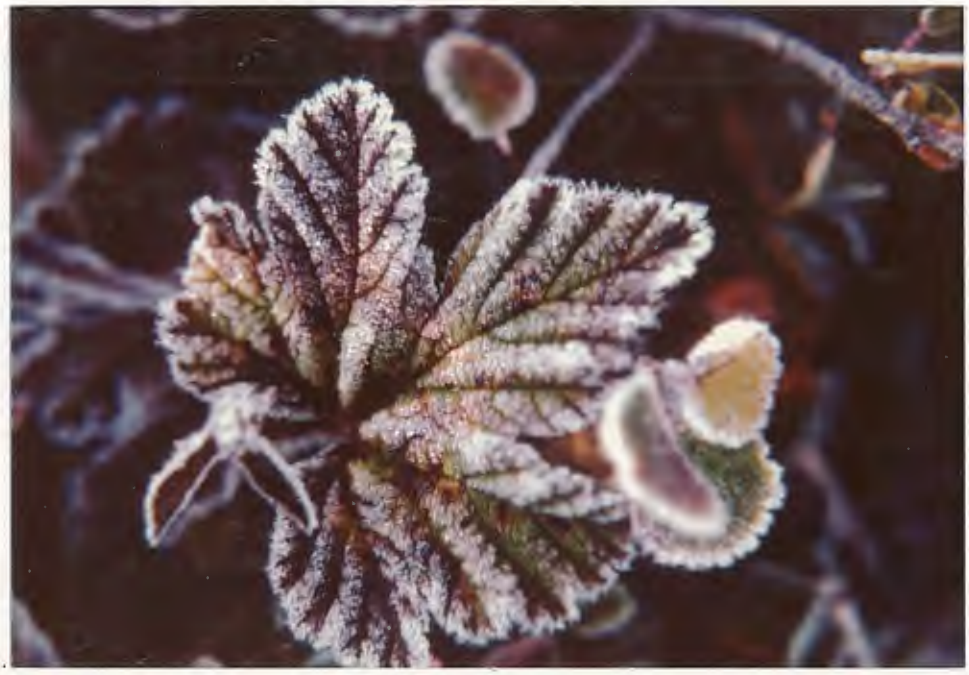


(AHB)

(PSN)

Morning frost on the leaves of cloudberry contrast with a mid-summer bloom of Epilobium on the sand dunes of Selawik National Wildlife Refuge, Alaska.

SELAWIK NATIONAL WILDLIFE REFUGE

Kotzebue, Alaska

Annual Narrative Report

Calendar Year 1984

U.S. Department of the Interior

Fish & Wildlife Service

National Wildlife Refuge System

Refuge Manager Kent Hall (MAS)

Assistant Refuge Manager Mike Spindler (KFH)

Secretary Donna Koutchak (MAS)

Biological Technician Allison Banks (KFH)

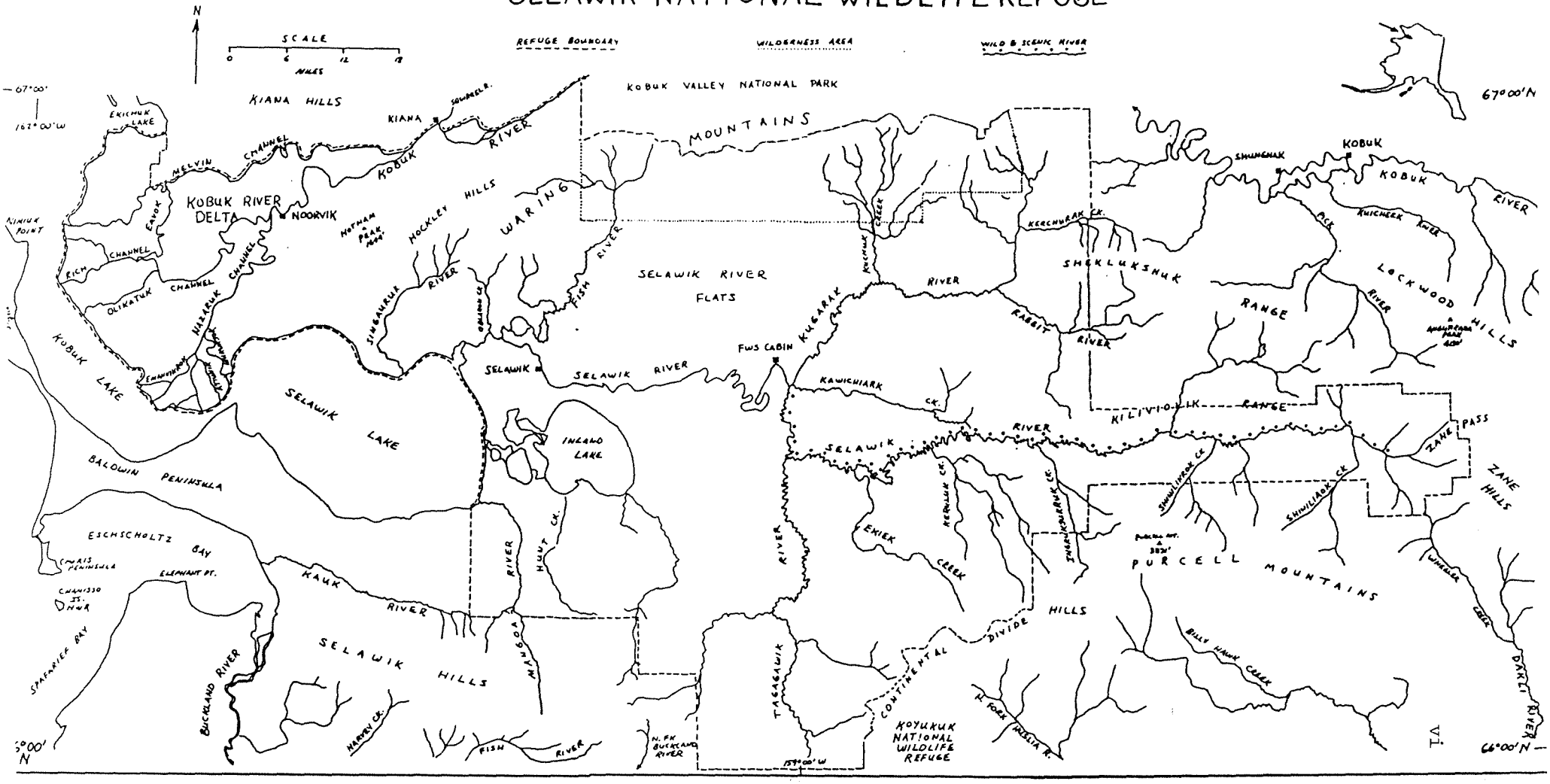
Biological Technician Gilbert Jackson (MAS)

Biological Technician Dennis Ronnse (MAS)

Volunteer Beverly Minn (KFH)

Volunteer Pamela Nelson (MAS)

SELAWIK NATIONAL WILDLIFE REFUGE



Personnel

1. Kent F. Hall, Refuge Manager, GS-12, PFT, EOD September 30, 1981.

2. Michael A. Spindler, Refuge Manager (Ass't)/Pilot, GS-11, PFT, EOD April 1, 1984. (transferred from Arctic NWR).

3. Donna K. Koutchak, Secretary (typing), GS-4, PFT (Local Hire) EOD November 29, 1983-Resigned November 15, 1984.

4. Lorena Williams, Secretary (typing), GS-4, PFT (Local Hire) EOD December 4, 1984 - Resigned December 10, 1984.

5. Dennis Ronsse, Biological Technician, GS-5, Temporary, July 9, 1984 - August 10, 1984.

6. Allison H. Banks, Biological Technician, GS-5, Temporary June 24, 1984 - September 14, 1984.

7. Gilbert Jackson, Biological Technician, GS-5, Temporary (Local Hire), June 24, 1984 - September 14, 1984.

8. Pamela S. Nelson, Volunteer, June 20 - August 20, 1984.

9. Beverly P. Minn, Volunteer, January 1, 1984 - November 1, 1984.

10. Anthony Miotke, Volunteer, August 10-15, 1984

11. Bradley Engstrand, Volunteer, August 16-20, 1984

12. Brian Foss, YCC, June 10, 1984 - August 15, 1984.

Review and Approvals

Kent F. Hall 4/19/85 — Submitted by — Date

— Regional Office Review 4/23/85

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INTRODUCTION

The Selawik National Wildlife Refuge was established under the authority of the Alaska National Interest Lands Conservation Act (ANILCA) which was signed into law by President Carter on December 2, 1980. This act withdrew approximately 2,150,000 acres from the public domain. As specified in ANILCA "The purposes for which the Selawik National Wildlife Refuge is established and shall be managed include--

(i) to conserve the fish and wildlife populations and habitats in their natural diversity, including but not limited to, the Western Arctic Caribou Herd (including participation in coordinated ecological studies and management of these caribou), waterfowl, shorebirds and other migratory birds, salmon and sheefish;

(ii) to fulfill international treaty obligations of the United States with respect to fish and wildlife and their habitats;

(iii) to provide, in a manner consistent with the purposes set forth in subparagraphs (i) and (ii), the opportunity for continued subsistence uses by local residents; and

(iv) to ensure, to the maximum extent practicable and in a manner consistent with the purposes set forth in paragraph (i) water quality and necessary water quantity within the refuge".

The refuge is located in northwest Alaska and nearly bisected by the Arctic Circle. In addition to the 2.15 million acres of the conceived unencumbered refuge land there are approximately 1.2 million acres of interim-conveyed or managed land within the refuge boundary.

Locally, the refuge area is referred to as the "Selawik Flats" (Fig. 1). The primary habitat is best described as transition between coastal tundra and tree-line woodlands, interspersed with thousands of permafrost-formed wetlands. The northern boundary encompasses the southern exposure of the Waring Mountains which are designated wilderness, and are relatively low-peaked, spruce-covered hills. The interim-managed lands include the Kobuk River delta and the Hockley Hills, an extension of the Waring Mountains.

Two villages, Selawik and Noorvik, are within the refuge boundary. Four other villages are located within 10 miles of the refuge. Approximately 2,500 people live in these six Inupiat Eskimo villages.

Fig. 1. The "Selawik Flats" wetlands form the majority of the refuge extending from the Waring Mountains (visible at top of photo) Wilderness area some 50 miles to the south to the Selawik Hills. From the Kobuk delta on the west to the head of the Selawik River on the east, the refuge extends for 150 miles.

(MAS)

Transportation methods include aircraft, boats, snow machines and walking. Except for short intra-city roads within several of the villages there are no roads. All villages have improved airports with gravel runways, and have daily commercial air service from Kotzebue.

The indigenous people of the area are Inupiat Eskimo. They are represented politically by the Northwest Alaska Native Association (NANA) Regional Corporation and the Alaska Federation of Natives (AFN). NANA is one of eleven such regional corporations designated under the Alaska Native Claims Settlement Act (ANCSA) of 1971.

In general, the local standard of living is being continually upgraded by the affluence generated in the distribution of Prudhoe Bay oil royalties. To an outsider the stakes seem high - loss of culture, habitat, wilderness, and associated resources. The challenge of resource management is presenting the perspective of a conscience in balancing the wants of people and the needs of wildlife.

A. HIGHLIGHTS

Michael Spindler reported for duty as assistant refuge manager/pilot in a new station aircraft, a Piper Super Cub.

Statistically-sound inventories were initiated for waterfowl production and large mammal censusing.

Eleven tundra swan cygnets were fitted with radio telemetry transmitters.

A wetland vegetation classification system was developed.

A feasibility study was funded by the state legislature to investigate potential commercialization of whitefish on conveyed lands around the village of Selawik.

A joint use buildings and facilities proposal was developed and submitted for funding in conjuction with the National Park Service Northwest Areas office in Kotzebue.

B. CLIMATIC CONDITIONS

The nearest official weather station to the refuge was located at Kotzebue. However, unofficial records were available for Selawik Village, and during the summer at the refuge field cabin on the Selawik River at Upinnigvik. Our analysis and comparison of both the official and unofficial records follows.

Kotzebue extreme high temperatures for 1984 were cooler than 1983 for all months except December (Table 1). The 1984 annual high reached 56oF in July while in 1983 it peaked at 72oF in July. In contrast, the extreme lows for 1984 were warmer than the previous year for all months except May. The coldest month, February, had a minimum low of -16oF and a maximum low of -26oF. The lowest recorded temperature in 1984 was -26oF. March brought a respite from February's bitter cold with a short warming trend yielding a mean monthly temperature of 6oF. April, May, and June were cooler relative to 1983 and the long term average. As would be expected following the cold late winter, spring arrived 3 weeks later than usual.

Overall, summer 1984 was cooler than summer 1983 with temperature fluctuations less than the extremes we experienced in 1983 (Table 1). The annual precipitation in 1984, 10.25 inches, was 1 inch less than 1983. July received 2.11 inches of rain, 0.48 inches greater than the 1.63 inches which fell in July 1983. August 1984, was still our rainiest month with a total of 2.98 inches, although 0.38 inches less than August 1983. A 1984 high mean monthly temperature for both September and October combined with 2 months of lower than normal precipitation put a 3 week delay on the arrival of ice and winter weather as well.

Table 1. Summary of Kotzebue climatological data, 1983-1984.

MONTH	TEMPERATURES (°F)								PRECIPITATION (inches)			
	High		Low		Ave. Mean	Deviation	Ave. Mean	Deviation	Total	Dev.from	Total	Dev. from
	1983	1984	1983	1984	1983	(30-yr.mean) 1983	1984	(30-yr.mean) 1984	1983	30-yr.mean 1983	1984	30-yr.mean 1984
January	24	3	-33	-9	-5	2	-3	0	0.29	0.00	0.54	0.26
February	29	-16	-31	-26	-4	2	-21	-15	0.15	-0.15	0.01	-0.29
March	27	15	-18	-3	8	8	6	6	0.27	-0.25	0.11	0.20
April	42	9	-15	-8	22	10	0	-12	0.72	0.39	0.24	-0.70
May	68	31	19	17	38	6	24	-8	0.13	-0.27	0.64	0.33
June	65	48	27	36	42	-2	42	-2	0.55	0.03	0.38	-0.15
July	72	56	39	47	54	1	51	-2	1.63	0.08	2.11	0.65
August	59	51	34	43	48	-4	47	-3	3.36	1.33	2.98	0.95
September	54	50	18	40	39	-3	45	3	1.68	0.25	1.70	0.20
October	42	32	-3	25	19	-3	28	5	0.99	0.38	0.35	-0.26
November	38	12	-7	4	16	8	8	0	1.04	0.63	0.50	0.03
December	34	35	-23	-15	12	16	5	9	0.15	-0.18	0.69	0.34
ANNUAL	72	56	-33	-26	24	3	15	-2	11.25	0.19	10.25	1.56

Weather information gathered for the Selawik Village area was obtained from the journals of Ray Skin. A native of Selawik, Ray Skin has been keeping accurate records of the weather and other events of the village for the last 30 years. The mean morning temperatures in Table 2 represent the mean of each initial morning observation taken daily between midnight and noon, but usually between 0500 and 0800. Accurate highs and lows for Selawik are at best as Ray Skin has consistently recorded them, and at worst, as the researcher was limited in transcribing the information from hand-written journals in a given amount of time.

The refuge cabin located at Upinnigvik, on the Selawik River, is 20 miles E of Selawik Village and 30 miles from the coastal waters of Selawik Lake. In comparing average morning temperatures, Upinnigvik was consistently warmer than the village by a maximum of 5oF in July 1984 and a minimum of 2oF in September (Fig. 2, Tables 2, 3). Again, for monthly highs Upinnigvik was notably warmer than Selawik for July, August, and September. July's high temperature for Upinnigvik was 92oF compared to 80oF at Selawik. The greatest monthly temperature extreme (84oF) occurred in August at the refuge cabin compared to an extreme of 63oF at Selawik Village, a difference of 21oF. The monthly lows for Upinnigvik were 2oF lower than Selawik Village for August and September, while the low for July at Upinnigvik was 2oF higher than that of Selawik Village.

C. LAND ACQUISITION

3. Other

Approximately 39,101 acres were interim-conveyed under sections (14a) and (14f) of ANCSA in the vicinity of Kiana.

Interim conveyance totalled approximately 318,636 acres at year's end. Remaining selected lands totalled approximately 900,000 acres.

In addition, 300 of 566 native allotments within the refuge boundary have been legislatively approved and conveyed. Of the 148 allotments on unencumbered refuge land, 45 have been approved.

D. PLANNING

1. Master Plan

The schedule for the "Selawik Comprehensive Conservative Plan" (SCCP) called for intensive planning to begin in November 1985 with completion sometime in 1987.

Selawik planning team leader Pete Jerome and writer Michael

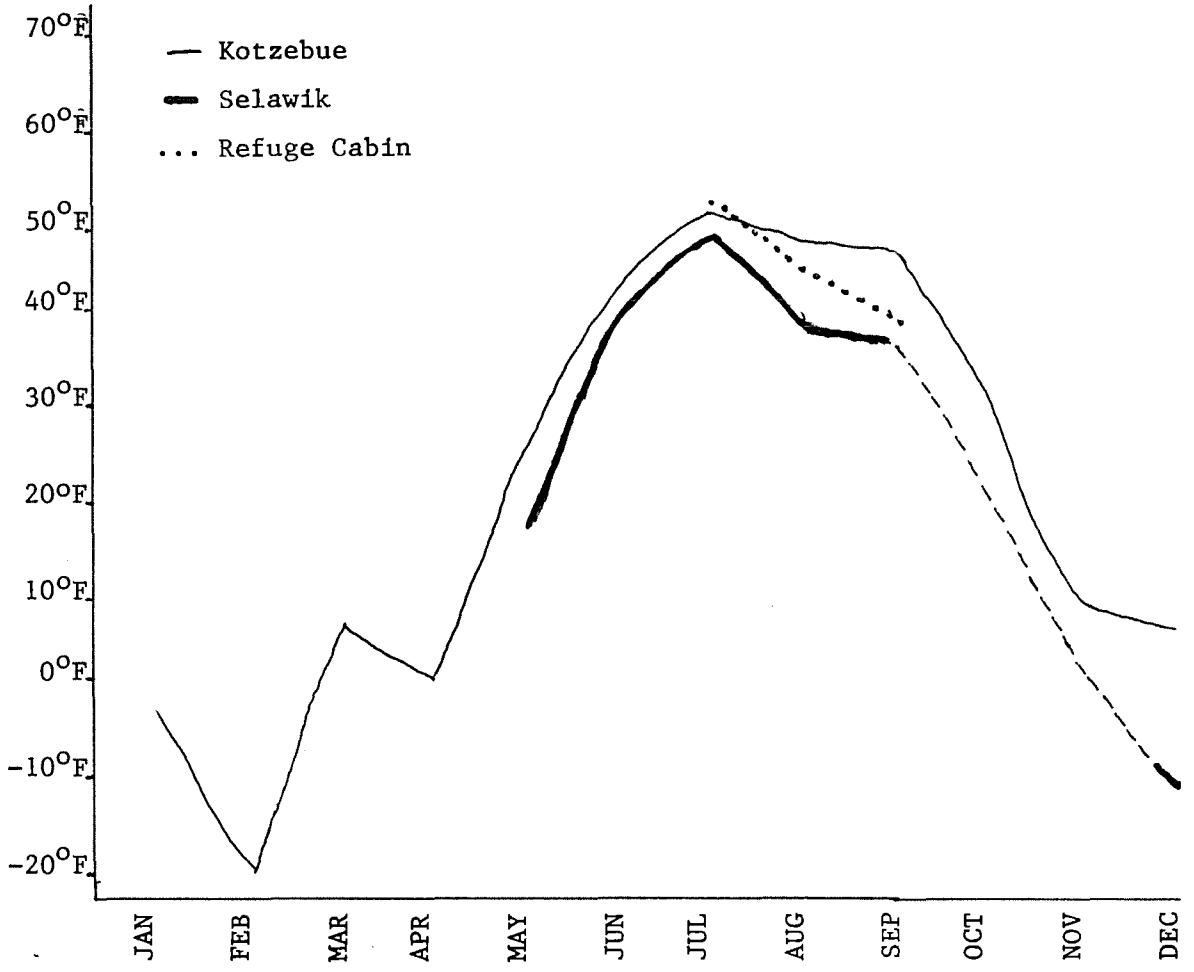


Fig. 2. 1984 mean monthly temperature comparison between Kotzebue, Selawik Village, and Refuge Cabin, Upinnigvik.

Table 2. Analysis of Selawik Village weather conditions repeated several times daily by Ray Skin, 1983-1984.

MONTH	Mean morning temp.[c]		High		Low		No. clear days		Mean wind speed		No. day wind direction																Calm	
	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984	N		NW		NE		E		SE		S		SW		W			
											83	84	83	84	83	84	83	84	83	84	83	84	83	84	83	84	83	84
May	NA	16	NA	51	NA	27	NA	15	NA	13.3					1		1						3		20		3		NA	2
June	44	42	82	86	32	25	6	10	15.8	11.9			1				2		2		1	1			13	12	4	8	4	5
July	56	48	92	80	43	36	5	6	13.9	12.8					3		1		1			1	1		12		1		7	3
August	47	42	63	63	32	27	2	2	12.7	09.6					3		2		4		1		2		5		5		3	8
September	31	36	50	63	12	27	5	6	14.4	10.0	2		2		5		13		2			5	3		3		1		6	5
October[a]	25	NA	36	NA	3	NA	3	NA	15.5	NA					6				1			3			3			1	2	NA
November	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA																				
December[b]	-2	-12	30	29	-45	-35	11	7	14.5	16.8					18		13		9		1	1	1		2		3		1	0	0

[a] Data for October 1983 includes days 1-17 only.

[b] Data for December 1984 includes days 12-31 only.

[c] Mean of morning tempuratures, were recorded between midnight and noon.

Table 3. Climatic data for field season 1984 at refuge cabin, Upinnigvik, Selawik NWR.

MONTH	High	Low	Average Meana	Total Precipitation
July	92	38	52.4	3.35
August	84	25	45.2	5.15
Septemberb	82	25	38.3	0.30

a Mean of morning temperatures, consistently read at 0700-0900 AST.
b September data represent 1-21 September only.

Rees visited the refuge field station in July for a get-acquainted and planning strategy meeting. Botanists Bill Kirk and Carl Markon, from the regional program support office, conducted about 3 days of vegetation ground-truthing. This information will be used in development of SCCP landsat satellite map products.

5. Research and Investigations

Planning was initiated for a research project to investigate feeding ecology of Pintail ducks on the refuge in response to proposed use of a biological control agent for mosquitoes on adjacent village and reindeer range land (see discussion under Other Resident Wildlife).

6. Other

The entire refuge was located within the Kobuk area of the Alaska Interagency Fire Management Plan. Intensive planning began late in 1983. The plan was developed and signed in May 1984 and was implemented for the 1984 fire season.

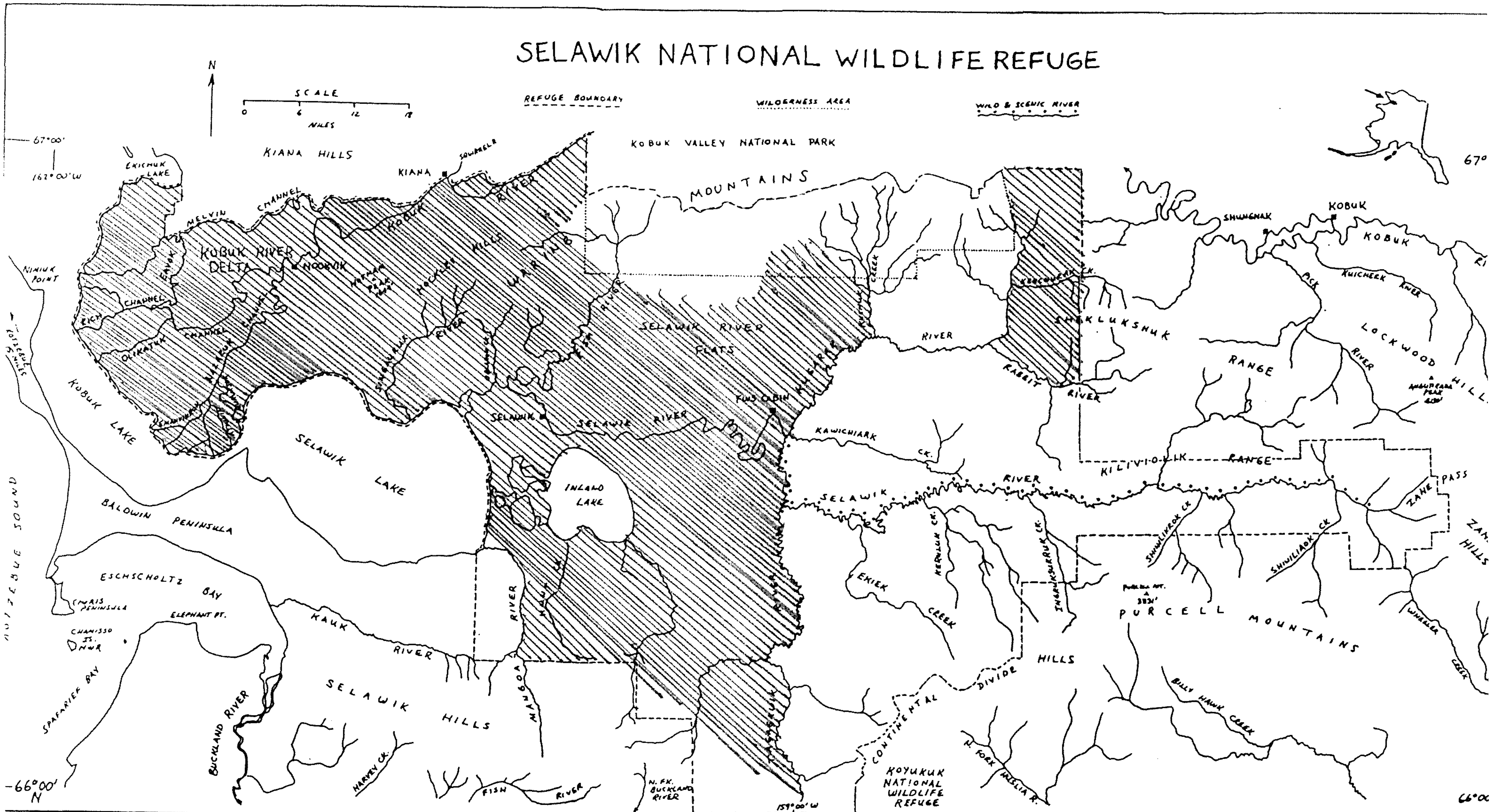
A highly cooperative spirit existed during the planning process among all of the major land owners/managers involved. Except for mandatory Full suppression (critical) designation near villages and several critical areas around cabins, the entire refuge was designated Modified or Limited action. Most unencumbered refuge lands received Limited designation (Fig. 3). Limited action consists of areas where natural fire is desirable or the loss due to fire is not as great as the cost of fighting the fire. Fire fighting efforts are to be limited to keeping a fire within the management unit or to protect critical sites within the area.

Modified action provides a level of protection between "Full" and "Limited". The intent is to provide landowners and managers with an alternative for those lands that require a high level of protection during critical burning months, but a lower level of protection when the risks of large damaging fires are less. The cutoff date when suppression changed from Full to Limited was set at July 1 in this plan, subject to field modification.

E. ADMINISTRATION

1. Personnel

1984 marked the first year in which the refuge had sufficient personnel, funding, and equipment to conduct a viable biological program with the objectives of sampling to make statistically-valid trend comparisions and population extrapolations. Increase in refuge seasonal staff combined with filling the assistant manager position with a dual function pilot allowed major increases in the intensity of the refuge field program (Table 4).



.g. 3. Fire management suppression zones for the Selawik National Wildlife Refuge, Alaska, 1984. Cross-hatching represents modified suppression, other areas on refuge are limited supression.

Table 4. Selawik NWR Personnel, 1981-1985.

Fiscal Year	Full-time Equivalents
1985	4.0
1984	2.6
1983	2.0
1982	2.0
1981	1.0 (assigned in Regional Office)

Table 5. Selawik NWR Funding

Fiscal Year	1210	1220	1260	Other	Total
1984	-	-	155,000	100,000a	255,000
1983	60,000	70,000	-	-	130,000
1982	60,000	60,000	-	-	120,000
1981	75,000	-	-	-	75,000

a ARRM funding

Michael Spindler was selected to fill the Refuge Manager/Pilot (training) position. The effective date of transfer from Arctic NWR was April 1, but due to flight training he didn't arrive to stay until mid-June. Before leaving Fairbanks, Mike completed an ambitious training schedule in which he upgraded his private pilot license with commercial, instrument, and seaplane ratings as well as OAS certification. Following his arrival in mid-June, Mike literally took-off with the refuge biological program by putting to use the new station Super Cub aircraft. A total of 312 hours (217 floatplane and 95 landplane) was flown by Mike for refuge operations during 1984.

Three actions involved local hire clerical personnel. Donna Koutchak resigned November 15 to move to Kodiak. After a month of advertising, Lorena Williams applied and worked for 9 days before accepting a $12/hour clerical job in a state agency. Our position was classified as a GS-4 ($7.50/hour). Both women were overqualified and underpaid and they knew it. Grocery baggers earned $8.50/hour in Kotzebue grocery stores! So at years end, the secretary job was filled indefinitely by the GS-12 refuge manager who competed effectively by being overpaid and underqualified. We hope the new clerk position salary can be made reasonable by pursuing the procedure to assign special local rates to all federal clerical personnel in Kotzebue.

Gilbert Jackson, Selawik resident, was local-hired as a biological technician. His local knowledge, maintenance, abilities, and positive attitude were an asset to our field season.

Allison Banks and Dennis Ronsse were hired as biological technicians from the regional personnel office seasonal register. Their major responsibilties revolved around waterfowl production surveys. Ronsse was recognized as an outstanding seasonal employee for his dedication in classification of refuge wetland vegetation types resulting in a progress report entitled "A Preliminary Investigation of Wetland Vegetation on the Selawik National Wildlife Refuge".

2. Youth Programs

Brian Foss, of Anchorage, worked in the Youth Conservation Corps program from June 10 - August 15, 1984. His sole duties involved assisting in staffing the National Park Service contact station, in which the refuge had a display and FWS pamphlets were distributed.

We could have used at least one more YCC for other refuge programs but no one else applied. Minimum wages did not even attract teenagers in Kotzebue.

3. Other Person-Power Programs

Gilbert Jackson and Lloyd Davis, both of Selawik, were hired for their skills and local knowledge or guide services on a daily basis several times during the year.

4. Volunteer Programs

Four volunteers served during the year. One assisted full time during the field season. Two provided short-term assistance on specific projects ie; banding and construction. The fourth assisted throughout the year with administrative duties and occasional trips to the field.

On the positive side, these volunteers provided services that could not have been accomplished with our budget. The additional flexibility in acquiring staff was welcome.

On the negative side, the fact that volunteers were not paid, and some were more energetic than some paid employees led to some probably unavoidable personnel problems. In addition, volunteerism did not seem to be effective in advancing wildlife career objectives for most volunteers. Our field season volunteer, who was also on the seasonal register with one summer experience as a volunteer technician and a Bachelor degree in biology, was rated on the GS-5 Biol. Tech. register no higher than applicants with no volunteer experience. Evidently devoting an entire summer doing volunteer biology for a refuge did not improve one's standing on the seasonal hire register. Even though the individual was recognized for exemplary service both years as a volunteer, the rating on the seasonal hire register apparently will not change. It seems unfair that FWS is more than willing to accept work from volunteers, but is unwilling to improve their future employment outlook by recognizing the volunteer experience as equivalent work experience and initiating some form of hiring preference for ex-volunteers. Until the situation improves, this station cannot in good conscience offer volunteer opportunities to persons seeking to get their "foot in the door" through volunteering.

5. Funding

The overall funding situation improved greatly in fiscal year 1984. The $100,000 provided by the Accelerated Refuge Maintenance Management (ARMM) program was welcome, even though "base" funding was woefully inadequate for the 1984 operation (Table 5). A return to base funding would result in little more than custodial desk management. Specifically, the base of $155,000 would provide salaries for manager, assistant manager, and secretary ($97,590); office and storage leases ($31,000); utilities ($15,000); and aircraft availability ($8,100). There would be no travel or operational funds.

Obviously, fiscal austerity is the current name of the game. With insight gained in 1984, we now know the cost of acquiring

minimally-acceptable biological monitoring data for the major species for which the refuge was established, e.g. waterfowl and caribou. Thus, the base operational budget should be adjusted and maintained at the total FY 84 level of $255,000.

6. Safety

No serious or lost time accidents or incidents occurred throughout the year. Due to the small size of the staff, safety meetings were generally informal discussions on how best to deal with problems. Several safety films were viewed and discussed.

Seasonal employees were oriented on map reading, radio and boat operations, bear safety, aircraft safety, and given an abbreviated shotgun qualification course.

Assistant Manager/Pilot Spindler attended OAS pilot's ground school April 1984 and November 1984. The pilot safety materials sent to the station by safety and security were appreciated and thoroughly read.

8. Other Items

Special Use Permits. Six permits were issued, all for different purposes as follows:

1.) A commercial hunting guide reported no activity on refuge lands during the year.

2.) The Bureau of Land Management conducted several reinspections of native allotments.

3.) The City of Noorvik extracted gravel from a pit on selected land.

4.) The Craigheads of the Wildlife/Wildlands Institute immobilized and fitted conventional and satellite telemetry transmitters on 2 caribou of the Western Arctic Herd. Their report indicated excellent accuracy between the two types of transmitters, and that periodic monthly or bi-weekly tracking of caribou often missed major daily movements recordable only by daily tracking.

5.) A pair of researchers from the University of Washington were issued a permit to collect lake sediment pollen samples from 10 sites on the refuge. The purpose was to analyze and describe the vegetational history of northern Alaska over the past 14,000 years. They postponed their visit until 1985, due to last minute conflicts.

6.) ARCO Alaska conducted surficial geological studies in the Waring Mountains and several sites south of Inland Lake. A report has not been received and was overdue

as stipulated.

F. HABITAT MANAGEMENT

1. General

Overall, habitat remained in "normal" condition. Water levels were maintained at adequate levels by spring runoff and summer rain storms. Several small wildfires occurred affecting an insignificant amount of tundra.

Winter lingered into late May, with several late snowstorms that reversed bird migrations. The coastal Kobuk River delta contained many wetlands with ice cover until mid-June. This environmental factor may have caused a significant change or shift in breeding waterfowl populations.

2. Wetlands

A seemingly impossible task was accomplished this year, which had broad management application. Secretary Donna Koutchak tackled the job of counting and measuring acreage of all refuge wetlands on U.S.G.S. 1:63,360 topographic maps. The process encompassed all or parts of 34 maps of which 20 were poorer quality blue line advance copies, which made the job even more difficult. A total estimate of 19,586 individual wetlands totalling 279,723 acres was derived from this task. The information was needed for random selection of wetlands and extrapolation of wildlife populations (Table 6).

The refuge wetland habitat was stratified into three major types: upland tundra, lowland tundra, and river delta (Fig. 4.). The numbers for the Kobuk River delta and upland tundra were considered accurate to the degree that the USGS topographic maps were accurate. For the lowland tundra habitat only blueline advance map copies were available. The poor quality of these copies corroborated by field observations, forced us to assume that wetlands of less than 4 acres in size were not counted on the advance copies since they were generally too small to decipher. In addition, wetland acreages were not determined in about 1/2 of this habitat type. Therefore the total number of wetlands and acreage for lowland tundra was based on an arithmetic extrapolation from approximatly 50% of the lowland area in which lake area was known.

A wetland vegetation habitat classification was developed by Biological Technician Dennis Ronsse following qualitative plant sampling at each of the 60 randomly-selected waterfowl study wetlands and additional vegetation sampling sites. Detailed descriptions of the habitat types were presented in Ronsse's report entitled "A Preliminary Investigation of Wetland Vegetation on the Selawik National Wildlife Refuge." A majority of refuge wetlands was classified as dominated by Equisetum fluviatile (31%), followed by Menyanthes trifoliata (24%), and

Table 6. Number of wetlands and estimated acreage by habitat stratum and size class, Selawik National Wildlife Refuge, Alaska. Based on manual counts and dot-grid using 1:63,360 USGS topographical maps.

Quad.	Size classes (acres)					Total Wetlands	Total Wetland acres
	< 4	4-12	12-40	40-100	> 100		
Kobuk River delta ($625mi^2$ = 400,000 acres)							
Sel C-5	402	479	106	41	32	1060	18,524
Sel C-6	146	235	65	33	23	502	13,042
Sel D-5	310	844	176	73	24	1427	18,832
Sel D-6	219	302	96	35	37	689	19,458
Sel D-4	96	530	74	16	8	724	8,674
Sel D-3	72	187	17	9	1	286	2,192
Subtotal	1245	2557	537	207	125	4688	99,246
Lowland Tundra ($2347mi^2$ = 1,502,080 acres)							
Sel C-1	488	542	144	37	12	1223	12,014
Sel C-2[a]	196	321	104	26	16	663	23,159
Sel C-3	376	249	47	24	24	720	14,232
Sel A-1	170	275	38	4	3	490	3,692
Sel A-2	9	40	4	1	0	54	410
Sel A-3	12	27	0	1	0	40	200
Sel B-3	78	255	59	21	12	425	7,380
Shg B-2	3	60	3	1	0	67	398
Remainder[b]	1631	2158	487	140	82	4498	74,526
Subtotal	2963	3927	886	255	149	8180	136,011
Upland Tundra ($600mi^2$ = 384,000 acres)							
Sel C-4	114	175	25	14	6	334	4,108
Sel C-3	76	80	14	2	1	173	1,164
Sel D-3	0	6	0	0	0	6	36
Sel D-2	268	402	23	6	2	701	4,024
Sel D-1	553	689	60	4	0	1306	6,282
Shg D-4	363	191	27	2	1	584	2,814
Shg D-5	1614	764	120	34	21	2553	16,708
Shg D-6	457	468	93	33	10	1061	9,330
Subtotal	3445	2775	362	95	41	6718	44,466
Grand Total	7653	9279	1782	557	315	19586	279,723

[a] Advance map was 88.6% complete, figures represent arithmetic extrapolation to full map area

[b] Remainder of Lowland Tundra stratum unavailable on USGS maps except for mostly illegible advance map copies. Figures represent arithmetic extrapolations for refuge portions of Selawik B-1,2, and Shungnak A-5,6, B-3,4,5,6, and C-2,3,4,5,6 quadrangles based on percentages for known quads.

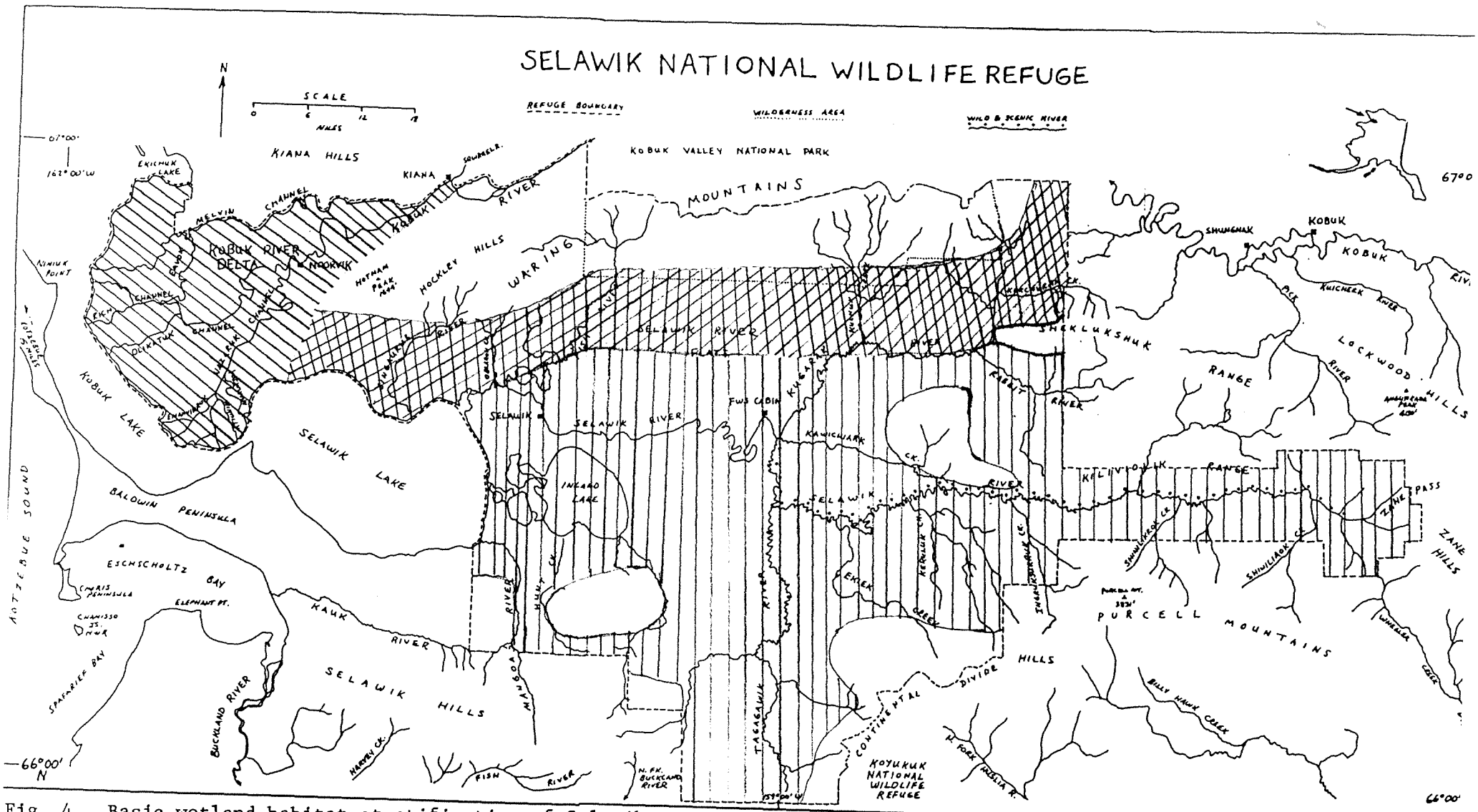


Fig. 4. Basic wetland habitat stratification of Selawik National Wildlife Refuge. Diagonal hatching represents Kobuk River delta, cross hatching represents upland tundra, vertical hatching represents lowland tundra, and blank represents non-wetland habitat.

Sphagnum (20%) (Table 7). These major wetland vegetation types, as well as some important less dominant types are pictured in Figs. 5 thru 14. The only vegetation type which was found to consistently support high levels of bird numbers was Arctophila (see discussion under Wildlife).

4. Cropland

Selawik Farm Project. This "farm" operation continued in an experimental phase with funding from the Alaska State Legislature. It is located about 10 miles north of Selawik Village on conveyed land. Rural Ventures Alaska, Inc. provided consultant services in the form of a full time horticulturist. The primary objectives of the project are to establish agriculture in the region, produce better quality and variety of food, and provide local employment opportunities.

Approximately 4 acres were intensively cultivated in 1984. The emphasis was placed on realizing a profit from a "truck-farm" (actually airplane) vegetable garden operation. Fresh produce was supplied to surrounding villages and Kotzebue. Primary crops were cabbage, potatoes, broccoli, turnips and cauliflower. The late spring followed by a cool July and late August frost resulted in a poor harvest. The size of most crops was small but quality and prices were generally better than lower-48 items shipped in to grocery stores. Continued subsidy of the project seemed likely despite this year's failure. Several state legislators and the governor visited the site in mid-August and were pleasantly impressed.

6. Other Habitats

Ground truthing of all land cover types relative to landsat satellite habitat mapping was accomplished by Regional Office botanists Bill Kirk and Carl Markon. The crew traveled by helicopter and visited about a dozen pre-selected sites over a 4-day period, 24 - 28 August. The data will not be compiled until mid-late 1985.

7. Grazing

Although a provision exists in ANILCA to permit reindeer grazing on about 25 townships within the refuge, no developments occurred this year. Local herding operations were still relatively small and expansion to new ranges does not appear likely in the near future.

Much of the ANILCA-encumbered reindeer grazing land was used as a major staging area of northward migrating caribou in Spring 1984. In addition, the area contained the highest density of moose on the refuge based on December 1984 surveys. These factors should weigh heavily against non-wildlife uses, even if reasonable alternative sites are not available for reindeer grazing off refuge lands.

Table 7. Relative ocurrence of the most dominant plant communities on a random sample of wetlands, July-August 1984, Selawik National Wildlife Refuge, Alaska.

Most Dominant Community Type	Number of Wetlands
Arctophila fulva	7
Equisetum fluviatle	18
Menyanthes trifoliata	14
Spaghnum	12
Calla palustris	5
Cicuta mackenzieana	2
Potentilla palustris	1

Fig. 5. The Arctophila wetland type was the most productive for waterfowl according to correlation analyses. (MAS)

Fig. 6. The Calamagrostis wetland type predominated in areas recently burned by wildfire. It resembled the dense nesting cover sought after by prairie duck refuge managers and tended to harbor more dabbler broods than other types. (Wetland No. 24-153.) (MAS)

Fig. 7. The Cicuta wetland type consisted of extensive floating mats of Cicuta mackenzieana, poison hemlock, which rarely would support a walking biologist (Wetland No. 04-408). (MAS)

Fig. 8. The Menyanthes wetland type also consisted of floating mats which would rarely support a walking person. (Wetland No. 24-052). (MAS)

Fig. 9. Mat-forming vegetation is characteristic of about half of refuge wetlands. Cicuta, Calla, Sphagnam, and Menyanthes, all form floating mats which generally proved difficult to negotiate on foot. Productivity of mat-type wetlands varied widely.

(MAS)

Fig. 10. Sphagnum-Calla floating wetland types frequently combine to nearly fill an entire wetland. Such floating mats, with a high sphagnum content, often would support a person on foot. (Pothole N of Wetland No. 04-366) (MAS)

Fig. 11. A steep-banked wetland in the upper Selawik River drainage offering a variety of habitat types, from emergent Carex to Alder, willow, and spruce thickets. (MAS)

Fig. 12. During periods of high water the Equisetum fluviatile type was over hip-boot deep. These wetland types were usually not very productive (Wetland No. 04-295). (MAS)

Fig. 13. A beaver-flooded pond surrounded by white spruce forest. With no emergent zone, the water level had reached the bases of the spruce trees by August 1984 (Wetland No. 22-047). (MAS)

Fig. 14. A steep-banked tundra wetland surrounded by Eriophorum vaginatum tussock tundra which had very little emergent vegetation. Land locked Northern Pike in the lake may have consumed most of the ducklings in 1984. (Wetland No. 30-769)

9. Fire Management

Twelve fires were officially detected on refuge lands in 1984 (Fig. 15, Table 8). Two major thunderstorm systems probably accounted for all of the refuge fires. Of the 10 active fires, 4 occurred in limited action areas, hence they were ignored and burned out leaving a total of 1402 acres burned. All were extinguished apparently by the same storms that started them. One could draw a conclusion that of the 6 fires which were controlled, most of them probably would have also been rained out, thereby further reducing suppression costs. This would have occurred if the date for active suppression in modified areas had not been extended by field modification to July 10, 1984. Total acreage burned on the refuge in 1984 was 1497.

All told, except for communication problems inherent during the field season, we and adjacent landowners/managers were pleased with the performance of the fire planning effort. No changes will be proposed for 1985 on refuge lands.

The 1984 Galena Fire Management Zone Operational Review stated that "Fire Management worked. It seemed to do what it was intended to do. It made the process of allocating scarce resources easier and thus limited resources went further. It undoubtedly reduced the cost of fire suppression."

11. Fishery Resources

Except for sheefish and a species list, refuge fishery resources are essentially unknown. Crisis management generated the necessary impetus to acquire some baseline information on whitefish in 1984.

The issue originated in 1983, when some Selawik village residents conceived the construction of a fish processing plant in the village. Species suggested for use included burbot, pike, and all species of whitefish except sheefish. The plant would have the capacity to process up to 260,000 pounds of fish flesh annually into sausage, patties, imitation crab meat and other products.

The Administration for Native Americans (ANA) issued a grant of $150,000 to conduct a feasibility study. The grant was administered by the City Council of Selawik, who contracted with Rural Ventures Alaska (RVA). RVA was an Anchorage-based consulting firm with a mission to encourage and develop smalltime enterprises throughout rural Alaska. (RVA has managed the Selawik Farm Project for the past several years.) This new enterprise was dubbed "Selawik Fish Project I".

Since the fishing would occur on lands within the refuge, albeit interim conveyed, and could affect populations which spawn on the refuge, we obviously wanted to be involved. The Alaska

Fig. 15. This lightning-caused wildfire burned to within a few miles east of Selawik NWR, June 18,1984. (MAS)

Fig. 16. A Northern pike in an experimental gill net, part of some preliminary baseline study accomplished in response to commercialization of the fishery in the lower Selawik River. (KFH)

Table 8. Wildfires occurring on Selawik NWR in 1984.

BLM Fire No.	Date	Location	Cause	Management Option	Suppression Activity	Acres Burned
A207	6/24-29	Sec. 11, T. 12N, R 7E.	Lightning	Limited	Unmanned rained out	1200
A226	6/24-25	Sec. 25, T. 15N, R 10W.	Lightning	Modified	2 smokejumpers retardant	40
A227	6/24-25	Sec. 24, T. 15N, R 10W.	Lightning	Modified	"	20
A228	6/24-25	Sec. 14, T. 15N, R 10W.	Lightning	Modified	4 smokejumpers retardant	9
A229	6/24-25	Sec. 4, T. 16N, R 6W.	Lightning	Modified	Unmanned Low priority spot	
A243	6/25	Sec. 25, T. 15N, R 12W.	False Alarm			
A244	6/25	Sec. 27, T. 15N, R 10W.	Lightning	Modified	2 smokejumpers	3
A246	6/25-27	Sec. 24, T. 16N, R 8W.	Lightning	Modified	6 smokejumpers	20
A264	6/26	Sec. 19, T. 18N, R 5W.	False Alarm			
A292	6/26-29	Sec. 5, T. 10N, R 2W.	Lightning	Modified	2 smokejumpers pump eqpt.	3
A391	7/3	Sec. 25, T. 13N, R 10E.	Lightning	Limited	Unmanned rained out	2
A411	7/3-9	Sec. 3, T. 12N, R 9E.	Lightning	Limited	Unmanned rained out	100
A412	7/3-9	Sec. 7, T. 12N, R 10E.	Lightning	Limited	Unmanned rained out	100

Department of Fish and Game was also forced to respond to the grant because no commercial fishing season existed for anything but salmon and sheefish in this region.

ADF&G issued an experimental quota to commercially harvest up to 5,000 pounds of whitefish and 1,000 pounds each of pike and burbot from waters in and near the village of Selawik, exclusive of refuge lands. The fish were to be used for various tests of products for the study.

Specific objectives of the study for 1984 were: 1) perform taste tests to determine consumer product preference; 2) conduct a market test; and 3) prepare a business plan for this project as a potential cottage industry for the City of Selawik. It became evident early in the year that transportation costs from Selawik to markets would be prohibitive. Thus, alternatives to a processing plant were discussed and implemented prior to fishing time.

The alternatives involved switching the direction of the study to dried and fresh/frozen products. The permit quota was divided equally among 15 participating fisherpersons from Selawik.

As listed in the final report by RVA, the major accomplishments of Selawik Fish I were: 1) determination that a processing plant in Selawik would not be feasible, 2) identification of more realistic options in terms of overall operating costs and market acceptance in Alaska; 3) coordination among agencies concerned about commercial development of fish in the Selawik area; 4) second-year funding was obtained to continue establishment of a developing fishery, by working toward a more thorough understanding of market potential, and analysis of existing freshwater fish resources; and 5) establishment of a procedure to implement direct mail shipments of dried fish from Selawik to markets in Anchorage to greatly reduce transportation costs.

A second year grant of $62,500 has been awarded by ANA to pursue development of the industry as well as funding a portion of research. The city council decided against contracting RVA during 1985, preferring instead to administer the contract with local people.

In an attempt to keep ahead of the game, the Selawik NWR staff contacted the Fairbanks Fisheries Resources Station (FWS) for support. Due to other commitments, they were unable to accomplish any field work in 1984, but did visit the refuge to become familier with the habitats. Likewise, ADF&G submitted proposals to address the issue of sustainable harvest, but were not funded. As a last resort to do something, we did some test netting at various sites on refuge land to obtain scale samples, weights and document fish species present (Fig. 16). In addition, we contacted several of the Selawik participants and collected the same information from fish they caught. Our

efforts were incidental to other activities and resulted in data from 10 locations and 19 fish - 4 least ciscoe, 2 round whitefish, 4 broad whitefish, 4 humpback whitefish and 5 northern pike.

The information was provided to ADF&G and Fairbanks Fisheries for analysis. Although the diversity was good for such a feeble effort, the sample was too small to draw any conclusions.

The Fairbanks Fisheries Resources Station drafted a study proposal for 1985 to document subsistence fishing activity and obtain biological information on whitefish in and near Selawik. They have committed a full time biologist to the project. The commercial fish research division of ADF&G and the City of Selawik will also likely be involved in 1985.

16. Marking and Banding

A total of 17 tundra swans was banded with FWS aluminum leg bands. Of the 2 adults and 15 cygnets banded, both adults and 14 cygnets received plastic neck collars. The collars were blue with a white letter "U" prefix followed by a 3-digit number. As far as we could determine collar retention was good, however, sightability was less than average due to the collar riding very low on the neck, often being concealed by feathers. Telemetry radio transmitters in a "backpack" configuration were placed on 11 cygnets, all of which were known to have left the refuge at fall migration. Valuable information on local movements and fall migration of tundra swan family groups was obtained from this marking effort (see below). One dead cygnet with a radio was recovered at Freezeout Lake Montana, and found to be emaciated, weighing only half its original weight at capture. Examination revealed no wear points on the cygnet's skin, so death more likely resulted from poor body condition coincident with an unusually severe cold weather spell during fall migration.

G. WILDLIFE

1. Wildlife Diversity

The refuge consists of a mixture of natural wetland and upland habitats which support a diversity of avian, mammalian and piscine species. The original refuge bird, mammal, and fish species lists were compiled and published in the 1974 final E.I.S. for the proposed refuge, and included 142 bird, 46 mammal, and 25 fish species. Extensive field work in 1984 enabled the staff to update and revise the bird species checklist. The list contained totals of 152 species, including 138 documented species, 73 breeders and probable breeders, 15 year-round residents, and 13 species attributed by literature records to the refuge or its adjacent waters (Table 9). Refuge activities continue to be aimed at preserving and further documenting natural diversity.

Table 9. Checklist to the birds of Selawik National Wildlife Refuge based on documented field observations (status given) and literature sources attributing the species to the refuge and adjacent waters (+ symbol). Sources: Grinnell (1909); Bailey (1949); Hudson (1957); Gabrielson and Lincoln (1959); Kessel (1968); Divoky (1972); Kessel and Gibson (1977); Refuge staff field observations 1981-5; and Uhl (pers. comm. 1985). Status definitions follow Kessel and Gibson (1977).

Species	Status
Red-throated loon	rare summer resident
Arctic loon	common breeder
Common loon	rare summer visitant
Yellow-billed loon	rare summer visitant
Horned grebe	rare breeder
Red-necked grebe	common breeder
Tundra swan	common breeder
Whooper swan	+
Trumpeter swan	+
Greater white-fronted goose	common breeder
Snow goose	common spring migrant
Snow goose (blue morph)	accidental summer visitant
Brant	common spring migrant
Canada goose (ssp. *taverneri*)	common breeder
Green-winged teal	common breeder
Mallard	uncommon breeder
Northern pintail	abundant breeder
Blue-winged teal	accidental summer visitant
Northern shoveler	uncommon breeder
American wigeon	abundant breeder
Canvasback	rare breeder
Greater scaup	abundant breeder
Lesser scaup	uncommon summer visitant
Common eider	rare breeder
Harlequin duck	rare summer visitant
Oldsquaw	common breeder
Black scoter	common breeder
Surf scoter	uncommon breeder
White-winged scoter	common summer visitant, prob. br.
Common goldeneye	rare breeder
Bufflehead	uncommon summer visitant
Red-breasted merganser	uncommon breeder
Osprey	rare summer visitant
Bald eagle	rare summer visitant
Northern harrier	common summer resident, prob. br.
Sharp-shinned hawk	rare summer visitant
Northern goshawk	rare resident
Rough-legged hawk	rare summer resident
Golden eagle	rare resident

Table 9. Birds of Selawik National Wildlife Refuge, continued.

Species	Status
American kestrel	rare summer visitant
Merlin	rare summer visitant
Peregrine falcon	rare summer migrant
Gyrfalcon	uncommon resident, prob. br.
Spruce grouse	uncommon resident
Willow ptarmigan	common resident
Rock ptarmigan	uncommon resident
Sandhill crane	common breeder
Black-bellied plover	uncommon migrant, prob. br.
Lesser golden-plover	common breeder
Mongolian plover	+
Semipalmated plover	uncommon summer resident, prob. br.
Greater yellowlegs	common summer resident, prob. br.
Solitary sandpiper	+
Wandering tattler	uncommon summer resident, prob. br.
Spotted sandpiper	uncommon summer resident, prob. br.
Upland sandpiper	+
Whimbrel	common summer resident, prob. br.
Bristle-thighed curlew	rare summer visitant, prob. br.
Hudsonian godwit	summer resident
Bar-tailed godwit	common migrant, prob. br.
Ruddy turnstone	common migrant, rare breeder
Black turnstone	common summer resident, prob. br.
Surfbird	+
Red knot	common spring migrant
Sanderling	uncommon fall migrant
Semipalmated sandpiper	common breeder
Western sandpiper	common breeder
Least sandpiper	uncommon breeder
Baird's sandpiper	rare breeder
Pectoral sandpiper	uncommon migrant, rare breeder
Sharp-tailed sandpiper	uncommon fall migrant
Dunlin	common breeder
Buff-breasted sandpiper	rare migrant
Long-billed dowitcher	uncommon breeder
Common snipe	common breeder
Red-necked phalarope	uncommon breeder
Red phalarope	common migrant, rare breeder
Pomarine jaeger	common spring migrant
Parasitic jaeger	common summer resident, prob. br.
Long-tailed jaeger	common breeder
Bonaparte's gull	uncommon summer visitant
Mew gull	abundant breeder
Hering gull	uncommon summer resident
Thayer's gull	rare summer resident
Slaty-backed gull	+
Glaucous-winged gull	+
Glaucous gull	common breeder

Table 9. Birds of Selawik National Wildlife Refuge, continued.

Species	Status
Black-legged kittiwake	uncommon summer visitant
Sabine's gull	uncommon migrant
Ivory gull	rare migrant
Ross' gull	rare migrant
Aleutian tern	accidental
Arctic tern	abundant breeder
Common murre	accidental
Thick-billed murrre	accidental
Tufted puffin	accidental
Horned puffin	accidental
Great horned owl	uncommon resident
Snowy owl	uncommon winter resident
Northern hawk-owl	uncommon resident
Great gray owl	rare resident
Short-eared owl	common summer resident, prob. br.
Boreal owl	uncommon resident
Belted kingfisher	uncommon summer resident
Downy woodpecker	rare summer visitant
Three-toed woodpecker	uncommon resident
Northern flicker	rare summer resident
Olive-sided flycatcher	+
Alder flycatcher	common summer resident, prob. br.
Say's phoebe	+
Tree swallow	common breeder
Bank swallow	common breeder
Barn swallow	+
Cliff swallow	rare migrant
Gray jay	common resident
Common raven	uncommon resident
Black-capped chickadee	common resident
Siberian tit	+
Boreal chickadee	common resident
American dipper	rare breeder
Arctic warbler	+
Ruby-crowned kinglet	rare summer visitant
Bluethroat	rare summer visitant
Gray-cheeked thrush	abundant summer resident, prob. br.
Swainson's thrush	rare summer visitant
American robin	abundant summer resident, prob. br.
Varied thrush	common summer resident, prob. br.
Yellow wagtail	common summer resident, prob. br.
White wagtail	rare summer visitant
Water pipit	uncommon summer resident, prob. br.
Bohemian waxwing	rare summer visitant
Northern shrike	uncommon summer resident, prob. br.
Orange-crowned warbler	uncommon summer resident, prob. br.
Yellow warbler	common breeder
Yellow-rumped warbler	rare summer visitant
Blackpoll warbler	uncommon breeder

Table 9. Birds of Selawik National Wildlife Refuge, continued

Species	Status
Northern waterthrush	uncommon breeder
Wilson's warbler	uncommon summer resident, prob. br.
American tree sparrow	abundant breeder
Savannah sparrow	abundant breeder
Fox sparrow	common breeder
Lincoln's sparrow	summer resident, prob. br.
Golden-crowned sparrow	uncommon summer visitant
White-crowned sparrow	common breeder
Dark-eyed junco	summer resident, prob. br.
Lapland longspur	common breeder
Snow bunting	common summer resident, prob. br.
Rusty blackbird	abundant breeder
Common grackle	accidental
Pine grosbeak	uncommon resident
White-winged crossbill	uncommon resident
Common redpoll	uncommon summer resident
Hoary redpoll	abundant summer resident, prob. br.

The above information should be considered provisional, since the area has received only limited visits by scientists, naturalists, and the birdwatching public. Reports of new species sightings or status changes are welcome. Please submit information as to observer(s), species, date(s), number of individuals, habitat, and behavior to: Refuge Manager, Selawik National Wildlife Refuge, P.O. Box 270, Kotzebue, Alaska, 99752 (Phone 907-442-3799).

2. Endangered Species

Nesting activity of arctic peregrine falcons has been documented along rivers to the north and south of the refuge. No nests have been located on refuge land, and it seems doubtful any will be found, due to lack of suitable nesting habitat.

A single falcon (probably peregrine) was observed flying over Selawik Village on 15 August, 1984.

Eskimo curlews were formerly found in their greatest numbers throughout the refuge area. None have been seen in recent times, but the possibility of locating an isolated population on the refuge has not been completely ruled out.

3. Waterfowl

Spring migration. The first sighting of a lone unidentified goose on the upper Selawik River was made by a charter pilot on 21 April and was soon followed by a sighting at Kotzebue on 26 April. Shortly thereafter the weather turned cold again with new snow falling on 6,7, and 25 May. The first confirmed Canada goose sighting at Kotzebue was 13 May, which was within the range of previous years (10 May, 1982 and 16 May, 1983), and was not apparently influenced by the late spring in 1984. Aerial surveys of migrating and spring staging waterfowl did, however, show the influence of the late spring with peak numbers of 4490 total birds observed 29 May, 1984 (Fig. 17a). The peak in 1984 occurred 12 days later than the peak in 1983, however, the magnitude of both peaks was equivalent (Fig. 17a). A majority of birds in the first 1984 survey on 19 May 1984 were snow geese seen on the east Noatak River delta and Ekichuk Lake, and pintails seen along the shores of both the Noatak and Kobuk deltas. The 29 May survey indicated large numbers of tundra swan, brant, and unidentified ducks seen along the shores of the Noatak, Kobuk, and Selawik River deltas. On the final spring survey in 1984, 11 June, bird numbers declined to about equal the first survey in mid-May, with only 827 birds seen.

Breeding pair counts. The Alaska waterfowl breeding pair aerial survey was conducted in the Kotzebue area stratum by Bruce Connant and Jack Hodges on 7 June 1984. The Kotzebue stratum was composed of 12 transect segments located on mostly Selawik NWR lands, and provided a good index of breeding population trends. Highlights of the 1984 survey for the Kotzebue stratum included a slight (2%) increase in overall duck population; large increases in green-winged teal (47%), Scaup (112%), Bufflehead (33%), and Scoter (70%); and large declines in Mallard (24%), Wigeon (27%), Shoveler (38%), Oldsquaw (41%), Canada geese (52%), and Sandhill cranes (35%) (Table 10). No single major factors could be identified as reasons for the above changes. Simple drought-displacement of prairie ducks would have caused increases in predominantly dabblers, and

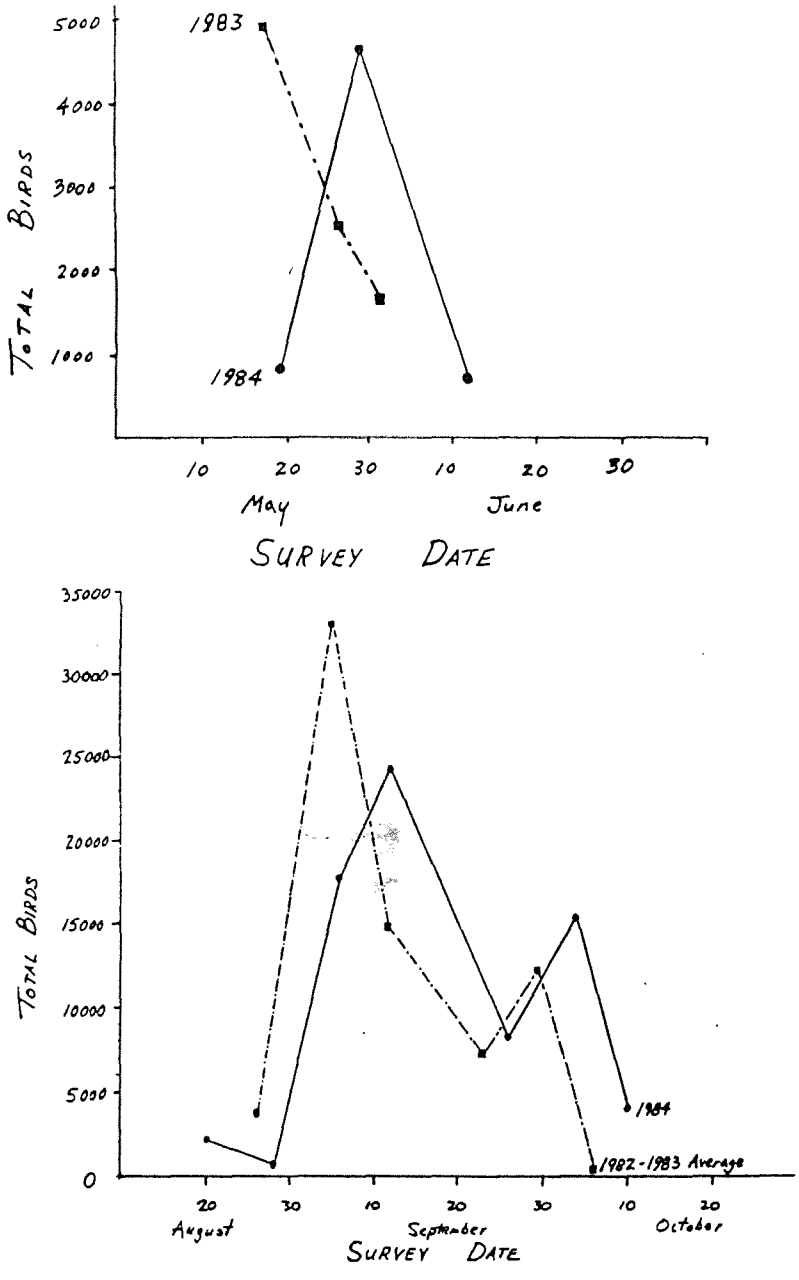


Fig. 17a (top) and 17b (bottom) showing seasonal abundance of waterfowl during spring and fall migration, respectively, on Selawik National Wildlife Refuge in 1984.

Table 10. Adjusted waterfowl breeding population estimates for Kotzebue area, Alaska (in thousands). Based on Aerial survey extrapolations for stratum 11 by Bruce Connant and Jack Hodges, USFWS Waterfowl Investigations, Juneau, Ak.

Ducks	1978	1979	1980	1981	1982	1983	1978-1983	1984	Departure from 6-year average (%)
Mallard	19.0	15.5	31.7	20.4	11.9	19.0	19.5	14.8	-24
American wigeon	93.9	71.0	87.9	78.2	63.2	87.9	80.4	59.0	-27
Green-winged teal	12.7	25.5	17.0	36.1	12.7	17.0	20.2	29.7	+47
Shoveler	16.2	8.6	41.1	52.2	5.9	8.6	22.1	13.7	-38
Northern pintail	115.7	87.7	138.6	126.1	93.2	89.8	108.5	117.9	+9
Canvasback	0.5	0	4.9	12.7	11.6	3.2	5.5	5.7	+4
Scaup	89.3	81.5	81.8	72.5	76.1	57.5	46.5	98.6	+112
Goldeneye	4.9	3.7	1.2	1.2	2.4	0	2.2	2.5	+14
Bufflehead	0	0.6	0.6	1.8	1.2	1.2	0.9	1.2	+33
Oldsquaw	55.1	30.4	33.3	53.6	49.3	30.4	42.0	24.6	-41
Scoter	23.3	11.0	17.7	15.5	29.8	16.7	19.0	32.3	+70
Total ducks	433.0	335.9	456.2	470.3	349.2	331.3	396.0	403.5	+2
Canada geese	10.4	13.5	9.8	10.7	21.0	6.1	11.9	5.7	-52
Sandhill crane	-	-	-	2.5	4.0	6.4	4.3	2.8	-35
Tundra swan	-	1.2	2.2	2.5	8.2	4.7	3.8	3.1	-18

conversely, a success or failure in local production conditions would have caused an increase or decline, respectively, for scaup, oldsquaw, wigeon, and green-winged teal.

Production surveys. The scope and extent of production surveys was greatly increased in 1984 with the capabilities afforded by a refuge aircraft and increased number of summer employees. A total of 60 wetland units was randomly selected throughout the refuge (Fig. 18). The random sample of wetlands fairly accurately represented the actual size distribution of wetlands on the refuge (Fig. 19). Each wetland was considered one sample unit of a random sample so that mean brood size, number of adult waterfowl, number of young waterfowl, and number of other wetland-associated species could be extrapolated for the 19,586 estimated total number of wetlands on the refuge. Each of the 60 wetland units comprising our sample was censused twice during the summer: mid-July for dabbler broods and mid-August for diver broods. The census at each wetland sample unit consisted of a 15-20 minute period with 1-2 observers watching from a concealed position followed by a complete walkaround the circumference of the wetland unit by the observers (Figs. 20,21). The experience of previous efforts on the brushy and deep-water wetlands of the refuge and of other studies (Savard 1981, Spindler et al. 1981) convinced us to use wetlands as sample units (rather than land area plots) and to include a period of silent observation followed by complete walkaround.

Mean brood size for all dabbler species except Mallard was lower in 1984 as compared to 1983 (Table 11). No distinct trend from 1983 to 1984 could be detected for divers and sea/ducks as a group, however, oldsquaw and black and surf scoters probably produced better in 1984. No white-fronted goose broods were detected in 1983, and 4 broods were seen in 1984, suggesting some improvement last year. Canada goose production was probably similar between 1983 and 1984. The above fluctuations in duck and goose productivity were apparently greater than for tundra swan, which maintained stable productivity with a mean brood size of 2.9 both years (see section below on the tundra swan study). Overall broods per waterbody was compared, indicating the "high-grade habitat" in the 2 study areas sampled in the preliminary study in 1983 produced more broods per waterbody as compared to the overall refuge random sample in 1984, as would be expected (Table 11).

Analysis of number of broods per wetland size class indicated greatest total broods and greatest broods per waterbody in the wetlands over 100 acres in size, and conversely the lowest total broods and broods per waterbody in the smallest size class (Table 12). The greatest number of wetlands on the refuge were of the smallest size class, whereas the smallest number of wetlands on the refuge were not the largest size class, but the second largest size class (Fig. 19). Considering broods per wetland and total number of wetlands present, the importance of both the very small size class (because of sheer numbers of

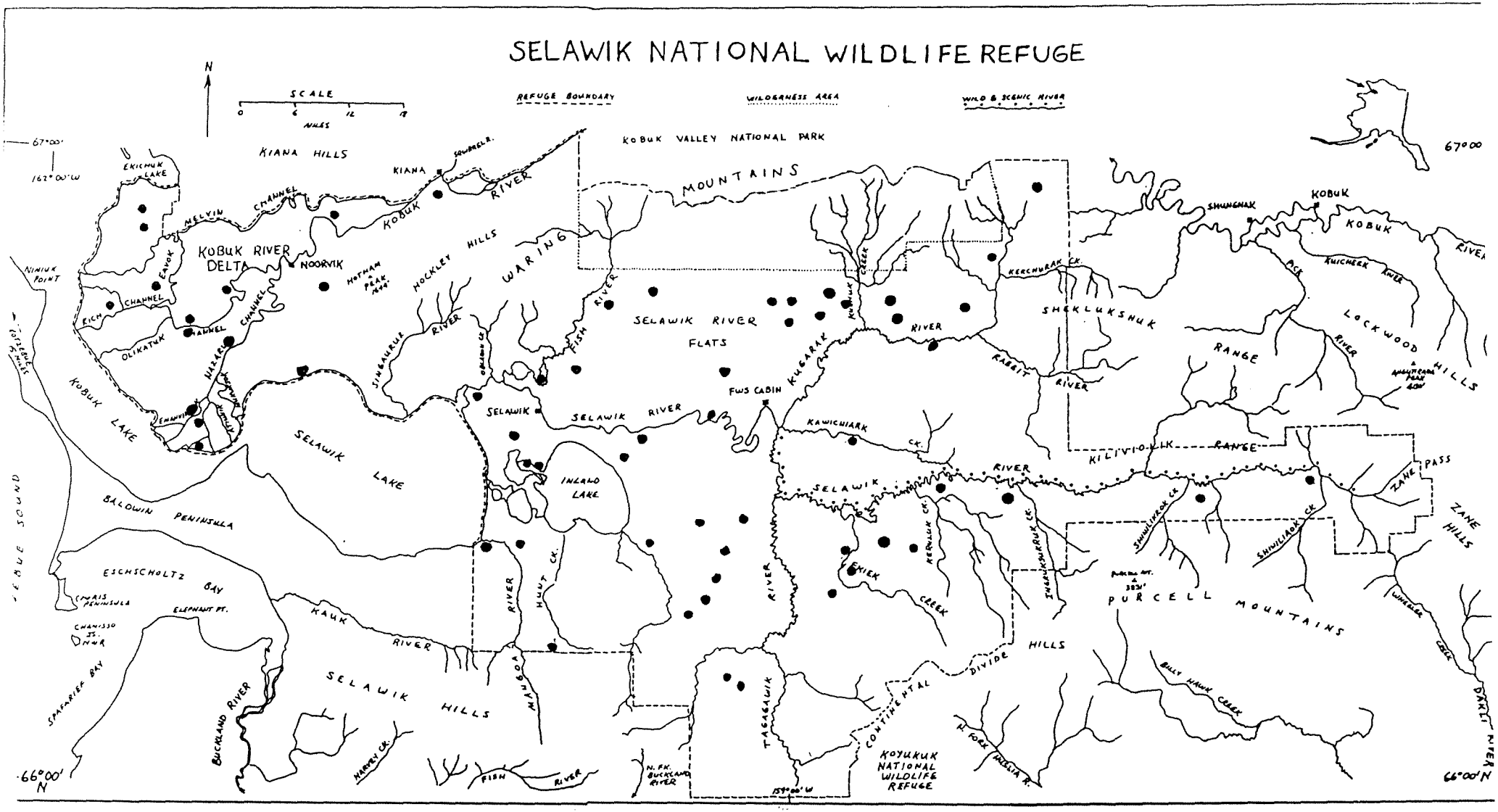


Fig. 18. Map showing geographical distribution of the 60 randomly-selected wetland sample units used for waterfowl productivity and habitat studies on Selawik National Wildlife Refuge in 1984.

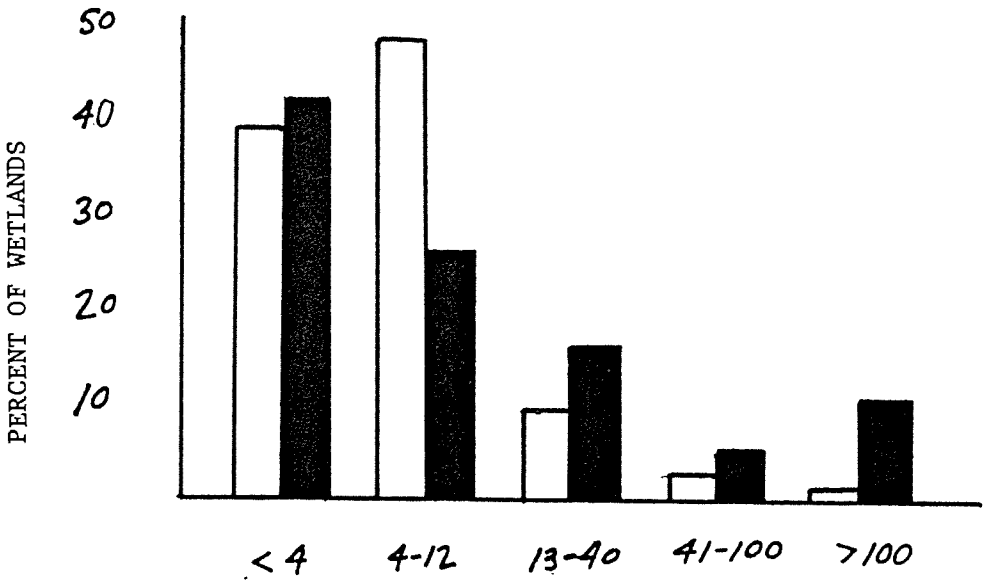


Fig. 19. Comparision of size class distribution of wetlands (solid) and the random sample of 60 wetlands (open) on Selawik National Wildlife Refuge, Alaska.

Fig. 20. Biological Technician Dennis Ronsse quietly observes wetland sample unit 24-153 from a distant vantage point prior to complete walkaround for duck brood surveys. Each of 60 sample units was censused in such a manner.
(MAS)

Fig. 21. The objective of the major field effort on Selawik NWR in 1984 was to count adults and young duck species in a consistent manner enabling statistically valid population extrapolations. Shoveler broods, as pictured here, were uncommon and seen very infrequently.

(PSN)

Table 11. Total broods and mean brood sizes from waterfowl productivity surveys, based on ground visits to individual wetlands at Selawik and Upinnigvik (cabin) study areas in 1983, and total refuge random sample in 1984, Selawik National Wildlife Refuge, Alaska.

Species/group	1983		July 1984		August 1984	
	No. of broods	Mean brood size	No. of broods	Mean brood size	No. of broods	Mean brood size
Mallard			1	6.0	4	4.5
American wigeon	37	4.9	17	4.1	10	3.9
Green-winged teal	7	6.4	8	2.8	2	2.0
Northern shoveler	6	5.5	4	3.8		
Pintail	8	4.7	28	3.5	6	2.8
Dabbler subtotal	58	5.1	58	3.6	22	3.5
Canvasback			1	8.0		
Greater Scaup	43	6.7	20	6.6	32	5.9
Common goldeneye			1	12.0		
Oldsquaw	2	5.0	18	6.1	7	4.1
Black scoter	9	4.0	15	7.8	10	4.5
Surf scoter			6	6.0	2	1.0
Diver/sea-duck subtotal	54	6.2	61	6.8	51	5.2
Tundra swan[a]	87	2.9	n/a	n/a	69	2.9
White-fronted goose			4	4.0	4	3.8
Canada goose	5	4.0	5	4.6	3	8.0
Unidentified goose	9	4.1				
Red-breasted merganser			1	8.0		
Grand Total	134		129		80	
Broods per waterbody[b]	1.6		1.3		1.1	

[a] Based on aerial survey data August 1983 and 1984.

[b] Based on total sample of 85 wetlands in Selawik Village area and Upinnigvik cabin area in 1983, and random sample of 60 wetlands spread over entire refuge in July and August 1984.

Table 12. Analysis of waterfowl broods per waterbody according to wetland size class, July 1984, Selawik National Wildlife Refuge, Alaska.

Wetland size classes (acres)	No. of broods	No. of Wetlands	Broods/ waterbody
< 4	7	24	0.29
4-12	6	16	0.38
13-40	19	11	1.73
41-100	13	3	4.33
>100	34	6	5.67
Overall	79	60	1.32

wetlands) and the largest size class (because of the large proportion of total productivity) became evident. However, we intend to conduct breeding pair surveys in future years, which could revise these conclusions about importance of wetland sizes.

The best estimates of refuge-wide production we could obtain from our random sample showed 3441 geese, 18,478 dabbling ducks and 10,832 divers/sea ducks (Table 13). White-fronted geese out-produced Canada geese 2:1. Pintail were the highest producing dabbling duck (8921), followed by wigeon (5990). The highest producing diving/sea duck was greater scaup (8283), followed by oldsquaw (6117). Our estimate of tundra swan production by this method was low (255 cygnets), relative to the aerial estimate (1081 cygnets), which was believed to be more accurate. At the time of this report preparation, the above extrapolated estimates had to be qualified with an estimated confidence interval of plus/minus 50%, based on extrapolation of weighted mean and variance from a simple random sample. Refinement of stratification and extrapolation techniques from our data set was being undertaken in cooperation with statisticians from the University of Southwest Louisiana. Improvements in application of a stratification procedure should result in more precise estimates for 1984 as well as recommendations for improvements in allocation of future sample effort by stratum. At the writing of this report it was clear that the larger wetlands were most important, had the highest density and variance in waterfowl numbers, and would therefore warrant greater sample effort relative to smaller size classes in the 1985 field work.

Summer adult population. Estimates of summer adult population were also made, and indicated 8538 geese, including 7774 white-fronted and 765 Canada geese (Table 13). The Canada goose estimate was probably low, because 3900-6300 Canada's were seen in early September during aerial surveys. The tundra swan estimate of 3568 adults was close to the aerial estimate of 2800-3100 adults. Total adult dabbling ducks was estimated at 14,400, with pintail (5607) and wigeon (4205) the most abundant. Total adult diving ducks were extrapolated at 8156, with oldsquaw (3186) the most abundant, followed by greater scaup (2549) (Table 13). To provide a general idea of 90% confidence limits, the total estimated adult population (all waterfowl plus wetland related species) was 92,588 birds plus or minus 45,603, or about 50% of the total estimate. It should be noted that the above estimates of summer adult population were preliminary and subject to the same qualifications listed for production.

The ground-based estimates of July adult numbers were significantly less than estimated June breeding populations based on extrapolations from aerial surveys. For example, the most abundant dabbler, pintail, was estimated at 117,900 early June breeding population for stratum 11, Selawik Flats-Kotzebue

Table 13. Preliminary summer adult population and production estimates for waterfowl and other wetland-related bird species, Selawik National Wildlife Refuge Alaska. Based on extrapolations from a simple random sample of 60 wetlands (out of 19,586 possible wetlands) intensively censused by ground methods, 15 July - 1 August, 1984.

Species/group	Actual count		Density/mi2		Extrapolation	
	Adults	Young	Adults	Young	Adults	Young
Arctic loon	17	5	4.957	1.458	2166	637
Red-throated loon	3	1	0.875	0.292	382	127
Red-necked grebe	20	2	5.831	0.583	2549	255
Sandhill crane	24		6.998		3058	
Subtotal marsh & waterbirds	64	8			8155	1019
Tundra swan	28	2	8.164	0.583	3568	255
Canada goose	6	9	1.749	2.624	765	1147
White-fronted goose	61	18	17.786	5.248	7774	2294
Subtotal geese	67	27	19.535	7.872	8539	3441
Mallard	17		4.957		2166	
Pintail	44	70	12.829	20.410	5607	8921
Wigeon	33	47	9.622	13.704	4205	5990
N. Shoveler	6	13	1.749	3.790	765	1657
Green-winged teal	13	15	3.790	4.374	1657	1912
Subtotal dabblers	113	145	32.947	42.278	14400	18480
Canvasback	+	+				
Greater Scaup	20	65	5.831	18.952	2549	8283
Goldeneye sp.	1		0.292		127	
Oldsquaw	25	48	7.289	13.995	3186	6117
Black scoter	11	6	3.207	1.749	1402	765
Surf scoter	6	31	1.749	9.039	765	3951
Red-breasted merganser	1		0.292		127	
Total diver/sea ducks	64	150	18.660	43.735	8156	19116
Subtotal waterfowl	272	324			34663	41292
N. harrier	4		1.166		510	
Short-eared owl	10		2.916		1274	
Subtotal raptors	14				1784	
Long billed dowitcher	3		0.875		382	
Golden plover	18		5.248		2294	
Greater yellowlegs	15		4.374		1912	
Least sandpiper	9	1	2.624		1147	
Baird's sandpiper	6		1.749		764	
Semipalmated sandpiper	1		0.292		127	
Pectoral sandpiper	1		0.292		127	
Buff-breasted sandpiper	1		0.292		127	
White-rumped sandpiper	1		0.292		127	
Whimbrel	2		0.583		255	
Bar-tailed godwit	1		0.292		127	
Red-necked phalarope	82	4	23.909		10450	
Snipe	22	1	6.415		2804	
Subtotal shorebirds	162	N/A			20643	N/A
Parasitic jaeger	3		0.875		382	

Table 13. Preliminary waterbird population estimates, July 1984, continued.

Species/group	Actual count Adults	Actual count Young	Density/mi2 Adults	Density/mi2 Young	Extrapolation Adults	Extrapolation Young
Long-tailed jaeger	35	1	10.205	N/A	4460	
Glaucous gull	27		7.872		3441	
Mew gull	39	4	11.371	1.166	4970	510
Arctic tern	65	8	18.952	2.333	8283	1019
Subtotal gulls, terns, jaegers	169	13			21536	N/A
Bank swallow	29		8.456		3696	
Northern waterthrush	2	3	0.583		255	
Rusty blackbird	12	1	3.499		1529	
Subtotal Passerines	43	4			5480	N/A
Total birds	724		211.099		92,261 plus/minus 45,603	N/A

+ Production was observed on non-sample wetlands.

Sound (Table 10). Since the majority of stratum 11 was comprised by Selawik NWR, it was doubtful that the ground-based estimate of 5607 reflected the departure of more than 100,000 breeding males and non-breeders! In both the aerial and ground extrapolation procedures, a great deal of error exists that needs to be identified and reckoned with in the implimentation of future field studies.

Wetland characteristics in relation to waterbird numbers. Habitat characteristics were recorded during waterfowl production survey visits to wetland sample units. Each wetland was classified as to percentage dominance of eight prevalent shoreline vegetation types. Physical characteristics such as water level, bank type, shoreline extent, mudflat extent, island extent, size, and pH were recorded. Other biological factors such as presence of pike, muskrat, beaver, and submergent vegetation were also noted. Correlation analysis showed that higher bird numbers were positively related to percent coverage of submergent vegetation and Arctophila fulva emergent cover; wetland surface area; presence of beaver; and number of islands. Surprisingly, higher bird numbers were negatively correlated with width of emergent zones (e.g. narrow emergent zones had more birds than wide emergent zones, which could have been in function of habitat specific sightability). Correlating highly with percent coverage of submergent vegetation were total adults, young, broods, divers, adult geese, shorebirds, and white-fronted geese. Specific positive correlations with Arctophila were total young, broods, adult dabblers, adult divers, pintail and green-winged teal. Total adult dabblers, pintail and wigeon were highly correlated with an alkaline pH. Total adult geese and white-fronted geese were correlated with Calla percent cover. Oldsquaw avoided wetlands with high Equisetum percentages. Positively correlated with wetland surface area were total adults, young, broods, dabbling ducks, diving ducks, shorebirds, gulls, terns, & allies, pintail, green-winged teal, greater scaup, and arctic tern. Larger numbers of islands was correlated with shorebirds and pintails. Presence of beaver was correlated with higher numbers of total adults, young, broods, divers, gulls, terns, & allies, green-winged teal, oldsquaw, and arctic tern. Mudflats were positively related to dabblers and pintail. These habitat correlations were useful in identifiying specific habitat characteristics of wetlands which made them apparently more valuable to waterbirds. Future work will focus on closer examination of the relationships between specific habitat and/or water quality features and levels of waterbird use.

Fall migration. Waterfowl use of the shorelines of Selawik and Kobuk Lakes and the Kobuk River delta was fairly low in late August, and comprised mostly of white-fronted geese, Canada geese, tundra swans, and American wigeon. Bird use increased dramatically in early September, peaked in mid-September, and remained high in early October (Fig. 17b). Species contributing to the major increase in early September were tundra swans,

Canada geese, northern pintail and American wigeon. Peak tundra swan use occurred on 12 September, as did peak Canada goose, scaup and unidentified duck use. Mallard use peaked later, on 10 October, as did tundra swan cygnet use. The greatest numbers of arctic loons and red-breasted merganser were observed on the last survey, 10 October.

Numbers of fall staging waterfowl built up and remained in coastal and river delta portions of the refuge 1-2 weeks later in 1984 as compared to 1982 and 1983, the only years with survey data (Fig. 17b). In the late August survey, every species or species group with the exception of whitefronted goose was present in lower numbers or not seen in the 1984 survey as compared to 1982 and 1983. For the early September survey tundra swan numbers were nearly equivalent in 1984, as compared to 1982 and 1983; white-fronted goose numbers were highest in 1982, whereas Canada geese were most abundant in 1984. Pintail/wigeon and unidentified ducks did not reach the high levels seen in early September 1982, a prairie duck influx year.

In the mid-September survey much greater numbers of swans, geese, and ducks were observed in 1984 as compared to 1983, possibly a result of windy survey conditions in 1983. By the late September survey, tundra swan adults and cygnets and geese were numerically equivalent in 1983 and 1984, whereas more ducks were seen in 1984. The latest coastal survey for which there are previous years data was conducted very early in October and showed 1000 more tundra swan adults in 1984 as compared to the last day of September 1983, but significantly, about 4000 fewer swan cygnets. The fewer number of cygnets was most likely a result of low production due to a late spring and cool rainy summer combined with the lack of movement of family groups from inland to coastal areas in 1984. Also significant, was that far more Canada geese, scaup/scoters, and unidentified ducks remained on the refuge on the latest survey in 1984 as compared to 1983.

Specific areas of the refuge receiving the greatest staging use in 1984 were north shore Selawik Lake on 28 August (mostly white-fronted geese); Ekichuk Lake on 12 September (mostly tundra swans); and Mukuksok and Kobuk delta east of Mukuksok both 4 and 10 October (used by large numbers of swans, geese, and ducks). It was apparent that specific areas along the coast were used during specific times and that peak use areas frequently changed due to locally varying conditions (e.g. wind direction, water level, food availability, and time of day, etc.).

Based on averages over the 5 aerial staging surveys conducted in 1984, Ekichuk Lake averaged the highest total bird use, followed by east shore Selawik Lake, Kobuk delta north of Rich Channel, and Kobuk delta near Mukuksok. The highest average swan use occurred at Ekichuk Lake and Kobuk delta north of Rich Channel (Fig. 22), followed by Mukuksok. The greatest goose usage

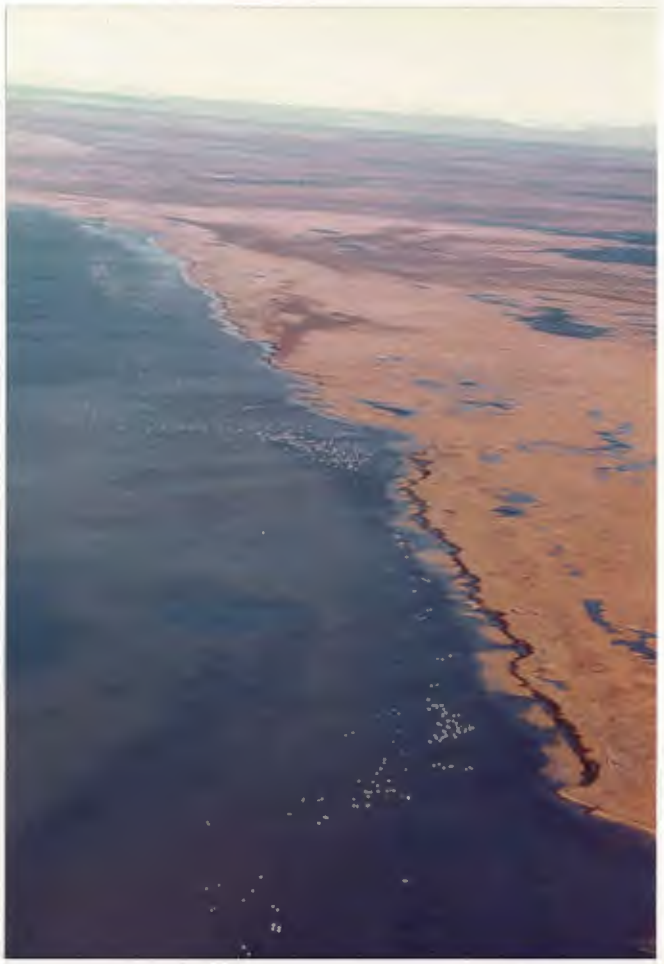


Fig. 22. These fall-staging tundra swans along the shores of the Kobuk River delta between Melvin and Rich channels were part of a flock that numbered over 2000 birds on October 1, 1984.

(KFH)

Fig. 23. Assistant Refuge Manager Mike Spindler taxis station Super Cub with Kent Hall on right float pursuing a tundra swan cygnet with a dip net, wetland No. 04-059, August 10, 1984. (PSN)

occurred at the east shores of Selawik Lake, followed by Ekichuk Lake and Kobuk delta north of Melvin Channel. Highest average duck usage occurred at Ekichuk Lake followed by Mukuksok and Kobuk River delta east of Mukuksok.

Tundra swan populations, productivity, and local movements. Studies were initiated in 1983 to document the abundance, productivity, and local movements of tundra swans on Selawik National Wildlife Refuge (Fig. 23). In 1984 an estimated 2700 - 3200 swans, including 700 - 760 nesting pairs summered on the refuge, compared to 9100 swans estimated on the refuge and its coastal environs during mid-September staging (Fig. 24). Summering locations for the majority of the staging population were unknown, however, abundant Potamogeton spp. in Kobuk Lake may have been an attractant. In 1984 breeding swan density was higher on the Selawik Flats as compared to the Kobuk River delta, opposite to the pattern observed in 1983 (Table 14). The reversal may have been due to a shift in favorability of the two sites, perhaps related to the late breakup on the more coastal Kobuk delta area in 1984. Overall breeding population was slightly higher in 1984 but production was slightly lower in 1984, 1081 cygnets as compared to 1277 cygnets in 1983 (Table 14). Local movement data from radio instrumented family groups revealed two staging patterns: (1) remain in brood-rearing area and migrate west to coastal area near Kobuk Lake/Selawik Lake followed by migration to east or (2) remain in brood-rearing area and migrate directly east without staging movement. Both Kobuk delta-radioed family groups remained within a 3 km radius of their capture area followed by movement to the Kobuk Lake coastal area and departure to east. Three of 4 Selawik flats-radioed family groups remained within a 3 km radius of the capture area then migrated directly east, whereas one family group first moved to the coastal Kobuk Lake area before migrating east.

The migration route to the east passed over Koyukuk NWR, and Tetlin NWR, both of which locations provided at least one relocation during migration. Other known migration stops included: Whitehorse, Yukon; Atlin, B.C.; Freezeout Lake, Montana; and Salt Lake, Utah. These stops suggested that most Selawik NWR swans were from the western population (Figs. 25,26,27)

4. Marsh and Water Birds

An ancillary benefit to using wetland sample units for census and extrapolation of waterfowl populations was the ability to make the first estimates of summer populations of marsh and water birds. An estimated 2166 arctic loons, 382 red-throated loons, and 2549 red-necked grebe adults produced an estimated 637 young arctic loons, 127 red-throated loons, and 255 red-necked grebes (Table 13). These estimates were preliminary and subject to the same need of refinement as the waterfowl estimates.

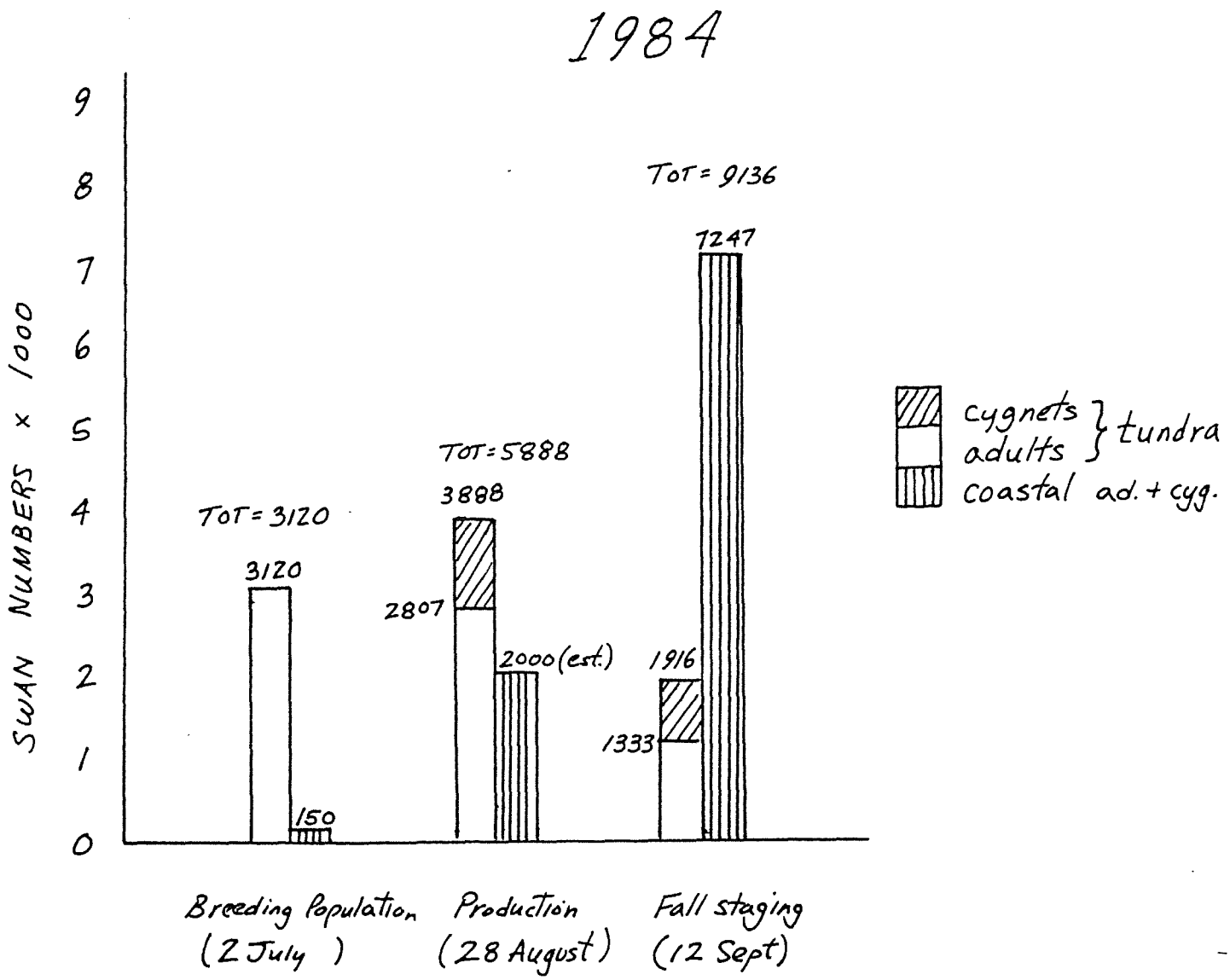


Figure 24. Partitioning of tundra swans in Selawik National Wildlife Refuge and coastal environs. Figures were based on a combination of aerial swan survey data (2 July and 28 August); coastal waterfowl survey data (28 August and 12 September); and tundra transect data (12 September).

Table 14. Estimated population density, nesting density, productivity, total population and production of tundra swans, Selawik National Wildlife Refuge, Alaska 1983 and 1984.

Area/year	Weighted average				Extrapolated total [a]			
	Total swans/Km^2	Adults/Km^2	Cygnets/Km^2	Nests/Km^2	Total swans	Adults	Cygnets	Nests
Kobuk River delta								
June 1983	0.47	0.47	-	0.18	761	761	-	291
June 1984[b]	0.35	0.35	-	0.13	567	567	-	210
August 1983	0.92	0.55	0.37	-	1489	890	599	-
August 1984[b]	0.62	0.41	0.21	-	1004	664	340	-
Lowlands								
June 1983	0.40	0.39	0.01	0.08	1894	1847	47	379
June 1984	0.52	0.49	0.02	0.11	2415	2320	95	521
August 1983	0.38	0.25	0.13	-	1800	1184	616	-
August 1984	0.56	0.41	0.15	-	2651	1941	710	-
Uplands								
June 1983	0.09	0.09	-	0.02	140	140	-	31
June 1984	0.15	0.15	-	0.02	233	233	-	31
August 1983	0.14	0.10	0.04	-	217	155	62	-
August 1984[b]	0.15	0.13	0.02	-	233	202	31	-
Overall Refuge								
June 1983	0.35	0.35	-	0.09	2795	2748	47	701
June 1984[b]	0.41	0.39	-	0.10	3215	3120	95	762
August 1983	0.44	0.28	0.16	-	3506	2229	1277	-
August 1984[b]	0.50	0.36	0.14	-	3888	2807	1081	-

[a]Extrapolations of densities based on 1619 Km^2 of swan habitat in Kobuk River delta; 4735 Km^2 in Lowland tundra; and 1551 Km^2 in upland tundra.

[b]Estimated values where one data point was missing.

Fig. 25. "Backpack" radio telemetry transmitters in the 164 mHz frequency range were attached using surgical tubing and steel hog rings which would eventually rust away to allow the radio to drop off after its one year life expectancy was over. (KFH)

Fig. 26. Migratory Bird Management Biologist Rod King assisted the staff in developing expertise in swan capture and handling methods, here in this photo he and Refuge Manager Kent Hall double check the radio harness to be sure it will not interfere with the swan's feather insulation and locomotion. (MAS)

Fig. 27. Capture crew releasing a brood of four tundra swan cygnets fitted with radio telemetry transmitters on Wetland No. 12-119 in the Kobuk River delta September 6, 1984. (BPM)

Fig. 28. Although not abundant, Great horned owls were observed regularly along the banks of the Selawik River; stick nests observed in birches near Upinnigvik indicated the species probably breeds on the refuge. (PSN)

5. Shorebirds, Gulls, Terns, and Allied Species (Jaegers)

Summer adult populations were censused during the two brood surveys. Maximum populations of shorebirds, gulls, terns, and jaegers generally occurred during June and decline steadily thereafter, as males and non-breeders of several species departed the breeding areas. Mid-July estimates of shorebirds totalled 20,643 birds, with red-necked phalarope the most abundant, at 10,450, followed by Common snipe (2804), and lesser-golden plover (2294) (Table 13).

The most abundant gull was mew gull, with 4970 adults and 510 young, followed by glaucous gull, with 3441 adults (Table 13). The mid-July arctic tern population was estimated at 8283, with 1019 young. Long-tailed jaegers were the most abundant allied species, with 4460 adults, followed by parasitic jaeger with 382 adults. Total shorebirds, gulls, terns, and allied species were estimated at 42,179, or almost half of all wetland-related birds on the refuge.

6. Raptors

Refuge population sampling methods focussed on wetland habitats, and hence were able to address only those raptorial species which frequented wetlands. Totals of 1274 short-eared owls and 510 northern harriers were estimated to have been present in association with refuge wetlands in mid-July 1984 (Table 13).

7. Other Migratory Birds

In cooperation with the Migratory Bird Office and the Alaska Department of Fish & Game, Nongame Division, three Breeding Bird Surveys were conducted this year. Two of the surveys were established in 1983 near Kotzebue: "Kotzebue" and "Noatak". The third, "Selawik", was established on the refuge near the cabin and up the Kugarak River, but was not completed within the specified time frame (before 21 June) to qualify as an official count (Figs. 28,29). It was done primarily to establish the census route and be ready for next year.

The Kotzebue count sampled village and tundra coastal habitat. The Noatak count sampled coastal river delta habitat. The Selawik count sampled inland riparian river/tundra habitat. The Kotzebue and Noatak counts were conducted under the midnight sun, and begun at 3:30 am. The Selawik count was begun at 4:15 am.

The Kotzebue count was conducted from a vehicle along the longest existing road, 8.25 miles. The Noatak and Selawik counts were conducted from boats and were 11.5 miles and 15 miles long, respectively.

The Kotzebue count revealed 27 species and 254 individuals. The

Fig. 29. Yellow warblers nested in willows along stream banks and lake margins and were encountered on the refuge breeding bird survey as well as during waterfowl production surveys. This nest probably hatched in mid June. (PSN)

Fig. 30. The vanguard of the northward spring caribou migration near Rabbit Mountain, April 1984. (KFH)

most common were greater scaup, oldsquaw, glaucous gull, and white-crowned sparrow (Table 15).

A total of 40 species and 316 individuals were observed on the Noatak count. The most common were semipalmated sandpiper, American wigeon, glaucous gull, and common snipe.

Thirty five species and 252 birds were tallied on the Selawik count. American wigeon was the most abundant followed by alder flycatcher, gray-cheeked thrush, and whimbrel.

The Christmas Bird Count established in 1983 near Kotzebue was conducted on January 1, 1985. Two more species were seen in 1984 as compared to the previous year, but only a third as many total birds as the previous year (Table 16). Spruce grouse, willow and rock ptarmigan, and snow buntings were seen in 1984 but not the previous year, whereas white-winged crossbill and hoary redpoll were missing in the 1984 count.

8. Game Mammals

Caribou. Aerial surveys of western arctic herd caribou indicated at least 9000 caribou moved across the refuge in September 1983, enroute to wintering areas south of the refuge. It is not known how many caribou may have wintered on the refuge in late 1983 or early 1984 because lack of funds and staff time precluded adequate aerial surveys. In March 1984 extensive aerial surveys and radio telemetry relocation flights performed in cooperation with ADF&G indicated about 27,300 caribou on the refuge or adjacent staging areas just south of the refuge near Talik Ridge and the Selawik Hills (Figs. 30-33). Spring migration consisted of over 30,000 caribou crossing the refuge in early May with crossing of the Kobuk River occurring 14-20 May which was about 3-4 weeks later than normal years. The late migration in 1984 was probably influenced by unseasonably cold and stormy weather throughout April.

ADF&G attempted to perform a photo census of the western arctic herd on their calving ground 200 miles NNW of the refuge on the Utukok River, but bad weather and poor timing precluded acquisition of aerial photographs during post-calving aggregation. A small sample of herd composition indicated poor calf production, 16-17 calves per 100 cows. The most recent photo census of the western arctic herd was performed in 1982 and indicated 172,000 caribou.

Fall migration onto the refuge began 31 August 1984, when about 1000 animals were observed moving south in small bands across the Kobuk River south of Ambler and north of the Rabbit River. A population extrapolation made from an aerial transect survey on 12 September indicated about 5700 caribou widely distributed over most of the refuge. In early October trails in the snow indicated that several thousand caribou moved across the upper Selawik River drainage, crossed the Purcell Mountains, and

Table 15. Birds recorded during Kotzebue area Breeding Bird Surveys June 1984.

	Survey Name		
Species	Kotzebue	Noatak	Selawik
Red-throated loon	1	–	1
Artic loon	–	11	1
Tundra swan	–	5	1
White-fronted goose	–	2	–
Brant	–	3	–
Canada goose	–	–	4
Green-winged teal	7	7	1
Mallard	2	1	–
Northern pintail	7	16	–
Northern shoveler	3	7	–
Gadwall	2	–	–
American wigeon	7	8	118
Canvasback	–	8	–
Greater scaup	68	29	–
Harlequin duck	1	–	–
Oldsquaw	25	14	–
Black scoter	–	2	1
White-winged scoter	4	–	–
Unidentified scoter	4	–	–
Red-breasted merganser	7	–	2
Northern harrier	–	–	1
Willow ptarmigan	–	13	–
Sandhill crane	–	18	1
Semipalmated plover	–	1	–
Greater yellowlegs	–	1	1
Whimbrel	–	2	14
Hudsonian godwit	–	1	–
Black turnstone	–	7	–
Semipalmated sandpiper	13	43	6
Dunlin	–	4	–
Long-billed dowitcher	–	–	1
Common snipe	4	22	7
Red-necked phalarope	1	6	–
Pomerine jaeger	–	1	–
Long-tailed jaeger	–	–	2
Mew gull	2	3	1
Glaucous gull	51	23	8
Black-legged kittiwake	6	–	–
Arctic tern	–	4	1
Short-eared owl	–	–	1
Alder flycatcher	–	3	21
Gray jay	–	–	1
Commom raven	2	–	2
Unident. chickadee	–	–	1
Gray-cheeked thrush	2	6	18
American robin	3	4	10

Table 15. Breeding bird surveys June 1984, continued.

Species	Kotzebue	Noatak	Selawik
Yellow wagtail	–	1	–
Yellow warbler	–	7	5
Blackpoll warbler	–	1	1
Northern waterthrush	–	1	8
Wilson's warbler	–	–	1
American tree sparrow	–	4	–
Savannah sparrow	4	–	1
Fox sparrow	3	8	3
White-crowned sparrow	17	12	4
Lapland longspur	2	5	2
Rusty blackbird	–	–	1
Hoary redpoll	6	2	–
Total Species/Ind.	27/254	40/316	35/252

Table 16. Christmas bird counts, Kotzebue (Sanningaruq), Alaska.

Species	Year 1983	1984
Spruce grouse	–	3
Willow ptarmigan	–	7
Rock ptarmigan	–	6
Gray jay	8	7
Common raven	3	7
Boreal chickdee	9	6
Snow bunting	–	14
White-winged crossbill	143	–
Hoary redpoll	2	–
Total Species/Individuals	5 / 165	7 / 50

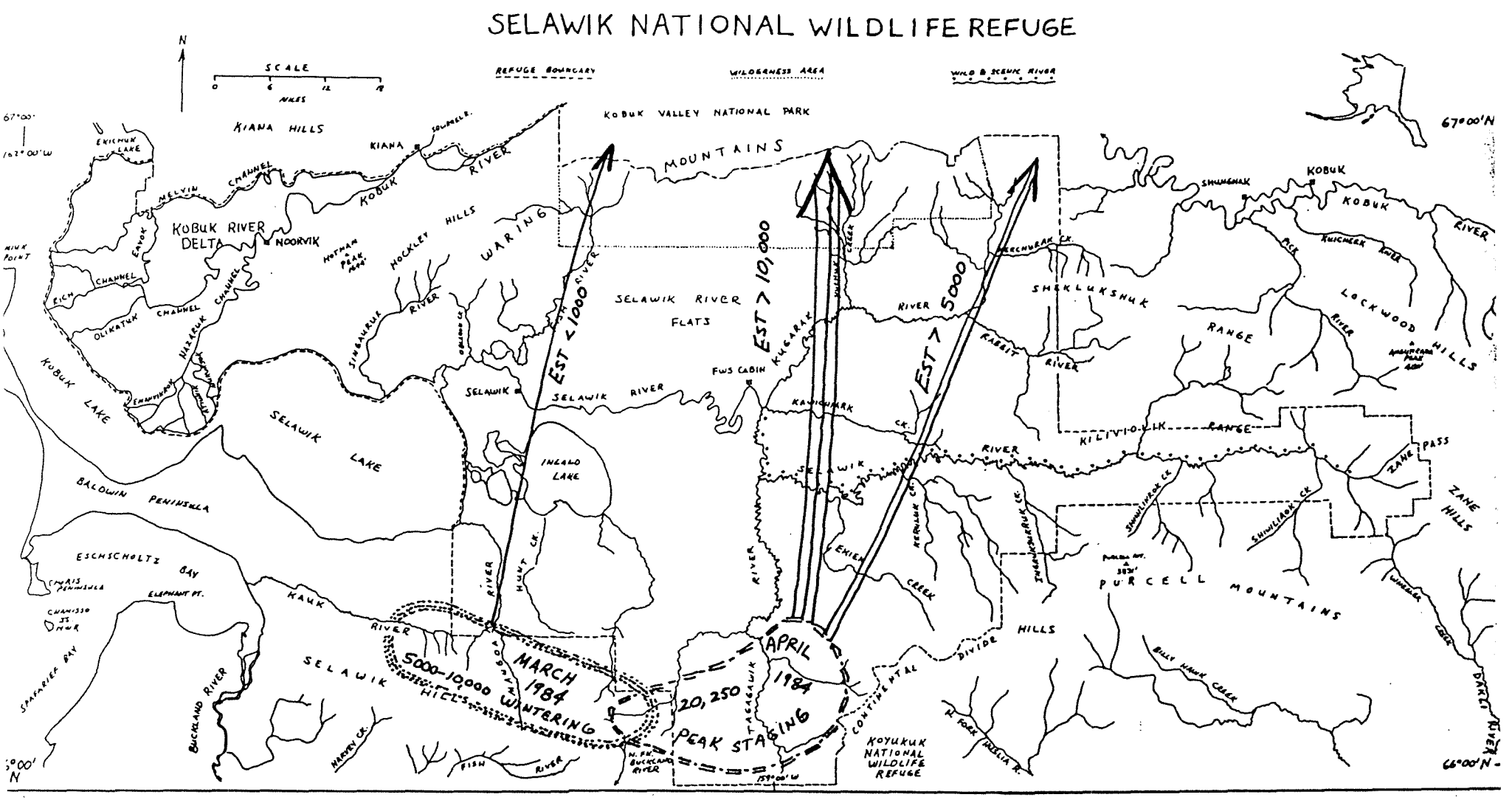


Fig. 31. Caribou distribution on Selawik National Wildlife Refuge, Alaska, Spring 1984.

Fig. 32. From an altitude of 10,000 feet a well-used caribou migration trail looks like an interstate highway. This photo was taken north of Ingruksukruk Creek in April 1984.

(KFH)

Fig. 33. A low-altitude view of caribou in migration near the Tagagwik River, April 1984. (KFH)

entered the N. Fork of the Huslia River in Koyukuk NWR (Fig. 34). One radio-collared caribou captured on Selawik NWR in April (to fit a satellite transmitter) was relocated on upper N. Fork Huslia River on 1 November. Caribou continued to winter on the refuge through December 1984, when an aerial census indicated 8496 plus/minus 5233 caribou (Table 17). The upper Selawik River and the area between the Selawik River and Waring Mountains were the most intensively used wintering areas, both of which had not been used by wintering caribou in the last 3 years.

Moose. The refuge moose population has gradually increased since the early 1950's, when moose were seen for the first time in the Tagagawik drainage, apparently colonizing there from the interior. Prior to initiation of the refuge moose work in 1984, ADF&G had performed moose trend surveys along the Selawik and Tagagawik Rivers. Maximum counts of about 400 moose led ADF&G to estimate the total population at about 1000. In December 1984 refuge staff censused a stratified-random sample of 15 plots to make population extrapolations using accepted methods (Gasaway et. al 1984). The extrapolations of mean moose density to the total refuge area of unselected lands (3359 mi2) indicated a total population of 1799 plus/minus 443 moose, including 1001 cows, 302 calves, and 496 bulls (Table 17). The overall calf/cow (0.30) and bull/cow (0.50) ratios appeared very good, indicating good general health of the population. Maximum population density occurred in the Tagagawik River-south boundary area of the refuge, where 1.3-3.3 moose/mi2 was observed, as compared to the refuge average of 0.5 moose/mi2. These densities compared favorably to average habitats in interior Alaska.

A trend survey area was also established in the highest density Tagagawik River 1977 burn-south boundary area of the refuge, mostly in case future budget constraints preclude census of the entire refuge as we were able to do in 1984. Future moose work on the refuge will be geared to monitoring population trends, especially in the higher density areas such as Tagagawik-south boundary. There was some reason for concern about such recently colonized areas occupied by expanding populations in the presence of very low wolf densities and low hunting pressure: similar areas on the Seward Peninsula have experienced overbrowsing and population declines.

Wolves. There appeared to be very few wolf packs using the refuge, based on over 100 hours of wildlife surveys in which no wolves were seen. Hunters from adjacent villages apparently did a pretty good job of keeping the wolf population low, since a tanned hide sold for $500 or more. One hunter from Buckland killed over 12 wolves in the caribou wintering area south of the refuge during fall-winter 1984.

Bears. Although no census work was accomplished in 1984, seven field observations of black bears were made during other

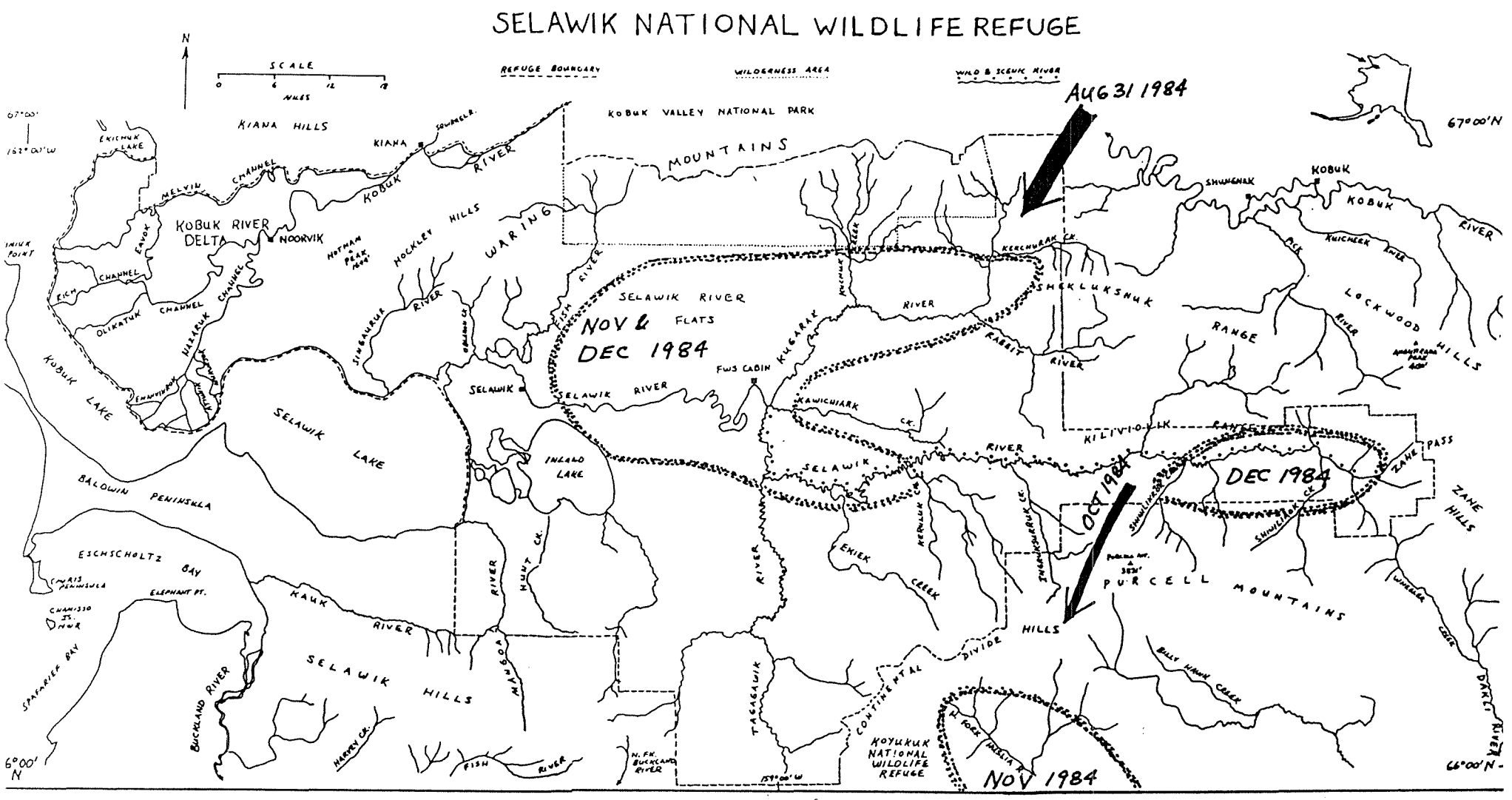


Fig. 34. Caribou distribution on Selawik National Wildlife Refuge, Alaska, Fall-Winter 1984.

Table 17. Moose, caribou, and miscellaneous population estimates based on a stratified random sample of 15 sample units (totalling 318.3 mi^2 or roughly a 9% sample by area) in Selawik National Wildlife Refuge, 4-19 December 1984.

Species/Class	Population estimate	90% Confidence limit (C.L.)	C.L. percentage of estimate	Confidence interval
Total moose	1799	443	25	1356-2242
Moose bulls	496	246	50	250-742
Moose cows	1001	248	25	753-1249
Moose Calves	302	167	55	135-469
Caribou	8496	5233	61	3263-13,729
Red Fox	232[a]	401	172	0-633
	10[b]	17	170	0-27
Wolverine	232[a]	401	172	0-633
	10[b]	19	190	0-29

[a] Estimate based on simple random sample.

b Estimate based on weighted stratified sample.

surveys. Black bears were seen most commonly in August as they were feeding on berries. Four observations were made of brown bears. The first brown bear of the season was seen on 10 April near the Tagagawik River (Fig. 35).

9. Marine Mammals

No specific survey work of marine mammals was attempted by this station. Probably the only marine mammal species to inhabit marine waters immediately adjacent to the refuge were spotted seals following chum salmon runs up the Kobuk River. Ringed seals and bearded seals were seen in Kotzebue Sound, 20 miles west of the refuge. The staff frequently provided assistance to persons with questions regarding the Marine Mammal Act. Four sets of beach-found walrus ivory were engraved and registered. Manager Hall assisted with surveillance and attempted siezure of illegal ivory on display in a Kotzebue clothing store. A shrewd attorney who worked for Alaska Legal Services quickly advised the store owner to move his ivory into a private bedroom, thereby discouraging legal seisure without a warrant.

ADF&G conducted a hearing in Kotzebue to ascertain local opinions regarding state take-over of marine mammal management in Alaska. Local testimony was overwhelmingly against state take-over. The major concerns were fear of increased competition from non-local hunters and the feeling that the state would be less conservative than the federal government in setting seasons and bag limits. The hearing was conducted by Bob Nelson, of ADF&G, who was pro-state management. This bias resulted in complaints that brought about a second hearing which was conducted by an impartial observer, and had the same result.

10. Other Resident Wildlife

Mosquitoes. A grant of $25,000 was appropriated by the Alaska state legislature to continue a feasibility study for localized mosquito control in the NANA region. The intent of the control was to benefit people and reindeer. The indirect impact on fish and wildlife was not even considered until the issue was raised by the refuge manager.

In 1983, we learned of a mosquito control test after the fact. It was determined that the test had been requested by the NANA Regional Corporation with intentions of alleviating their reindeer herd from mosquito "attacks", which allegedly has resulted in the deaths of some reindeer. The corporation president was contacted by the refuge manager and informed of potential consequences to fish & wildlife that could result if mosquito control programs were carried out.

The control agent Bacillus thuringiensis var. israeliensis (Bti), is a bacteria. Bti is registered for mosquito control, and is known to be totally effective if applied properly to

Fig. 35. This spring grizzly bear was sighted in the Waring Mountains near Fish River, April 1984. Bears emerge from dens during mid-April, despite heavy snow cover. (KFH)

Fig. 36. Fall-killed pintails often show migration fat accumulation. Potamogton beds in Kobuk Lake and larger lakes inland were heavily utilized by staging waterfowl, from mid-August to late September 1984. Most waterfowl departed by mid-September due to ice cover. (KFH)

larval stages. It also affects filter-feeding chironomids and blackflies. It is a naturally occuring bacteria in low levels, and has obvious advantages over the use of chemicals. However, Bti is likely to be too effective and could have serious indirect impacts on fish and wildlife which likely depend on various stages of mosquitoes and midges for food. There are many unknowns about insects and their use by fish and wildlife in Alaska. It is known that insect diversity is much lower relative to areas further south and that most, if not all, species of mosquitoes produce only one generation per year. This contrasts with warmer climates where mosquitoes may hatch every 2 weeks.

In response to the 1983 refuge concerns over indirect wildlife related impacts of the test control program, the NANA Regional Corporation lobbied for and obtained in 1984, the $25,000 grant appropriated by the Alaska state legislature. The grant was used to contract an entomologist from the University of Alaska, David Bleicher, to 1) evaluate Bti as a larvicidal agent for the reduction of Culicid populations and 2) determine effects of Bti on non-target aquatic insect populations. In addition, the grant called for a test application in several regional villages and an aerial spaying test on no more than 2000 acres of corporation land.

The Alaska Department of Environmental Conservation (DEC) became active in this issue--The one and only state pesticide specialist, Bill Burgoyne, was involved in the feasibility study. However, since Bti was registered for general use, DEC had no control over its application if done with ground equipment. A permit was to be required from DEC in order to apply Bti from the air.

The feasibility study was coordinated by a smooth-talking California crop duster named Larry Landes. Several manufacturers of Bti under various trade names have visited Kotzebue and other areas of the state. It was obvious that they perceived Alaska as a new untapped market.

Only 1 village was visited and the aerial spray was not accomplished. Dave Bleicher, attempted his objectives, but timing was wrong for making any evaluations as proposed. It was likely that such study plans would be successful in 1985.

In response to the Bti issue, the refuge manager proposed a waterfowl feeding ecology study that was funded at $35,000 under ARMM in FY 85. The study was contracted through the University of Maine Cooperative Wildlife Research Unit under a Research Work Order. The principal investigator Dr. Patrick Brown, developed the research proposal and selected a graduate student in late 1984.

The feeding ecology study was conceived due to a lack of specific studies in the literature relative to food habits of

breeding ducks and their young in northwestern Alaska. With well-founded preconceived notions based on similar studies elsewhere, mainly in the prairies, this study was intended to document the importance of insects and invertebrates in the diet of pintails and/or other waterfowl species in northwest Alaska.

Refuge lands will be secure from applications of Bti. Conveyed lands within the refuge will be subject to treatment, as well as other waterfowl and fish-producing areas outside the refuge. Hopefully, the study will provide the information necessary to make intelligent decisions and recognition of potential tradeoffs.

Ptarmigan. Ptarmigan summer populations appeared to be very low, as compared to numbers seen in similar habitats elsewhere in Alaska. Wintering numbers of ptarmigan were higher than summer, but still appeared to be lower than expected.

Wolverine. Concern over low populations of wolverine remained high although little time was devoted to developing a study plan. Only one wolverine was seen in the numerous hours of aerial survey over the refuge in 1984. (Table 17). Demand for wolverines in the region is high because of the excellent parka ruffs that can be made from the hide, the relatively high numbers of traditional subsistence hunters and skilled skin-sewers in the region, and the relative ease in snowmobile or aerial hunting of the species. The Selawik flats was known as a major wolverine hunting area in the 1960's and 1970's, which was probably related to numbers of wintering caribou, as well as the general lack of local snowmachines and aircraft.

The fix for the apparantly low population level, once documented, would first involve restriction of take. Options being considered, in cooperation with local ADF&G biologists, are closure to land and shoot hunting from aircraft, restricting the trapping season length and restricting trapping methods to traps only. We perceive stiff resistence to such measures from most of the locals and the Fish & Game Advisory Committee, necessitating good quality biological information.

Beaver and Muskrat. Beavers colonized the Selawik Flats in the early 1950's, at a time when muskrat were abundant. Since then, abundance of beavers has increased while abundance of muskrat has declined. Concern has been expressed by Selawik trappers and Nelson Walker, a fur-buyer who formerly lived in Selawik, that beavers have been out-competing muskrat, the latter of which is a more desireable furbearer. Even though muskrat are a cyclic species, it seemed evident that the long-term trend was for increasing beaver and declining muskrat and that some population monitoring was appropriate. We were able to extrapolate adult beaver and muskrat numbers based on the visits to 60 randomly-selected wetlands, and estimated 1146 beaver and 255 muskrat on the refuge. The same qualifications on data quality applied to these data as with the waterfowl estimates.

Desire on the part of trappers to decrease beaver numbers and increase muskrat numbers may conflict with waterfowl, in that wetlands with beaver activity supported more ducks than those without. In any event, the results of the Kanuti NWR Beaver/Waterfowl study will be eagerly awaited. Meanwhile we will collect literature and ultimately hope to interest a graduate student in the project.

Other furbearers. Red fox, lynx, and river otter were also sought after by trappers. We made only a few observations, mostly aerial, of these species while conducting other field work.

H. PUBLIC USE

1. General

The major users of the refuge are subsistence oriented. Westernization of villages has forced new definitions of the word subsistence. In local terms, the issue becomes cultural. Eskimo perspectives have evolved from living off the migrating/seasonal resources of the arctic. Western ethics of non-consumptive and consumptive uses often times clash with local interpretations. Maintaining the integrity of the refuge will require the careful balance of both perspectives.

6. Interpretive Exhibits

The National Park Service Northwest Areas office is located in Kotzebue and they once again allowed the placement of a refuge display in their visitor contact center. FWS literature was also made available. The center was located in the NANA museum and was a regular tour bus stop. It was open about 12-hours a day from June through August. This year we provided a YCC employee to assist in staffing the center from mid-June through mid-August.

The NPS estimated approximately 7700 people visited the center in 1984, up from 4900 in 1983. Most visitors were associated with fly-in one- or two-day arctic circle tours.

7. Other Interpretive Programs

Programs were given at area schools during March in observance of National Wildlife Week. The theme of "Water, We Can't Live Without It!" was appropriate in relating refuge resources. An interpretive talk, movie and hands-on demonstration were presented by the refuge manager and volunteer Minn. Over 1200 students viewed the programs.

The potential for meaningful enviromental education programs in this area is unlimited. A few of the more enlightened teachers have incorporated some innovative units in their curricula. All

told though, the resources would benefit greatly if the Service would make a full blown committment to environmental education.

8. Hunting

The entire refuge was included within Alaska Game Management Unit 23. Seasons and bag limits have been quite liberal (Table 18). No major changes were made in 1984, relative to 1983. Duck hunting opening day 1984 on the Noatak and Kobuk River deltas was outstanding, with an estimated 20-30 participants. Success and activity declined gradually thereafter (Fig. 36). Success for moose and caribou hunters was also quite good. Both animals were in good supply and hunters willing to spend a few days in the field would usually get an opportunity..

Harvest of big game mammals has been monitored by ADF&G through a voluntary mail-in harvest ticket system. ADF&G has estimated that moose harvest ticket reports for Selawik represented 20-50% of the actual harvest. Reporting compliance for caribou and bear was also believed to be low. Reported harvest of moose has been relatively stable 1982-1984, while caribou harvest has increased (Table 19).

10. Trapping

The Alaska Department of Fish and Game normally attempts to compile fur sealing and sales-expert records that help monitor furbearer harvests. Since the graph summarizing furbearer harvests from the Selawik River drainage 1974-1983 was presented in the 1983 Annual Narrative Report, no new data have been compiled by ADF&G. Trapping activity on the refuge was monitored casually in conjuction with other aerial survey work. There were about 5-8 trappers with camps on the upper Selawik, Tagagawik, and Kugarak rivers who were active in 1984. Their harvest was unknown, as was the harvest of trappers based in the villages of Selawik, Noorvik, Kiana, Ambler, Shungnak, and Kobuk who occasionally use the refuge for trapping.

12. Other Wildlife-oriented recreation.

The season was started with a group of two men, led by Robert Kincheloe, who cross-country skiied from Cape Prince of Wales on the Seward Peninsula to the Continental Divide on Selawik NWR. Spring break-up forced the resumption of the journey in early June, when the team hired a local guide in Selawik to transport them by boat to Ingruksukruk Creek, where they resumed their Continental Divide trek, hopefully, to the Arctic NWR. It was part of a 4 year expedition to follow the Continental Divide from Alaska to Mexico.

A few recreational groups were reported by Selawik residents to have floated the Selawik River from its headwaters to the village of Selawik in summer 1984. Refuge personnel apparently missed the floaters even though routine aerial surveys and

Alaska Game Management Unit 23
Hunting & Trapping Seasons
1984/5

Regulations effective July 1, 1984-June 30, 1985

Alaska Department of Fish and Game
Box 686, Kotzebue, Alaska 99752

UNIT 23: KOTZEBUE SOUND: The area drained by all streams flowing into the Arctic Ocean and Kotzebue sound from Cape Lisburne on the north to, and including, the drainage into the Goodhope River on the south.

HUNTING SEASONS and BAG LIMITS

SPECIES	OPEN SEASON	BAG LIMIT
Black Bear	No closed season	Three bears, however the taking of cubs or females accompanied by cubs is prohibited.
Grizzly Bear	Resident: Sept. 1-Oct. 10 April 15-May 25	One bear every four regulatory years; taking of cubs and females accompanied by cubs is prohibited.
Grizzly Bear	Nonresident: Sept. 1-Oct. 10 April 15-May 25	One bear every four regulatory years by drawing permit only; The taking of cubs and females accompanied by cubs is prohibited. 25 permits will be issued. See separate permit hunt supplement.
Caribou Units 22A, 22B, 23, 24 and 26A	July 1-April 30	Five caribou per day. Five transported south of the Yukon per year.
Moose (That portion on the Seward Peninsula west of and including the Kiwalik drainage.)	Aug. 1-Mar. 31	One moose; cow moose may be taken only from Sept. 15-May 31.
Moose (Buckland Drainage)	Aug. 1-Dec. 31	One bull
Moose (Remainder of Unit 23)	Aug. 1-Dec. 31	One moose; antlerless moose may be taken only from Sept. 15-Oct. 31.
Muskoxen	No open season	
Mt. Sheep	Residents of GMU 23 who permanently reside north and west of the Noatak River:	One Sheep, by registration permit only; 30 sheep may be taken.
	Aug. 1-Apr. 30	
	All other hunters: Aug 10-Sept. 20	One ram with 7/8 curl or larger.
Wolf	Aug. 10-Apr. 30	No limit
Wolverine	Sept. 1-Mar 31	One Wolverine
Beaver	No open season	
Coyote	Sept. 1-April 30	Two coyotes
Arctic Fox	Sept. 1-April 30	Two foxes
Red Fox	Nov. 1-Feb. 15	Two foxes
Lynx	Nov. 1-Mar. 31	Two lynx
Red Squirrel & Parka Squirrel	No closed season	No limit
Grouse	Aug. 10-April 30	15 per day, 30 in possession
Ptarmigan	Aug. 10-April 30	20 per day, 40 in possession
Snowy Owls	No closed season	No limit; however, birds may only be taken for food or clothing.
Snowshoe Hare & Jack Rabbit	No closed season	No limit

TRAPPING SEASONS and BAG LIMITS

SPECIES	OPEN SEASON	BAG LIMIT
Beaver	Nov. 1-June 10	30 per season
Muskrat	Nov. 1-June 10	No limit
Coyote	Nov. 1-Apr. 15	No limit
White Fox	Nov. 1-Apr. 15	No limit
Red Fox	Nov. 1-Apr. 15	No limit
Lynx	Nov. 1-Apr. 15	No limit
Marten	Nov. 1-Apr. 15	No limit
Mink & Weasel	Nov. 1-Jan. 31	No limit
Otter, Land	Nov. 1-Apr. 15	No limit
Squirrel and Marmot	No closed season	No limit
Wolf	Nov. 1-Apr. 15	No limit
Wolverine	Nov. 1-Apr. 15	No limit

LICENSES, TAGS and PERMITS

All individuals over 16 and under 60 must purchase a hunting and/or a trapping license. In addition a harvest tag is required for caribou, moose, and sheep.

Nonresidents and aliens must purchase a big game tag for each big game animal to be taken. Nonresident tags are available at license vendors. Nonresident grizzly hunters must apply for a drawing permit.

NOTE. In Unit 23, residents no longer need a $25 tag to hunt grizzlies.

SEALING REQUIREMENTS

All of the following animals shot or trapped in GMU 23 must be sealed: Grizzly bears, lynx, land otter, wolf, wolverine, and beaver.

GAME BIOLOGISTS - ROLAND QUIMBY, KOTZEBUE, phone 442-3420
and DAVID JAMES - AMBLER - 445-2175
GAME WARDEN - ROLLIN YOUNG - Phone 442-3925

Table 19. Reported harvest of big game mammals on Selawik National Wildlife Refuge, Alaska 1982-1984, based on ADF&G voluntary harvest report tickets.

Species	1982	1983	1984
Moose	12	9	12
Caribou	77	102	unavail.a
Brown bear	2	1	unavail.

a Season ends April 30, 1985.

continued occupation of the field cabin on the Selawik River, June 25 to September 21, would have provided ample opportunity to encounter such floaters.

15. Off-Road Vehicling

Although less a sport than elsewhere, use of off-road vehicles is primarily a necessity for personal transportation in Alaska. Most traffic is in the form of snowmobiles and three-wheelers within a 10 mile radius of villages. Snowmobiles are used for subsistence hunting and trapping activities extending dozens of miles away from villages. A major trail system extends between Kotzebue and Noorvik, Noorvik and Kiana, Noorvik and Selawik, Selawik and Kiana, and Selawik and Ambler. These trails are marked by wooden stakes or tripods and are the "highways" of the region. Most snowmobile traffic utilizes the trail system for at least part of a journey. The Kotzebue-Noorvik-Kiana-Selawik-Noorvik-Kotzebue trail is used for a 250-mile dog-sled race called the "Kobuk-250". A snowmobile race follows the same route later in the winter, and may conflict with caribou migration and wintering activities in future years. Under section 1110 of ANILCA we have to permit "the use of snowmachines....for traditional activities...and for travel to and from villages and homesites." In the future, the question may be how traditional is a snowmobile race?

Summer three-wheeler travel between Selawik Village and it's Farm Project 10 miles to the north has caused erosion of tussock tundra vegetation down to bare peat and mud (Fig. 37). Although the situation exists entirely on conveyed lands, there is some concern that such three-wheeler abuse could spread to refuge lands.

17. Law Enforcement

The subject brings the ire of most village residents. Refuge staff have taken a low-key approach to enforcement because of the deep cultural differences between traditional subsistence and modern sport hunting-biased seasons and regulations. If the traditions of subsistence are observed to become abusive and wasteful, the time to initiate law enforcement activities arrives.

We observed one instance of wasteful hunting-a pile of several rotting caribou, apparently shot but never utilized, 10 miles NE of Selawik Village. Since the incident had occurred months before our discovering the pile, there was little that could be done. More frequent aerial and ground patrols will be needed to detect such instances soon after they occur.

I. EQUIPMENT AND FACILITIES

1. New Construction

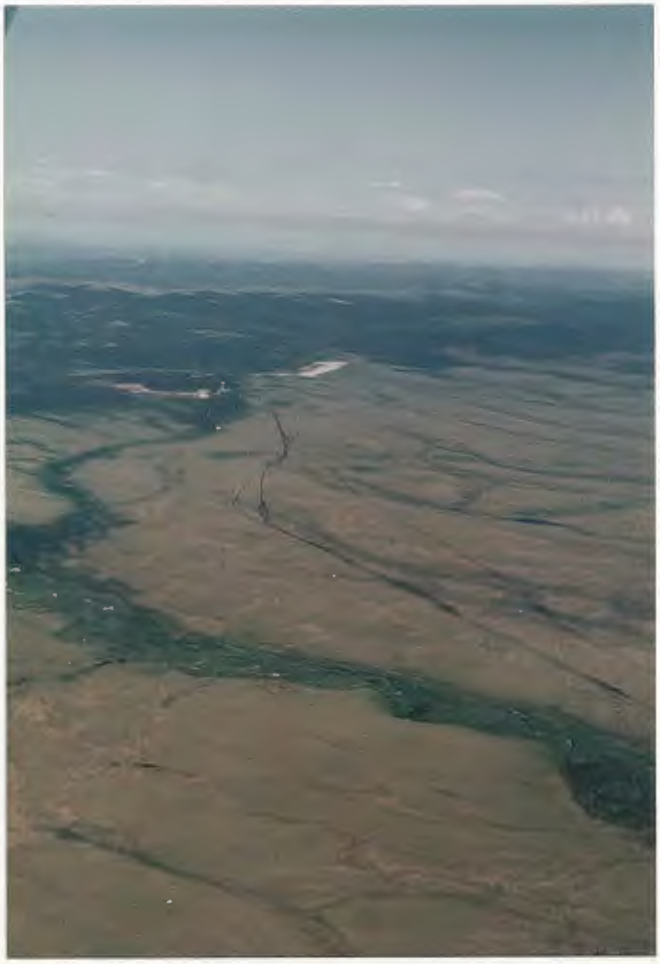


Fig. 37. Surface vegetation damage from summer three-wheeler traffic over wet tundra was caused by over-use of the trail from the Selawik Farm Project to the village of Selawik, June 1984. The farm road and airstrip can be seen top center in the photo. All damage was on interim-conveyed lands, but similar trails are occurring in and near villages, and could eventually impact refuge land.

(MAS)

Fig. 38. Aerial view of the city of Kotzebue built on a gravel spit 33 miles north of the Arctic Circle. A town of 3200 people, 80% of which are Eskimos, Kotzebue is the regional transportation and services hub for Northwest Alaska.

(PSN)

Refuge headquarters facilities in Kotzebue consisted of 2 three bedroom trailers used for housing, 600 square feet of leased office space and 1000 square feet of leased storage space (Figs. 38,39,40). Field facilities consisted of a leased 500 square foot trailer in Selawik Village and a Service owned 200 square foot cabin in the center of the refuge at Upinnigvik (Figs. 41,42). A considerable amount of staff time during the year was spent preparing proposals for a headquarters office-visitor center, aircraft hangar, shop and housing facilities in Kotzebue. The concept of sharing all such facilities except housing with the National Park Service to save on construction and maintenance costs was suggested and encouraged by a congressional Subcommittee. In cooperation with NPS a joint use facility package was submitted in October. The election and subsequent fiscal austerity have apparently cooled the atmosphere since no action had been taken in Washington by years end.

Annual office and storage lease costs total $31,000, with very little to show for it except an office to do paperwork in and part of an unheated building to store field gear in. Outside storage of the station aircraft, vehicle, and other equipment was beginning to take its toll in rust-,salt-, wind-, and vandal-damage at year's end. Refuge housing was above average in size and quality for a village situation, but well below average for Alaska and for refuges in particular. It seemed ironic that the only Alaska refuge station with permanent staff housed year-round above the arctic circle had some of the poorest housing in terms of size, storage, and energy conservation.

The refuge field cabin at Upinnigvik was inhabited nearly continously from June 25 to September 21, 1984. Up to eight persons were based there for various field projects, so an insulated weatherport wall tent was set up for extra sleeping accommodations. A second weatherport was purchased late in 1984 for use at the same location during field season 1985. The two weatherports should allow adequate sleeping space for up to 10 people in 1985, leaving the cabin available for cooking, eating, writing field notes, and taking refuge from the bugs and the rain.

A wooden stairway was constructed at the Upinnigvik cabin because the path up "coronary hill" (a steep 200 foot river bank) was becoming badly eroded and had dangerous footing, especially in rainy muddy weather (Fig. 43). The risk of coronary attack was decreased as well, because the new stairway takes a more gradual, scenic route through an alder grove to get from the river landing to the cabin.

4. Equipment Utilization and Replacement

The refuge boat, an 18 foot aluminum VALCO sprang a major leak following a trip across Selawik Lake in rough water. Since this

Fig. 39. Well, it's not Park Avenue, but it's government housing in the Arctic. What more could you ask for?.... Water (hot water!), sewer, and even electricity. Many residents have cable TV and micro-wave ovens. (MAS)

Fig. 40. Here is the Roger Nordlam quonset hut. A nice place to work when it's chilly outside! The refuge subleases 1000sq foot portion of the quonset with access to the heated shop, for $9000/year from the National Park Service.

Fig. 41. Our home away from home in the field. The refuge field cabin at Upinnigvik (Eskimo for "place to spend the summer") on the Selawik River. A superinsulated, prefab package constructed in 1983. Centrally located in the refuge, it is accessible by floatplane, skiplane, and snowmobile trail. (KFH)

Fig. 42. No problems with stuffy sleeping accommodations here. An insulated weatherport wall tent was erected at the field cabin for housing of seasonal workers. A similar weatherport was purchased for additional accommodations in 1985. (PSN)

Fig. 43. Keeping on top of things with a little help from your friends...Manager Kent Hall and Volunteer Brad Engstrand designed, and with the help of other refuge staff, constructed a stairway from the refuge cabin down to the Selawik River landing.

(MAS)

Fig. 44. The refuge boat. Will it be sink or swim for our field heros? An 18-foot Aluminum VALCO craft at its June 1984 debut on the river. New twin 70 hp Evinrude outboards were installed by Biological Technician Gilbert Jackson, right.

was our only freight boat we had to continue using it or curtail operations (Figs. 44,45). It had to be moored by driving the bow half-way up on shore, and while under-way, had to operate with the sea-cock open to drain out the leaking water. Several attempts to find and repair the leaks were to no avail. The boat leaked upon it's arrival in Kotzebue in 1982, and was re-welded at manufacturers expense. A phone call and letter to the manufacturer requesting assistance remained unanswered. Although 2 new Evinrude 70-hp outboard motors in twin configuration were installed, we began looking for a new boat.

A used 21-foot fiberglass Boston Whaler valued at over $20,000 was transferred to Selawik NWR as excess property from the Aleutian Islands Unit of Alaska Maritime NWR (Fig.46). This boat will add versatility and safety to our water-based field operation. Unfortunately for our 1984 field work, our new-used whaler did not arrive in Kotzebue until the last barge of the year (mid-September). Due to some minor shipping damage and maintenance the whaler was not available for use prior to freeze up.

Two inflatable rubber rafts, a Zodiac and an Avon were used extensively during the summer brood-production surveys and other work (Figs. 47,48). The Zodiac was wearing out and the Avon was vandalized in Selawik Village, therefore both were replaced with similar-sized Achilles inflatable rafts with new 25-hp. outboards.

The refuge truck, a 1980 Chevrolet Suburban continued to serve faithfully, except for vandalism of its front windshield and accidental breakage of a rear side window. Amazingly, the truck was usually able to start in below zero-weather without being plugged in, but usual practice was to electrically preheat the engine for several hours before starting. The 4-wheel drive feature was used many times to negotiate the Kotzebue roads and snowdrifts following frequent winter blizzards. Any future vehicle acquired should have 4-wheel drive and a snow plow for plowing refuge housing parking and airplane parking areas.

The station aircraft, a Piper Super Cub, N91251, arrived in Kotzebue for the first time on June 30, 1984, even though OAS took delivery of the aircraft in March 1984. (The delays were due to the time required for the pilot to move and obtain necessary training to meet OAS qualifications). Daily availability of an airplane on floats added a new dimension, and a host of problems, to refuge operations. The amount of biological work we were able to accomplish for less than the cost of chartering, combined with the flexibility of being able to stop, start, or continue flying at will was unsurpassed. Operation of the station Super Cub cost about $70/hour, (including OAS charges, fuel, maintenance, and modification charges), as compared to $130/hour for a charter Super Cub and $180/hour for a charter Cessna-185.

Fig. 45. Looks like it'll be sink and swim! Refuge Manager Kent Hall fixes the all-important bilge pump on our VALCO boat. After the first few trips of the season were made with the boat, it began leaking again for 2 out of 3 years. (AHB)

Fig. 46. A replacement boat, a 21 ft. Boston Whaler, was acquired as excess property from Alaska Maritime Refuge. We look forward to dry feet in our marine field work in summer 1985!

Fig. 47. The refuge Zodiac raft proved versatile as ever. Manager Kent Hall used it to rescue the fuel cache at the Upinnigvik cabin when high water innundated the beach landing area. (PSN)

Fig. 48. The high waters in early August 1984 made it necessary to anchor out the station Super Cub and refuel from a barrel in a Zodiac. Fortunately, the high water lasted only about 2 weeks. (AHB)

Operation of the airplane was based mostly out of Kotzebue, but during summer the plane was based at the Refuge Cabin at Upinnigvik about 5 days per week. A 500 gallon fuel tank/trailer/pump and filter unit was purchased for storage and dispensing av gas in Kotzebue (Fig. 49). Similarly, a 600 gallon tank and fueling station was constructed in Selawik Village which will minimize the amount of fueling done out of barrels (Fig. 50). Av gas was obtained in bulk from the Chevron dealer for $1.75 a gallon and hauled to Selawik by a local air Charter Service in a Cessna "Ag-truck" for $1.00 per gallon.

Aircraft parking has been a perennial problem in Kotzebue long before FWS aircraft arrived. The State of Alaska DOTPF, was responsible for airport maintenance and development of sufficient aircraft parking spaces. DOTPF was conducting master planning for airport expansion in 1984, but construction was estimated to be years away. Parking in 1984 was "first come, first served" and it was not uncommon for aircraft owners to quarrel over the few available parking spaces. An aircraft gone for several days risked losing its parking space to another owner. The refuge resorted to parking a vehicle and the fuel tank in the aircraft's spot to reserve it when the plane was in the field. Winter brought considerably more problems with lack of availability of electricity for engine pre-heating, daily drifting snow, and high winds. Salt-laden snow drifting in from Kotzebue Sound and the adjacent lagoon caused the brakes on N91251 to corrode and lock up despite preventive measures. A $500 trip to Kotzebue by an OAS mechanic and replacement of the brakes at $200 each solved the problem for a few months, but was viewed only as a temporary solution. Rust and corrosion are taking their toll elsewhere on the year-old airplane as well. To achieve a long, thorough engine preheat, a catalytic heater was placed in the cowl the night before flying anytime the temperature was less than 20oF. If the wind was blowing or temperature was less than -10oF, two heaters were necessary. An attempt to secure electricity from the neighboring National Guard hangar failed due to high-level unwillingness to cooperate. Our only long-term alternative to parking and electricity seemed to be leasing a hangar site from the State of Alaska and connection to commercial electricity. We have urged FWS to coordinate with the State of Alaska DOTPF to secure a leased hangar site, even if hangar construction is years away, to alleviate the parking and preheating problem.

Field operation of the aircraft has proceeded considerably smoother compared with the base operations in Kotzebue, but fluctuating water levels at Upinnigvik occasionally necessitated the anxious act of anchoring the plane in the middle of the Selawik River overnight, and accessing the plane with Zodiac raft (Fig. 48). In normal water levels a small sand beach provides mooring for the the floatplane and boats. During late July and early August, a week-long deluge caused the river stage to rise 7 vertical feet within 2 days and then gradually recede. Potential for fuel drums and other supplies floating

Fig. 49. A 500-gallon fuel tank-trailer with pump and filter was purchased and arrived September 1984. It has increased the safety and economy of refueling the station aircraft. (MAS)

Fig. 50. Prior to completion of the fueling station in the village of Selawik in October 1984, most field re-fueling was performed out of barrels. (MAS)

away added to the urgency of the situation (Figs. 47,48). With as high as 10 take-offs, landings, and dockings per day for ferrying personnel and equipment by aircraft and boat, as well as fluctuating river levels, a safer mooring facility should be developed.

5. Communication Systems

HF SSB Communications on FWS channels 3215 and 5907.5 were woefully inadequate probably due in part to sunspot-caused poor propagation in 1984. Reliability was estimated to be less than 30% over the summer field season mostly due to static, interference, and weak signals despite improved antennas and fully charged batteries. Hopefully future years will allow use of our HF radios again.

The Alaska Fire Service under BLM, has proposed a statewide VHF repeater system that could tie-in to the telephone lines. Fire Management Coordinator, Red Sheldon, with a Boise Interagency Fire Center Radio expert visited the refuge to determine possible radio repeater sites. They chose Hotham Peak, near Noorvik, and Purcell Mountain on the border between Selawik and Koyukuk NWR's. Purchase and installation of base stations, repeaters, mobiles, and portables will be very expensive, but the system should be less vulnerable to atmospheric static and interference, and will hopefully be reliable assuming the mountain-top repeaters and antennas survive the weather. We anxiously await field test results from other sites.

6. Energy conservation

The refuge field cabin at Upinnigvik was powered solely by a solar photovoltaic panel, which proved to be insufficent for combined operation of field radios, lights, and a small refrigerator. A 250 watt, 12 volt D.C. wind generator was installed in July 1984 to suppliment the solar panels. The solar was rewired to operate radios only; while the wind generator was wired to operate the lights and refrigerator.

The metal windows and poor insulation of the quarters trailers in Kotzebue caused excessive heat loss and fuel oil consumption. Thermostats were turned down to 63oF each night to save energy. Unfortunately to maintain daytime comfort at 68oF the furnaces ran almost continuously in subzero weather or whenever the wind was greater than 10 mph (about 50% of the time).

J. OTHER ITEMS

1. Cooperative Programs

A cooperative agreement was signed between Selawik NWR and Northwest Areas, National Park Service for swapping aircraft when needed and leasing a portion of the NPS Quonset hut for

storage of FWS equipment. Under the agreement, NPS can use our Super Cub and we can use their Cessna 185 on an availability basis. The OAS charges are simply billed to the using agency's account. As mentioned above, another cooperative agreement was signed for construction of joint office, visitor contact, shop, and hangar facilities in Kotzebue.

The assistant refuge manager/pilot joined the Civil Air Patrol (CAP) and the refuge has made the station aircraft and pilot available for use on CAP search and rescue missions, especially on refuge land and its adjacent areas. One benefit to the service was the occasional use of the excellent CAP hangar on an "as available" basis when emergency repairs must be performed in winter. (The hangar was not available to us for routine maintenance). Another benefit was if our pilot got lost, CAP would come find him!

2. Items of interest

Assistant Regional Director Jan Riffe, his son Matthew, and replacement Assistant Regional Director to-be John Rodgers, visited the refuge field cabin at Upinnigvik July 13-15, 1984. It was primarily an orientation trip for Rodgers as well as assisting in developing a pike and sheefish sampling method.

Walt Stiegletz and Stephanie Caswell from the Washington Office spent a night at Upinnigvik on August 30 during a whirlwind tour associated with a regional program evaluation. They were accompanied by Assistant ARD Joe Mazzoni and Refuge Supervisor-North John Kurtz. We appreciated the opportunity to justify our existence as well as equate faces with names.

Refuge supervisor North John Kurtz visited the refuge September 19-21 for a station inspection.

3. Credits

Without the assistance of all the staff members listed at the beginning of this narrative, especially summer employees and volunteers, the refuge program would not have been nearly as active as it was in 1984. We extend our thanks to all those personnel. This Narrative was prepared by Kent Hall (sections A, C, D, E, F1, F4, F6, F7, F9, G7, G11, H6, and K); Mike Spindler (sections F2, F9, G1, G2, G3, G4, G5, G6, G8, G9, G10, G16, H8, H10, H12, H15, H17, I, and J); and Kelley Peterson (Section B). The report was edited by Hall and Spindler, semi-edited and typed by Peterson. Pictures were mounted by Peterson.

K. FEEDBACK

We feel fortunate to be stewards of one of Alaska's remote, pristine, and unique refuges. It seems a privilege to be the first manager to formulate the direction of the refuge program

and the first biologist to initiate the monitoring program. Such privileges seem luxurious compared to the more complicated and threatened refuges elsewhere in the country, and habitats elsewhere in the world which are not so fortunate to be located in countries with ambitious conservation programs. Yet while living in such an isolated corner of the State of Alaska our problems seem large and insurmountable when the whole nationwide picture is not considered. Likewise, it is easy for administrators far away to say that because we are isolated we haven't any threats, and consequently haven't any problems.

On the positive side of feedback, we have noticed great improvements in the responsiveness of Wildlife Resources, Refuge Operations, and Contracting and General Services. Our funding has been adequate, and we feel we gave the taxpayers a lot of action for their dollar spent. It's easy to get frustrated and complain about the lack of or substandard facilities, knowing it may be years before things improve, but we are also taxpayers and must answer to the people at a local level.

On the negative side, we found that the Regional Office and/or Central Office Personnel Offices to be unresponsive, and their policies unrealistic and cumbersome relative to upgrading clerical positions and giving preference on the summer hire register to ex-FWS volunteers and persons with Alaskan field experience.

Regional (as well as local) personnel changes added to frustration. These changes were compounded by adding policy changes as well. Our feeding ecology study was justified and funded in FY 83 as $35,000 ARMM project for FY 85. We followed established procedures in soliciting proposals and obtaining approvals and then verbally committed financial support to a university cooperator and graduate student. The proposal was submitted for signature to the Regional Office and a new set of employees began asking the same questions asked 2 years prior, but arriving at different conclusions. The point is, consistency of commitment on some issues should automatically transcend personnel changes. This study was signed as committed but delayed long enough in the Regional Office that we were not sure field work could commence in the timely schedule necessary for this type of project.

It also seems worthy to note that duck populations don't "seem right" in this remote section of Alaska. We read in various reports and magazines about the abundance of pristine waterfowl breeding habitat in Alaska. Drought on the prairies prompts a response that "the birds flew farther north". Our production surveys in 1984 took us to all "corners" of the refuge and it was obvious the ducks "weren't here". Low waterfowl densities couldn't be blamed solely on spring and summer subsistence hunting because 99% of the prime habitat was totally inaccessible except by very expensive float plane. It was difficult to comprehend that a typical 500 acre wetland 20,

miles from the closest inhabitants with numerous small bays, peninsulas, well dispersed emergent vegetation and abundant aquatics and invertebrates hosted only a single brood of 3 wigeon! A lot of recent rhetoric attributed low waterfowl populations in general, to spring and summer harvest of migratory birds in Alaska. One could get the impression that eliminating this use would solve the problems of declining populations of most waterfowl species. From our perspective it seemed there was a great deal of prime habitat that was un-used, accompanied by a shortage of returning spring migrant ducks. Fall harvest levels and other waterfowl issues such as wintering habitat are likely more pressing on the resource, and we would like to see the service play a more active role addressing those issues.

Finally, since the age of computers has arrived, we suggest the Service follow through the purchase of millions of dollars worth of equipment with at least one qualified biometrician or statistician in Region 7 to insure these "machines" are used to their utmost capabilities biologically as well as administratively!