's a few mushers here……I have a lot of young boys stop by the dog yard when I'm cooking and they talk about wanting to start….but they don't follow through." (KR07, St. Mary's)

> "I think here in Huslia it's [mushing] gonna die out…..same as Kaltag, Koyukuk, Nulato……'cause there's no young person interested, you know. They are interested up until about sixteen, seventeen, and then when they get in high school they lose interest. It's too bad, you know, but kids just aren't interested…….they're not doing anything…..there's a lot of kids like that around here……TV and Nintendo…….all they do is get together and start playing games." (KR09, Huslia)

> "It has nothing to do with fish runs. It mostly has to do with the increasing age of the mushers. We are gradually scaling down the yard." (HH3 Manley)

> "The cost of maintaining dogs increased. Wage employment means less time for the dogs, and old age makes it hard on the body!" (HH5 Manley)

> "I'm getting older now and can't handle 20 dogs in harness any more. I used to have kids around to run a few of the dogs." (HH8 Tanana)

> "Dogs is just plain work, and the newer generation, you notice……the younger kids, they don't want to make boats, they don't want to make dog sleds, they don't want to make canoes, they won't make snowshoes…..they're gonna lose out….they got their big fast sno-gos and boats……its just, I don't know, we have gotten spoiled with all the modern conveniences and the younger guys are getting' away from the dogs. And if you're not into it and you don't really have access to it its kind of hard. As for the future……it all depends on the young kids. If they can get these kids into it ….and there is a few…..it'll continue. But these older guys, even my generation, we're gonna get older and at some point not be able to take care of dogs." (KR04, Fort Yukon)

Despite these gloomy predictions, and the acknowledged downturn in village mushing, sled dogs are still maintained in many Yukon River villages by a small but enthusiastic group of current mushers. A long-time musher from Fort Yukon was optimistic that mushing in the villages would never completely vanish:

> "There's always gonna be a certain few that like it and they'll have dogs whether they make money or not. If you're doggy, it just gets in your blood. The guys that have 'em now are just the very few die-hards that like dogs. It'll probably stay about like it is now. I don't think it will ever completely disappear." KR04 Fort Yukon.

Changes in the Use and Feeding of Sled Dogs 1991-2008

A comparison of survey data from 1991 and 2008 points to some subtle but important shifts that have occurred with regard to dog use and feeding practices. Current mushers appear to be maintaining dog yards of substantially the same size in 2008 as they did in 1991. In 1991, 95 mushing households had an estimated 1,363 adult dogs for an average kennel size of about 14 dogs. In 2008, 42 mushing households had a total of 671 dogs resulting in an average kennel size of 16 dogs. For both study years, the range in size of dog yards was identical—4 to 80 dogs. A similar majority of mushers in both survey years reported having 15 dogs or less—57% in 1991 and 59% in 2008. In 1991 10% of surveyed mushers reported maintaining kennels of 30 dogs or more, and in 2008 this percentage had risen slightly to 13%. All in all, the data pertaining to kennel sizes show remarkable consistency between survey years.

Dog mushers reported using their dogs for a similar mix of activities in 2008 as they did in 1991. Most mushers listed multiple use categories for their dogs and it was common for teams involved in racing to also be used for hauling tasks and general transportation. In both survey years, the top three use categories selected by mushers included: general transportation, hauling wood and water, and sprint racing. Among current mushers, sprint racing moved from the third most selected use category in 1991 to the number one use category selected by mushers in 2008. The utilitarian use of dogs for trap line transportation recorded the most significant decline. In 1991 44% of surveyed mushers reported using their dogs on the trap line compared to just 22% in 2008.

This subtle move toward sprint racing and away from utilitarian uses such as trap line transportation fits with general comments mushers offered regarding changes in the overall genetic makeup of village sled dogs. Over the last 20 years, hound strains have been introduced to produce dogs that have greater speed. According to mushers, many village dogs today are smaller, and have less dense coats than the traditional village huskies. This makes them less tolerant to cold and less suitable for the rigors of trap line and general trail use. Whereas the sturdy village huskies of 20 years ago could typically be used interchangeably for trail use and racing, the competitive nature of sled dog racing today, for all practical purposes, requires village mushers to make a choice between having work dogs or dogs capable of racing competitively.

The 2008 data indicate some shifts in feeding practices relative to use of fish. In 1991 more than half (52.3%) of surveyed mushers reported that locally-caught fish made up 75% or more of their dog's diet. In 2008 the percentage of mushers reporting 75% or more of their dog's diet was fish dropped to 43.8%. Mushers in 2008 were still highly reliant on fish, however, with more than 78% reporting that fish made up one-half or more of their dog's diet. These data suggest that mushers still rely heavily on fish to feed dogs but are slightly less reliant on fish than they were in 1991.

A look at the species composition of fish harvested to feed dogs shows a small shift towards the use of fewer salmon and increased use of non-salmon fish to feed dogs. In 1991 salmon comprised roughly 87% of the fish fed to dogs in the seven study communities. In 2008 salmon comprised 72% of the fish fed to dogs. Conversely, the use of non-salmon fish by surveyed mushers increased from 13% in 1991 to 28% in 2008. The shift from salmon to non-salmon was most pronounced in the community of Tanana where reliance on salmon declined from 88% of the harvest for dogs in 1991 to 63% in 2008. This shift in species composition by Tanana mushers was almost entirely attributed to increases in the harvest of whitefish (large and small) which, combined, constituted 32% of the harvest fed to dogs in 2008 and made up only 5% of the Tanana harvest in 1991.

Looking next at pounds of fish harvested per sled dog as a relative measure of reliance on fish, the data show a slightly lower use of fish by surveyed mushers overall in 2008 than in 1991. A look at the pounds-per-dog numbers for individual communities, however, shows a bit more complexity. The pounds of fish harvested per dog in 2008 increased in some communities and decreased in others, with no apparent pattern. The community with the most significant decline in use of fish to feed dogs was Huslia where mushers reported using 1,017 pounds of fish per dog in 1991 and just 581 pounds of fish per dog in 2008. Interestingly, the pounds of fish harvested per dog in Huslia (581 lbs.) and St. Mary's (583 lbs) are nearly identical. These two communities are also the only communities where sprint racing was selected as a use category by 100% of the mushers. Mushers involved in sprint racing commonly shift their dogs from a fish diet to a diet of "higher octane" commercial foods during the race season. With this in mind,

survey data showing a small decline in the overall use of fish to feed dogs in 2008 probably reflects the general shift toward increased involvement in sprint racing discussed above and the intentional use of more commercial feed during the race season.

Finally, we need to examine one of the central questions prompting the 2008 survey: How have Yukon River mushers coped with the declines in salmon runs and increased harvest restrictions that have punctuated the last decade and a half? For the large number of individuals who have chosen to get out of dog mushing, we do not know for certain what role poor salmon runs might have played in that decision. In the upper portions of the Yukon drainage where dependence on salmon for dog food is high, it is logical to assume that repeated prospects for poor subsistence harvests may have contributed to the decision of some mushers to get out of mushing. Likewise, on the lower Yukon where dependence on commercial fishing is high, it is logical to assume that disruptions in commercial fishing and lost incomes may have contributed to musher decisions there. But these are only speculations.

What is clear, and somewhat surprising, is the relative ease with which most current mushers reported being able to cope with low salmon years. In Tanana, one of the communities most reliant on chum salmon to feed sled dogs, the comments of one musher regarding years of low salmon runs were especially enlightening:

> Yeah, we have had some bum years, but you know, the difference between a good chum run and a bad chum run means I have to run my wheel for three or four days to get the fish for the dogs instead of running it for one or two…….in a good year I can get all the dog fish I need in one day of fishing the wheel. (KR01, Tanana)

These comments from Tanana may not be entirely representative of the Yukon as whole, as fishermen there commonly fish in the “rapids” region above Tanana where the Yukon is restricted to a single swift channel and fishing sites are legendary for their productivity. Still, similar comments from other mushers indicated that in years of poor salmon runs they could typically compensate for low salmon numbers by fishing harder or longer to obtain the salmon quantities they need or shift their fishing effort to other fish species.

The ability of mushers to take low salmon years in relative stride should come as no surprise. One of the hallmarks of rural subsistence economies is resiliency. Survey data and interview

comments collected from mushers combine to show that those that have weathered the recent years of low salmon runs and remained active in dog mushing are a particularly dedicated, resilient, and adaptive group of individuals that will do whatever it takes to harvest and preserve their annual supply of fish. Fishing to feed sled dogs is almost universally done in conjunction with or as extensions of other subsistence or commercial fishing activities. Thus, fishing occupies a spot at the very center of an overall way of life, and significant economic resources are poured into securing and maintaining the boats, motors, fuel, nets, and other equipment required to fish. Fishing, therefore, falls more into the category of an essential activity, rather than an optional one.

Mushers point out that even in years of strong salmon runs, fishing is an uncertain proposition. Equipment breakdowns, unusually high or low water conditions, and weather conditions that hamper fish preservation are events that all fishermen occasionally face and must have contingencies to deal with. Most fishermen, and mushers in particular, have adopted fishing strategies that incorporate multiple fishing events to obtain the fish they need. A poor harvest in one fishing event can frequently be compensated for by increasing effort elsewhere. In-season adjustments can be made by fishing longer, altering the gear used, changing fishing locations, combining fishing efforts with other individuals, or shifting the timing of fishing activities. These sorts of flexible and adaptive strategies offer some protection from a fish run that does not materialize, weather or water conditions that hamper fishing effort, loss of preserved fish to spoilage or animals, and gear or equipment problems that might cause them to miss a critical fishing window. Years of low salmon returns and changes in fishing regulations simply add to a long list of potential situations that fishers must be prepared to cope with.

Also built into these flexible feeding strategies is the option to make up for any notable shortages of fish by increasing the purchase of commercial dog food. By a wide margin, this was the most selected option identified by surveyed mushers when asked how they cope with years of low salmon runs. This option typically involves finding ways to extend or supplement seasonal wage employment in order to afford the cost of additional purchased food.

A long-time musher residing in Manley provided a detailed description of the typical seasonal round of activities associated with having, maintaining, and fishing for sled dogs. This description is illustrative of the multi-phased approach to fishing for dogs that allows most mushers to adapt to fishing restrictions and low salmon numbers. It also illustrates the central spot that sled dogs occupy in musher's lives and how sled dogs are intertwined in a broader lifestyle that is unlikely to be deterred or fundamentally changed by a poor salmon run:

> "Lets start with spring……the name of the game in the spring is stretching out your food supplies with the onset of warm temperatures and getting through until fish arrive. With the commercial feed, as long as you keep it dry and the mice out of it it's fine. But lets say you have a lot of frozen meat, like chicken, just sitting out there on pallets, or you have leftover crib fish you haven't used yet……you have to have a strategy for using it up or keeping it cold. May is kind of an off-time for the dogs, because the yard maintenance is done, you've taken stock of your left-over food supplies and fishing has not started yet. The first opportunities for fishing are dictated by breakup, but in the Manley area the first real chance to get fresh fish is around the last week of May or the first week of June when we throw in a small-mesh net for non-salmon and maybe get a few pike and whitefish for the dogs.
>
> We usually make the move up to the (Yukon River) fish camp the first week in June. All the dogs go with us to fish camp. I usually store a supply of dried king salmon backbones in a cache that can serve as immediate food for the dogs. I will usually take up some commercial food or I might have some stored up there. And I've got a great little whitefish net and I'm lucky enough to have a little eddy right there that I can fish. So I get up there, throw a net in, and I've got food to eat for myself and food for the dogs. Oh, and firewood……I'll spend a couple days scouring the beach trying to get some wood for the dog cooker. Every day you are cooking for the dogs.
>
> The kings arrive the last week in June and the dogs will be fed king scraps as soon as we are cutting fish. The dogs will sometimes get tired of the rich king scraps and not eat…….so then you cook up a batch of ciscoes and they dive right in to that. And the kings generally run most of July. Every king that is cut for human use, the backbone is saved for dog food because that's really good food and pretty maintenance free. As the run turns to summer chums we'll back off. We don't really like the summer chums…..sorry, they're just worthless, I mean, you can throw them in the dog cooker and feed 'em, but as far as cutting them, they just shrivel up, they get maggots, they're a real pain…….so we're not excited about them.
>
> We'll stay at the Yukon camp into the last few days of August to take the early portion of the fall chum run for human food and then do most our fishing for dog food on the Tanana when it starts to get cold. I'll bring most of the dried king backbones back with me to Manley to feed the dogs until the crib fish are put up. We catch the Tanana chums almost all with nets. We might cut [and dry] a few before moose hunting if the run is early or we're worried about getting enough, but then we'll take a break and go moose hunting. After hunting is over the big fishing effort starts…….we may get a hundred and fifty fish in the net over night…..sometimes it's 10% coho and sometimes it's more like 50/50…..but we take

> ‘em all back to the landing, fling ‘em into totes and take them back to the house. Each day’s catch is sprayed with Malathion to keep the flies off…..we use a garden sprayer. Then when the weather is cold enough, the fish are removed from the totes and spread out on tarps on the ground so that they don’t touch each other. When they are substantially frozen they can be stacked or piled and then covered. The slow freezing process results in a sour fish that the dogs seem to really like. But they are still fish, and the dogs can’t race on those cribs. You can use them for recreation, you can use them for general working teams, but I would call it maintenance food. If you are serious about racing you start going to chicken and commercial (feed) and all the supplements by December. All your pups might be on cribbed fish, your yearlings might be on cribbed fish, but your core race team will not be on fish. So, to have dogs in the village you have to embrace a whole lifestyle……boat, motor, fishing site, nets, wheel,,,,,,,,and you have to acquire the necessary skills to do what needs to be done. It’s a lot of work but it’s just a wonderful way to live. “ (KR06, Manley)

The remarkable ability of mushers surveyed in 2008 to cope with diminished salmon runs should not suggest that they have not been impacted by changes and uncertainties in Yukon River salmon fisheries. Surveys conducted in 1991 and 2008, however, do not include questions designed to measure changes in fishing effort or costs, or to quantify the various difficulties mushers may have had in obtaining the fish they need. Coping strategies such as fishing longer or purchasing more commercial food involve the expenditure of more time, effort, or cash income and must certainly have presented challenges for mushers and the impacts may have hit some areas or regions of the Yukon harder than others. The Yukon Flats region surrounding Fort Yukon is an area where the impacts of low salmon runs are frequently magnified. The braided nature of the river gives salmon numerous channels to pass through making individual fishing sites less productive and the late timing of the runs means that fall fishing can be unexpectedly cut short by freezing temperatures. While no surveyed mushers in Fort Yukon spoke specifically of hardships caused by low salmon numbers, at the time of this writing, mushers in Fort Yukon caught short by low chum harvests in 2009 were making a public plea for assistance in feeding hungry sled dogs (Fairbanks Daily News Miner 11/30/09) and relief agencies in Fairbanks were organizing food shipments to dog owners there. Wolfe and Scott (2009) also report that several mushers in the Yukon Flats community of Stevens Village specifically cited past poor chum runs as the reason for getting out of sled dogs or having to reduce the size of their dog yards.

Expanding Survey Findings Drainage-wide

Data collection for this project was confined to what is thought to be a representative sub-set of rural Yukon River communities. What can the data tell us of dog mushing and the use of fish to feed dogs in the Yukon drainage as a whole? Sample communities were initially selected for the 1991 research effort to include communities from the lower, middle, and upper portions of the drainage and the cultural diversity that exists within the drainage. This mix of communities also includes one community from each of two major Yukon tributaries (the Koyukuk and Tanana rivers), and the community of Manley is thought to be representative of mushing activities in rural road-connected communities within the drainage. Certainly there are other communities such as Eagle, Galena, and Marshall where dog mushing remains active that might have been selected for the 2008 sample communities if comparative data to the 1991 survey was not a primary factor in the study design. The fact that one of the 1991 study communities (Kaltag) no longer had any active mushers in 2008 was a surprise. Retaining it as a study community in 2008 seems sound in that it is representative of several other communities where dog mushing is reputed to have very nearly disappeared. For these reasons, the study communities and the data set collected in 2008 are presumed to be broadly representative of the Yukon River region as a whole.

A critical step in expanding survey data drainage-wide is estimating the total number of sled dogs in the drainage. To arrive at an estimate for the survey year, three 2008 data sources have been utilized. This study provides accurate 2008 sled dog numbers for the seven surveyed communities of Fort Yukon, Kaltag, Huslia, Manley, Russian Mission, St. Mary's and Tanana. Wolfe and Scott (2009) provide accurate counts of sled dogs in 2008 for four additional Yukon River communities (Alakanuk, Anvik, Grayling, and Stevens Village). And finally, ADF&G post-season harvest survey data and fishing permit returns for 2008 can be utilized for all remaining Yukon River communities.

ADF&G data for 2008 (Busher et al. in preparation) are designated as preliminary as of this writing. As noted previously, dog numbers compiled by ADF&G include significant numbers of household pets in addition to sled dogs. For 2008, ADF&G estimated a total of 5,297 dogs in the Alaska portion of the Yukon River drainage. If a correction factor is applied to the ADF&G dog

numbers to remove the base level of household pets, the remaining dog numbers can be used to approximate the number of sled dogs.

Most village households have a dog. Some households have no dogs while others may have two or more. There is some evidence that lower Yukon River communities tend to have higher levels of pet dog ownership than upper Yukon communities as dogs are viewed in traditional Yup'ik beliefs as a culturally respectful way to dispose of game cutting and wild food scraps. The lower Yukon community of Alakanuk is a good example, where Wolfe and Scott (2009) found approximately 250 dogs in 154 households in 2008, or 1.63 dogs per households, none of which were sled dogs. If a correction factor of 1.5 pet dogs per household is subtracted from ADF&G's estimated total number of dogs in lower Yukon River communities (Alakanuk to Grayling) the number of sled dogs in the lower Yukon River for 2008 can be estimated at 174 dogs.

For middle and upper Yukon communities (Kaltag and above), if a correction factor of one pet dog per household is subtracted from the total number of dogs estimated by ADF&G, the number of sled dogs in the remainder of the drainage is estimated at 2,047 dogs. For the purposes of estimating quantities of fish used to feed sled dogs, some additional adjustments must be made to this number however, as it includes sled dogs from road-connected urban and near-urban locations where accompanying harvest data show very little use of fish to feed dogs. If dog numbers allocated to Fairbanks, Minto, and upper Tanana River communities are excluded, the number of sled dogs in the middle and upper Yukon drainage being fed fish as described in this report is estimated at 1,476 dogs. Using these sources and the correction factors outlined above, the total number of sled dogs utilizing fish as food from the Alaska portion of the Yukon River draining in 2008 is estimated at 1,650 dogs.

Harvest data presented in Table 7 show two distinct regional patterns of fish use by mushers. Fish utilized by Russian Mission and St. Mary's mushers illustrate the lower Yukon River pattern, where mushers rely heavily (67%) on non-salmon fish for dog food and sled dogs consume an annual average of about 444 pounds of fish per dog. The harvest by Fort Yukon, Huslia, Manley, and Tanana mushers illustrates the middle and upper Yukon River pattern where mushers rely heavily (76%) on salmon for dog food and sled dogs consume an annual average of

about 786 pounds of fish per dog. Applying these harvest patterns to the regional estimates of sled dog numbers allows drainage-wide harvest estimates to be made.

Dog estimates presented above suggest a total of 174 sled dogs being fed using the lower Yukon River pattern. At 444 pounds of fish per dog this translates to 77,256 pounds of fish used to feed sled dogs in the lower Yukon region. Sixty seven percent of this total (51,761 pounds) is comprised of non-salmon fish species, with pike (17,228 pounds) and large whitefish (16,764 pounds) being the largest contributors. Another 7,262 pounds of blackfish, 4,249 pounds of arctic lamprey, and smaller quantities of burbot, sheefish, and small whitefish make up the remainder of the non-salmon harvest fed to dogs. Salmon contributes 33% (25,494 pounds) of the lower Yukon fish harvest fed to sled dogs, including 21,400 pounds of chum salmon (2,972 fish) and 2,627 pounds of coho salmon (380 fish).

The number of sled dogs being fed using the middle and upper Yukon River pattern is estimated at 1,476 dogs. At an average of 786 pounds of fish per dog this translates to 1,160,136 pounds of fish used to feed sled dogs in the middle and upper Yukon region. Of this total, 75.6% (877,063 pounds) consists of salmon, including 20,882 pounds of king salmon cutting scraps, 787,732 pounds of chum salmon (109,407 fish) and 68,448 pounds of coho salmon (9,920 fish). Non-salmon fish species make up 24.4% (283,073 pounds) of the middle and upper river fish harvest fed to dogs, including 158,939 pounds of large whitefish (39,735 fish) and 70,768 pounds of small whitefish (37,346 fish). Another 53,336 pounds of burbot, pike, and sheefish make up the balance of the non-salmon fish fed to sled dogs in the middle and upper Yukon.

Combining the regional estimates presented above results in a drainage-wide estimate of 1,237,392 pounds of locally-caught fish used to feed sled dogs during the 12-month period preceding the 2008 surveys. The number of small salmon (chum and coho) harvested as food for sled dogs during this same period is estimated at 122,679 salmon. This number is significantly higher than the estimated number of salmon used to feed dogs provided by ADF&G's 2008 harvest assessment. Busher et.al. (in prep.) estimate the total Yukon River subsistence harvest of small salmon for all uses in 2008 at approximately 193,000 salmon and estimates the total number of salmon used for dog food at less than 70,000 fish. Reasons for the large discrepancy

between estimates made by ADF&G and this study are not entirely clear. The two data collection efforts have very different sampling strategies, target populations, expansion methods, and objectives, but should ideally converge on critical data points for a similar time period. Sampling and expansion methodologies for both studies result in large confidence intervals that might, in theory, allow high and low estimates from these two studies to be more closely aligned. It should also be noted that a large majority of the salmon harvested as dog food and reported by surveyed mushers during the spring and early summer of 2008 were actually harvested from the 2007 salmon run, and this may account for at least some of the discrepancy. As of this writing, ADF&G's post-season Yukon River salmon harvest data for the 2007 season are unavailable. Nonetheless, the survey methodology used here, targeting only mushers, and asking only about fish harvests fed to dogs, should result in an accurate accounting of this portion of the annual subsistence harvest. Therefore the outcome of the analysis presented here offers insights for the data collection methods associated with the annual post-season harvest assessment.

The Legal Status of Feeding Subsistence-Caught Fish to Dogs

Occasional questions from mushers and non-mushers alike regarding the legality of feeding subsistence-caught fish to dogs call for a brief review of relevant statutes. The inclusion of *transportation* in both the federal and state definitions of subsistence is widely interpreted as pertaining specifically to the maintenance of dog teams. Under the Alaska National Interest Lands Conservation Act (ANILCA), subsistence uses are defined as:

> "the customary and traditional uses by rural Alaska residents of wild renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or <u>transportation</u>; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade." (ANILCA Section 803). [emphasis added]

Under Alaska State law, subsistence uses means:

> "the noncommercial, customary and traditional uses of wild, renewable resources by a resident domiciled in a rural area of the state for direct personal or family consumption, as food, shelter, fuel, clothing, tools, or <u>transportation</u>; for the making and selling of handicraft articles out of non-edible by-products of fish and wildlife resources taken for personal or family consumption and for the customary trade, barter, or sharing for personal or family consumption" (AS 16.05.940 (30)). [emphasis added]

ANILCA Section 804[1] directs that the Federal Subsistence Board select amongst subsistence users, not uses, when shortages are of a severity to require such action. Under ANILCA there is no statutory or regulatory mechanism to prioritize amongst uses. To date, the Federal Subsistence Board has not distinguished or prioritized amongst recognized subsistence uses (i.e. subsistence for human food versus subsistence for use as dog food), basing its practice on the premise that all subsistence uses as defined in ANILCA qualify for the subsistence preference. Similarly, under state law, there has to date been no effort by the Alaska Board of Fisheries to attempt to define or differentiate between commercial and non-commercial dog teams. Thus, the maintenance of dog teams, regardless of how the dogs are used, currently qualifies as a subsistence use.

CONCLUSIONS

All research objectives were met and the findings support the following conclusions:

- Between 1991 and 2008 the number of sled dogs and the number of people involved in dog mushing in rural Yukon River communities has declined by more than 50%. A complex set of economic and social changes in rural communities has eroded the ability of many rural dog mushers to adhere to the lifestyle required to keep sled dogs. Disruptions in Yukon River salmon fisheries in recent years have contributed to the stresses being felt in rural villages but are not the root cause of the decline in village mushing.

- Existing rural dog teams remain highly reliant on locally-caught fish, particularly chum salmon, for food. Overall, the average pounds of fish harvested per sled dog in 2008 was

[1] Section 804 of ANILCA provides a subsistence priority for the taking of fish and wildlife on federally administered lands and waters. Whenever it is necessary to restrict the subsistence uses of populations of fish and wildlife on these lands, in order to protect the continued viability of fish and wildlife populations, or to continue the use of these populations, such a priority is to be implemented through appropriate limitations. These limitations are based on the application of three criteria, including 1) Customary and Direct Dependence upon the Populations as a Mainstay of Livelihood; 2) Local Residency– Proximity to the Resource; and, 3) Availability of Alternative Resources.

slightly lower than 1991, and the percentage of the harvest contributed by non-salmon fish species was higher.

- Existing rural dog teams are being maintained for a variety of purposes. The data on use of dogs show a general increase in the use of dogs for sprint racing in 2008 compared to 1991 and an overall decreased use of dogs for utilitarian purposes such as working trap lines and general transportation. The emphasis on speed and sprint racing over the last 15 to 20 years has resulted in changes in the genetic make-up of the average village sled dog and has changed the complexion of village mushing.

- Drainage-wide extrapolations of survey data result in an estimated 1,650 sled dogs populating rural Yukon drainage communities and consuming more than 1.2 million pounds of locally-caught fish annually. While these represent significant declines from 1991 estimates, sled dogs remain major consumers of Yukon River fish and a significant driver of subsistence fisheries across the drainage.

RECOMMENDATIONS AND MANAGEMENT IMPLICATIONS

In rural Yukon River communities, households that maintain sled dogs tend to be among the most active harvesters of subsistence fish. Understanding the impact of dog teams on subsistence fish harvests is an important issue for federal subsistence fisheries management. As a legal and important use of subsistence-caught fish it is timely for managers and management agencies to fully understand the linkages between fish and sled dogs in this climate of historically low salmon harvests. Fisheries managers need to be aware of and monitor changes in this dynamic user group in order to accurately assess harvest patterns and trends. Current subsistence harvest monitoring efforts in the Yukon drainage probably include, but have no specific focus on, mushing households. Furthermore, they typically rely on extrapolations or expansions from fairly small samples in each community to achieve estimates of fish harvest and numbers of dogs. The patchy nature of sled dog ownership provides sampling challenges. The inclusion or exclusion of just one mushing household in any given community can easily affect the accuracy and precision of these estimates for individual communities and for the drainage as

a whole. Periodic studies like this one provide managers with another tool to track specific trends in the use and feeding of sled dogs, refine harvest estimates, and gain a more complete understanding of the dynamics associated with this important user group.

With the downturn in Yukon River salmon numbers and disruptions in commercial salmon fisheries there have been attempts in recent years to establish new commercial fisheries on non-salmon species such as Bering cisco and arctic lamprey. To fully develop and regulate such fisheries, managers will need to accurately assess and accommodate existing subsistence uses of these species. Harvest quantities of fish used as food for sled dogs will be a significant component of this required data set and can best be assessed through studies like this one.

Regional estimates of amounts necessary for subsistence (ANS) have been established by the Alaska Board of Fisheries for salmon and non-salmon fish species and codified in State statute. ANS estimates are typically based on harvest ranges over time and can be subject to periodic revision by the Board of Fisheries. Sled dogs figure prominently enough in fish harvests to affect drainage-wide harvest averages. The decline in village sled dog numbers documented by this study will likely result in annual harvest for many fish species that are significantly below ANS levels established a decade or more ago. The history of village sled dogs has been marked by periods of decline and resurgence in the past. What the future holds for village sled dog numbers is unclear. Caution should be exercised in any attempt to adjust ANS guidelines based on what might be a temporary downturn in the use of rural dog teams.

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Appendix A. 2008 Survey Instrument

Community_____ HH ID _____

Respondents Age _____ HH Size _____

DOGS & KENNEL INFORMATION

1. How many sled dogs do you currently have? (exclude puppies < 9 mo. Old) _____

2. How do you use your dogs? (check all that apply)

_____Sprint racing
_____Distance racing
_____Transportation for trapping
_____Hauling wood, water etc.
_____Household pets or "scrap dogs"
_____ Gen. transport/camping/recreation
_____Breeding dogs for sale
_____Rent or lease dogs or teams
_____Watch/guard/bear dogs
Other:_____

3. How long have you been involved in mushing dogs. _____

4. How many (working) snowmobiles does this household own? _____

DOG FOOD INFORMATION

5. Do you feed locally-caught fish to your dogs? **Yes** **Scraps Only** **No** (if No, skip to question 10.)

6. Please list the kinds and quantity of fish used for dogs in the last 12 months and how you obtained them:

Fish Species	**How Obtained (indicate quantity)**				
	Commercial Fishing	**Subsistence Fishing**	**barter/trade**	**purchase**	**given**
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

7. In the last 12 months, about what proportion of your dogs' diet was fish?

¼ or less **¼ to ½** **about half** **½ to ¾** **¾ or more** **All**

8. Does this represent a typical year of fish use for you and your dogs?

Less Fish than usual **About average** **More Fish than usual**

9. If you use salmon as dog food, what strategy(ies) do you use to cope with years of low salmon returns?

Fish Salmon Harder/Longer **Increase Use of other fish** **Buy More Commercial food** **Decrease Number of Dogs**

Other: _____

10. What do you feed your dogs besides fish? (check all that apply)

_____Commercial dry dog food

_____Rice or other bulk grains

_____Commercial bone or fish meals

_____Other purchased foods_____

_____furbearer carcasses

_____moose scraps

_____caribou scraps

_____other wild foods _____

11. Do you think recent high gas prices have increased the use of sled dogs? **Yes** **No**

Comments relating to fuel costs:

FOCUS ON CHANGE (for individuals with 10+ years of involvement in dog mushing)

Over the past 10 or 15 years Yukon Salmon stocks have experienced significant ups and downs, salmon fisheries have become more regulated and drainage-wide subsistence harvests of small salmon have declined. We would like to understand how these and other changes may have impacted dog mushers along the Yukon River.

12. How does the size of your dog yard compare now to 10 or 15 years ago?

No Real Change **Fewer dogs now** (explain why below) **More dogs now** (explain why below)

13. Has the way you use your dogs changed from the way you used them 10 or 15 years ago?

Yes (explain below) **No Real Change**

14. How does your use of salmon to feed dogs compare now to 10 or 15 years ago?

No Real Change **Use Less Salmon now** (explain below) **Use More Salmon now** (explain below)

THANK YOU VERY MUCH FOR PARTICIPATING

APPENDIX B. Fish Weight Conversion Factors

Resource	Conversion Factor (round weight)	Units	Source
Salmon			
chum salmon	7.2	individual	Yukon River commercial mean 2000-2006
coho salmon	6.9	individual	Yukon River commercial mean 2000-2006
king salmon scraps	1.0	pounds	
pink salmon	3.2	individual	Yukon River commercial mean 1988-1990
Non-Salmon			
arctic lamprey	1.00	pounds	
blackfish	1.00	pounds	
burbot	6.0	individual	YK River Standard
pike	3.0	individual	YK River Standard
sheefish	10.7	individual	YK River Standard
small whitefish	1.9	individual	YK River Standard
large whitefish	4.0	individual	YK River Standard

Source: ADF&G Division of Subsistence, Community Profile Database

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