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Abstract: A survey to determine the number of white-fronted geese (Anser albifrons) and Canada geese (Branta canadensis) within the boundaries of the Koyukuk NWR and the Kaiyuh Flat Unit of the Innoko NWR was conducted from 16 July to 8 August, 1985. Within the boundaries of the Koyukuk NWR, there were 5,857± 3,127 (SE) adult and 669± 448 (SE) young white-fronted geese and 155 adult & 15 young Canada geese. The highest densities of geese were along the river corridors. No geese were observed in the Kaiyuh Unit.

Narrative:

Introductions: A goose survey was conducted to gather data on the goose populations using the Koyukuk NWR. The Koyukuk NWR provides habitat for white-fronted geese (Anser albifrons) and Canada geese (Branta canadensis), and information on those two species is essential for good management at the refuge.

Study Area:

The study area was comprised of the area within the boundaries of the Koyukuk NWR and the Kaiyuh Flats portion of the Innoko NWR. The area is in a basin surrounded by high hills. The basin includes numerous lakes, marshes, rivers and streams. The vegetation types include treeless bogs, open spruce forests, closed spruce-hardwood forests, and alpine tundra.

The study area was surveyed using two different methods. The first method used one square mile plots and the second method used a combination of censusing and random sampling one square mile plots.

In the first survey method, the area was surveyed from 16 July to 8 August by censusing 27 one square mile plots. The plots were delineated by section lines on USGS topographical maps. According to USGS maps, these plots contained potential waterfowl habitat and were accessible by a Cessna 185 equipped with floats. Twenty-three of the plots were randomly selected within the boundaries of the Koyukuk NWR and four were nonrandomly selected within the boundaries of the Kaiyuh Flats. Waterfowl habitat was determined from 1:250,000 scale USGS topographical maps. Any section of land containing water boundary from a lake greater than two acres or from a double lined river or slough was considered to be brood habitat. The Koyukuk NWR contained 3,998

sq. mi. of waterfowl habitat and the Kaiyuh Flats contained 957 sq. mi. of waterfowl habitat. Individual plots were censused with binoculars by walking or boating along the water boundaries within the plots. Rivers and sloughs that had unvegetated banks, good visibility, and a low probability of waterfowl use, were censused from a Cessna 185 or 207.

Population estimates were obtained using two techniques. One estimate was obtained using simple random sampling and one using stratified random sampling (Coughley, 1977). With the stratified random sampling, the area within the boundaries of the Koyukuk NWR was divided into two strata: Stratum A being the area associated with the river system and Stratum B being the area not associated with the river system.

The area associated with the river system was delineated from 1:250,000 scale USGS topographical maps and was defined as including any one mile section which contained a double-lined river or slough, an oxbow lake connected to a river or slough, or Boat Lake. Stratum A1 contained 727 square miles of waterfowl habitat and Stratum B1 contained 3,271 square miles of waterfowl habitat. Ten plots were located in Stratum A1 and 13 plots were located in Stratum B1.

In the second survey method, the area within the boundaries of the Koyukuk NWR was again divided into two strata, A2 and B2. These strata were similar to A1 and B1. The difference was that the area upstream of the refuge cabin on the Koyukuk River was included in Stratum B2, and instead of using sample plots in Stratum A2, Stratum A2 was censused by a pilot and observer from 7-9 August in a Cessna 185 flying at 500 feet over the river and slough corridors, over oxbow lakes and over Boat Lake. The area censused included any portion of waterfowl habitat within 1/4 mile of the waterbodies censused. Stratum A2 contained a total of 636 square miles of waterfowl habitat, and Stratum B2 contained 3,362 square miles of waterfowl habitat. Fifteen plots were located in Stratum B2.

Results and Discussions:

The two survey methods gave three very different population estimates for white-fronted geese on the Koyukuk NWR (Table 1). The standard errors are so large it is difficult to determine which, if any, estimate is reasonable, though the smaller total estimate of 6,526 seems more accurate since the high density river corridor stratum was censused rather than sampled.

No population estimates for white-fronted geese were obtained on the Kaiyuh Unit because no geese were seen. The lack of geese observed, however, may have been due to the low number of plots sampled instead of a lack of geese present.

No Canada geese were seen on the one square mile plots, but 155 adult and 15 young Canada geese were observed in the river corridor on the Koyukuk NWR. Sightability from the air for Canada geese may have been low. When geese were censused on the Dulbi River by boat on 10-11 July, 1985, 103 adults and 86 young Canada geese were seen. When the same area was censused by air on 8 August, 40 adults and 9 young were observed.

The difficulty in estimating goose population sizes on the Koyukuk NWR arises from the fact that the geese are not randomly distributed. The density of white-fronted geese in Stratum A1 was 16 times larger than in Stratum B1 (Table 2), but even within the strata, the distribution of the white-fronted geese was clumped. In Stratum A2, 24% of all adults and 61% of all young seen were on the Dulbi River. Other concentrations were at Huntington Slough with 18% of the adults, Three-Day Slough with 16% of the adults and 16% of the young, and Boat Lake with 12% of the adults.

Canada geese were also not randomly distributed. All of the Canada geese observed were in Stratum A2. Of the total seen, 39% of the adults and 40% of the young were seen on the Kateel River, 26% of the adults and 60% of the young were seen on the Dulbi River, and 30% of the adults were seen on Three-Day Slough.

Management Recommendations:

The entire river corridor should be censused by air. This year, all but 58 miles of the corridor was censused in nine hours. The remaining area could be censused in less than an hour.

A river or slough should be censused by boat at the same time it is censused by plane to develop correction factors for birds not seen from the air. The Dulbi River would be a good river to conduct both censuses. Of the birds sighted from the air, it contained 28% of the white-fronted geese and 29% of the Canada geese.

Areas that could provide important trend data in the future are the Dulbi River, Huntington Slough, Three-Day Slough, Boat Lake, and Kateel River. These areas contained 72% of the adult and 81% of the young white-fronted geese and 95% of the adult and 100% of the young Canada geese seen in the river corridor.

Literature Cited:

Caughley, G., 1977. Analysis of Vertebrae Populations. John Wiley & Sons, London. 234 pp.

Table 1. Estimates of the number of white-fronted geese within the boundaries of the Koyukuk NWR in 1985 using three computation methods.

Classi- fication	Geese/Sq. Mi. using simple random.		Stratified Random		Combination of simple random plots & census area.	
	N	SE	N	SE	N	SE
Adult	40,660	30,891	20,061	13,135	5,857	3,127
Young	4,518	2,924	2,236	1,278	669	448
Total:	45,177	33,131	22,297	13,979	6,526	3,189

Table 2. White-fronted geese per square mile in Stratum A1 and Stratum B1 on the Koyukuk NWR.

	X	SE
Stratum A1		
Adult	21.7	17.537
Young	2.40	1.628
Total	24.1	18.724
Stratum B1		
Adult	1.31	1.071
Young	0.15	0.154
Total	1.46	1.090