# CLARENCE RHODE NATIONAL WILDLIFE RANGE

## Annual Report

## January 1, 1965 to December 31, 1965

### STAFF

| | |
|---|---|
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| Jerry L. Hout | Assistant Refuge Manager |
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Department of the Interior
Bureau of Sport Fisheries and Wildlife
Fish and Wildlife Service
Bethel, Alaska

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# I GENERAL

## Weather Conditions.

Weather during 1965 was cold and dry with temperatures and precipitation below normal in most months (Fig. 1). Snowfall during the winter of 1964-65 was only slightly above normal, but below average temperatures resulted in a considerably deeper accumulation of snow by spring than would otherwise be expected.

The most critical climatological factors affecting waterfowl production on the Wildlife Range are those which influence the time and characteristics of the spring breakup of rivers and lakes. Thus, winter and spring temperatures, snowpack, both local and in headwater areas, and ice thickness may be reflected at breakup. Ability to predict the time of breakup would considerably advance our forecast of production of broods as well as aid in planning field investigations. However, assistance from several thousands of Alaskans who annually spend hundreds of thousands of dollars on ice pool tickets has only indicated that breakups are quite unpredictable.

The heavy snow pack on the Delta suggested that extensive flooding would accompany breakup, but melting occurred so gradually that most ice on the lower Kuskokwim River lasted until it melted in place. The river opened at Bethel on May 19, five days later than average, but 15 days earlier than in 1964, the latest breakup in 41 years of record. Tundra ponds in the vicinity of Bethel started melting at edges in mid May, but were not clear of ice until May 24. Larger lakes were ice covered until early June.

Spring conditions on the Wildlife Range (60 to 120 miles west of Bethel) were much more severe than at Bethel. On June 1, Baird Inlet, the Kashunuk River and other major rivers flowing through the Range were still ice covered and snow remained on many important nesting areas. However, brant were starting to nest in areas bare of snow. On June 10 ice in the Ninglafak River still prevented travel from Chevak to the Old Chevak field station by boat. Rivers and all but the largest lakes were clear of ice and the ground bare except for remnant drifts by June 15.

The late spring in coastal areas retarded nesting for most waterfowl and production of all geese was much reduced from that anticipated in earlier years. Nesting distribution, particularly of brant, was also much altered, presumably by the presence of snow on normal nesting

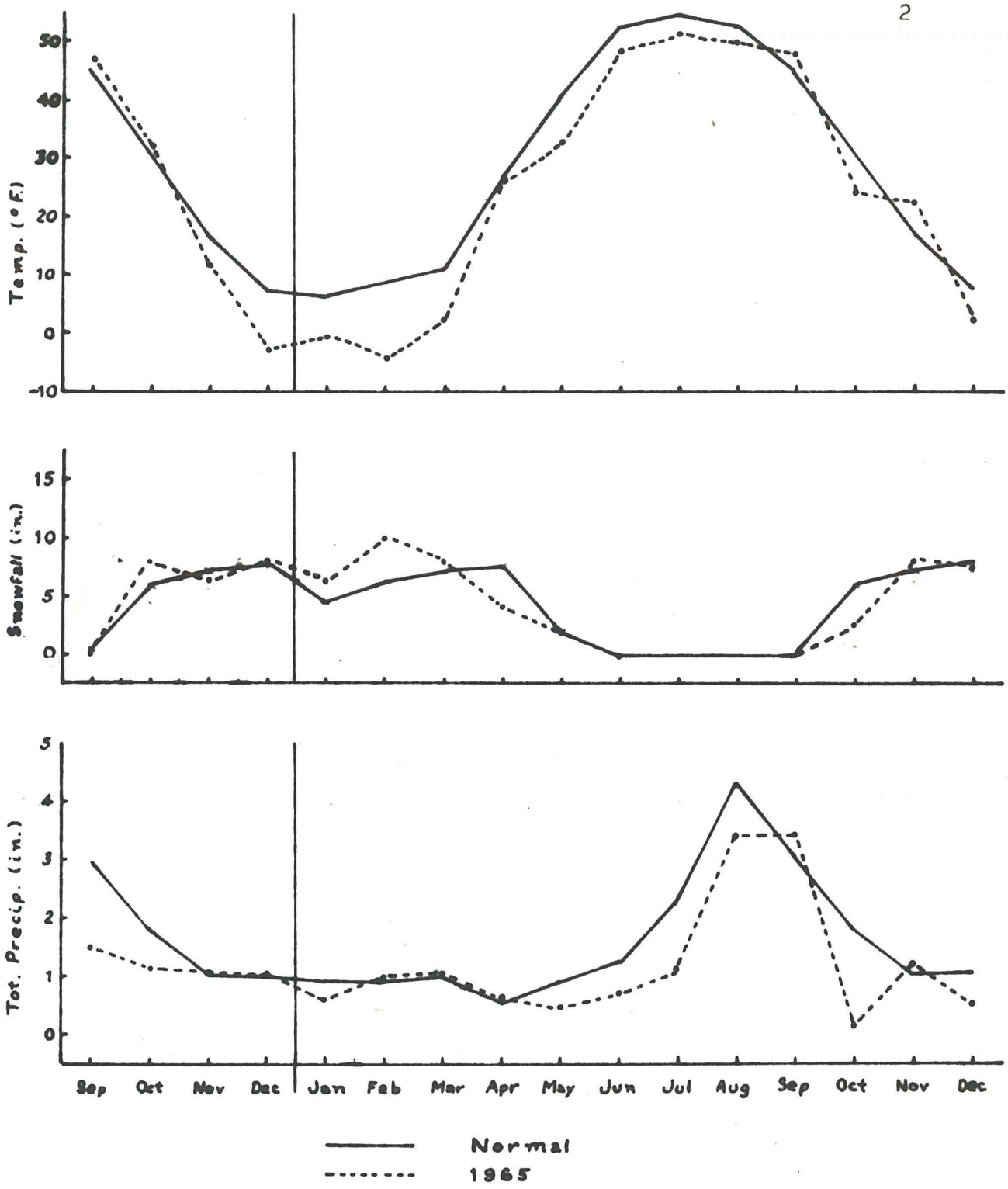



Fig. 1. Weather Patterns at Bethel

areas at the time nesting was initiated.

Weather presents a continuing problem to refuge activities by its effect on logistics. A succession of storms throughout the winter blocked roads and caused the accumulation of huge drifts between Headquarters buildings. Because all water used at the Refuge Headquarters is supplied by truck, the removal of snow from driveways became a major problem.

Transportation on the refuge is entirely by air or water and is thus continously subject to the whim of the wind. The most critical period is spring when snow and ice are unsafe for ski landings, and floats are still not useable. This is also the critical period for nesting of ducks and geese, and it is usually impossible to reach nesting areas until incubation is well underway.

Habitat Conditions.

Water: There are no water level gaging stations on the Wildlife Range or on adjacent portions of the Yukon-Kuskokwim Delta. Observations of water conditions are therefore qualititive in nature. Shortage of water is probably never a problem, but excess water may occassionally be detrimental to production of waterfowl.

Potential sources of water supply to the Wildlife Range and to other portions of Delta were examined during routine flights over the Delta and during a specific investigation of this problem made by aerial reconnaissance with Charles D. Evans, Branch of River Basins Studies.

Lakes in upland portions of the Yukon-Kuskokwim Delta are mostly in closed basins and have drainage areas of negligible size. These lakes are maintained principally by precipitation directly into the body of the lake. Evaporation records are not maintained at any location on the Delta, but evaporation rates for Fairbanks (undoubtedly much higher than on the Delta), indicate that there is at least 5-8 inches excess of precipitation over evaporation. Thus, water levels in lakes depending solely on precipitation are relatively stable. However, the deep snow accumulation resulted in somewhat higher levels in 1965 than the summer of 1964.

Lakes in floodplains (probably the majority of those on the Wildlife Range) are more dynamic in character than upland lakes. In addition to receiving water by precipitation, they may fluctuate as a consequence of flooding, either from freshwater runoff or from tidal flow.

Freshwater runoff results almost entirely from drainage within the Delta. No channel from the Kuskokwim River reaches the Range, and only the Kashunuk River system, which includes the Keoklevik and Aphrewn Rivers, in the North Unit of the Range, are connected to the Yukon River.

Examination of the entire course of the Kashunuk River indicated that only two channels carried water from the Yukon to the Kashunuk at the moderate water levels existing at the time of the survey--one from the upper end of Driftwood Slough and the other from the lower end at a point opposite Goose Island. Other channels between these may carry water at flood stages of the Yukon. However, the Kashunuk becomes quite confined by both natural levies and uplands before reaching Chukwoktulik village and maximum capacity of the channel is negligible compared to that of the lower Kashunuk. Thus, even at flood stages of the Yukon, the Yukon probably contributes less than 10% of the flow to the lower Kashunuk.

The silt load from the Yukon appears to be deposited well upriver and also does not appreciably affect the lower Kashunuk. Water of the Kashunuk as well as other connecting rivers (Aphrewn, Manokinak, and Azun) is thus essentially from drainage on a small part of the Delta itself, roughly from an area of 3,000 to 4,000 square miles. During most of the year, the primary current in the lower Kashunuk and other rivers on the Wildlife Range is produced by tidal flow. As drainage from the Delta is almost silt free, the considerable silt load of these rivers must be produced by the tidal currents and wave action. Much of this silt is redeposited, but the net flow is seaward, and the erosion of the Delta in the vicinity of the North Unit of the Range may be severe. Such erosion can be seen between the Kashunuk and the Aphrewn Rivers, and in Hazen Bay where one of the islands forming the Hazen Bay Refuge has washed away.

Tidal flooding is the most important ecological factor other than climate that effects the character of the most important waterfowl habitats on the Range. Nearly all streams and many lakes flood many miles inland on each tide. Storm tides produced by a combination of high lunar tides and strong winds occur frequently and may cause flooding of much of the coastal portions of the Range (See Annual Report for 1964). Although the principle long term effect of such tides is upon habitat, they may occassionally have a more direct effect on waterfowl production. Thus, such a tide inundated the brant nesting areas in 1963 and caused an estimated 95% loss of production in flooded areas. In 1965 a storm tide covered much of the brant nesting area on July 2, but by this time most nests were hatched and losses were negligible.

Food: Food conditions for waterfowl are considered to be relatively stable on the Yukon Delta. However, in late springs availability of food may be limited by lack of open water and the new growth preferred by geese may be retarded. No quantitative measure of food availability or its effect on waterfowl is available, but lack of food during the critical spring period may be a cause of poor production in late years.

The production of food in upland areas was probably somewhat lower than normal, but food supply was not critical for any species of wildlife. The crop of blueberries, Vaccinium uliginosum L., and crowberries, Empetrum nigrum L. was fair although possibly below average. Lingen berries, Vaccinium vitis aedea L., were unusually scarce.

## II WILDLIFE

Birds.

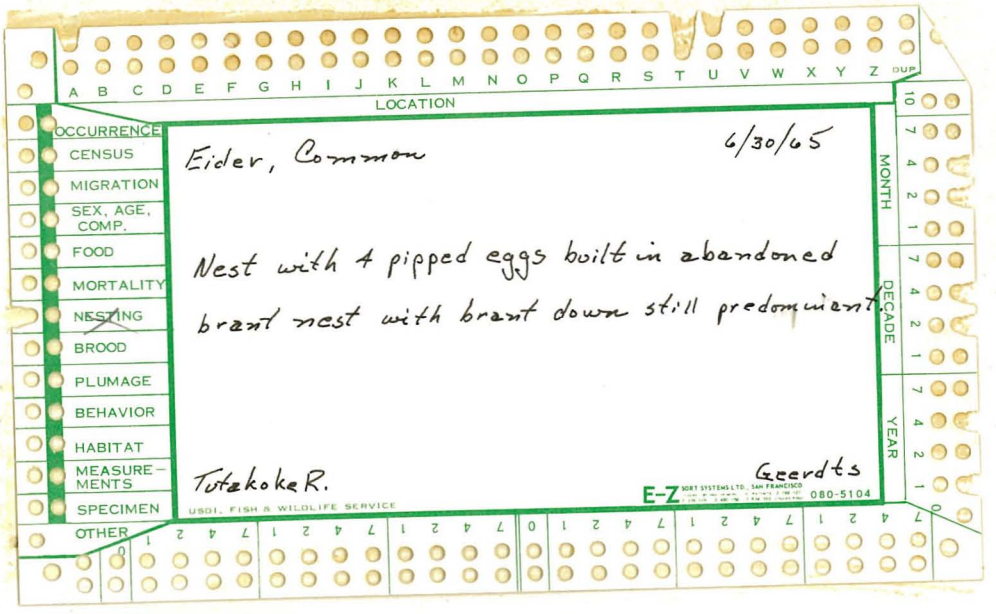
Observations of birds are maintained in a combination of two systems. For some species of waterfowl on which intensive field studies produce voluminous data, various field forms are used to facilitate analysis of data. Most observations of birds, however, are recorded on punch cards which are filed by species. These cards (Fig. 2) are designed to permit easy retrieval of information by species, date, location and subject. Format is standardized to permit interchange of information between offices. Visitors to the Wildlife Range are encouraged to record their observations on cards for filing at Bethel in order to prevent loss of data that would be useful to the Bureau or to other ornithologists.

A preliminary checklist of birds of the Yukon-Kuskokwim Delta is attached as an appendix.

Migratory Birds: Existing information on migratory birds is not sufficient to permit detection of population changes for most species. It is likely, however, that the storm tide of June 22, 1963 and the unusually late spring of 1964 have reduced populations of many species. Breeding ground surveys in coastal tundra areas of Alaska by J. G. King and C. Lostetter indicated that puddle ducks were fewer by 37 percent and diving ducks by 44 percent as compared to surveys conducted in 1964. Population trends on the Wildlife Range may approximate these results.

Documentation of the spring migration is supported only by observations at Bethel where the phenological sequence is slightly earlier than on the Wildlife Range. The first migrant to appear was a drake pintail on April 18. Two goldeneye females arrived on April 19 the first mallards on April 28, and the first Canada goose on June 1. However, most migrants, including waterfowl, did not arrive until mid May when lakes started to open at edges.

The vociferous lesser sandhill cranes were the vangard of the annual avalanche of migrants. On May 10 three flocks passed high overhead but a pair, perhaps from one of these or another flock, landed on the tundra near the Refuge Headquarters. The main movement came on May 11 when cranes were heard throughout the day. Eight flocks that were counted varied in size from 9 to 70 and averaged 32 birds each. On May 12 only 6 flocks were recorded and thereafter only small groups or pairs were observed scattered over the tundra. Direction of flight for nearly all flocks was west to southwest and only one flock was headed north. This direction of movement suggests that cranes arrive from the interior, perhaps from the Tanana Valley via Lake Minchumina and the Kuskokwim River. Cranes moving past Bethel probably nest south of Baird Inlet. Several flocks of Canada and white-fronted geese were observed between May 12 and 18 and a single flock of about 30 snow geese flew over Headquarters on May 12. Presumably, most or all of these



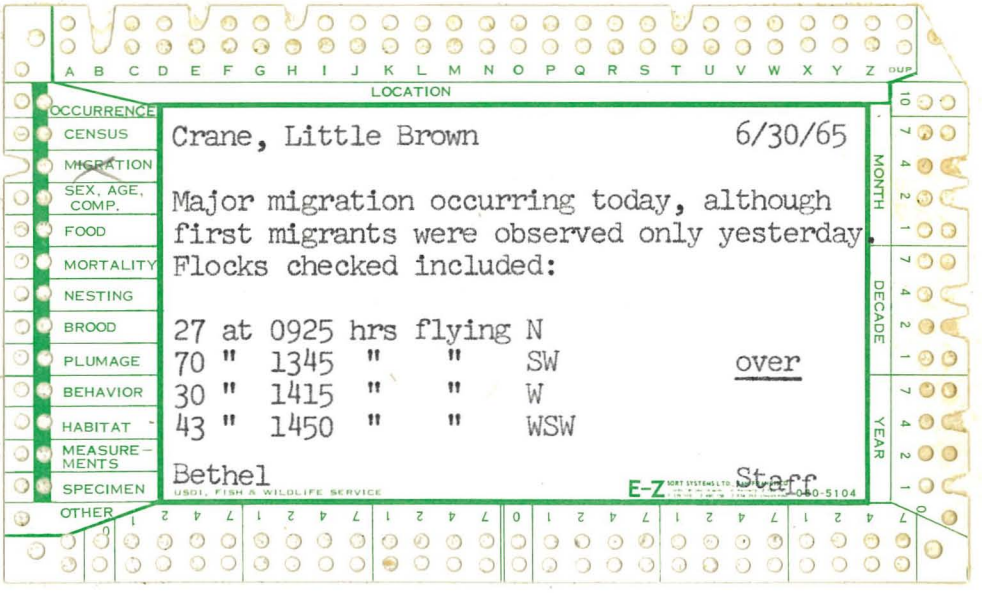




Fig. 2. Examples of punch cards used for recording observations of birds. Observations may be transcribed from field diaries, but the safest procedure is to complete cards in the field as observations occur.

flocks were migrants. Arrival of most other birds was coincident with or slightly later than the major movement of waterfowl as indicated in the chronological list of first observations below:

| | |
|---|---|
| May 10 | Crane and common snipe |
| May 12 | Snow goose, swan and white-fronted goose |
| May 13 | Robin |
| May 14 | Northern phalarope, ruby crowned kinglet, and semi-palmated sandpiper |
| May 15 | Mew gull, Alaska longspur |
| May 16 | Greater scaup |
| May 17 | Long-tailed jaeger |
| May 18 | Arctic tern, rusty blackbird, ruddy turnstone, violet-green swallow |
| May 20 | Bonapartes gull, tree sparrow, western sandpiper |
| May 21 | Green-winged teal |
| May 23 | Black-bellied plover, tree swallow |
| May 24 | Common loon, goshawk |
| May 26 | Horned grebe, parasitic jaeger, short-eared owl, yellow wagtail |
| June 2 | Pileolated warbler |

Nesting commences soon after the arrival of migrants. Aerial surveys of the Delta on June second indicated that brant were nesting although the ground was still not entirely free of snow. Hatching dates of brant, cackling, emperor, and white-fronted geese indicated that they started nesting before the first of June, and that the swans were nesting by mid May. Detailed results of nesting and brood studies are summarized in Section V.

By June 30 many non-breeding cackling geese were entering the molt and on July 3 approximately 1,000 molting brant were observed on the Tutakok River. All yearlings and other non-productive brant observed during the period of July 10 to 17 were flightless. By July 28 about a fourth of the adult and subadult brant were fledged but most cacklers were still flightless. Only one swan of more than 100 observed seemed capable of flight. A banding drive on August 17 resulted in a catch of 7 adult brant—all other adults in the drive flying when they reached the trap. Probably all adults in this drive had raised broods.

Observation of an estimated 1,600 brant at the Izembek National Wildlife Refuge on August 26 indicated the first departure of brant from the Wildlife Range. By early September large numbers of brant had arrived at Izembek and on the 11th none were observed on the major nesting and molting areas on the North Unit of the Wildlife Range. However, a few hundred brant were still present in Chagvan and Nanvak Bays near Cape Newenham on September 28.

In early September cackling geese appeared in small flocks at Bethel, well inland from major nesting and molting areas, although on September 11 and 12, they were still present in considerable numbers

on the North Unit of the Range. Cacklers continued to forage on the tundra near Bethel until at least September 29 when many flocks were observed moving southward between Bethel and Cape Newenham.

Emperor geese were still abundant in small flocks or in family groups on the North Unit of the Wildlife Range on September 11 and 12. Several flocks were observed flying southward across Dall Lake on the South Unit during the afternoon of September 18. These flocks may have been migrating, as no emperors were observed on flights over the South Unit of the Range on September 28, and many emperors were present at Izembek Bay by October 2.

Three small flocks of snow geese (5, 11, and 20) were observed on Dall Lake on September 18 and were thought to presage the early arrival of snows from their nesting grounds on Wrangel Island. However, an extensive search of the South Unit of the Wildlife Range and the Kuskokwim River to Cape Newenham on September 28 and 29 revealed the presence of less than 1,000 birds. From 20,000 to 30,000 snows were observed on or near the South Unit on October 2, but this was considerably fewer than normal for fall populations. No immature birds were observed. The movement onto the Southern portion of the Delta on October second coincided with a change in weather patterns which produced strong north winds. Hunters reported that the snows were already starting to move out by October 3.

White-fronted geese were frequently observed in flight or foraging on the tundra in the vicinity of Bethel until October 26 when many flocks of from 30 to 40 birds each and totaling 1,000 to 1,500 birds were observed flying almost due south. This was apparently a part of a major movement off the Delta because on flights over the Delta on September 28 and 29, only a single small flock was observed.

Cranes were abundant on the Wildlife Range on September 11 and 12, and at that time were still scattered in pairs or in small groups of one or two families. However a mass exodus from the Range must have occurred between October 12 and 18 when an extensive search of the South Unit did not produce a single observation

Resident Game Birds: The willow ptarmigan is the only resident game bird found on the refuge. On May 26 no ptarmigan were found near the Refuge Headquarters at Bethel where 27 territorial males were observed in 1964, but general observations on the Wildlife Range and at Bethel suggested that the fall population was about the same or perhaps slightly higher than last year.

Ptarmigan are erratically migratory, most of them moving off the tundra into forested or brushy areas in winter. The movement is influenced by the extent of snow cover which determines food availability on the tundra. A most unusual movement of ptarmigan was noted at Bethel on March 12, 1965, when between 1630 and 2000 hours a flock of 1,000 to 2,000 walked past the Refuge Headquarters toward the brushy areas on the river. The inconvienent mode of travel was caused by headwinds of

30 to 40 mph with rain and sleet.

Mass movements of ptarmigan usually cause accidental injuries and mortality--the most frequent resulting from collisions with telephone and power lines. Local residents retrieve many of these dead or injured birds. Ravens also are benefited. Thus, on March 15 following the ptarmigan movement described above, 14 ravens were observed feeding on 9 different ptarmigan between the Refuge Headquarters and Bethel, a distance of two miles.

The Refuge Staff has cooperated with the Alaska Department of Fish and Game on a state wide study of ptarmigan and grouse. Twenty-six intact specimens and pertinent data from an additional 13 specimens were furnished to Dr. Robert B. Weeden, who is in charge of the project. In addition, all observations of ptarmigan (flocks observed, nesting records, brood sizes, etc.) are transmitted to the State. The refuge benefits by obtaining a much more critical analysis of our data than would be possible on a local basis.

Grouse do not occur on the Wildlife Range or in the immediate vicinity of the Refuge Headquarters, which is located on the tundra, although spruce grouse are common within the wooded area which begins at Bethel.

Other Birds: Ravens are observed on the refuge throughout the year, but are less abundant there than in the vicinity of Bethel where refuse provides a more stable food supply. They are not sufficiently abundant to be considered a serious predator of waterfowl, and are therefore not considered a pest. In winter ravens are one of the most valuable members of our avifauna, because this intellectual acrobat is the only bird to be seen on most days.

Gyrfalcons are rarely observed on the Yukon Delta, and only two were observed during the year. One of these was observed at Bethel on January 2 while feeding on a ptarmigan.

Snowy owls vary in abundance with prey populations. During the summer of 1963 they were common on Nelson Island, adjacent to the Refuge, but none were observed there or on the refuge in 1965. Only one was seen in the vicinity of Bethel. The existent low population of owls reflects the status of rodent populations.

Chickadees are occassionally observed in the small patches of willows or alders growing near the Refuge Headquarters in Bethel but have not been observed on the Wildlife Range.

Pine grosbeaks are not observed during most winters but several flocks were present in the vicinity of Bethel during December 1965. This species would not be expected on the Wildlife Range where wooded habitat is lacking. An immature female was obtained for the refuge collection.

Glaucous gulls are the most important predator of waterfowl on the Wildlife Range. Repeated instances of collective defense of brant against gulls suggests that in this species, and perhaps other geese, the ganging of young with their parents was evolved as a means of protection against predators. Under normal conditions gulls do not often harrass large flocks of brant, but when broods are scattered they become quite vulnerable. A rather spectacular example of the efficiency of gulls in attacking a lone brood was observed this summer. A female brant with one gosling when attacked by a single gull had no difficulty in defending the gosling. However, the appearance of two more gulls brought immediate results, for as the brant defended against one gull, a second gull snatched the gosling.

Mammals.

Furbearers: The harvest of mink declined for the second year. Summer and early fall populations were considered to be fair to good but catches during the fall and early winter of 1965 were disappointing. An annual contest for the largest mink is sponsored by the local bank. This winter the prize mink measured 3 3/8 x 44 3/4 inches. Trappers receive about $45.00 for extra large Kuskokwim Mink, but this particular mink was worth one Model 94 Winchester.

Marine Mammals; Seals are hunted in coastal waters and in estuaries on the refuge but the size of the harvest is unknown. Large price increases in recent years have increased the sale of skins at the expense of domestic use.

Five walrus carcasses were found on the refuge. The tusks had been removed from three animals, but meat or hides had not been salvaged.

Small Rodents and Shrews: Population of small rodents (Microtus, Clethrionomys, Dicorostonyx, Lemmus, and Sorex) were at a low point in numbers during the winter of 1964-1965 but seemed somewhat more abundant during the fall and early winter of 1965.

## III REFUGE DEVELOPMENT AND MAINTENANCE

The major physical improvement project of this year was the construction of a 24 foot extension to the service building which will serve in the dual capacity of a garage and work shop. Because other construction projects in Bethel had absorbed the local supply of carpenters and other tradesmen, Wassillie Berlin and Paul Tinker, Eskimos from the village of Kasigluk, were employed as laborers to assist Maintenanceman Geerdts who served as chief carpenter, electrician, heating engineer and foreman. Although Berlin and Tinker were not skilled carpenters, they proved entirely satisfactory assistants, and the job was completed at a considerably lower cost that was estimated.

Other improvements at the Headquarters site included the raising and regrading of the driveway in front of the addition to the service building and eastward approximately 75 feet. Dirt fill was extended to about 30 feet east of the service building and surfaced with gravel to provide a parking and storage area. Wooden walkways were constructed between the residences and office. Most material for the walkways was salvaged from scrap lumber and packing crates that have littered the Headquarters site from the time of construction. The gasoline storage facilities were changed from a haphazard arrangement of 55 gallon drums to a single 500 gallon storage tank with metered and filtered hand pump. These various changes have resulted in convenience of operation and improved appearance of the Headquarters site. Further improvements in appearance are necessary.

Facilities on the Wildlife Range are also in dire need of improvement. The only permanent installation on the 110 mile long Wildlife Range is the field headquarters at Old Chevak on the North Unit. This 16 x 24 foot structure was formerly a Catholic Mission Church and was purchased from The Order of Jesuits in 1952 for $1600.00. There has been no maintenance work on this building since the date of purchase. The building was constructed in the 1920's and has interior wall of tongue and grooved boards and an exterior of unpainted sheet-metal. Walls and ceilings are insulated with tundra moss and lichen--in the ceiling to a depth of more than a foot. The upper portions of the structure are sound but the pilings on which the building rests, the sills, and some of the floor joists have become rotten and no longer provide needed support. Lumber has been purchased for the construction of bunks, cabinets and for minor repairs of the interior. Nine 24 to 30 foot drift logs of spruce were salvaged from the Kashunuk River to replace existing piling and sills. Construction and repairs are planned to proceed on an indefinite schedule during 1966 and 1967 as slack time in field activities permits.

A tent frame was constructed on the lower Kashunuk River to permit easier access to brant study areas than is possible from in Old Chevak. Such a frame, common for summer camps in Alaska, has wooden floor and sidewalls to fit a white, 10 ounce canvas wall tent. This 10 x 12 foot shelter is adequate for parties of up to three persons for short periods, but was considered entirely unacceptable (crowded, cold, and clammy) for extended periods or for larger parties.

## IV RESOURCE MANAGEMENT

The Clarence Rhode National Wildlife Refuge is a wilderness area, and intensive development of refuge lands to enhance the quality of habitat is neither appropriate nor necessary. The clincher, is of course the fact that such development is not financially possible. Resident fish and wildlife populations are managed entirely by regulations of the Alaska Department of Fish and Game for the Game Management Unit in which the range is contained.

## V FIELD INVESTIGATIONS OR APPLIED RESEARCH

Primary emphasis of field studies on the Wildlife Range have been on populations and productivity of black brant. Information on other species, even those of considerable importance such as the cackling and white-fronted geese and whistling swan, has accrued primarily as a by product of the studies on brant.

In July, Phillip Headley initiated a study on populations and life history of the emperor goose. This beautiful goose has its primary nesting grounds on the Wildlife Range and is of much interest. The study is sponsored by the Alaska Cooperative Wildlife Research Unit by means of funds principally supplied by the Alaska Department of Fish and Game. Because the benefits to the refuge may be considerable, the refuge staff is providing all possible assistance to this project.

Production Studies.

Nesting: Information on nesting success is routinely obtained from complete searches of a 231 acre area on Tanuyakok Slough and of 45 plots, each of one acre, located in the brant nesting habitat along the Kashunuk River. The large area was established as a study area by Fish and Wildlife Service biologist Sigurd T. Olsen in 1951, and the one-acre plots by Alaska Department of Fish and Game biologist Peter E. K. Shepherd in 1961.

Although data obtained between 1961 and 1964 from the Tanuyakok Study Area and from the one acre plots were remarkably consistent (Table 1), the study plots have the obvious advantage of permitting statistical evaluation of year to year changes in nesting density. Snow still covered much of the brant nesting habitat, including the Tanuyakok Study Area, at the start of nesting, and caused major changes in nesting distribution. Nesting density of brant on the study area dropped 97%--from 222 to only 6 nests. Nesting densities of other species were also reduced. Although distribution of brant on the one-acre plots was altered, nesting densities increased slightly over 1964, and were probably accurate in reflecting the somewhat improved nesting conditions of this year.

In order to further evaluate the discrepancy between the Tanuyakok Study Area and the one-acre plots, two additional areas were searched: one of 40 acres on the Tutakok River, and the other of 10 acres on Oivuktulik Slough (Table 2). Nesting densities of brant on these areas (6.8 and 9.6 per acre) were 5 to 7 times higher than ever obtained on the study area or the one-acre plots. These extreme nesting densities may have been caused entirely by the unusual nesting distribution, but this is not certain, because we have no previous record for these areas.

Neither study areas or the one-acre plots accurately reflect species composition on the Wildlife Range. Changes in nesting densities of the cackling goose on the Tanuyakok Study Area, however, are closely correlated with those of brant ($r=.9$), and may reflect nesting success on other areas of the Wildlife Range in most years, although not in a year with abnormal nesting distribution such as 1965.

The size of clutches in all waterfowl nests that were found both on and off study areas were recorded. Results are summarized in Table 3. Too few nests were found for most species to detect changes in clutch size between 1964 and 1965. However, the average size of 359 clutches of brant averaged significantly larger in 1965 than in 1964 as did those for 44 clutches of whistling swan. The sizes of brant clutches varied from an average of 2.48 eggs per clutch on the Tutakok Study Area to 4.23 on the Oivuktalik Study Area (Table 4). These differences are significant. Phenology of nesting was only slightly (1-3 days) later on the Tutakok River. It is uncertain whether this delay was caused by later melting of snow there or by the possibility that birds displaced from other areas were slower to nest. Further, we can not be certain whether the smaller clutch size there was cause merely by the delay in nesting or by the added factor of displacement.

The 96 brant nests on the Oivuktalik Study Area were checked every other day from June 23 to July 3 to obtain information on nesting phenology and hatching success (Table 5). Two nests were abandoned and contained no eggs when first observed and three nests were still active at the termination of observations. All other nests hatched, although young in two of the nests died while still in the nest. The proportion of successful nest was at least 92.7 percent, and may have been as high as 95.8 percent. Loss of eggs was low and 350 or 89.5 percent of the 391 eggs in 94 nests hatched with young surviving to leave the nest. The most important factor for hatching failure was the existence of infertile or addled eggs (Table 6).

Brood Studies: Chicks or goslings were counted in all Class I broods encountered while boating on the Lower Kashunuk River and adjacent sloughs. Aerial surveys of broods covered the major brant nesting areas on the North Unit. Swan broods were tallied on all routine flights over the Delta

Sizes for Class I broods of brant and geese averaged slightly larger in 1965 than in 1964, but samples for most species are so small that it is not possible to demonstrate statistical significance (Table 7).

Broods sizes of half grown swans observed in August were almost identical in size to those observed in August of 1964 despite the fact that clutch sizes were more than 25 percent larger in 1965 than in 1964 (Table 8). Average size of 295 broods tallied in late September indicated an attrition of 0.17 cygnets per brood since mid August.

Banding Studies.

A total of 2,475 brant were trapped during July and August (Table 9). An additional 500 to 800 brant were caught on July 13, but were released without handling to avoid injury to the many young brant caught in the drive.

Experimental Double Banding: The State of Alaska banded brant with both aluminum and monel bands in 1963 to determine the loss rate of aluminum bands. There was no loss of either monel or aluminum bands among 77 returns trapped in 1964 and loss of only one aluminum band among 79 returns trapped in 1965. However, in 1965, two years after banding, one or more digits of the number on 67 percent of the bands could not be deciphered, and the condition of many bands indicated that they would soon be lost. All monel bands were still in excellent condition.

Experimental Neck Banding: A total of 1,773 brant were neck banded with light green bands made of 1/2 inch poly-vynal chloride tape. These bands were fastened with a jesse knot so as to leave double streamers about 5 inches long. An additional 387 brant were neck banded with red bands on the Mackenzie Delta by Tom Barry of the Canadian Wildlife Service. A total of 272 control (normal) brant were banded on the Yukon Delta.

Observation of 63 green and 15 red bands in a sample of 31,124 checked at Izembek Bay indicated a total population of about 860,000 brant (SE = 100,000). Winter inventory estimates have not exceeded 200,000 brant and the index estimate seemed excessive. Positive error in the index estimate could be caused by differential mortality of neck banded birds, loss of neck bands, and by failure to observe banded birds at Izembek Bay. However, recapture of 204 neck banded birds 5 and 7 days after banding indicated that there was no loss of bands, and there was no evidence of mortality. Barry's experience with neck banded brant on the Mackenzie Delta extending over several years also has indicated that band loss and mortality is low. Further, the impression of all observers who checked brant at Izembek was that relatively few neck banded birds were missed. Although these various sources of error are additive, it seems impossible that they could produce an estimate four times that of winter inventories unless the winter inventories are in error. Follow-up studies on the Delta in 1966 will permit evaluation of all of these sources of error, and will permit better evaluation of results than is now possible.

It is also possible to derive population estimates by using the 38 direct recoveries of 3,600 brant banded in 1963, and the estimated kill of 10,900 based on mail questionaires of the Migratory Bird Population Station. These provide an uncorrected estimate of 1,032,057 brant. As not all bands are reported, the number of recoveries was corrected by using an estimated reporting rate of 61 percent or that which Geis (JWM, 25:154-159) estimated for mallards in the Pacific Flyway. The corrected estimate is 633,000 with 95 percent confidence limits of about 75,000. This estimate suggests that the results of the neck band estimates are not unreasonable, and we have concluded that the brant population exceeds 600,000 birds and that the winter inventory grossly underestimates the population. However, the implications to management of brant are of such magnitude that further studies will be necessary before we can accept the larger population estimate.

Table 1. Number of Nests Located on Study Areas

| Study Area and Species | Number of Nests 1951 | 1961 | 1962 | 1963 | 1964 | 1965 |
|---|---|---|---|---|---|---|
| Tanuyakok Study Area (231 acres) | | | | | | |
| Brant | 74 | 260 | 332 | 293 | 222 | 6 |
| Cackling Goose | 49 | 49 | 67 | 60 | 25 | 10 |
| Other Geese | 0 | 0 | 5 | 3 | | 1 |
| Game Ducks | 2 | 8 | 4 | 6 | | 0 |
| Spectacled Eider | 8 | 36 | 26 | 22 | 21 | 1 |
| Other Sea Ducks | 3 | 3 | 8 | 5 | | 0 |
| | 136 | 356 | 442 | 389 | 268 | 18 |
| One Acre Plots (45 acres) | | | | | | |
| Brant | | 45 | 57 | 50 | 38 | 45 |
| Cackling Goose | | - | Data not available | | - | 2 |
| Other Geese | | - | " " | " | - | 1 |
| Game Ducks | | - | " " | " | - | 0 |
| Spectacled Eider | | - | " " | " | - | 1 |
| Other Sea Ducks | | - | " " | " | - | 0 |
| | | 45 | 57 | 50 | 38 | 49 |

Table 2. Number of Waterfowl Nests Found on Supplementary Study Areas

| Species | 40 acres - Tutakok River | 10 acres - Oivuktulik |
|---|---|---|
| Brant | 267 | 96 |
| Cackling Goose | 4 | 0 |
| Spectacled Eider | 4 | 1 |
| Common Eider | 0 | 1 |

Table 3. Average Sizes of Clutches of Ducks, Brant, Geese, Swans and Cranes

| Species | Frequency of Clutch Size | | | | | | | | | | 1965 | | 1964 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Nests | Av. Clutch | Nests | Av. Clutch |
| Pintail | | | | | | 1 | 1 | | | | 2 | 6.50 | 10 | 6.60 |
| Greater Scaup | | | | | | | 2 | | 1 | | 3 | 7.67 | 6 | 8.17 |
| Common Eider | 1 | | 1 | 1 | 1 | | | | | | 4 | 3.25 | 2 | 5.50 |
| Spectacled Eider | | | 4 | 1 | 13 | 1 | 1 | | | 1 | 21 | 4.95 | 9 | 5.22 |
| Old Squaw | | | | 1 | | | | | | | 1 | 4.00 | 3 | 6.67 |
| Black Brant | 122 | 40 | 86 | 103 | 89 | 12 | | | | | 359 | 3.87 | 222 | 3.30 |
| Cackling Goose | 2 | 11 | 12 | 15 | 14 | 4 | | 1 | | | 59 | 3.76 | 11 | 3.82 |
| Emperor Goose | | | 4 | | 1 | 1 | | | | | 6 | 3.83 | 11 | 4.45 |
| White-fronted Goose | | 2 | 5 | 3 | 3 | 3 | 1 | | | | 19 | 4.56 | 5 | 4.80 |
| Whistling Swan | | | | | | | | | | | 44 | 4.34 | 35 | 3.50 |
| Lesser Sandhill Crane | 1 | 4 | | | | | | | | | 5 | 1.80 | - | - |

Table 4. Variation in Sizes of Clutches for Brant

| Date | Location[1/] | Frequency of Clutch Size | | | | | | Total Nests | Average Clutch |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | | |
| 6/22/65 | Tutakok River | 120 | 21 | 43 | 48 | 30 | 5 | 267 | 2.48 |
| 6/23/65 | Tutakok River Trap Site | 1 | 10 | 13 | 17 | 6 | | 47 | 3.34 |
| 6/23/65 | Oivuktalic | | 6 | 17 | 24 | 42 | 4 | 93 | 4.23 |

1/ All nesting areas listed were within a radius of 2 miles

Table 5. Nesting Success and Hatching Phenology for Black Brant

| Date | Percent of Nests Hatched 1963[2/] | 1964[1/ 3/] |
|---|---|---|
| June 23 | | 0 |
| 25 | | 7.4 |
| 27 | | 47.9 |
| 29 | | 80.9 |
| July 1 | | 95.7 |
| 3 | | 96.8[5/] |
| 4 | 55 | |
| 6 | 82 | |
| 8 | 93[4/] | |
| Possible Total | 97 (maximum) | 92.7 (minimum) |

1/ Samples consisted of 100 nests in 1964 and 96 nests in 1965

2/ All empty nests found on July 4, 1963 were considered to have been successfully terminated. Thus, the estimate of total hatch is a maximum figure.

3/ Percentages are based on 94 active nests found on June 23, 1964

4/ Four nests still active

5/ Three nests still active

Table 6. Fate of Eggs in Nests of Black Brant

| Fate | | Number | Percent |
|---|---|---|---|
| Eggs Hatched | | 350 | 89.5 |
| Eggs Not Hatched | | | |
| Addled or infertile | 15 | | |
| Embryo died during incubation | 2 | | |
| Disappeared from nests | 2 | | |
| Disappeared, possibly hatched | 1 | | |
| Chicks dead in nest | 4 | | |
| Pipped eggs deserted | 2 | | |
| Unknown | 5 | 31 | 7.9 |
| Inactive Nests, Fate, unknown | | 10 | 2.6 |
| Total | | 391 | 100 |

Table 7. Average Sizes of Class I Broods of Brant and Geese

| Species | Frequency of Brood Size | | | | | | | Mixed Broods | | 1965 | | 1964 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Prs. | Young | Total Broods | Average Brood Size | Total Broods | Average Brood Size |
| **Brant** | | | | | | | | | | | | | |
| Ground | 44 | 63 | 79 | 77 | 50 | 22 | 0 | 48 | 161 | 383 | 3.29 | 371 | 3.15 |
| Air | 16 | 29 | 29 | 19 | 7 | 7 | 0 | | | 107 | 2.93 | | |
| **Cackler** | | | | | | | | | | | | | |
| Ground | | | 3 | 6 | 1 | | | | | 10 | 4.10 | 28 | 3.96 |
| Air | | | | 1 | 2 | | | | | 3 | 4.67 | | |
| **Emperor** | | | | | | | | | | | | | |
| Ground | | 1 | 3 | 1 | 1 | | | | | 6 | 3.33 | 7 | 3.57 |
| Air | | 6 | 8 | 6 | 5 | 1 | | | | 26 | 3.92 | | |
| **White-front** | | 2 | | | | | | | | 2 | 2.00 | 6 | 3.33 |

Table 8. Average Size of Swan Broods

| Date[1/] | Frequency of Broods 1 | 2 | 3 | 4 | 5 | 6 | + | Total Broods | Average Brood Size |
|---|---|---|---|---|---|---|---|---|---|
| August 13 | | 2 | 3 | 4 | 1 | | | 10 | 3.40 |
| 15 | 7 | 7 | 7 | 6 | 3 | | 9 | 31 | 2.90 |
| 18 | 1 | 4 | 7 | 1 | | | | 13 | 2.62 |
| 25 | 2 | 2 | 3 | 4 | | | | 11 | 2.82 |
| Misc observations | | 1 | 1 | | | | | 2 | 2.50 |
| Totals | 10 | 16 | 21 | 15 | 4 | 0 | 9 | 67 | 2.90 |
| September 18 | 3 | 8 | 8 | 7 | 2 | 1 | | 29 | 3.00 |
| 28 | 41 | 56 | 25 | 36 | 8 | | | 206 | 2.58 |
| 29 | 8 | 7 | 8 | 9 | | 1 | | 34 | 2.76 |
| Totals | 52 | 71 | 91 | 52 | 10 | 2 | | 295 | 2.73 |

1/ Cygnets were about half grown by mid August and were fledged by late September.

Table 9. Summary of Brant Banding

| | Unknown | Local Male | Local Female | Sub Adult Male | Sub Adult Female | Adult Male | Adult Female | Total |
|---|---|---|---|---|---|---|---|---|
| New Banded | | | | | | | | |
| Normal | | 4 | 3 | 9 | 13 | 95 | 78 | 202 |
| Neck-banded | | 133 | 107 | 98 | 183 | 611 | 641 | 1773 |
| Recoveries or Returned : Rebanded | | | | | | | | |
| Normal | | | | | | 28 | 35 | 63 |
| Neck-banded | | | | | | | 1 | 1 |
| Total Banded | | 137 | 110 | 107 | 196 | 734 | 755 | 2039 |
| Recoveries or Returned : Released | 8 | | | | | 67 | 74 | 149 |
| Repeats | | | | | | | | |
| Normal | 67 | | | | | | | 67 |
| Neck-banded | 204 | | | | | | | 204 |
| Released without bands | 1 | | | | 1 | | 3 | 5 |
| Locals too small to band | 8 | | | | | | | 8 |
| Banding Mortality | 1 | | | | | 1 | 1 | 3 |
| Total Handled | 289 | 137 | 110 | 107 | 197 | 802 | 833 | 2475 |

## VI PUBLIC RELATIONS

General.

The impact of the Refuge or Refuge Programs upon the larger community of the Yukon Delta is negligible. Only three villages on the Delta were visited, and in one instance contact in the village was only with the white school teacher. Villages not visited included Newtok and Chefornak which are located on the Wildlife Range.

The best means of contact with outlying Eskimo villages has been through employment of villagers on Bureau projects. Natives which have had little contact with whites except for school teachers are shy and distrustful of the motives or intent of any caucasian and Game Wardens in particular. The term "Gussok", or white man, is still used to threaten children into good behavior. Native employees have without exception been excellent workers and have contributed field skills and knowledge of the country which prove invaluable. The friendly working relationships which develop with them extend to other villagers. Although, it is unlikely that such contacts measurably change attitudes toward Bureau programs, they provide the necessary initial channel of communication.

Contact with residents of Bethel is largely with the white community merchants and other federal or state officials. Such contact is increased by membership of three of refuge staff in the Lions Club which is the only local service organization. This group sponsors the Boy Scouts with Assistant Refuge Manager Jerry L. Hout as Institutional Representative. Both Hout and Maintenanceman James R. Geerdts are active on the Boy Scouts Executive Committee and various scout activities.

Although associations in Bethel are gradually bringing about an understanding of if not sympathy with Bureau objectives, some factors impede further progress. An example is provided by remarks quoted from a speech by U. S. Senator Gruening at Bethel on May 14, 1965. Bracketed deletions and additions are ours.

> "You are very fortunate in the representation that you have here in the State Legislature. Ray Christiansen was talking to you about a problem that we have faced jointly, when the Federal Bureaucracy, the Fish and Wildlife Service, [~~decided~~] for no good reason [and] for the first time in history provided [that] you couldn't shoot ducks for food which you have always been taking. For some reason, [~~inexcusable,~~] with no danger to conservation, [~~that~~] you could always hunt these ducks for food. And despite the fact that this came as an order from the Fish and Wildlife Service, and they actually went and arrested some of you here and in Barrow for doing this, I counsel you not to pay any attention to it. You go right ahead and do what you have been doing, and if you are taken to court for it I will come and stand behind you and try to get you off and help defend you, for this is a violation of a basic liberty, and it was not, was not, a violation of any treaty. It was the misinterpretation by an over zealous bureaucrat and his associates in trying to interpret the treaty for you."

As a different approach to public education, copies of "Waterfowl Tomorrow" were mailed with a cover letter to each of the Bureau of Indian Affairs Schools on the Delta. Much of the material in this book is beyond the comprehension of children from this area, but even the pictures may be sufficient to extend the limited horizon of children in isolated villages. The impact on teachers may be more important. Although we know that in some cases the book is appreciated, we have no means of measuring its impact.

Recreational Use.

Recreational use of the refuge is limited to occassional hunting of waterfowl in fall. Subsistence hunting and fishing is important but estimates of annual harvests are not available.

Refuge Visitors.

A list of visitors to the Wildlife Range or to the Headquarters at Bethel is provided in Table 10. Visitors who contributed to the fund of information on wildlife included:

Dr. David R. Klein, Alaska Cooperative Wildlife Research Unit, completed a study on utilization of waterfowl by Eskimo residents of Delta. Mr. K. L. Sather, Round Lake Waterfowl Station, and J. P. Williams, Norwich, England, collected eggs of various species of waterfowl for hatching at Round Lake. Phillip Headley, Alaska Cooperative Wildlife Research Unit, initiated studies on emperor geese. Dr. D. Reed, Arctic Health Research Center, with assistants collected blood samples from brant for use in studies of antibodies against arthropod born viral diseases. J. G. King, BSF&W, Juneau and C. H. Lostetter, BSF&W, Portland conducted the annual waterfowl breeding population surveys. King also assisted with swan nesting and brood studies and with fall censuses of snow geese. Charles D. Evans, Bureau of Commercial Fisheries, A. Starker Leopold, University of California, Berkley, L. Eberhardt, Battelle Memorial Institute, and J. Leonard, University of Michigan, toured the lower Yukon River area to determine the possible downstream effects of the proposed Rampart Dam. Evans remained for more intensive surveys of the area and assisted in determining the effect of water from the Yukon River on the Wildlife Range.

Table 10. Wildlife Range and Headquarters Visitors

| Date | Name | Title & Organization | Purpose |
|---|---|---|---|
| January 25 | John Doyle | Fishery Extension Agent, Juneau | Conference |
| February 3 | Bart Graves | Welfare Agent, BIA, Bethel | " |
| " " | Bill Mailer | State Welfare Agent, Bethel | " |
| April 21 | George M. Gustafson | Bureau of Land Management, Anchorage | " |
| " " | Ross Youngblood | " " " " | " |
| " " | Cal Niver | " " " " | " |
| " " | Peter Reader | Realty Specialist, BIA, Bethel | " |
| May 2 | Virgil Severins | Extension Agent, Univ. of Alaska | Gardening & 4H |
| " " | Bruce Elmgren | " " " " | " " |
| May 10 | Joseph Panuyak | Seasonal Biological Aid, Chevak | Courtsey visit |
| May 11 | Fred Woldstad | State Fish & Game, Fairbanks | Beaver Sealing |
| " " | Charles Kellog | " " " " | " " |
| May 20 | Bill Bellinger | " " " , Tok | Transportation |
| May 30 | Clinton Lostetter | Ass't Reg Sup of M&E, Portland | Waterfowl Survey |
| " " | James King | Waterfowl Supervisor, Juneau | " " |
| June 4 | Kenneth Sather | Round Lake Waterfowl Station, Minn | Collect eggs |
| " " | Jack P. Williams | Norwich, Norfolk England | " " |
| June 29 | Nev Aspinwall | Univ. of British Columbia | Conference |
| " " | Dale Whitney | Spenard, Alaska | Courtsey visit |
| " " | Greg Bos | University of Alaska | Muskox survey |
| June 30 | Bill Taylor | Maintenanceman, BIA, Anchorage | Courtsey visit |
| " " | Mr. & Mrs. Lee Ellis | Project Manager, BIA | Reindeer-Nunivak |
| July 5 | Thomas Evans | Public Affairs Ass't to Commissioner | Orientation |
| July 8 | Robert Pegau | University of Alaska | Muskox survey |
| " " | Hans Roth | " " | " " |

continued

Table 10. Wildlife Range and Headquarters Visitors (cont)

| Date | Name | Title & Organization | Purpose |
|---|---|---|---|
| July 12 | David L. Spencer | Supervisor, Alaska Wildlife Refuges | Inspection |
| " " | Paul T. Quick | Regional Director, Portland | " |
| " " | John D. Findlay | Associate Director, Portland | " |
| " " | Mitch Takata | Director, Hawaii Division of Fish & Game | " |
| " " | Theron Smith | Aircraft Supervisor, Anchorage | " |
| " " | James McBroon | Assistant Director, Technical Services Washington, D. C. | " |
| " " | Bob Simpson | Assistant Regional Director, Juneau | " |
| " " | Robert McVay | Fish & Wildlife Administrator, SEALAS, RBS Juneau, Alaska | " |
| " " | Charles D. Evans | Administrator, RBS, Anchorage | " |
| July 21 | David L. Spencer | Supervisor, Alaska Wildlife Refuges | Muskox Survey |
| July 2 - August 25 | Phillip Headley | University of Alaska | Emperor goose study |
| July 27 | Raymond Tremblay | U. S. Game & Management Agent, Anchorage | Duck banding |
| " " | Wallace Smith | " " " " " " | " " |
| " " | Keith Banning | " " " " " Juneau | " " |
| " " | James G. King | Waterfowl Supervisor, Juneau | " " |
| " " | Wallace Smith Jr. | Anchorage, Alaska | " " |
| August 16 | L. L. Eberhardt | Richland, Washington | Rampart study |
| " " | A. Starker Leopold | Berkley, California | " " |
| " " | Justin Leonard | University of Michigan | " " |
| " " | Charles D. Evans | Administrator, RBS, Anchorage | " " |
| August 25 | David L. Spencer | Supervisor, Alaska Wildlife Refuges | Inspection |
| " " | Bruce P. Stollberg | Chief, Branch of Resources, Wash. D. C. | " |
| August 27 | Gregory Bos | University of Alaska | Muskox study |
| September 27 | James G. King | Waterfowl Supervisor, Juneau | Waterfowl survey |

continued

Table 10. Wildlife Range and Headquarters Visitors (cont)

| Date | Name | Title & Organization | Purpose |
|---|---|---|---|
| November 15 | Peter L. Reader | Realty Specialist, BIA, Bethel | Commission visit |
| " " | John Moore | Educational Specialist, BIA, Bethel | " " |

## VII OTHER ITEMS

Refuge Manager Lensink participated in the Regional Refuge Biologists Workshop held at Arden Hills, Minnesota in March. During May and early June, Lensink obtained additional flight training in Anchorage to qualify for flight authorization in Bureau Aircraft.

In early August Lensink and Biological Aid Joseph Panuyak assisted in a duck banding project at Takslesluk Lake that was supervised by Game Management Agent Raymond Tremblay.

Maintenanceman Geerdts repaired roofs of offices and residences and serviced furnaces at the Izembek National Wildlife Refuge Headquarters at Cold Bay.

Assistant Refuge Manager Hout and Refuge Manager Lensink participated on surveillance of "Project Longshot" activities on Amchitka Island in the Aleutian Islands National Wildlife Refuge.

Time devoted to these non-receiving or extra-curricular projects totaled about 6 months. An additional three months was devoted to field and office work of the Nunivak National Wildlife Refuge which is under the supervision of the Bethel office. Nunivak National Wildlife Refuge is considered in a separate Report.

# APPENDIX

# BIRDS OF THE YUKON-KUSKOKWIM DELTA

The region of about 25,000 square miles considered includes that part of the Bering Sea Coast between Saint Michael and Cape Newenham and including Nelson and Nunivak Islands. The inland boundary of the area runs from Saint Michael southwest along the base of a range of hills to Mt. Village on the Yukon River, then upstream to the vicinity of Paimiut Island, from Paimiut Island south to the Kuskokwim River and finally along the base to the Kilbuck and Ahklun Mountains to Kuskokwim Bay in the vicinity of Cape Newenham. Most of this area is lowland plain with little relief. However, Nunivak and Nelson Islands are mountainous and small ranges of mountains, the Askinuks and the Kusilvaks, lie between Hooper Bay and the Yukon River. Isolated groups of hills break the relief in scattered localities. Marine escarpments occur on Nunivak and Nelson Islands, at Cape Romanzof and at Cape Newenham. Areas of cliffs occur inland in the Askinuk Mountains and the Ingakslugwat Hills. The dominant characteristic of the area is contributed by the hundreds of thousand of ponds, lakes, streams and tidal sloughs which provide unique habitat for waterfowl and shorebirds of many species.

The major portion of the region is covered by tundra which on floodplains or tidal flats is dominated chiefly by grasses and sedges and on uplands by various low growing shrubs, mosses and lichens. Woodland vegetation typical of the interior forests extends into the tundra along rivers and streams, gradually giving way to narrow bands of alder or willow. On the Yukon these bands of willow or aspen extend almost to the Bering Coast. Shrub communities occur also on the shores of some lakes and in mountainous areas, but are rare in coastal lowlands.

Three National Wildlife Refuges are located on the Delta. Nunivak Island was established as a National Wildlife Refuge in 1929 and serves as a sanctuary for the only herd of muskox in the United States. Vast seabird rookeries are present on the cliffs of the western coast of the island. Hazen Bay National Wildlife Refuge occupies a small low-lying island at the northern outlet to Baird Inlet. It was established as a refuge in 1937 and is an important nesting area for black brant and cackling geese. The Clarence Rhode National Wildlife Range was established in 1960 and includes about 2,800 square miles of lowland tundra on the Bering Sea. It contains the primary North American nesting areas for black brant, cackling geese, and emperor geese.

The following checklist is a compliation of published records of ornithologists who have visited the Yukon-Kuskokwim Delta and of observations by the staff of the Clarence Rhode and Nunivak National Wildlife Refuges. Interpretation of published accounts of relative abundance is frequently difficult because abundance of many species varies annually and others are found in only a small part of the region considered. Further, ornithologists have visited only a minor portion of the area and most observations

are confined to the vicinity of villages on the Yukon and Kuskokwim Rivers and to Hooper Bay and the Askinuk Mountains. Because of the wide variation in habitats, abundance is indicated separately for the primary habitats in which a given birds occurs. Similar habitats, ie., lucstrine areas, may be found in two or more of the major habitat types. In such instances the habitat listed should be considered as much a geographical area as an ecological type.

BIRDS OF THE YUKON-KUSKOKWIM DELTA

Status: r = resident; sr = summer resident; wr = winter resident; m = migrant; a = accidental or stagler; x = unknown

Abundance: a = abundant; c = common; u = unknown; r = rare; v = variable; x = unknown

| Species | Status | Abundance in Primary Habitats | | | | | Remarks |
|---|---|---|---|---|---|---|---|
| | | Tundra | Alpine | Shrub | Forest | Marine | |
| Common Loon * | sr | u | | | u | | |
| Yellow-billed Loon | sr | r | | | | | |
| Arctic Loon * | sr | a | | | a | | |
| Red-throated Loon * | sr | c | | | c | | |
| Red-necked Grebe | sr | u | | | u | | |
| Horned Grebe | sr | r | | | r | | |
| Black-footed Albatross | x | | | | | x | |
| Slender-billed Shearwater | x | | | | | x | |
| Forktailed Petrel | x | | | | | x | |
| Pacific Fulmar * | sr | | | | | x | Nests on marine escarpments |
| Double-crested Cormorant | a | | | | | r | Single record |
| Pelagic Cormorant * | sr | | | | | u | Nests on marine escarpments |
| Red-faced Cormorant | x | | | | | x | Not recorded |
| Whistling Swan * | sr | a | | | c | | |
| Trumpeter Swan | sr | | | | u | | |
| Canada Goose * | sr | a | | | c | | |
| Cackling Goose * | sr | a | | | | | Mostly coastal |
| Black Brant * | sr | a | | | | | Mostly coastal |
| Emperor Goose * | sr | a | | | | | Mostly coastal |
| Lesser Snow Goose * | m | a | | | | | Rarely as a summer resident |
| White-fronted Goose * | sr | a | | | c | | |

BIRDS OF THE YUKON-KUSKOKWIM DELTA

Status: r = resident; sr = summer resident; wr = winter resident; m = migrant; a = accidental or stagler; x = unknown

Abundance: a = abundant; c = common; u = unknown; r = rare; v = variable; x = unknown

| Species | Status | Abundance in Primary Habitats | | | | | Remarks |
|---|---|---|---|---|---|---|---|
| | | Tundra | Alpine | Shrub | Forest | Marine | |
| Common Loon * | sr | u | | | u | | |
| Yellow-billed Loon | sr | r | | | | | |
| Arctic Loon * | sr | a | | | a | | |
| Red-throated Loon * | sr | c | | | c | | |
| Red-necked Grebe | sr | u | | | u | | |
| Horned Grebe | sr | r | | | r | | |
| Black-footed Albatross | x | | | | | x | |
| Slender-billed Shearwater | x | | | | | x | |
| Forktailed Petrel | x | | | | | x | |
| Pacific Fulmar * | sr | | | | | x | Nests on marine escarpments |
| Double-crested Cormorant | a | | | | | r | Single record |
| Pelagic Cormorant * | sr | | | | | u | Nests on marine escarpments |
| Red-faced Cormorant | x | | | | | x | Not recorded |
| Whistling Swan * | sr | a | | | c | | |
| Trumpeter Swan | sr | | | | u | | |
| Canada Goose * | sr | a | | | c | | |
| Cackling Goose * | sr | a | | | | | Mostly coastal |
| Black Brant * | sr | a | | | | | Mostly coastal |
| Emperor Goose * | sr | a | | | | | Mostly coastal |
| Lesser Snow Goose * | m | a | | | | | Rarely as a summer resident |
| White-fronted Goose * | sr | a | | | c | | |

BIRDS OF THE YUKON-KUSKOKWIM DELTA (CONT)

| Species | Status | Abundance in Primary Habitat: Tundra | Alpine | Shrub | Forest | Marine | Remarks |
|---|---|---|---|---|---|---|---|
| Mallard * | sr | u | | | c | | |
| Pintail * | sr | a | | | a | | |
| Green-winged Teal * | sr | c | | | c | | |
| Blue-winged Teal | a | r | | | r | | No recent observations |
| European Widgeon | a | | | | | | Not recorded |
| American Widgeon * | sr | u | | | c | | |
| Gadwall | a | | | | | | Not recorded |
| Shoveler * | sr | u | | | c | | |
| Canvasback | sr | r | | | r | | Non breeding males on larger tundra lakes |
| Greater Scaup * | sr | a | | | a | | |
| Lesser Scaup | sr | u | | | u | | |
| American Goldeneye | sr | u | | | u | | |
| Barrow's Goldeneye | sr | u | | | c | | Molting birds common on larger tundra lakes |
| Bufflehead | sr | u | | | c | | Molting birds common on larger tundra lakes |
| Old Squaw * | sr | a | | | u | | |
| Harlequin | sr | | | | | u | |
| Steller's Eider * | r | u | | | | c | Mostly coastal |
| Common Eider * | r | c | | | | c | " " |
| King Eider | m | | | | | a | " " |
| Spectacled Eider * | r | a | | | | c | " " |
| Common Scoter * | sr | c | | | c | c | " " |
| White-winged Scoter | sr | u | | | u | u | |
| Surf Scoter | sr | u | | | u | c | |
| Common Merganser | a | | | | | | A single sight record |
| Red-breasted Merganser * | sr | c | | | c | | |
| Goshawk | sr | u | | | c | | |
| Sharp-shinned Hawk | sr | | | | u | | Not recorded |
| Red-tailed Hawk | sr | | | | u | | |
| Rough Legged Hawk * | sr | u | c | | | | |

BIRDS OF THE YUKON-KUSKOKWIM DELTA (CONT)

| Species | Status | Abundance in Primary Habitat | | | | | Remarks |
|---|---|---|---|---|---|---|---|
| | | Tundra | Alpine | Shrub | Forest | Marine | |
| Golden Eagle * | sr | | u | | | | |
| Bald Eagle | a | r | r | | r | | |
| Harrier | sr | u | | | u | | |
| Osprey | sr | | | | u | | |
| Peregrine Falcon | sr | | x | | x | | |
| Gyrfalcon * | r | u | c | | | | |
| Merlin | sr | | | | x | | |
| Kestrel | sr | | | | x | | |
| Spruce Grouse * | r | | | | c | | |
| Ruffed Grouse | r | | | | u | | |
| Willow Ptarmigan * | r | v | v | v | v | | Wintering birds in shrub and forest areas |
| Rock Ptarmigan * | r | | v | | | | |
| Lesser Sandhill Crane * | sr | a | | | a | | |
| Semi-palmated Plover * | sr | u | | | u | | |
| Killdeer | a | r | | | | | Single record |
| Golden Plover * | sr | c | c | | | | |
| Black-bellied Plover * | sr | c | | | | | |
| Surfbird | m | u | | | | | |
| Ruddy Turnstone * | sr | u | | | | | |
| Black Turnstone * | sr | a | | | | | |
| Common Snipe * | sr | c | | | a | | |
| Hudsonian Whimbrel * | sr | c | | | | | |
| Bristle-thighed Curlew * | sr | u | | | | | |
| Eskimo Curlew | Extinct | | | | | | Formerly the most abundant curlew |
| Spotted Sandpiper | x | u | | | u | | |
| Solitary Sandpiper | sr | | | | u | | |

BIRDS OF THE YUKON-KUSKOKWIM DELTA (CONT)

| Species | Status | Abundance in Primary Habitat | | | | | Remarks |
|---|---|---|---|---|---|---|---|
| | | Tundra | Alpine | Shrub | Forest | Marine | |
| Wandering Tattler | m | u | | | | | |
| Greater Yellowlegs | x | x | | | x | | |
| Lesser Yellowlegs | sr | u | | | c | | |
| Eurasian Knot | a | r | | | | | |
| Rock Sandpiper * | sr | u | | | | | |
| Sharp-tailed Sandpiper | m | c | u | | | | |
| Pectoral Sandpiper * | sr | u | u | | | | |
| Baird's Sandpiper * | sr | | u | | | | |
| Least Sandpiper | sr | u | | | | | |
| Dunlin * | sr | a | | | | | Mostly coastal |
| Long-billed Dowitcher * | sr | u | | | u | | |
| Semi-palmated Sandpiper * | sr | u | | | | | |
| Western Sandpiper * | sr | a | | | | | |
| Buff-breasted Sandpiper | sr | u | | | | | |
| Bar-tailed Godwit * | sr | c | | | | | |
| Hudsonian Godwit | m | c | | | u | | |
| Sanderling | m | u | | | | | |
| Red Phalarope * | sr | c | | | | | |
| Northern Phalarope * | sr | a | | | a | | |
| Pomarine Jaeger * | sr | c | | | | | |
| Parasitic Jaeger * | sr | c | | | | | |
| Long-tailed Jaeger * | sr | c | | | | | |
| Glaucous Gull * | sr | a | | | | | |
| Glaucous-winged Gull * | sr | u | | | | u | Nests on marine escarpments |
| Slaty-backed Gull | a | r | | | | | |
| Herring Gull | sr | | | | u | | |
| Mew Gull * | sr | c | | | c | | |
| Bonapartes Gull | sr | | | | c | | |
| Pacific Kittiwake * | sr | | | | | c | |

BIRDS OF THE YUKON-KUSKOKWIM DELTA (CONT)

| Species | Status | Abundance in Primary Habitat | | | | | Remarks |
|---|---|---|---|---|---|---|---|
| | | Tundra | Alpine | Shrub | Forest | Marine | |
| Red-legged Kittiwake | x | | | | | x | |
| Ross' Gull | a | r | | | | | |
| Sabine's Gull * | xr | a | | | | | Mostly coastal |
| Arctic Tern * | sr | c | | | a | | |
| Aleutian Tern * | sr | c | | | | | |
| North Pacific Murre * | sr | | | | | a | |
| Thick-billed Murre | x | | | | | x | |
| Mandt's Black Guillemot | x | | | | | x | |
| Pidgeon Guillemot | x | | | | | c | |
| Parakeet Auklet | sr | | | | | c | |
| Crested Auklet | x | | | | | x | |
| Least Auklet | x | | | | | x | |
| Horned Puffin * | xr | | | | | a | |
| Tufted Puffin * | xr | | | | | a | |
| Great Horned Owl * | r | u | | | c | | Two races |
| Snowy Owl * | r | v | | | | | |
| Hawk Owl | r | | | u | c | | |
| Short-eared Owl * | sr | u | | | u | | |
| Boreal Owl | sr | | | | r | | |
| Boreal Yellow-shafted Flicker | sr | | | | u | | |
| Valdez Downy Woodpecker | r | | | | u | | |
| Three-toed Woodpecker | r | | | | x | | |
| Olive-sided Flycatcher | sr | | | | u | | |
| Trail's Alder Flycatcher | sr | | | u | c | | |
| Horned Lark | sr | | u | | | | |
| Violet-green Swallow * | sr | | | | c | | |

BIRDS OF THE YUKON-KUSKOKWIM DELTA (CONT)

| Species | Status | Tundra | Alpine | Shrub | Forest | Marine | Remarks |
|---|---|---|---|---|---|---|---|
| Tree Swallow * | sr | c | | | c | | |
| Bank Swallow * | sr | c | | | c | | |
| Barn Swallow * | sr | | | | | | In villages (u) |
| Cliff Swallow * | sr | | | | | | In villages (u) |
| Alaska Gray Jay | r | | | u | c | | |
| Northern Raven * | r | u | | | c | | Abundant near villages |
| Yukon Black-capped Chickadee | r | | | | u | | |
| Alaska Gray-headed Chickadee | r | | | | u | | |
| Hudsonian Boreal Chickadee | r | | | | u | | |
| Northern Dipper | r | r | | | r | | |
| Robin * | sr | | | u | c | | |
| Varied Thrush * | sr | | | u | c | | |
| Gray-cheeked Thrush* | sr | | | a | a | | |
| European Wheatear | m | r | | | | | |
| Red-spotted Bluethroat | a | | | | | | Single record |
| Kennicatts Arctic Warbler | x | u | | | | | |
| Northern Middendorff's Warbler | a | | | | | | Single record |
| Eastern Mountain Accenter | a | | | | | | " " |
| Western Ruby-crowned Kinlet | sr | | | | u | | |
| Swinhoe's White Wagtail | a | | | | | | Single record |
| Alaska Yellow Wagtail * | sr | c | | | | | |
| Western Water Pipit * | sr | u | | | | | |
| Japanese Water Pipit | a | | | | | | Single record |
| Red-throated Pipit | a | | | | | | " " |

BIRDS OF THE YUKON-KUSKOKWIM DELTA (CONT)

| Species | Status | Abundance in Primary Habitat | | | | | Remarks |
|---|---|---|---|---|---|---|---|
| | | Tundra | Alpine | Shrub | Forest | Marine | |
| Bohemian Waxwing | r | | | | c | | |
| Northwestern Shrike | r | | | | u | | |
| Lutescent Orange-crowned Warbler * | sr | | | | c | | |
| Alaska Yellow WArbler * | sr | | | | a | | |
| Alaska Myrtle Warbler | sr | | | | u | | |
| Black-poll Warbler | sr | | | u | a | | |
| Grinnell's Northern Waterthrush | sr | | | u | c | | |
| Northern Pileolated Warbler * | sr | | | c | c | | |
| Rusty Blackbird | | | | | u | | |
| Cassin's Bullfinch | a | | | | | | Single record |
| Alaska Pine Grosbeak | r | | | | c | | |
| Pribiliof Rosy Finch | sr | | x | | | x | |
| Hoary Redpoll * | r | | | c | c | | |
| Mealy Redpoll * | r | | | c | c | | |
| American white-winged Crossbill | r | | | | u | | |
| Western Savannah Sparrow * | sr | a | | | c | | |
| Northern Slate-colored Junco | sr | | | | u | | |
| Tree Sparrow * | sr | | | c | a | | |
| Gamble's White-crowned Sparrow * | sr | | | u | c | | |
| Golden-crowned Sparrow * | sr | | | u | u | | |
| Yukon Fox Sparrow * | sr | | | a | a | | |
| Lincoln's Sparrow | sr | r | | | | | Single record |
| Alaska Longspur * | sr | a | | | | | |
| Eastern Snow Bunting * | r | a | | | | | |
| Pribiliof Snow Bunting | wr | c | | | | | |
| McKay's Snow Bunting | wr | c | | | | | |

* Nesting records

Submitted by: Calvin L. Lonsinh
Refuge Manager

January 31, 1965
Date

Approved by: _____
David L. Spencer, Associate Refuge Supervisor

Nearly all adult brant and many of the young could fly by August 17. Many birds capable of flight were decoyed back to the trap by the flightless birds and were banded. Tent was errected after the drive to provide the banding crew protection from wind and rain. Photo by C. J. Lensink, 8-17-65.


Refuge Clerk Nathan Toots and Biological Aid Joseph Panuyak during time out from banding for coffee. Banding was a non-stop operation and for larger catches continued throughout the night. The photo provides an interesting optical illusion--both men were inside of the tent. Photo by C. J. Lensink, 8-17-65.

Wassili Berlin with hammer, Paul Tinker living dangerously, and Jim Geerdts holding ladder while working on an addition to the Service Building.
Photo by J. L. Hout, 9-30-65.

This addition will provide space for a heated workshop. The level fill to the right has been surfaced with gravel and will be used as a parking and equipment storage area. Photo by J. L. Hout, 9-30-65.

Snow removal was a major problem during the winter of 1964-65. Photos show some of the equipment employed in the battle. The small rotary plow on the upper left proved to be an excellent piece of equipment and not a toy.