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Natural Resource Report NPS/AR/NRTR—2006-057



Photo by Nathan Olson, USFWS



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James P. Lawler (National Park Service) and Jim Dau (Alaska Department of Fish and Game)

National Park Service
4175 Geist Road
Fairbanks, Alaska 99709-3420

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2006 AERIAL MOOSE SURVEY IN THE UPPER KOBUK DRAINAGE, ALASKA

DATA SUMMARY

Survey Dates: 4 - 7 April 2006

Total area covered by survey: 4001 mi² (10,363 km²)

Total moose observed: 219 moose (195 adults and 24 calves)

Population estimate: 737 (90% confidence interval = 577 - 897) moose

Estimated total density: 0.18 moose per mi² (0.16 adult moose per mi²)
(0.07 moose per km²; 0.06 adult moose per km²)

Estimated ratios: 17 calves:100 adults

INTRODUCTION

Moose are an important subsistence resource for the residents of Kobuk, Shugnak and Ambler. Moose hunting is also an important source of income for hunting guides and transporters in the area and many sport hunters enjoy hunting in this area. In recent years, with the perception of a decline in the moose population, questions have been raised concerning the allocation of moose between local and non-local hunters. The issue of subsistence versus sport hunting is controversial throughout the state of Alaska and conflicts will likely intensify as competition increases for limited wildlife resources and access. Our objective in this study was to update our understanding of the upper Kobuk River moose population.

The Alaska Department of Fish and Game (ADF&G) and the National Park Service (NPS) cooperatively censused moose in a 4001 mi² (10,363 km²) area in the upper Kobuk River drainage during 4 -7 April 2006. Snow conditions were excellent with good lighting.

The area surveyed in the spring of 2006 is the same area surveyed in the spring of 2003. In both years, we used the Geo-Spatial Population Estimator (GSPE; VerHoef 2001) to estimate moose populations and compared these results to moose population estimates from Moosepop (Gasaway et al. 1986). In addition many of the pilots and observers that participated in the 2003 survey also participated in the 2006 survey. This provided a great opportunity for evaluating the results from these 2 survey years.

We surveyed moose in the upper Kobuk River drainage during the spring of 2003 because reports from local residents and non-local hunters as well as opportunistic observations by ADF&G and wildlife enforcement personnel indicated moose densities were low and possibly declining in this area. Results from the 2003 survey confirmed a low density for moose in the upper Kobuk River (0.21 moose per mi²).

STUDY AREA

The survey area included an area roughly bound on the West by the Black and Shugnak Rivers (157°25'W), on the East by the Helpmejack Hills (153°55'W), on the North by crest of the Schwatka Mountains (67°24'N), and to the South by the Kobuk/Koyukuk divide (66°15'N) (Fig. 1). Principal landowners in this area are the State of Alaska,

NANA Corporation and the NPS. Vegetation types in this area are: upland shrub, upland spruce/birch/shrub, riparian spruce/willow/cottonwood, tussock tundra, and wet sedge meadows. Alpine areas (above 1500 ft) and large lakes were intentionally excluded from the survey because these areas are not typically utilized by moose.

METHODS

Moose population surveys were conducted in the upper Kobuk river drainage following guidelines outlined by Gasaway et al. (1986) and modified by VerHoef (2001). These survey methods were developed by the ADF&G and are in wide use across the state allowing for comparison of survey areas. The survey area was delineated using a geographical information system (ArcView GIS 3.2, Environmental Systems Research, Inc. [ESRI], Redlands, California) and covered approximately 4001 mi² (10,363 km²) (Fig. 1). The survey area was divided into a grid of rectangular sample units of 2 degrees latitude and 5 degrees longitude resulting in units of approximately 5.2 mi² (13.5 km²). There were a total of 763 units within the survey area. Units were randomly selected for order of sampling selection. For analysis (but not sampling selection), sample units were stratified as high (H) or low (L) moose density based on habitat characteristics and moose observed during stratification flights conducted during the survey. Units were considered to be H if they were thought to contain ≥ 1 moose.

Six planes participated in the census. Four planes surveyed sample units and two planes stratified units. Survey planes each had a pilot and an observer. The stratification plane had 1 – 2 observers. All survey planes were Piper Supercubs. The stratification planes were a Cessna 185 and a Cessna 206. All pilots had previous experience flying in aerial moose surveys. Three of the six observers had previous experience as observers on aerial moose surveys.

The survey was based out of Dahl Creek (Fig. 1) so that planes and staff would be close to the survey area. Dahl creek has a large airstrip for equipment and fuel delivery, and facilities for personnel.

Survey aircraft used Global Positioning System (GPS) receivers to identify the boundaries of sample units. Search intensity varied with habitat. Greater effort was spent in areas with cover (i.e., forests) than in open habitat. Moose observed were assigned a group number and the coordinates of the group were recorded using the aircraft GPS receivers. Numbers of moose in each group were recorded and each moose was classified as either an adult or calf. Moose population estimates within the survey area were calculated using the Geo-Spatial Population Estimator (GSPE; VerHoef 2001, DeLong 2006).

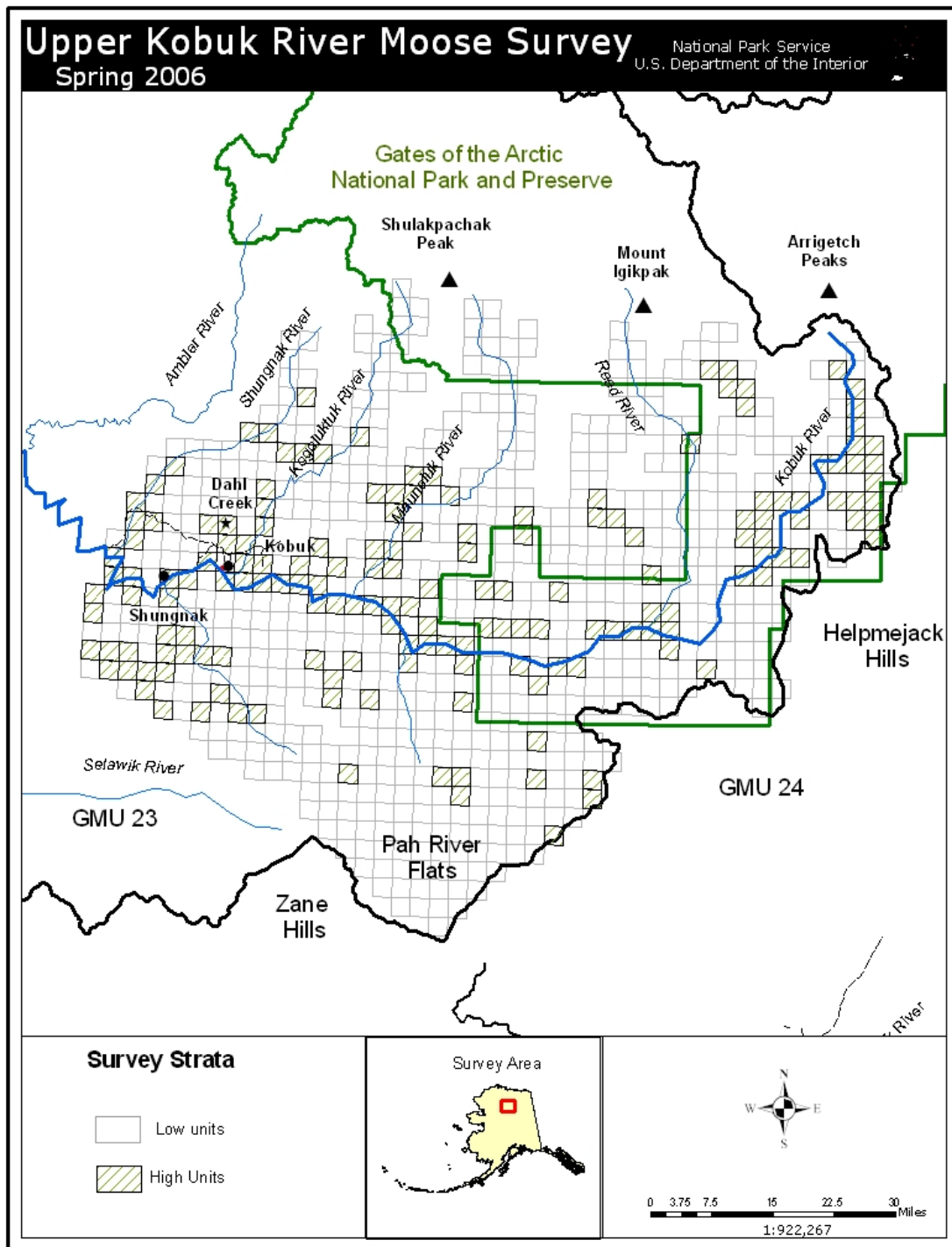


Figure 1. Units delineated for a moose survey on the upper Kobuk River in April 2006. Units were stratified as High if ≥ 1 moose was anticipated to be in the unit and Low if no moose were anticipated to be in the unit.

RESULTS

Snow cover was complete from 4 -7 April 2006. Snow depth varied throughout the survey area but tended to be deeper in the southern portion of the survey area. No new snow fell during the survey and snow on the ground appeared fresh. Survey conditions from 4 - 6 April were excellent with bright and sunny conditions and light winds. On 7 April 2006, survey conditions deteriorated with overcast skies and wind.

Unit sampling

Out of 763 total sample units (Fig. 1), H units comprised 22% ($n=167$; 875 mi²) and L units comprised 78% ($n=596$; 3127 mi²) of the total number of units in the survey area. Survey aircraft sampled 30% of all H units in the survey area ($n=50$; 262 mi²) and 23% of all L units in the survey area ($n=136$; 712 mi²). Twenty four percent of all survey units in the survey area were sampled ($n=186$; 974 mi²). Crews sampled 1-23 units a day (Mean [$\pm$ SE] = 13.3 [$\pm$ 1.83]). Mean ($\pm$ SE) survey rates were 18.6 ($\pm$ 0.69) minutes per unit (3.5 [$\pm$ 0.13] minutes per mi²).

A total of 219 moose were observed during the March survey (Table 2). Slightly over 13% of the adult moose observed were accompanied by calves. If we assume 48% of observed adults were bulls based on past sex composition work conducted in this area (Lawler et al. 2003), 105 of the moose observed during the March survey were bulls and 114 were cows. This results in a calf:cow ratio of 21:100. Only one cow was observed during the survey with 2 calves. Observed density of all moose in the area surveyed was 0.22 moose per mi². The majority of moose observed were in the western portion of the survey area (Fig. 2). Observed total moose densities were lower in 2006 in comparison to a comparable survey conducted in 2003. Observed moose densities in the H units and L units were higher in 2006 in comparison to 2003 (Table 2). However, because we classified substantially fewer units as H in 2006 in comparison to 2003 (167 units and 289 units in 2006 and 2003, respectively), the density of moose observed in the H strata during 2006 had less of an influence on the density of moose observed in the entire survey area in comparison to 2003. It should also be noted that more units were mis-stratified in 2006 in comparison to 2003 as a number of the L units in 2006 contained moose (Fig. 2; Table 2).

Population estimates

Results from the GSPE program indicate a total density of moose of 0.18 moose per mi² and a density for moose calves of 0.02 calves per mi² over the entire survey area (Table 3). Results from MOOSEPOP indicate a total moose density of 0.20 moose per mi² and a density of moose calves of 0.02 calves per mi² (Table 4). Although the GSPE point estimate for the moose population in 2006 is lower than the point estimate in 2003 (Tables 3 and 4), a two-tailed t-test comparing the 2003 and 2006 survey results indicated this difference was not significant ($t= 0.06$, $d.f.= 358$, $p=0.48$).

Table 2. Summary of moose observed during populations surveys conducted 23-26 March 2003 and 4 - 7 April 2006 in the upper Kobuk River drainage, Alaska. Units were stratified as H if ≥ 1 moose was anticipated to be in the unit and L if no moose were anticipated to be in the unit.

	Year	# of moose observed		Observed density (# moose per mi ²)		Total observed	Total Density
		H	L	H	L		
Adults	2003	223	3	0.44	0.01	226	0.25
	2006	148	47	0.57	0.06	195	0.20
Calves	2003	26	0	0.05	0.00	26	0.03
	2006	16	8	0.06	0.01	24	0.02

Table 3. Statistics for estimated numbers of moose on the upper Kobuk River drainage during March 2003 and April 2006 using the moose Geo-Spatial Population Estimator (VerHoef 2001).

Year	Statistical Pop. estimator	Population estimate	Total ($\pm$ SE)	80% CI ^a (% of est.) ^b	90% CI ^a (% of est.) ^b	95% CI ^a (% of est.) ^b
2003	GSPE	Total Moose	856 (± 100.8)	727 – 985 (15)	690 – 1022 (19)	658 – 1053 (23)
		Calves	91 (± 21.7)	63 – 119 (30)	56 – 127 (39)	49 – 134 (47)
2006	GSPE	Total Moose	737 (± 97.4)	612 – 862 (17)	577 – 897 (22)	546 – 928 (26)
		Calves	96 (± 19.0)	71 – 120 (25)	64 – 127 (33)	59 – 133 (39)

^a Upper and lower bounds of confidence intervals (CI).

^b The confidence interval expressed as a percentage ($\pm$) of the total estimate.

Table 4. Statistics for estimated numbers of moose on the upper Kobuk River drainage during March 2003 and April 2006 using the Moosepop (Gasaway et al. 1986).

Year	Statistical Pop. estimator	Population estimate	Total ($\pm$ SE)	80% CI ^a (% of est.) ^b	90% CI ^a (% of est.) ^b	95% CI ^a (% of est.) ^b
2003	Moosepop	Total Moose	754 ($\pm$ 117.4)	603 – 906 (20)	559 – 949 (26)	521 – 987 (31)
		Calves	77 ($\pm$ 22.5)	48 – 106 (39)	39 – 114 (49)	32 – 121 (58)
2006	Moosepop	Total Moose	789 ($\pm$ 123.2)	630 – 949 (20)	585 – 994 (26)	544 – 1035 (31)
		Calves	89 ($\pm$ 21.5)	61 – 116 (31)	53 – 124 (40)	46 – 131 (48)

^a Upper and lower bounds of confidence intervals (CI).

^b The confidence interval expressed as a percentage ($\pm$) of the total estimate.

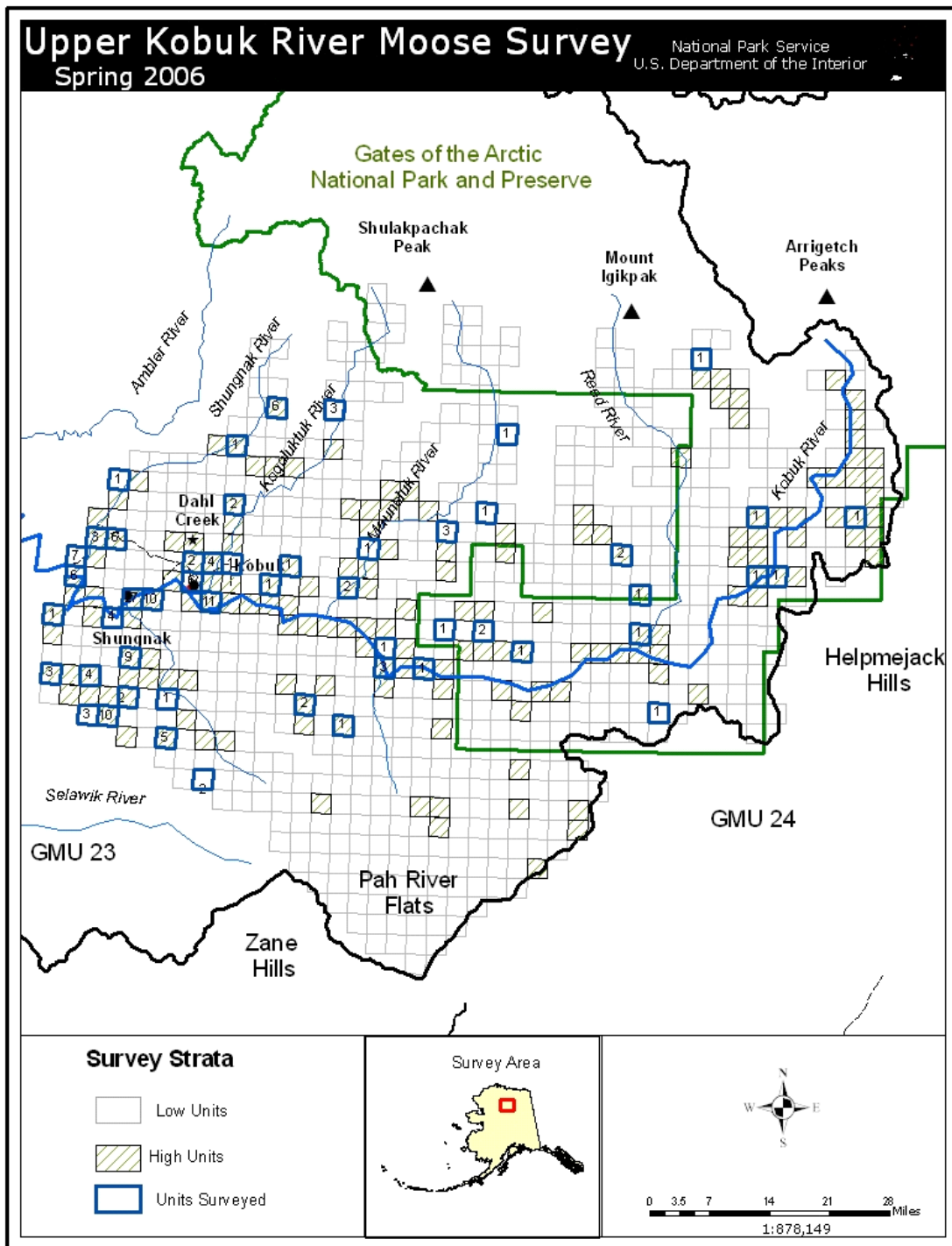


Figure 2. Units delineated for a moose survey on the upper Kobuk River in April 2006. Units were stratified as High if ≥ 1 moose was anticipated to be in the unit and Low if no moose were anticipated to be in the unit. Numbers in survey units completed indicate the total number of moose observed in that unit.

DISCUSSION

There were no indications that the number of moose in the Upper Kobuk drainage have significantly changed from 2003 to 2006. Moose densities in the Upper Kobuk drainage were substantially lower during the 2006 survey in comparison to a smaller survey that was conducted in 1995 (Dau et al. 1996) in the same general area (densities of 0.18 and 0.57 moose per mi² in 2006 and 1995, respectively). Although current moose densities in this area are low, they are comparable to those in the Koyukuk drainage (density of 0.19 moose per mi² in 2004), the survey area immediately to the east (Lawler et al. 2006). These two survey areas share many similarities in that they are dominated in the North by the Brook's Range and a substantial amount of suitable moose habitat occurs in the relatively high elevation drainages flowing out of these mountains. Moose surveys conducted West and Southwest of the Upper Kobuk survey area found moose densities higher than what we report for the Upper Kobuk (0.40 moose per mi² and 1.04 moose per mi² for the Kobuk Valley National Park survey area and Kobuk Delta survey area, respectively; N. Olson, Fish and Wildlife Service, personal communication).

As previously reported (Lawler et al. 2003) an estimate of 0.20 moose per mi² is extremely low and indicates the need for a conservative approach to managing moose in the upper Kobuk River drainage. Moose population numbers are low enough to warrant maintaining the current conservative harvest levels to prevent hunting from reducing the population.

RECOMMENDATIONS

1. Repeat the upper Kobuk River drainage survey in 3-4 years to evaluate population density.
2. Retain current state regulations for moose:

RESIDENT HUNTERS

General hunt: Sept. 1 - 20; 1 bull having antlers $\geq 50''$ wide or ≥ 4 brow tines on one side

Registration hunt (RM880): Aug. 1 - Dec. 31; 1 bull; antlerless moose may be taken Nov. 1 - Dec. 31 however calves and cows accompanied by a calf may not be taken

NONRESIDENT HUNTERS

Drawing permit hunts: Sept. 1 - 20; 1 bull having antlers $\geq 50''$ wide or ≥ 4 brow tines on one side; numbers of permits will be announced before the beginning of each hunt

3. Retain current Federal subsistence regulations but open a discussion with Federal and State biologists/managers. Moose densities throughout Game Management Unit (GMU) 23 vary substantially. For example, moose densities are more than 4 times higher on the lower Kobuk (0.84 moose per mi²; B. Shults, NPS, personal communication) in comparison to the densities we observed during this study (0.18 moose per mi²). An

understanding of spatial moose distribution and harvest patterns of cows and bulls throughout the GMU should guide these discussions. The current Federal subsistence regulation for GMU 23 reads:

Aug 1 – Mar. 31; 1 moose; no person may take a calf or a cow accompanied by a calf.

COSTS

The costs of this survey were shared between the NPS and the ADF&G (Table 5). Flight times to complete the March survey are presented in Table 6.

Table 5. Costs of an aerial survey to estimate moose sex and age composition and population level on the upper Kobuk River drainage during April 2006.

	Cost	Item Description
ADF&G	\$100	Misc. supplies for DPS cabin 30.0 hrs ADF&G Cub (includes ferry time)
	\$100*	TOTAL
NPS	\$12,500	Avgas delivered to Dahl Creek (25 barrels as 55 gal. Barrel)
	\$4471	Cessna 206 (charter) to transport gear from Fairbanks to Dahl Creek
	\$2060	Supplies for winterizing Dahl Creek for survey
	\$373	Misc. supplies including propane, regular gas, hand pump, spark plugs, WD-40, Kitchen utensils
	\$66	White gas, batteries, duct tape
	\$784	Groceries for 10 people for 5 days
	\$2781	Cessna 206 (charter) for stratification
	\$2531	Cessna 185 (NPS) for stratification
	\$530	Satellite phone charges (flight following)
	\$2341	Survey plane (NPS Supercub)
	\$5986	Survey plane (Arctic Air Alaska Supercub)
	\$5402	Survey plane (Shadow Aviation Supercub)
	\$39825	TOTAL
	\$51789*	GRAND TOTAL

* Costs not included in this estimate are ADF&G flight times and some fuel costs.

Table 5. Flight times of survey planes for March survey on the upper Kobuk River, April 2006.

	Plane	Ferry Time (h)	Survey Time
ADF&G	Sample unit survey		
	PA-18	6.0	24.0
	Misc.		
	PA-18		
	PA-18		
NPS	Stratification		
	Cessna 185 (NPS)		17.1 (includes ferry time)
	Cessna 206 (Charter)		5.2
	Sample unit survey		
	PA-18 (NPS)		26.6 (includes ferry time)
	PA-18 (Charter)		32.8 (includes ferry time)
	PA-18 (Charter)		32.5 (includes ferry time)
	Misc.		
	C-206	16.51	6 (gear and personnel transport from FAI to Dahl Creek)

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