

ANWAR-
STATE
AGENCY
COMMENTS



Official Business

Alaska State Legislature

House

P.O. BOX V
State Capitol
Juneau, Alaska 99811

MEMORANDUM

TO: ANWR tour participants (list below)
FROM: Ned Farquhar *Ned*
SUBJECT: More details
DATE: May 16, 1987

Planning

If you haven't yet, please let me know within the next couple of days whether you intend to join the tour. There are several alternates lined up who wish to go but can't join until we get the primaries figured out.

Purchasing transportation

Please purchase your round-trip airfare from your home to Anchorage ~~to~~ Fairbanks at least two weeks ahead of time to take advantage of excursion fares; there are no excursion fares from Anchorage/Fairbanks to Deadhorse. You should plan to arrive in Deadhorse the evening of Sunday, June 7 or on the earliest plane the morning of Monday, June 8. If you expect to join the North Slope Borough oilfield tour (described briefly below), you will be leaving Deadhorse either late Tuesday night or early Wednesday morning. (These dates could change if the weather is bad, but we need to plan on them.)

You can get a TR from me for your travel. But I'll be leaving Juneau on Thursday, May 21, so get it while it's hot.

Please keep me informed about the travel expenses you bill to the Committee. I need to keep a current budget.

Lodging

The North Slope Borough will provide lodging for the entire group at Deadhorse and Kuparuk. Please pick a roommate and let me know so that I can tell the Borough. The accommodations are regular motel-type.

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Contacts

I need to know your contact phone numbers between the end of session and June 7. My schedule is like this: May 21 travelling; May 22 - June 2 at 804-491-1999; June 2 - June 6 at 202-234-6030; June 7 travelling. Please call me anytime. I will appreciate being posted of any changes in your plans.

I am attaching a copy of Rep. Cotten's original memo on the trip and of USFWS's invitation for your review and files in case you have not received this information.

Distribution list

Rep. Pearce	Rep. Cotten
Rep. Springer	Rep. Shultz
Rep. Hoffmann	Rep. Adams
Rep. Herrmann	Rep. Grussendorf
Rep. Davidson	Rep. Davis
Rep. Sund	Rep. Boyer
Rep. Navarre	Rep. Menard
Louann Cutler	
Doug Rickey	

REPRESENTATIVE
SAM COTTEN
DISTRICT 15



P.O. BOX 296, EAGLE RIVER, AK 99577
P.O. BOX V, JUNEAU, AK 99811

ALASKA STATE LEGISLATURE
HOUSE OF REPRESENTATIVES

TO: Resources Committee members
Rep. Ben Grussendorf
Rep. Al Adams
FROM: Rep. Sam Cotten, co-Chair
SUBJECT: Caribou calving in ANWR
DATE: May 7, 1987

The Department of Interior will be inviting the House and Senate Resources Committees and the presiding members of each body to tour the caribou calving grounds in the Arctic National Wildlife Refuge. Please keep in touch with my staff in response to this memorandum.

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Tuesday morning. Please keep my staff informed of your preliminary plans.

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The North Slope Borough has offered to accommodate legislators in its Deadhorse facility. Please bring personal items.

Follow-up

Please get in touch with Ned as soon as you can to indicate whether you plan to join the tour. Also please let him know your contact phone number for the first three weeks after session.



United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503

IN REPLY REFER TO:
RD

MAY 8 1987

Representative Sam Cotten
Co-Chairman, House Resources Committee
Alaska State Legislature
P.O. Box V, Mail Stop 3100
Juneau, Alaska 99811

Dear Representative Cotten:

During Assistant Secretary Bill Horn's recent visit to Alaska, several members of the State and House Resources Committees expressed a keen interest in visiting the Arctic National Wildlife Refuge (ANWR) coastal plain area during the caribou calving season. Secretary Horn, in response, expressed willingness to both you and Senator Coghill to cooperate with the State in accommodating that desire.

We are pleased to invite you to participate in a one-day visit to the ANWR coastal plain, June 8, 1987.

Our funds for this kind of effort are limited, as you can readily appreciate. Nonetheless, we are prepared to share the cost of this visit with you and the State of Alaska. It will be necessary, if you decide to participate, for you to provide your own transportation from your point of origin to Deadhorse and back to your point of origin or other subsequent destination. The same will be true in the event you decide, for any reason, to overnight in Deadhorse. We will provide air transportation from Deadhorse to Kaktovik and back to Deadhorse at the end of the day, as well as for the aerial tour of the coastal plain area. We will have the Refuge Manager, Mr. Glenn Elison, and one or two additional Fish and Wildlife Service personnel accompanying the party to answer questions, discuss issues as they arise, and assist you in gaining additional insight to the admittedly complex series of issues.

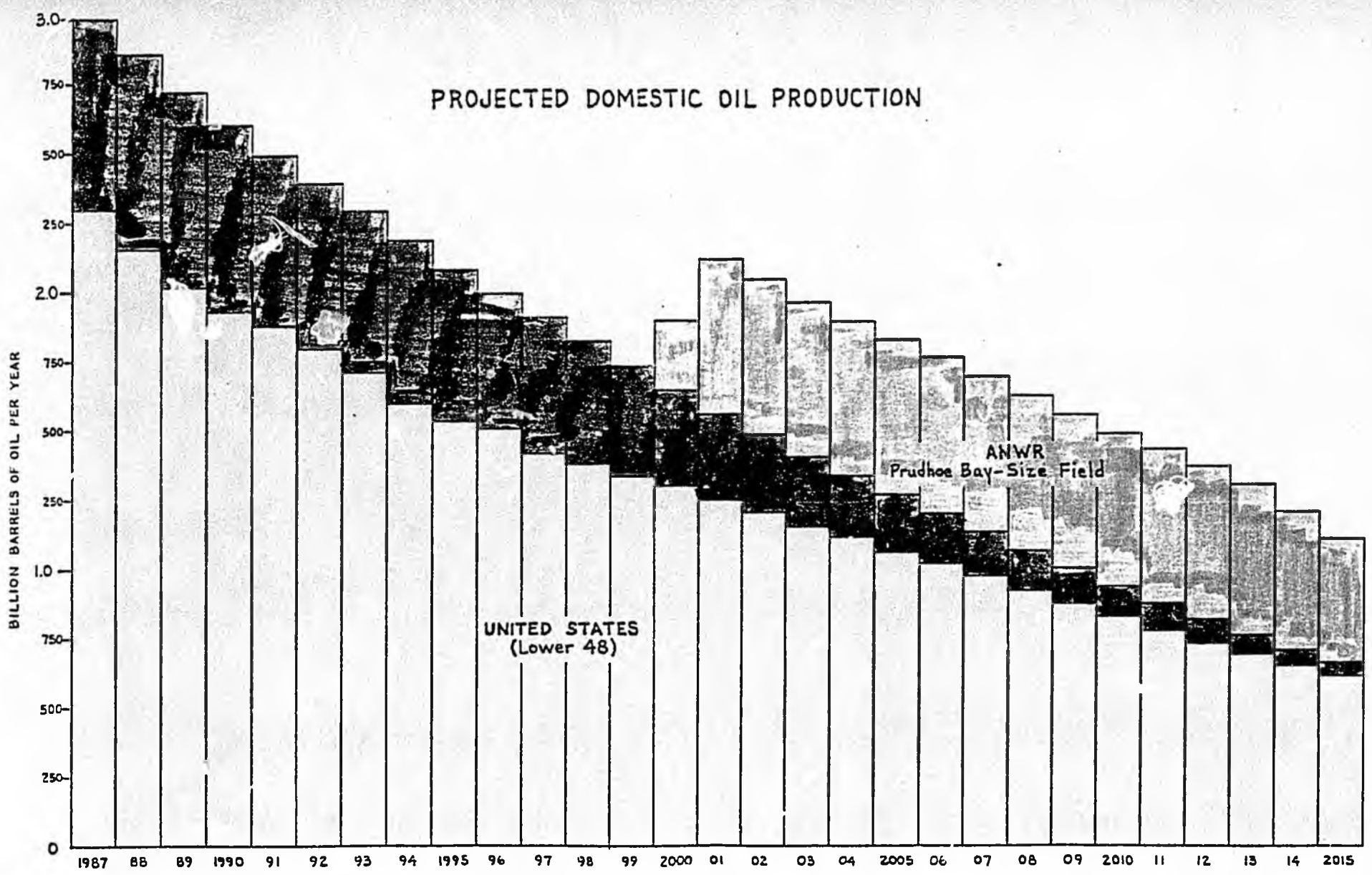
We hope this trip will afford you a better understanding, from an "on the ground" prospective, of the dynamics of the Porcupine caribou herd and the prospects of oil and gas development within the coastal plain. Logistics for this trip will require considerable advance planning. We therefore request your cooperation in giving us your decision as to whether you will participate at your earliest convenience. In any case, we request you confirm your attendance no later than May 20 with both your respective Committee Chairman and this office. We look forward to seeing you at Deadhorse Airport at approximately 9:00 a.m., Monday, June 8, 1987. If you have questions or need additional information, please contact Mr. Dave Olsen of my staff in Anchorage at 786-3542. He will be coordinating the trip.

Sincerely,

Walter O. Stieglitz

Walter O. Stieglitz
Regional Director

PROJECTED DOMESTIC OIL PRODUCTION



REPRESENTATIVE
BEN GRUSSENDORF

P O Box 928
SITKA, ALASKA 99835
(907) 747-8458

RULES COMMITTEE
LEGISLATIVE COUNCIL

DISTRICT 3
ELFIN COVE
PELICAN
PORT ALEXANDER
SITKA
TENAKEE

Alaska State Legislature



House of Representatives
SPEAKER OF THE HOUSE

May 15, 1987

WRITE IN JUNEAU
PO Box 5
JUNEAU, ALASKA 99801
(907) 465-3424
(907) 465-3720

Walter Stieglitz
Regional Director
U.S. Department of the Interior
Fish and Wildlife Service
1011 E. Tudor Road
Anchorage, Alaska 99503

Dear Mr. Stieglitz:

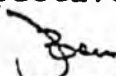
I am pleased to accept your invitation, in my capacity as Speaker of the House of Representatives, to visit the ANWR coastal plain on June 8, 1987. I would like to have one of my special assistants, Mr. Doug Rickey, with me as he is involved with ANWR issue.

I understand that we are to provide transportation for the round-trip from our point of origin, Juneau, to Deadhorse and any expenses while we are in Deadhorse.

I look forward to the opportunity offered and will see you at the Deadhorse airport at 9:00 a.m., Monday, June 8.

Thank you for your time and effort involved in the coordination of our visit.

Respectively yours,


Rep. Ben Grussendorf
Speaker of the House

BG:fb

cc: Rep. Adelheid Herrmann, co-chair, House resources
committee

Rep. Sam Cotten, co-chair, House resources committee



United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503

IN REPLY REFER TO:
RD

MAY 8 1987

Representative John Sund
House Resources Committee
Alaska State Legislature
P.O. Box V, Mail Stop 3100
Juneau, Alaska 99811

yes
Walter O. Stieglitz - I will participate

Dear Representative Sund:

During Assistant Secretary Bill Horn's recent visit to Alaska, several members of the State and House Resources Committees expressed a keen interest in visiting the Arctic National Wildlife Refuge (ANWR) coastal plain area during the caribou calving season. Secretary Horn, in response, expressed willingness to both Committee Chairmen Coghill and Cotten to cooperate with the State in accommodating that desire.

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Sincerely,

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Regional Director



United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503

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MAY 9 1987

Representative Lyman Hoffman
House Resources Committee
Alaska State Legislature
P.O. Box V, Mail Stop 3100
Juneau, Alaska 99811

Dear Representative Hoffman:

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Spruger

Attu Ned.



REPRESENTATIVE
SAM COTTEN
DISTRICT 15

P.O. BOX 296, EAGLE RIVER, AK 99577
P.O. BOX V, JUNEAU, AK 99811

← **To**

from Henry Springer

IRE

I will be overseas

5/30 - 6/20 so won't

TO:

be available. If anything

changes after that I would

FROM:

SUBJECT:

be interested.

DATE:

Have phone: 344-3821

@ Anchorage

MAY 11 1987

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Rep. Al Adams
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M E M O R A N D U M

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REPRESENTATIVE
SAM COTTEN
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FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503

IN REPLY REFER TO:
RD

MAY 8 1987

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FROM: Rep. Sam Cotten, co-Chair
SUBJECT: Caribou calving in ANWR
DATE: May 7, 1987

The Department of Interior will be inviting the House and Senate Resources Committees and the presiding members of each body to tour the caribou calving grounds in the Arctic National Wildlife Refuge. Please keep in touch with my staff in response to this memorandum.

Scheduling

The current itinerary is to leave Deadhorse (Prudhoe Bay) in the morning on Monday, June 8, for half- or full-day overflights of the area. This schedule is subject to change. My staff will need to know a contact phone number for you after session in case the schedule does change. The Interior Department projects that the calving will occur no earlier than June 8, but that the schedule could slip back a day or two, to the 9th or 10th of June. Likewise, if the weather prevents a tour on Monday, the Department will reschedule it for Tuesday.

This means that it will be best to schedule for arrival at Deadhorse on the evening of Sunday, June 7.

My staff is also trying to schedule some other oil-field and North Slope Borough tours for Tuesday and Wednesday after the calving grounds tour. If there is something that you are particularly interested in, please contact Ned Farquhar. I will let you know a more definite schedule for ancillary activities as soon as it shapes up.

Departure will depend on logistics and conditions on Monday and Tuesday; it should be safe to plan to leave Deadhorse on Tuesday evening or Wednesday morning as long as there are no disruptions. If you decide not to participate in the oil-field or Borough tours, you could depart Monday evening or

Tuesday morning. Please keep my staff informed of your preliminary plans.

Transportation

The Fish and Wildlife Service will be providing the transportation from Deadhorse to Kaktovik to the calving grounds in a twin otter. You are responsible for travel to Deadhorse. Please contact my office for more information.

Lodging

The North Slope Borough has offered to accommodate legislators in its Deadhorse facility. Please bring personal items.

Follow-up

Please get in touch with Ned as soon as you can to indicate whether you plan to join the tour. Also please let him know your contact phone number for the first three weeks after session.

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STANDARD
ALASKA PRODUCTION

February 20, 1987
7006U

Mr. Ned Farquhar
Alaska State Legislature
P O Box V
Juneau, Alaska 99811

Dear Ned,

I was pleased to have the time to speak with you on the 19th about our analysis of the environmental issues related to ANWR, especially the caribou. SAPC has conducted a particularly thoughtful and thorough analysis of the USFWS draft EIS, and I believe that we have "dug deeply" enough to discover many significant points. AS ANWR receives further consideration, please feel free to call upon me if I can help in any way.

Enclosed is a copy of Standard's comments on the USFWS draft EIS; this is the document that you and I spent sometime looking at last Thursday. I have also enclosed a copy of a paper by Dr. A.T. Bergerud et al. entitled "The buffalo of the North: Caribou (Rangifer tarandus) and human development".

This paper describes the experience with caribou and reindeer (=Eurasian caribou) and human development in both North America and Eurasia. There are two important conclusions of this paper: First, caribou/reindeer are coexisting very successfully with human developments in several parts of the world -- The Central Arctic Herd in the Prudhoe Bay area is not unique. Second, the factor that clearly can seriously affect caribou herds is mortality from high rates of predation and excessive hunting.

I have also enclosed a copy of an AOGA publication that outlines the basis for believing that ANWR may hold large reserves of oil. And finally, you may find interesting a publication that I wrote a couple of years ago on the bowhead whale -- a species that I have studied for more than a decade.

I look forward to seeing you again in the near future.

Yours very truly,



M. A. Fraker
Environmental Scientist

AN ASSESSMENT OF PETROLEUM DEVELOPMENT ON THE STATUS OF THE PORCUPINE HERD

by

DR. A. T. BERGERUD

Professor of Biology, University of Victoria, Victoria, B.C. Canada. V8W 2Y2

The U.S. Federal government has proposed that the 1002 lands of the Arctic Coastal Plain and in the Arctic National Wildlife Refuge, Alaska, be opened for exploration and full leasing for petroleum supplies. Included within the 1002 proposed lease area are 242,000 acres of 311,000 acres (78%) of the core calving area of the Porcupine Herd (core defined as areas used in ≥ 5 of 14 years) and 934,000 acres of 2,117,000 acres (45%) of concentrated calving area of the herd (areas with ≥ 50 animals/mi²). Also included in the 1002 area is the habitat where nearly the entire herd, now estimated at 18,000 animals, masses in early July to seek relief from mosquitoes. The herd leaves the 1002 area in mid to late July and does not return until the following May. I have been asked as a caribou biologist, by AOGA, to evaluate the impact of full leasing and development on the viability of the herd and specifically to critique the environmental impact statement prepared by the Fish and Wildlife Service on the proposed full leasing and development.

Background Theoretical Considerations

The environment of the caribou (Rangifer tarandus) can be segregated into: other animals, a place in which to live, food and weather (Fig. 1, Andrewartha and Birch 1954). The interactions of caribou with insects, open habitats, food and weather represent variable contingencies that result in facultative responses by caribou that can be modified relative to disturbance factors (Fig. 1). The interactions of caribou with other caribou and with wolves in open environments are consistent contingencies affecting reproductive fitness - these are obligatory responses that will respond to change very slowly, if at all, when habitats are modified.

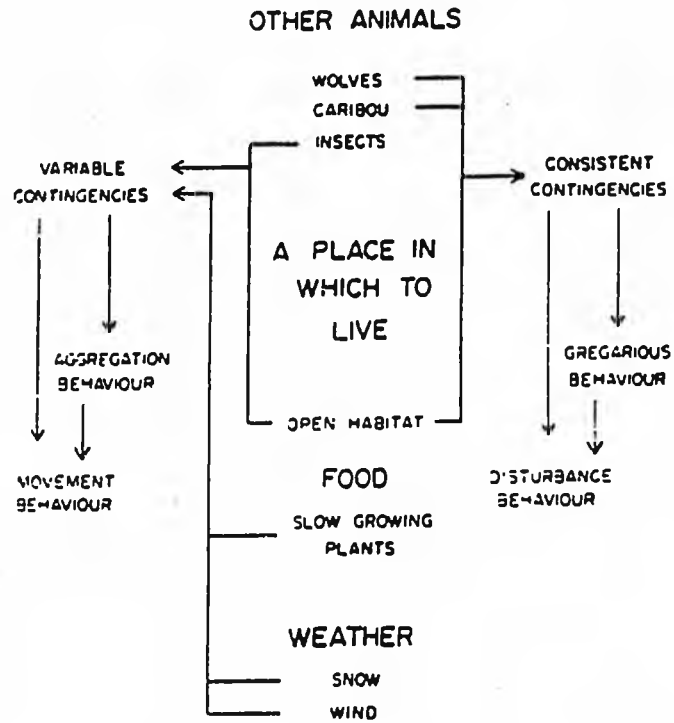


Figure 1. Diagram of the proposed manner in which the four components of the environment interact as variable and consistent contingencies in the development of movement, aggregation, gregarious and disturbance behaviour of caribou (Bergerud 1974b).

I feel that the major behavioral responses of caribou in the 1002 area are the insect x weather facultative responses and the predator x habitat obligatory responses. Unlike many biologists, I do not feel that food is a major factor in the calving and massing of caribou in June and July in the 1002 area.

Are Caribou Wilderness Animals?

Much of the concern for the well-being of caribou arises from the view that caribou are wilderness animals that cannot adapt to coinhabiting ranges with man. This concept has arisen, in part, because caribou are found on ranges far removed from major developments. Also, caribou herds have declined on the southern edge of their range as settlement proceeded (Cringan 1956). Thirdly, caribou are unwary and easily over-exploited. And lastly, caribou utilize slow-growing lichens that are many years in recovering following forest fires.

However, a closer examination of these facts suggests that they are not sufficient to define caribou as wilderness animals nor to imply that loss of wilderness per se will bring about the demise of herds. Obviously, mule deer (Odocoileus hemionus) and antelope (Antilocapra americana) were once far removed from European man in the 1700's, but they are not called wilderness animals today; they have adapted. The decline of caribou along their southern boundary was due to increased predation from man and natural predators, as well as from disease contracted from white-tailed deer (Odocoileus virginianus) (Bergerud 1974a) and not from outright habitat alteration. There is no evidence that herds abandoned their annual ranges because of an intrinsic aversion to man or man-made

structures. The nomadic life style of caribou and its propensity for shifting habitats makes it as adaptable to short term habitat alterations as it is to the slow succession of lichen following natural fires and regeneration cycles. The unwary nature of caribou means that they can coinhabit range with man if not overhunted. In fact, reindeer (Rangifer tarandus) are an important domestic animal in Eurasia. Several caribou researchers have noted that caribou are both highly adapted and adaptable (Skoog 1968, Bergerud 1974b, Roby 1978, Skogland, pers. comm.).

Resource-Limited by Food?

Another basic philosophy that influences how some caribou biologists view the impacts of development on caribou is the closely held belief that the carrying capacity of the habitat for caribou is determined by food resources, the slow growing lichens in winter, and green plants in the summer. It follows from this belief that if caribou are displaced by development and lose part of their range, then the potential carrying capacity is reduced. Another concern is that, if the animals are at a carrying capacity limited by food, then additional disturbance may stress the animals, thereby reducing reproductive rates and increasing mortality rates. A further refinement is that caribou select their calving grounds to maximize the quantity and quality of the diet - to optimally forage (Kuropat and Bryant 1980). Hence displacement from the calving areas should adversely affect the herd.

As an example of this type of thinking, Whitten and Cameron (Arctic (1984:293) said, speaking of developmental impacts, "For example, a series of mild winters might compensate for the negative effects of harassment or

habitat loss." Bergerud, Jakimchuk and Carruthers replied (Arctic 1984:295) "The supposition advanced by Whitten and Cameron...assumes:

- (1) that winter conditions limit caribou numbers (this has never been substantiated in mainland North America);
- (2) that harassment results in caribou mortality - never substantiated and the extreme case (Pot Hill data) given in our paper represents the best available contrary evidence pertaining to this assumption;
- (3) that habitat loss (unspecified) has governed caribou numbers (greater evidence for the opposite case is available in the literature);
- (4) that ranges are at carrying capacity - which is not the case for any of the herds we discussed;
- (5) finally, that the supposition has some basis in fact. However this supposition has never been researched."

Such a seemingly innocuous statement, as made by Whitten and Cameron, reveals a basic philosophy of food limitation, and is the cornerstone of many dire predictions of caribou demise with development.

But in fact, the carrying capacity of this herd is not limited by winter food supplies. The dynamics of the Porcupine Herd were modelled in a workshop at the University of British Columbia in 1978. The herd then numbered 110,000. The simulation model indicated that the herd was not limited by winter food supplies. Food would not be limiting until the herd reached about one million animals. The simulation even indicated that if no animals crossed the Dempster Highway and the entire range east of the road in the Ogilvie Mts was lost, the herd could still prosper if food resources were the only consideration. The same simulation, however,

indicated that the herd would be limited by wolf predation at densities far below those imposed by food resources (Walters et al. 1979).

Both reproductive and natural mortality rates of caribou are little affected by winter food supplies. Fecundity is relatively fixed at 1 calf/female/year for females ≥ 3 years-of-age regardless of densities (Bergerud 1971, Skogland 1986). Skogland provided an equation for recruitment for females ≥ 1 year in Norway, where there are few predators, where $R = 0.65 - 0.012 Dw - 0.00013 Dw^2$ where $Dw = \text{caribou}/\text{km}^2$. Even at a density of 10 caribou/ km^2 of winter range, recruitment would equal 52 yearlings/100 females. At a density of 10 animals/ km^2 the Porcupine herd would number 1,800,000 animals; and even this density would not hold since this many caribou would have greatly expanded their range.

In North America, in herds coexisting with wolves, recruitment is commonly less than 25 yearlings/100 females and yet densities seldom exceed 2 caribou/ km^2 (Bergerud 1980). This disparity in densities and recruitment between Norway and North America is due to predation in North America. Predation limits populations far below that provided by food supplies (Bergerud et al. 1983).

Carrying capacity has been defined as that point where recruitment = natural mortality (Caughley 1977). For caribou on mainland North America the carrying capacity is determined by the abundance of predators (Bergerud and Elliot 1986). Recruitment equalled natural mortality for 22 herds at 6.5 wolves/1000 km^2 (Bergerud and Elliot 1986) regardless of the density of caribou on the winter range.

Long Term vs. Short Term, Individual vs. Herd

Bergerud, Jakimchuk and Carruthers (1984) reviewed the demography of 8 herds relative to disturbance by human activities. They concluded that the major impacts were (1) the building of transportation corridors that permitted increased human harvests of caribou and (2) the improvement in calf survival when wolves were reduced. Caribou herds continued to cross roads, and herds such as those in Newfoundland, still prospered when habitats were altered by logging and flooding. The Central Arctic Herd in Alaska increased from about 5,000 to 13,000 (early 1970's to 1984) despite the Prudhoe Bay oil field.

The conclusions of Bergerud et al. (1984) were debated in letters to the editor by Whitten and Cameron (Arctic 1984:293), Klein and White (Arctic 1984:293-294) and Miller and Gunn (Arctic 1985:154-155). Rebuttals to all letters were provided by Bergerud and Jakimchuk (Arctic 1984:294-295, Arctic 1985:155-156). Klein and White agreed that the herds were increasing but thought that disturbance must be viewed on a long term basis. But this is a nonsequitur - if there are no effects of disturbance for a short term, how are they significant on a long term? The long term is the addition of short term intervals. Miller and Gunn agreed that the herds were increasing but stated that disturbance must be viewed on the basis of the individual, not the herd. Again, this is a nonsequitur - since individuals comprise herds, if the herds are prospering, then the individuals are also faring well.

Now, there are new arguments that the prosperity of the Central Arctic Herd in the face of development cannot be used to gauge the success of the Porcupine Herd when faced with similar development and the question

is, why not? The Central Arctic Herd spends its entire annual cycle quite close to the development zone - the Porcupine Herd spends only two months. All the animals now alive in the Central Arctic Herd have been born since development commenced; they have adapted. The basic reason that some biologists cannot accept that caribou can cope with development is their ingrained views that caribou are "wilderness animals" and that food supplies are limiting. The new research work planned for the Porcupine by the Alaska Fish and Game is proceeding on this basis. Now caribou will be radio-tracked by satellites and energy budgets calculated daily, perhaps hourly. It all flows from the unsupported belief that nutrients and energy will ultimately limit total numbers of caribou in this herd.

Biology of Calving and Aggregating Behavior

Before we can evaluate the potential impacts of development on the Porcupine Herd we must determine why the animals use the Coastal Plain in the 1002 area for calving and grouping after calving. Basically, what are the environmental factors that determine where caribou locate their calving grounds?

The calving grounds of the migratory herds in the Holarctic are usually located on the northern distribution of the herd's range in tundra habitats (Appendix I:Fig. 1). The cows leave the bulls and commence migration towards these areas generally in April before green plants appear. Some herds migrate northeast, others northwest, and two herds south of Hudson Bay even migrate east. The consistent factor in all these migrations is that cows cross the tree-line at right angles

(Appendix I:Fig. 1) Wolves in North America generally den near tree line (Appendix II). By migrating at right angles to the tree line the cows can maximize their distance from wolves, with the least effort. Caribou cows migrate and calve on the bleak inhospitable arctic tundra to reduce contact with wolves (Appendix II) and there are very few wolves on the calving grounds of the Porcupine Herd.

An alternative hypothesis is that caribou seek their northern tundra calving grounds to optimally forage, primarily on Eriophorum angustifolium (Kuropat and Bryant 1980). I was able to disprove this hypothesis in 1984 by comparing the nitrogen in fecal droppings and plants at the time of calving between cows on calving grounds and bulls still south of calving grounds. The bulls were feeding in more nutritious plant communities than the cows (Appendix I:Table 1). If the calving grounds were really unique in the quality of forage then the bulls should have been with the cows. If the cows were primarily "interested" in the quality of their forage, they should have stayed back with the bulls. The fact that cows commonly calve on Eriophorum tussock associations may be due to the particular microtopography of these habitats which results in little accumulation of snow and early snow melt (Benson 1969). That is not to say that caribou do not optimally forage within the constraints of selecting the best overall habitat to avoid predators. However, over all, the diet of the cows in late May and early June is not highly nutritious (Appendix I:Table 1) and this has resulted because of their own migratory behaviour.

The location of the calving grounds varies between years because of annual variations in snow cover. The caribou arrived on the calving

grounds of the Porcupine Herd on 5 May 1974 and 12 May 1975 when snow cover was light; they arrived 20 May 1976 and 24 May 1973 with medium snow cover and even later on 26 May and 30 May when winter snows had been heavy (Curatolo and Roseneau 1977). The calving ground of the Porcupine Herd is on the areas of reduced snow cover generally sandwiched between the foothills and the slightly colder coastal strip (Fig. 2). In an early spring, as in 1974, the animals will be farther west and north than in late years such as 1972 and 1973. In an early year, more caribou will calve in the 1002 area than in a late year. In 1982, the season was so retarded that the herd calved in the Yukon (ANWR Progress Rept FY 83-6). We can think of the annual variations as caused by snow induced limitations to the basic spacing antipredator tactic. But within this tactic, to maximize the distance from tree line, the animals also need to find brown substrates so that calves can be cryptic, especially to avoid predation from golden eagles (Aquila chrysaetos). Thus snow cover affects the distribution within the coastal plain but not the overall regional distribution.

We know less about the extrinsic and socialization factors in the massing of caribou in late June and July than we know about calving. In some years, such as 1976 and 1981, no large aggregations formed. But in all years, the animals concentrate on the 1002 lands. This occurred even in 1982 when the herd calved in the Yukon (ANWR Progress Rept. FY 83-6). We also know that the Porcupine Herd is unique that in some years the entire herd comes together for a few days in July. This represents the most spectacular aggregation of ungulates in North America and compares favorably with the aggregating of the wildebeeste (Connochaetes taurinus)

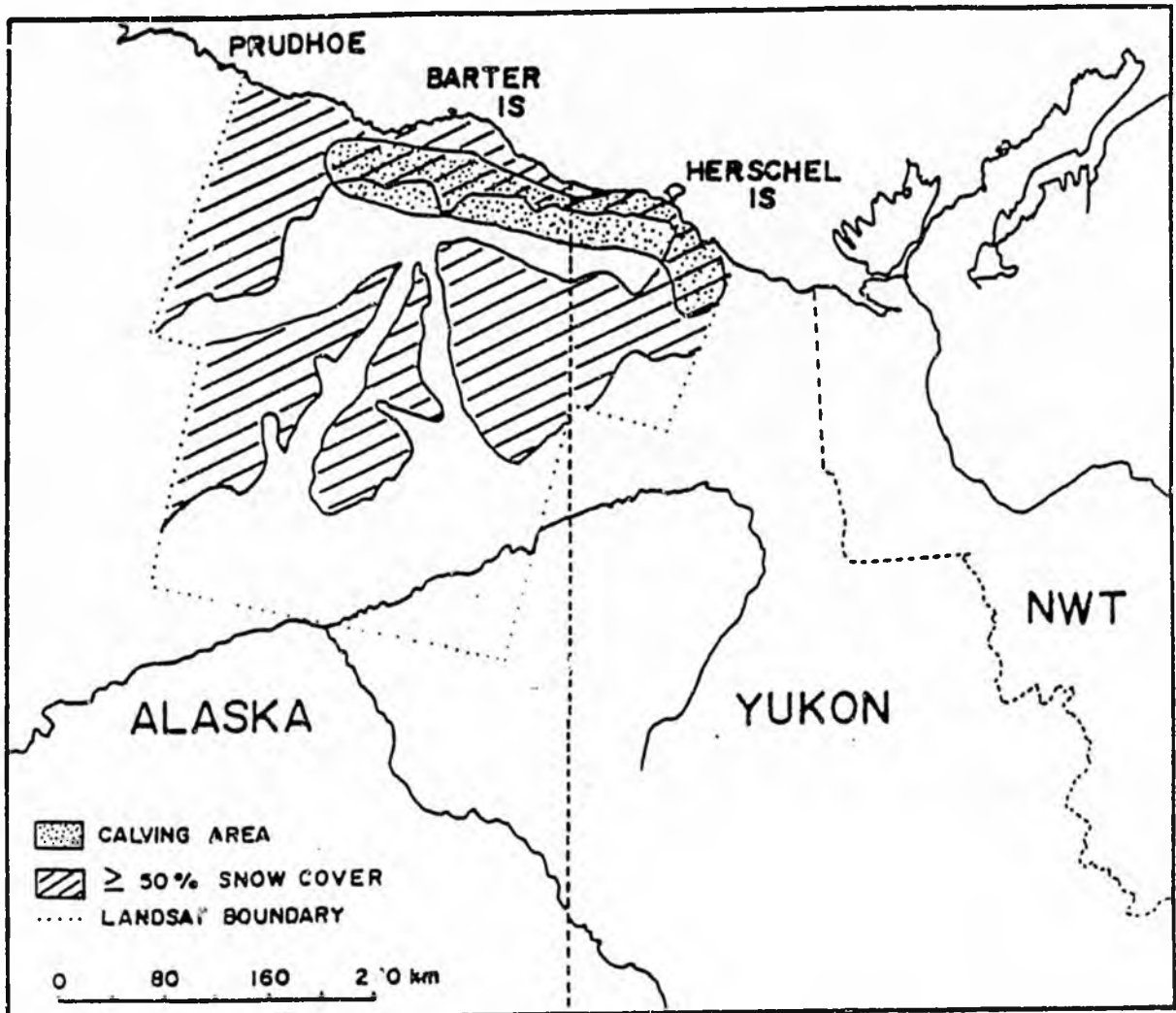


Figure 2. The snow profile of northeastern Alaska in late May 1978 (from Lent 1980).

on the Serengeti.

Initially, after calving, cows with their calves group together in the vicinity of where the calves were born (Lent 1966, Bergerud 1974b). This aggregating represents another antipredator tactic. A caribou calf will benefit if there is another animal between itself and a predator (the selfish herd concept) (Appendix II). Later, with the onset of the mosquitoes, the caribou in the Porcupine Herd move to the coast where cooler temperatures and fog provide some relief. The animals are usually concentrated in July south of Barter Island in the 1002 lands.

Why is this particular strip of coast selected? The animals may select the coast adjacent to Barter Island simply because the core calving area is near the Jago River, hence a direct route to the coast leads to Barter Island. In support of this view, in 1974, when the concentrated calving was along the Katakturuk River, the post calving grouping was at nearby Camden Bay. But to the contrary of this sequence, when the animals calved near Herschel Island in 1982, they still travelled up the coast after calving to the area adjacent to Barter Island (ANWR Progress Rept. FY 83-6). This fidelity to the coast opposite Barter Island could be due primarily to (1) tradition and socialization, or it might result because (2) the animals may, between the end of calving and the emergence of insects, follow the green phenology west, or, (3) the concentration at Barter Island may relate to some additional relief factor from mosquitoes. For example, a small herd of 2000 animals on the Hudson Bay Coast in Ontario aggregates in July on the tidal benches where there are large mud flats. In the absence of vegetation to hold insects, these caribou probably gain added relief from mosquitoes. This same situation

may hold for the tidal flats near Barter Island. Thus we don't know if the uniqueness of the gathering near Barter Island is because of its juxtaposition to calving locations or if the area, per se, has its own special attraction.

Critique of the Arctic National Wildlife Refuge-Alaska Coastal Plain
Resource Assessment

My comments are limited here to the full leasing option and are restricted to caribou. This is the worst case scenario and many of my comments will reflect my view that caribou can adapt to full leasing and developing if the proper mitigating actions are taken. I will only discuss my major criticisms, which does not mean that I necessarily agree with sections not discussed.

2 mile limit: On several pages it is suggested that maternal cows will avoid a strip 2-miles out from major roads and development. This implies a 4-mile displacement when both sides of the road are considered. The reference for this avoidance strip is Dau and Cameron (1986). Based on this 2-mile rule, the report calculates the acreage lost to caribou from development. Firstly, the concern should not be the lost acreage as it relates to carrying capacity. The cows have not selected the coastal plain for its forage resources but to avoid predators. If wolves travel the haul road, as they did the TAPS highway (Roby 1978) it will be advantageous for caribou to avoid the habitat adjacent to the road. Secondly, Dau and Cameron (1986) did not show caribou avoidance of a 2-mile strip on both sides of travel routes. Dau and Cameron documented

a 50% avoidance of adjacent habitats at 2 kilometers from the road and no avoidance at 3 kilometers (p. 100:Fig. 4). Thus there should be 50% avoidance at 1.2 miles and no avoidance at 1.9 miles. Actually, Murphy and Curatolo (in press) show that caribou, including cows and calves, resume normal foraging and daily activities when 600 meters from active roads in the Prudhoe oil field. Therefore, a maximum statement is that maternal cows avoid about a 1½ mile strip on each side of the road; thus the displacement statements in the report should be reduced substantially.

If development proceeds in area 3 as shown on page 7 of the assessment statement, there would be 47 miles of road in the core calving area. We could expect maternal cows to be displaced from an area of 141 mi² or about 90,000 acres. However, the area between the two parallel roads in the hypothetical development would also probably be lost. Parallel roads to reach different objectives should be avoided. However, parallel roads to reach the same objective might be a way to re-direct traffic to minimize disturbance, depending upon which route has the most caribou nearby.

P. 28, Para. 1. "The lower levels of earlier estimates may reflect a truly smaller population, less accurate or less complete survey techniques,...". Because the Porcupine herd gathers in one or a few major aggregations, the census results of the herd by aerial photography is highly accurate. The herd has definitely been increasing. This increase has resulted from greater calf survival (Fig. 3). The increased calf survival occurred because wolves were reduced by rabies in the late 1970's and early 1980's. Jakimchuk and associates saw considerably more wolves in 1971 and 1972 than have been seen in recent years.

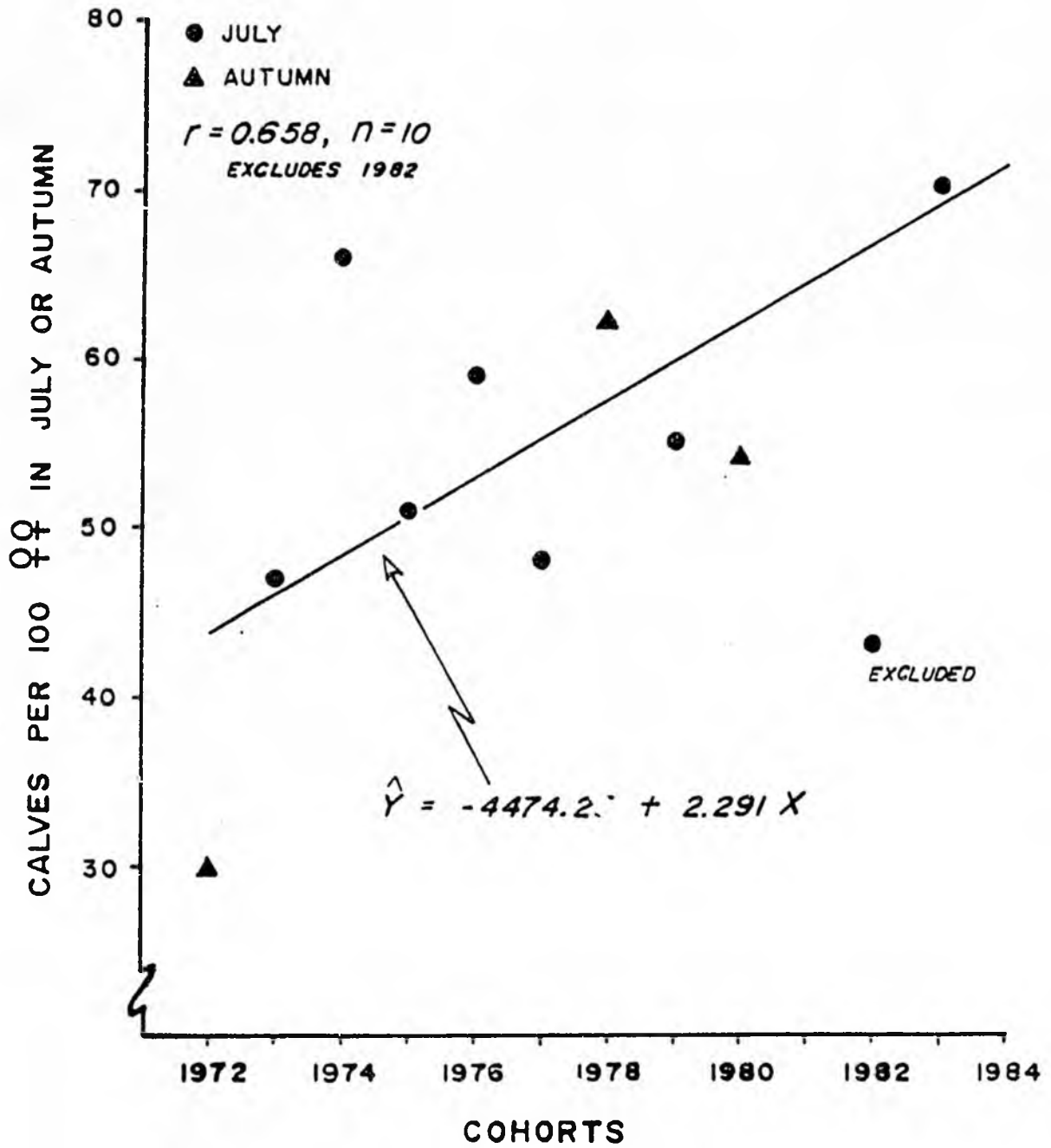


Figure 3. The regression of calf survival (calves/100 ♀♀) on year.

P. 29, Para. 4. "Access to insect-relief habitat and forage resources during this period may be critical to herd productivity." No one has documented that fecundity or calf survival have been affected by failure to reach mosquito relief habitat. There are no other large herds in North America that have access to a foggy coastal strip. Even if the animals could not use the coastal strip this would only put them on par with other herds. Note that there were an excellent 59 calves/100 cows in July 1976; in that year the animals did not mass on the shores of the coast. However, if caribou did seek the foothills for insect relief, reduced calf survival would be expected because of increased predation.

In this paragraph and throughout the report, the word "productivity" is used as a synonym for "recruitment". This is an unfortunate usage. To many ecologists, productivity brings to mind "to produce", the elements of reproduction, and for others it implies biomass as in the terms primary and secondary productivity. The use of the word "productivity" comes with the philosophy of a food carrying capacity. For many ungulates in the lower 48 states (where there are no wolves) the number of young born per 100 adult females does vary with nutritional conditions. In these southern ungulates, the final recruitment may indeed reflect the initial variations in pregnancy percentages. For caribou, we should use the terms "fecundity", "parous percentage", or "pregnancy rate" to describe the initial number of calves/100 cows at birth, prior to mortality. The emphasis thereafter should be on documenting the survival or mortality statistics; the final yearlings/100 females parameter at 12 months should be called "recruitment". "Productivity" is a catch-all and reveals a basic indoctrination that the resources of the land result

in cows being productive or not productive. Since fecundity is fixed in mature caribou the emphasis should always be on survival after the calves are born.

P. 29, Para. 10. "Riparian areas are used for travel corridors...".

This does not sound feasible since wolves also use riparian areas for travel. Caribou in Spatsizi, B.C. avoid ambush cover in tall willows (Bergerud, Butler and Miller 1984). Also the streams are in flood in late May and early June and are not suitable for small calves. In Svalbard, T. Skogland (pers. comm.) indicated that bull caribou use the riparian communities and flood plains but cows avoid these dangerous areas. Curatolo (1985) also indicated that bulls used the riparian community but cows generally avoid them (see also Roby 1978).

P. 108, Para. 1. "Caribou select calving areas because of favorable... advanced new vegetation...proximity to insect relief habitat...".

Caribou only select calving grounds to avoid predators (Appendix I,II). The report is too general in using the word "insect-relief". Generally, insect relief is meant to include both mosquitoes and oestrid flies, whereas the coastal habitats that the caribou seek are to escape only mosquitoes. Oestrids do not emerge until late in July, when the animals have left the 1002 lands.

P. 108, Para. 2. "Displacement of the PCH from a core calving area to a less desirable area would be expected to reduce productivity". Again, the word should not be productivity. If the development results in a

displacement of caribou farther south towards tree line it will result in increased predation (Fig. 4) and reduced survival. "Loss of important habitat has been shown to directly impact ungulate populations (Wolfe, 1978; Skovlin, 1982)". This is a general motherhood statement and these references are for ungulates living without wolves and are not appropriate for the Porcupine Herd. When caribou herds increase they expand their range and when they decline the range shrinks (Bergerud 1980). Calf survival drives numbers and hence range occupancy.

"...Whitten and Cameron (1985) contend that the CAH has not experienced a reduction in productivity ... because (1) the CAH has been displaced from only a part of its calving grounds;...". The herd could be displaced from all of its calving area and still not decline if predator numbers were managed. The CAH herd increased 1972 to 1985 because of high calf survival since wolf numbers had declined with development. As their second point, Whitten and Cameron argued that the CAH did not decline with development because "...(2) suitable alternative high-quality habitat appears available...". The habitat at Prudhoe Bay is so poor that White et al. (1975) calculated some negative energy budgets and thought that the herd was energy-limited when it numbered a few thousand animals in the early 1970's. Again, the habitat was thought to be so poor from a forage standpoint that Skogland (1980) listed it as the area with the least plant biomass of 6 herds in the Holarctic. Yet today the CAH has grown to >15,000 animals. Point 2 of Whitten and Cameron (1985), referenced in the assessment statement, is an ad hoc hypothesis to explain away the herd's prosperity in the face of development. As their last point, Whitten and Cameron felt that the CAH

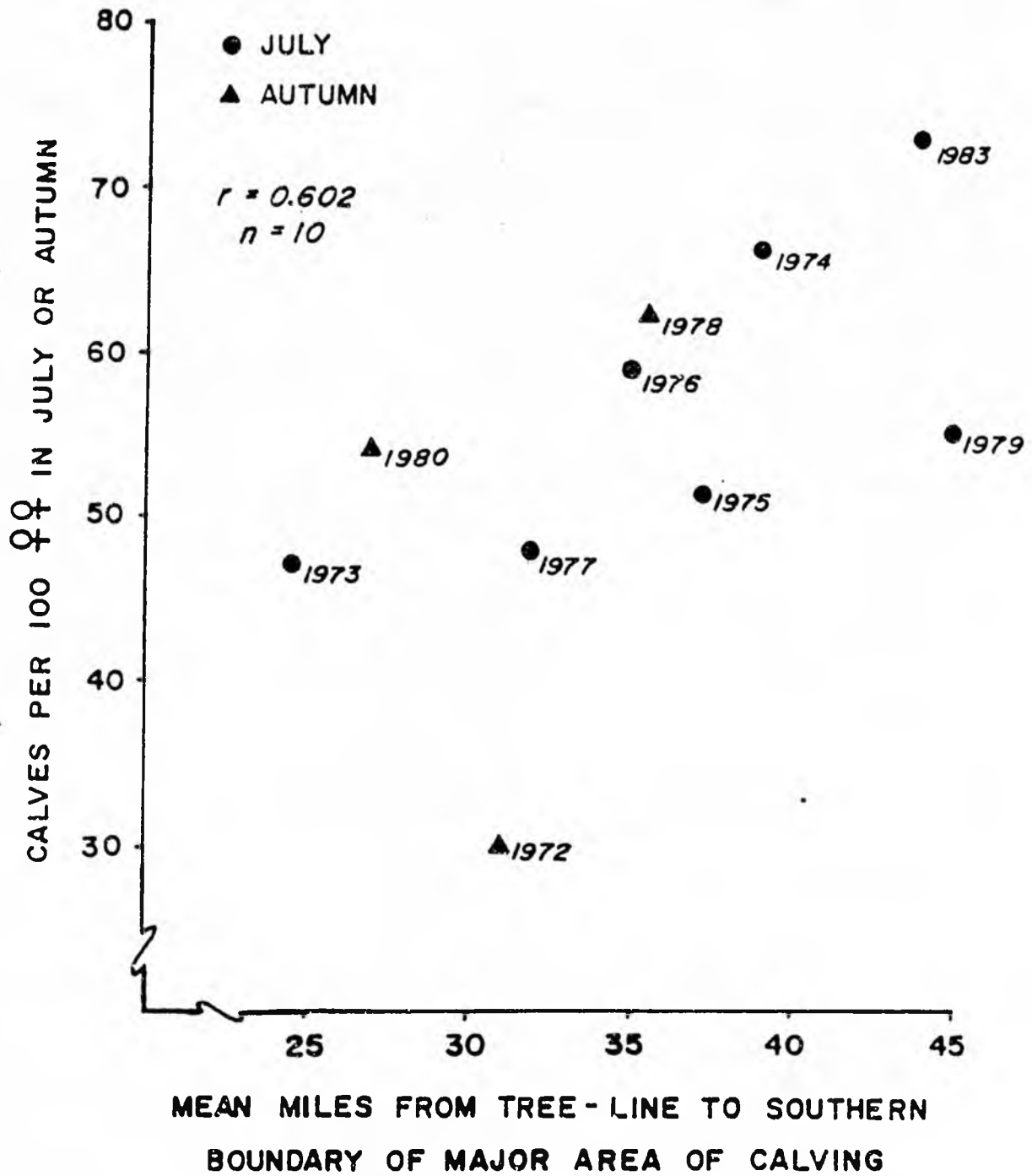


Figure 4. The regression of calf survival (calves/100 ♀♀) on distance of calving ground from tree line.

has not declined with development because the "...(3) overall density of CAH caribou on their calving grounds is much lower than that of arctic herds in Alaska". Again, this reflects Whitten and Cameron's dogmatic opinion that forage determines numbers. The CAH calving ground is about 125 miles from tree line and the PCH, only 30-40 miles. Given the much larger "safe" space, the cows in the CAH are also able to disperse which is another antipredator tactic (Appendix II). The animals in the PCH herd, faced with less space, are more aggregated. Again this is expected, if the animals were dispersed, many would be nearer tree line and at greater predation risk. Since food supplies are not limiting for either herd, the greater densities for the PCH are not a problem. In fact the aggregating is a tactic to avoid predators; when animals face food problems such as in the high arctic or on Svalbard, the groups disperse and densities are low (T. Skogland and F. Miller, pers. comm.).

P. 108, Para. 3. "Both absolute..." This paragraph is irrelevant. One cannot use density figures (see above) to argue that the PCH will face greater consequences than the CAH from development. The CAH lives year round with development and has prospered; the PCH will only be near the development for 2-3 months. Densities are functions of aggregating behaviour and the lower densities for the CAH than the PCH mean greater forage as well as less space for the PCH, and in no way signify the density-dependent problems that Whitten and Cameron imply.

P. 108, Para. 4. "With the CAH calving density remaining low compared to other herds,... overcrowding and consequent habitat stress that might

result in reduced productivity have not yet occurred, ..." This statement is not correct; there is no habitat stress. The CAH cows have selected their calving range, with its low plant biomass, to avoid predators. Cows in other herds in North America are also prepared to sacrifice optimal foraging to avoid predators (Ferguson 1982, Bergerud et al. 1984).

P. 108, Para. 5. "The PCH is much more crowded..." They are not crowded - they aggregate to maintain maximum distance from tree line.

P. 109, Para. 2. This paragraph continues to discuss insect disturbance. But what is involved is primarily mosquitoes. Oestrid flies are not on the wing until the animals leave the 1002 lands. Helle in his publications was primarily concerned with oestrids and other flies and not mosquitoes. To quote their work in this context of causing mortality is stretching the argument.

P. 109, Para. 6. "Failure to obtain relief from insect harassment from either factor (barrier or displacement) could shorten foraging time, leading to poorer physical condition and subsequently to increased susceptibility to predation and reduced overwinter survival."

The 1976 and 1981 cohorts did not apparently use the coast line for insect relief and these cohorts did quite well. These animals are not on a fine edge in physical condition. No one has documented winter starvation in North America as a result of high insect years. When the insects abate in late August and September, the animals are able to recoup their losses

and fatten for winter. Remember that the Porcupine herd has a unique fog belt for insect relief that other herds do not have and even they (PCH) desert the mosquito relief habitat by mid-July. Murphy and Curatolo (in press) showed that caribou at Prudhoe Bay, away from the road, feed 53% of the day prior to mosquito emergence, 41% with mosquito harassment and 29% with oestrids on the wing. Oestrid flies harass caribou more than do mosquitoes and yet PCH animals contend with oestrid flies well inland in August.

P. 112, Para. 4. (and p. 132 as well) "These changes ... could result in a major population decline and change in distribution of 20-40 percent..."

They have provided no data to show a 20-40% population decline. Neither was a consensus reached on the magnitude of any negative effects on the PCH population size or distribution by the 14 specialists at the Caribou Impact Analysis Workshop (ANWR) in November, 1985. I believe that the caribou will continue to use the 1002 lands with development, except near active roads. Even if there was some displacement, there is no need for the herd to decline if wolf populations are managed to provide positive recruitment or calf survival sufficient to balance natural and hunting mortality.

P. 112, Para. 5. "The population decline or distribution change would be 5 - 10 percent for the CAH throughout its range." There is no evidence to support such a decline. A change in distribution cannot cause a decline unless it changes the reproductive or mortality rates. Caribou, even in undisturbed populations, frequently exhibit range shifts,

including areas used for calving. Why can't the authors be objective? The empirical evidence is there for all to see; the CAH increased coincident with development because predator numbers were reduced. how can the field findings be twisted to fit preconceived ideas?

Impacts and Mitigation

The one guaranteed impact of the development of the 1002 lands will be that cows with young calves will avoid active roads for a distance of >1.2 miles. This is based both on theoretical considerations (Bergerud et al. 1984) and empirical observations (Dau and Cameron. 1986). The loss of this habitat will not cause additional stress on the animals since they are not nutritionally limited. Nor will activity budgets be seriously altered by development activities (Murphy and Curatolo in press). It might be more serious if the animals remained near the road where predators may travel. We do not want these cows to habituate to traffic because this would suggest that they might become less wary to their natural predators.

An impact that might affect calf survival would be if the females in May failed to cross the east-west haul road because of the traffic and shifted their calving distribution closer to the foothills where there are greater numbers of wolves and bears. Such a barrier affect has not resulted from the TAPS corridor and haul road. The CAH animals have crossed the road and shifted their distributions between years, making use of habitats both east and west of the corridor. Presumably, these shifts relate to snow cover (Jakimchuk pers. comm.). The PCH herd, since it is both more migratory and larger than the CAH, should

cross a pipeline-road corridor more readily than the CAH. Also, the PCH caribou should cross rather than be funneled by the corridor because caribou should not be easily deflected when undertaking directional shifts to antipredator and mosquito-relief habitat.

Certainly, every effort must be made to allow the animals to continue to use all their potential space to avoid predators. Initially, until the impact of the corridor is understood, traffic will have to be prohibited in the period May 15-June 10 within several miles of cows moving west or north towards the road. Another effort to mitigate the effect of the corridor should be to reduce its visual impact as seen by animals entering the area (moving north and west). Once in the area, the animals will find their way out. If ramps are built they are more important on the south side of the road than on the north side. Murphy and Curatolo (in press) have shown that disturbance is greater when there is an active road combined with a pipeline. Theoretically, the vehicle appears as a predator - and the pipeline as the ambush cover. The pipeline and haul road should be separated by at least 1 km with the pipeline north of the road. Pipelines should be cryptic (painted green and brown), be motionless and scentless.

Another potential impact is that the road facilities will increase predator access to the herd. Wolves can be expected to move north down river valleys and then move laterally, using the road to cross rivers east and west. The cows, by calving between north-south river valleys, have in the past taken advantage of the rivers as potential barriers to east-west movements of predators, especially since the rivers are in flood in late May and early June. We do not want to increase the ease of

access to calving areas for predators by development (Bergerud 1985).

Even if the calving animals are displaced southwards by the corridor, the PCH can remain a viable herd if predator populations are managed. It is an incredible omission in this impact statement that predator management was not mentioned. The reduction of wolves is our major tool to improve calf survival. Wolves would not necessarily have to be reduced on the Coastal Plain. Control operations could take place on the winter range. The goal would be to have recruitment equal natural mortality + hunting mortality, which means, for the Porcupine herd, that about 12% of the herd should be yearlings in April-May (Bergerud and Elliot 1986). This oil development may provide advantages for predators. Once we disturb the status-quo, we must be prepared to manage the predators. This management is the fail-safe position.

I believe that the PCH will cross the haul road in seeking mosquito relief along the coast. The cow and calf that Curacolo (1986) radio-tracked in the CAH herd crossed the road 8 times in one mosquito season. Once a large herd starts across it will continue even if a vehicle approaches. Certainly large herds moving west and north will have to be monitored hourly as they approach the corridor and all traffic halted or rerouted. However, even if the animals did not cross and gain the coastal strip, I believe that the herd would be little affected in its vitality.

The one fact that we cannot escape is that the wilderness character of the coastal plain will be lost for decades. The post calving aggregation of the Porcupine Herd is the most spectacular large mammal display on the North American continent. We must do all that we can to

see that this massing does not become a memory as did the thundering buffalo herds of the plains. The animals should continue to mass in the undisturbed KIC lands, adjacent to the coast, in a wilderness setting.

Because I believe caribou can coexist in close proximity to an ethical man, I look forward to the day when I can go on a guided tour down the Haul road and view this massing of the mighty legions in July. The day will surely come when the old rigs will have been dismantled, the pipes disassembled, the scars left to heal, and the wind again sweeps unrestricted across the cotton grass plains. The caribou will still be there in uncounted numbers, coming as always down their ancestral tracks, and, we too will be there to see and marvel at the majestics of our fellow species.

REFERENCES

- ANDREWARTHA, H. G. and L. C. BIRCH. 1954. The distribution and abundance of animals. Univ. of Chicago Press. 782 pp.
- BENSON, C. S. 1969. The seasonal snow cover of Arctic Alaska. Research Paper No. 51. Arctic Inst. of North America. 86 pp.
- BERGERUD, A. T. 1971. The population dynamics of Newfoundland caribou. Wildl. Monogr. No. 25. 55 pp.
- BERGERUD, A. T. 1974a. Decline of caribou in North America following settlement. J. Wildl. Manage. 38: 757-770.
- BERGERUD, A. T. 1974b. The role of the environment in the aggregation, movement and disturbance behaviour of caribou. I.U.C.N. Publications, New Series No. 24:552-584.
- BERGERUD, A. T. 1980. A review of the population dynamics of caribou and wild reindeer in North America. 2nd Int. Reindeer/Caribou Symp. 556-581.
- BERGERUD, A. T. 1985. Antipredator strategies of caribou: dispersion along shorelines. Can. J. Zool. 63:1324-1329.
- BERGERUD, A. T., H. E. BUTLER, and D. R. MILLER. 1984. Antipredator tactics of calving caribou: dispersion in mountains. Can. J. Zool. 62:1566-1575.
- BERGERUD, A. T. and J. P. ELLIOT. 1986. Dynamics of caribou-wolf fluctuations in British Columbia. Can. J. Zool. 64:1515-1529.
- BERGERUD, A. T., R. D. JAKIMCHUK, and D. R. CARRUTHERS. 1984. The buffalo of the north: caribou (Rangifer tarandus) and human developments. Arctic 37:7-22.

- BERGERUD, A. T., E. MERCER, K. CURNEW, and M. NOLAN. 1983. Growth of the Avalon caribou herd. *J. Wildl. Manage.* 47:989-998.
- CAUGHLEY, G. 1977. Analysis of vertebrate populations. John Wiley and Sons. N.Y. 234 pp.
- CRINGAN, A. T. 1956. Some aspects of the biology of caribou and a study of the woodland caribou range of the Slate Islands, Lake Superior, Ontario. M.A. thesis, University of Toronto. 300 pp.
- CURATOLO, J. A. 1985. Sexual segregation and habitat use by the Central Arctic caribou herd during the summer. 2nd North American Caribou Workshop, Val Morin, Quebec. pp. 193-198.
- CURATOLO, J. A. 1986. Evaluation of satellite telemetry system for monitoring movements of caribou. Rangifer Special Issue No. 1: 73-79.
- CURATOLO, J. A. and D. G. ROSENEAU. 1977. The distribution and movements of the Porcupine Caribou Herd in northeastern Alaska and the Yukon Territory 1976. Unpubl. Rept. Renewable Resources Consulting Service Ltd. 59 pp.
- DAU, J. R. and R. D. CAMERON. 1986. Effects of a road system on caribou distribution during calving. Rangifer Special Issue No. 1:95-101.
- FERGUSON, S. H. 1982. Why are caribou on Pic Island? M.Sc. thesis, University of Victoria, Victoria, B.C. 171 pp.
- KUROPAT, P. and J. P. BRYANT. 1980. Foraging behavior of cow caribou on the Utukok calving ground in northwestern Alaska. 2nd Int. Reindeer/caribou Symp. Roros, Norway. pp. 64-69.
- LENT, P. C. 1966. Calving and related social behavior in the barren-ground caribou. *Zeit. Tierpsychol.* 23:702-256

- LENT, P. C. 1980. Synoptic snowmelt patterns in arctic Alaska in relation to caribou habitat use. 2nd Int. Reindeer/caribou Symp., Roros, Norway. pp. 71-77.
- MURPHY, S. M. and J. A. CURATOLO. (in press - 1987). Behavior of caribou during summer in the Prudhoe oilfield, Alaska. Can. J. Zool. (in press).
- ROBY, D. D. 1978. Behavioral patterns of barren-ground caribou of the Central Arctic Herd adjacent to the trans-Alaska oil pipelines. M.Sc. thesis. University of Alaska, Fairbanks. 200 pp.
- SKOGLAND, T. 1980. Comparative summer feeding strategies of arctic and alpine Rangifer. J. Anim. Ecol. 49:81-98.
- SKOGLAND, T. 1986. Density dependent food limitation and maximal production in wild reindeer herds. J. Wildl. Manage. 50:314-319.
- SKOOG, R. O. 1968. Ecology of the caribou in Alaska. Ph.D. thesis. University of California, Berkeley. 699 pp.
- WALTERS, C. J., R. HILBORN, R. PETERMAN, M. JONES, and B. EVERITT. 1979. Porcupine caribou workshop draft report on submodels and scenarios. Unpubl. Rept. Institute of Animal Resource Ecology. University of British Columbia, Vancouver. 42 pp.
- WHITE, R. G., B. R. THOMSON, T. SKOGLAND, S. J. PERSON, D. F. HOLLEMAN and J. P. LUICK. 1975. Ecology of caribou at Prudhoe Bay, Alaska. Biol. Papers, Univ. of Alaska, Fairbanks. Spec. Rept. No. 2:151-187.

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Caribou, Wolves and Man

Abstract: The migratory tundra caribou/reindeer (Rangifer tarandus) in the Holarctic now number 3 million and are increasing, $r = 0.11$, and approaching estimated pristine numbers in North America. In contrast, the sedentary forest races living south of the tree-line number about 325 thousand animals in the world; their numbers are declining in some areas in both Eurasia and North America. The chief natural mortality factor determining the survival of neonates and adults is predation and the wolf (Canis lupus) is the major predator. Recruitment and natural adult mortality are approximately equal when wolf numbers are about $6.5/1000 \text{ km}^2$. Wolf numbers have been reduced ($<6.5/1000 \text{ km}^2$) north of the tree-line in the Nearctic since the 1970's by hunting facilitated by snowmobile transportation. But south of the tree-line wolf numbers may be locally high ($>8/1000 \text{ km}^2$) where moose (Alces alces) have expanded their range in this century. Caribou can adapt to economic development in the Arctic if their space for mobility to cope with their predators is kept inviolate. It should be possible through management of wolf numbers to further increase the abundance of caribou and wolves and provide surpluses of both species for northern peoples yet maintain a viable large mammal ecosystem in the Arctic.

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A growing problem man faces in this century is the extinction of animal species with ever increasing economic development. We are losing species at an alarming rate (1). Some major mammal systems are threatened (2). Concerns for the future of caribou/reindeer (Rangifer tarandus) were voiced in the 1970's when the discovery of vast oil reserves in the Arctic accelerated commercial exploration and development. As recently as 1981 David Brower said "We face a choice. Caribou or ever more kilowatts?" (3). The view is widely held that caribou numbers in North America are vastly reduced and the species may even be threatened. Laycock in a recent book in 1983 stated: "In 1900 Canada might have held as many as 2 million barren-ground caribou. A fraction of that number wander the Canadian Arctic today and in Alaska too, caribou numbers have fallen for reasons not fully understood." (4).

However such pessimistic predictions have not materialized and we now know a great deal about the demography of the herds. At present there are in excess of 2 million barren-ground caribou in North America and $>730^3$ in the USSR (Fig. 1)(5). Biologists have counted more migratory barren-ground caribou (also called wild tundra reindeer in Eurasia) in the 1980's than at any time since systematic aerial surveys originated some 40 years ago (6) (Table 1). We are approaching pristine estimates. But in contrast to this population eruption of the tundra races, the more sedentary woodland caribou populations (called wild forest or mountain reindeer in Eurasia) living south of the tree-line, are only maintaining their numbers or else declining in many areas, in both North America and the USSR (Fig. 1). The contrast in the dynamics of these two different ecotypes provides insight into limiting factors and can help evaluate the potential impacts of the future.

Caribou populations in the past have seldom been stable in numbers (7). For a herd to increase, the recruitment of yearlings (R) must exceed the loss of adults from mortality; adult mortality includes both natural and hunting losses. The reproductive or birth rate of caribou is relatively constant between populations in North America; approximately 80% of the mature females annually give birth to single calves (8). But calf mortality in the first 12-months-of-life varies greatly; extreme values in the literature are 18 to 90% (9). Again, the annual natural deaths of adults can be as low as 5% or as high as 28% (10).

A generalization is that herds usually increase when recruitment of yearlings exceeds 12-15%, if the animals in the herd are not hunted (11). At the present time a majority of the herds that migrate to the arctic tundra in the spring to give birth to their young (the barren-ground/tundra herds) have yearling percentages in excess of 20%; whereas the caribou that calve south of the tree-line (the woodland/forest herds) have calf percentages of only 12-13% (Table 1).

In the past 10 years biologists have determined the causes of death of calves and adults by radio-tracking both neonates and adults. Close to 900 radios have been placed on adults in 41 herds in North America and 317 radios have been strapped on young calves. In a number of the studies the collars were equipped with sensors which modulated the radio signal when the animal was motionless which permitted the researchers to find the animals quickly after death and more accurately determine the mortality factors.

The survival of calves (recruitment) and the loss of adults in 17 herds in North America is negatively correlated (12) (Fig. 2) suggesting a

did the pattern
differ in the herds?

common mortality factor. The primary cause of death of both calves and adults in the recent radio monitoring studies was predation. Wolves (Canis lupus) and bears (Ursus arctos, U. americanus) killed 77 of 105 (73%) of the adults with radios that died in 12 herds (13). Wolves, bears and golden eagles (Aquila chrysaetos) were the most important predators of radio equipped calves, 89 of 111 natural deaths were caused by predation (14). These results are in agreement with earlier findings that showed 64% of 489 calves found dead on the calving grounds had died from predation (15). Other mortality factors beside predation such as starvation or disease have not been important for mainland populations free to disperse (16). However starvation is a common cause of death for insular populations where maritime weather has resulted in icing of vegetation (17).

The major limiting factor in the growth of mainland populations is predation (18). The rate-of-increase of caribou introduced to predator-free environments has averaged $\bar{r} = 0.27 \pm 0.18$, $n = 6$, $CV = 16.6$. This is an extremely high rate and close to the theoretical maximum rate for the species, $\bar{r}_m = 0.30$. In contrast, the mean rate-of-increase for 10 herds coexisting with their natural predators and lightly hunted was only $\bar{r} = -0.009$, some herds were increasing, others declining. Biologists have reduced wolves in the range of 5 herds in Alaska and Canada; prior to the reduction, the mean percentage of recruits was 5.2 ± 1.16 and after reduction the mean percentage increased to 23.4 ± 2.38 (19). Recruitment in 24 herds in the Nearctic was negatively correlated with the abundance of wolves and adult natural mortality was positively correlated with wolf numbers in 18 herds (20) (Fig. 3). Recruitment equaled mortality when wolf densities were $6.5 \text{ wolves}/1000 \text{ km}^2$ (Fig. 3). Since both recruitment and mortality covary with the abundance of wolves and the slopes of both

111 $\overline{89,000}$
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regressions are steep (Fig. 3), fluctuations in caribou numbers should be expected with small changes in the abundance of wolves. At the present time wolf numbers are generally less than 6.5 wolves/1000 km² in the ranges of the tundra herds whereas woodland groups contend with numbers >6.5 wolves/1000 km² (Fig. 3). This difference in the abundance of wolves is currently a major factor in the divergent dynamics of the two ecotypes.

The low numbers of wolves in the arctic has been primarily caused by hunting by man. In the Soviet Union wolves are controlled by the government in the vicinity of the 4 largest migratory herds that are either increasing or providing large surpluses for harvest (Fig. 1). The density of wolves in the range of the largest herd in the USSR, the Taimyr Herd (530³ animals), was only 2.6 wolves/1000 km² in 1976 (21). These 4 herds coexist with domestic reindeer, and wolves are controlled to reduce losses to domestic stock. In North America, where there are few domestic reindeer, wolves are sought for their fur. The pelt value steadily increased in the 1970's and averaged >\$200 in the Northwest Territories in 1978-79 (22). Harvests accelerated in the 1970's when snowmobiles replaced the traditional dog teams and hunters could follow the wolves. As an example the Inuit at Coppermine, NWT harvested 914 wolves in the winter of 1978-79 and 234 in 1979-80. This harvest represented \approx 50% of the wolves associated with the migratory Bathurst Herd(23). Before the harvest the percentage of calves in this herd had averaged 10% and after the wolf reduction the recruitment rose to 20% and the herd has now shown a substantial increase in numbers (Table 1). Wolves have also been reduced on the range of the Western Arctic and Kaminuriak Herds (24). In Ungava, wolves have been scarce for at least the past 80 years and harvests may be preventing their increase (25). Wolves in the Arctic may also have disease

problems. Rabies has been found in several wolf packs on the range of the Porcupine Herd which is another herd that increased after 1977. The mortality factors for wolves may vary but at this time wolves are at low densities north of tree-line in the Holarctic; 16 of the largest herds in the world totalled 1402³ in the late 1970's but by the mid-1980's, had increased to 2468³ animals ($\underline{r} = 0.113$, $\lambda = 1.120$, Table 1).

Wolf numbers are much higher south of tree-line in the boreal forest (Fig. 3). Hunting from snowmobiles is less effective in tree-cover. Also, the wolf is a religious symbol to some Indian groups living in the boreal forest. In the Soviet Union, wolf control in forested habitats is less than on the tundra because there are fewer domestic reindeer south of the tree-line. Wolf numbers are now probably higher in some sections of British Columbia, Alberta, and Ontario than in the 1800's. Since 1875 moose (*Alces alces*) have extended their range north 200-700 km (26). This increase in the prey biomass resulted in more wolves than the simpler caribou-wolf system. Wolves coexisting with moose commonly reach densities $>8/1000 \text{ km}^2$, too high to maintain stable populations of caribou outside refuge habitats (Fig. 3) (27). Since caribou are easier to kill than moose, wolves can switch to caribou when caribou are common. When the caribou decline the moose prey base remains to support the predators, buffering predator-prey fluctuations (28). Another problem is that humans, by constructing roads and seismic lines in the boreal forest have provided access and travel routes for both wolves and illegal hunters. Logging has further compounded problems for southern caribou by reducing the size of their range which in turn facilitates the searching of the predators.

The proverbial question asks - if predation limits the numbers of caribou, why haven't caribou gone extinct, how have caribou and wolves

coexisted for so many thousands of years. The answer is space. The density-dependent respite for the caribou was the vastness of the north. The "miles beyond measure" (29). This space allowed caribou to mitigate predation by natural predators and pristine man. At calving time woodland caribou space-out in habitats mostly removed from wolves and alternate prey and they also seek island refuges (30). If caribou numbers are decreasing the space between these solitary calving females that show philopatry to their calving sites increases (31). When numbers are low the remaining females are sufficiently dispersed that it becomes unprofitable for predators to continue to search for young calves. The antipredator strategy of tundra caribou is to space-away; they migrate to calving grounds at the northern edge of the herd's distribution, whereas wolves mostly stay farther south denning near tree-line and relying on alternate prey (32). Before European man, the Indians also had their home sites south of tree-line far from the calving grounds. The Inuit, whose settlements were north of the calving grounds, turned to the sea in the summer for a living. Hence the caribou in pristine times had space to separate themselves from their major predators.

Prior to European settlement, when tundra ranges declined due to predation, the herds should have reduced the size of their annual ranges. This sequence has been documented in the declines in the 1950's - 60's (33); when herds were low in numbers they stayed farther north in both summer and winter. These density-dependent range contractions increased their inaccessibility to their major predators. When these caribou herds increased they expanded their range and came farther south, especially in winter. Movement resumed along traditional and predictable migration arteries. In the past with such range extension, Indians and denning wolves would have fared

References and Notes

1. N. Myers, Natural History 94, 2 (1985).
2. M. Iwago, National Geographic 169, 563 (1986).
3. D. Brower, Forward in Caribou and the barren-lands by G. Calef, Firefly Books, Toronto, Ontario, (1981).
4. G. Laycock, North American Wildlife, Bison Books, Greenwich, CT., (1983).
5. Population totals for North America and Western Europe from many sources, primarily status reports presented at the 2nd and 4th International reindeer/caribou symposia at Roros, Norway (1979) and Whitehorse, Yukon (1985). Population total and trends from USSR from V. Y. Labutin et al. in Biological Problems of the North, 10th All-Union Symposium, Magadan, abstract pp. 80-81 (1983); B. V. Novikov, Red Data Book of the Russian Federated SSR, abstract 108-109 (1983a); B. V. Novikov, in Biological Problems of the North, 10th All-Union Symposium, Magadan, abstract pp. 88-89 (1983).
6. Major references for USSR herds: D. R. Klein and V. Kuzyakin. J. Wildl. Manage. 46: 728 (1982); V. Y. Labutin et al. ibid. (1983), B. V. Novikov, ibid (1983b); G. D. Yakushkin et al. in Wild Reindeer of the Soviet Union, E. E. Syroechkovskii ed. translated from Russian. Oxonian Press, Ltd. New Delhi, pp. 47-53 (1984). For migratory herds in Canada: D. C. Thomas, Can. Wildl. Ser. Rept. No. 9 (1969); G. R. Parker, Can. Wildl. Ser. Rept. No. 20 (1972); G. W. Calef in Parameters of Caribou Population Ecology in Alaska, D. R. Klein and R. G. White eds. Biol. Pap. Univ. Alaska Spec. Rept. 3, pp. 9-16 (1978); Labrador Inuit Asso. Management of th George River Caribou Herd, 4th

Int. Reindeer/Caribou Symposium, Whitehorse, Yukon (1985); D. Heard, Status of caribou herds in N.A., 4th Int. Reindeer/Caribou Symposium, Whitehorse, Yukon (1985); D. Heard, pers. comm.; Carruthers, D. R. and R. D. Jakimchuk, *Acta Zool. Fennica* 175, 141 (1983). For migratory herds in Alaska: J. L. Davis, in Parameters of Caribou Population Ecology in Alaska, D. R. Klein, R. G. White eds. Biol. Pap. Univ. Alaska, Spec. Rept. 3, pp. 1-8 (1978); K. R. Whitten and R. D. Cameron, *Acta Zool. Fennica* 175, 159 (1983); Anonymous, Initial Report Baseline Study Arctic National Refuge Resource Assessment, U.S. Dept. of Interior, Anchorage, Alaska (1982); P. Valkenburg and J. L. Davis, Population Status of the Fortymile Caribou Herd, Alaska Dept. of Fish and Game Rept., Juneau Alaska (1985); J.L. Davis and P. Valkenburg, Qualitative and Quantitative Aspects of Natural Mortality of the Western Arctic Caribou Herd, Alaska Dept. of Fish and Game Rept., Juneau, Alaska (1985); B. Townsend, Annual Rept. of Survey-inventory activities, Pt. 11. Caribou, Vol. 16, Alaska Dept. of Fish and Game, Juneau, Alaska (1986). K. W. Pitcher, Big Game Studies, Vol. 4, Caribou, Sitka Hydroelectric Project Annual Rept. Alaska Dept. of Fish and Game, Juneau, Alaska (1984); R. A. Sellers in Annual Rept. of Survey-inventory Activities, Pt. 6, Caribou, Alaska Dept. of Fish and Game, Juneau, Alaska, pp. 6-8 (1984). For sedentary forest/woodland caribou in Canada: A. T. Bergerud and J. P. Elliot, Can. J. Zool. in press (1986); E. J. Edmonds and M. Bloomfield, A Study of Woodland Caribou in West Central Alberta, Alberta Energy and Natural Resources, Edmonton, Alberta (1984); R. Farnell and J. McDonald, The Finlayson Caribou Management Project, Yukon Dept. Renewable Resources, Whitehorse,

- Yukon (1986); D. A. Gauthier, thesis, University of Waterloo, Waterloo, Ontario (1984); W. K. Brown, thesis, University of Waterloo, Waterloo, Ontario (1986).
7. R. O. Skong, thesis, University of California, Berkeley, California, (1968); J. P. Kelsall, The Caribou, Queen's Printer, Ottawa, (1968).
 8. A. T. Bergerud, 2nd Reindeer/Caribou Symposium, Roros, Norway, pp. 556-581 (1980).
 9. A. T. Bergerud et al. J. Wildl. Manage. 47, 989 (1983); A. T. Bergerud and J. P. Elliot, ibid (1986).
 10. R. O. Skoog, ibid. (1968); J. P. Kelsall, ibid. (1968); R. Farnell and J. McDonald, ibid (1986).
 11. A. T. Bergerud, Wildlife Monog. 25, (1971); A. T. Bergerud, J. Wildl. Manage. 38, 757, (1974).
 12. R. O. Skoog, ibid. (1968); K. W. Pitcher, ibid. (1984); A. T. Bergerud and J. P. Elliot, ibid. (1986); T. K. Fuller and L. B. Keith, J. Wildl. Manage. 45, 197 (1981); E. J. Edmonds and M. Bloomfield, ibid. (1984); R. Farnell and J. McDonald, ibid. (1986); D. A. Gauthier, ibid. (1984); J. L. Davis and P. Valkenburg, Demography of the Delta Herd, Alaska Dept. of Fish and Game, Juneau, Alaska (1985b); J. L. Davis and P. Valkenburg, ibid. (1985a); P. Valkenburg and J. L. Davis, ibid. (1986).
 13. N. latitude and W. longitude of herds, woodland: 52°-121°, 53°-126°, 54°-62°, 54°-120°, 55°-121°, 57°-113°, 58°-128°, 62°-130°; migratory-tundra (latitude and longitude of calving grounds): 62°-148°, 64°-147°, 65°-145°, 70°-160°. References mostly Unpubl. govt. repts. D. Seip and D. Hebert, Progress Rept. University of British Columbia, Vancouver, B.C. (1985), R. Marshall, Progress Rept. No. 3, Ministry of Environment, W. K. Brown, ibid. (1986). E. J. Edmonds and M. Bloomfield, Can. J.

- Zool. (in press, 1986); L. Sopuck, Final Report, Renewable Resources, Sidney, B.C. (1985); T. K. Fuller and L. B. Keith, ibid.; (1981); D. F. Hatler, Rept. No. 3, Spatsizi Association, Telkwa, B.C. (1985); R. Farnell, and J. McDonald, ibid. (1986); K. W. Pitcher, ibid. (1984), J. L. Davis and P. Valkenburg, ibid. (1985b). P. Valkenburg and J. L. Davis, ibid. (1985); J. L. Davis and P. Valkenburg, ibid. (1985a).
14. N. latitude and west longitude of herds: 58°-128°, 70°-144°, 63°-152°; R. E. Page, thesis, University of Victoria, Victoria, B.C. (1986); P. Valkenburg, Caribou, Vol. 16. Alaska Dept. of Fish and Game, Juneau, Alaska, pp. 18-20. F. J. Mauer et al., Arctic National Wildlife Refuge Progress Rept. No. FY83-6, Dept. of Interior, Anchorage, Alaska; K. R. Whitten et al., Arctic National Wildlife Refuge Progress Rept. FY84-12, Dept. of Interior, Anchorage, Alaska (1983). K. R. Whitten et al. ibid. FY85-18 (1985).
15. F. L. Miller and E. Broughton, Can. Wildl. Serv. Ottawa, Canada, Rept. Ser. No. 26 (1974); D. Heard and D. Decker, Wildl. Serv. Yellowknife, NWT, Rept. 20 (1980); S. V. Tessaro, Caribou Calf Mortality Study, Wildl. Serv., Yellowknife, NWT, (1984); F. L. Miller, E. Broughton, and A. Gunn, Paper 33 in 2nd N.A. Caribou Workshop, McGill Subarctic Res. Paper No. 40, McGill, Quebec (1985).
16. A. T. Bergerud, ibid. (1980), R. O. Skoog, ibid. (1968).
17. R. O. Skoog, ibid. (1968).
18. A. T. Bergerud, ibid. (1980).
19. review in A. T. Bergerud and J. P. Elliot, ibid. (1986).
20. References listed (12) plus: R. A. Rausch, Am. Zool. 7, 253 (1967); R. O. Stevenson, Wolf Report, Alaska Dept. Fish and Game, Juneau, Alaska (1975 and 1978); G. C. Haber, thesis, University of British Columbia,

- Vancouver, British Columbia (1977); W. B. Ballard et al. Nelchina Basin Wolf Studies. Alaska Dept. Fish and Game, Juneau, Alaska (1981).
- R. R. Bjorge and J. R. Gunson in Wolves in Canada and Alaska, L. N. Carbyn, ed. Can. Wildl. Serv. Rept. Ser. 45, pp. 106-111 (1983).
- D. C. Heard, E. S. Fleck, G. W. Calef, The Wolf on the Barren-grounds in Central NWT, Renewable Resources, Yellowknife, NWT (1985); D. D. James, thesis, University of Alaska, Fairbanks (1983); W. C. Gasaway et al. Wildl. Monog. 84 (1983); S. Luttich, pers. comm. (1985).
- G. J. Weiler et al. ANWP Progress Rept. FY85-5, Arctic National Wildlife Refuge, Fairbanks, Alaska (1985).
21. D. R. Klein and V. Kuzyakin, ibid. (1982).
22. D. C. Heard in Wolves in Canada and Alaska, L. N. Carbyn ed., Can. Wildl. Serv., Ottawa, Rept. Ser. 45, 44-47 (1983).
23. D. C. Heard, E. S. Fleck, G. W. Calef. ibid. (1985).
24. D. C. Heard, pers. commun. (1985). D. C. Heard, The demography and management of the Kaminuriak Herd 1968 to 1984, 4th Int. Reindeer/Caribou Symposium (1985), Whitehorse, Yukon, in press in Rangifer.
25. A. T. Bergerud. J. Wildl. Manage. 31, 621 (1967); A. T. Bergerud, personal files (1985).
26. J. Hatter, thesis, State College of Washington, Pullman, Wash. (1950); R. L. Peterson, North American Moose. University of Toronto, Toronto, Ontario (1955).
27. L. B. Keith in Wolves in Canada and Alaska, L. N. Carbyn, ed. Can. Wildl. Serv. Ottawa, Rept. Ser. No. 45, pp. 66-77 (1983); F. Messier, Can. J. Zool. 63, 1068 (1985); V. Van Ballenberghe et al. Wildl. Monog. 43 (1975).
28. A. T. Bergerud and J. P. Elliot, ibid. (1986).

29. quote from G. W. Calef, Audubon 78, 42 (1976).
30. D. W. Simkin, Ontario Dept. Lands and Forests, Sec. Rept. No. 59 (1965); M. W. Shoesmith, thesis, University of Manitoba, Winnipeg, Manitoba (1978); A. T. Bergerud et al. Can. J. Zool. 62, 1566 (1984); A. T. Bergerud, Can. J. Zool. 63, 1324 (1985).
31. M. W. Shoesmith, ibid. (1978); E. J. Edmonds and M. Bloomfield, ibid. (1986), W.K. Brown, ibid. (1986).
32. D. C. Heard, E. S. Fleck, G. W. Calef, ibid. (1985); E. Kuyte, Can. Wildl. Serv. Ottawa, Canada, Rept. Ser. 21 (1972); R. Jacobson, Study no. 10 (A.L.U.R.) Dept. of Indian Affairs and Northern Development, Ottawa (1979); E. S. Fleck and A. Gunn, Barren-ground caribou Progress Rept. No. 7, NWT Wildl. Serv., Yellowknife, NWT (1982).
33. G. W. Calef, Environmental impact assessment of the portion of the Mackenzie gas pipeline from Alaska to Alberta. Environmental Protection Board, Winnipeg, Manitoba Vol. IV, pp. 101-120 (1977).
A. T. Bergerud, ibid. (1980).
34. C. B. Huffaker, Hilgardia, 27, 343 (1958).
35. C. Elton, Voies, Mice and Lemmings, Clarendon Press, Oxford (1942);
A. E. Spiess, Reindeer and Caribou Hunters. Academic Press, N.Y. (1979).
Inland Eskimos died from starvation as late as 1957 in Canada when caribou numbers were low in the NWT, F. Symington, Tuktu, a Question of Survival, Queen's Printer, Ottawa (1965). I found the Naskapi Indians in Ungava still living in tents and following the caribou by dog teams in the late 1950's. An entire way-of-life was transformed when snowmobiles came into general use in the early 1970's; then hunters could in a few hours travel great distances in search of

caribou while their families remained at settlements. Caribou could also be located by aircraft and radio messages relayed their locations.

36. R. O. Skoog, ibid. (1968), J. P. Kelsall, ibid. (1968).
37. A. W. F. Banfield, Can. Wildl. Serv. Wildl. Manage. Bull. Ser. 1, Nos. 10A, 10B (1954); J. P. Kelsall, ibid. (1968); J. L. Davis, ibid. (1978).
38. A. T. Bergerud et al. Arctic 37,7 (1984).
39. K. R. Whitten and R. D. Cameron, Acta Zool. Fennica 175, 191 (1983); W. T. Smith in Annual Rept. of Survey-inventory Activities, Vol. 11, Caribou, B. Townsend, ed. Alaska Dept. of Fish and Game, Juneau, Alaska, pp. 53-55.
40. Wolves can maintain their numbers with annual harvests of 25%, L. B. Keith, ibid. (1983).

Table 1. Status and recruitment of some reindeer/caribou herds since the late 1960's.

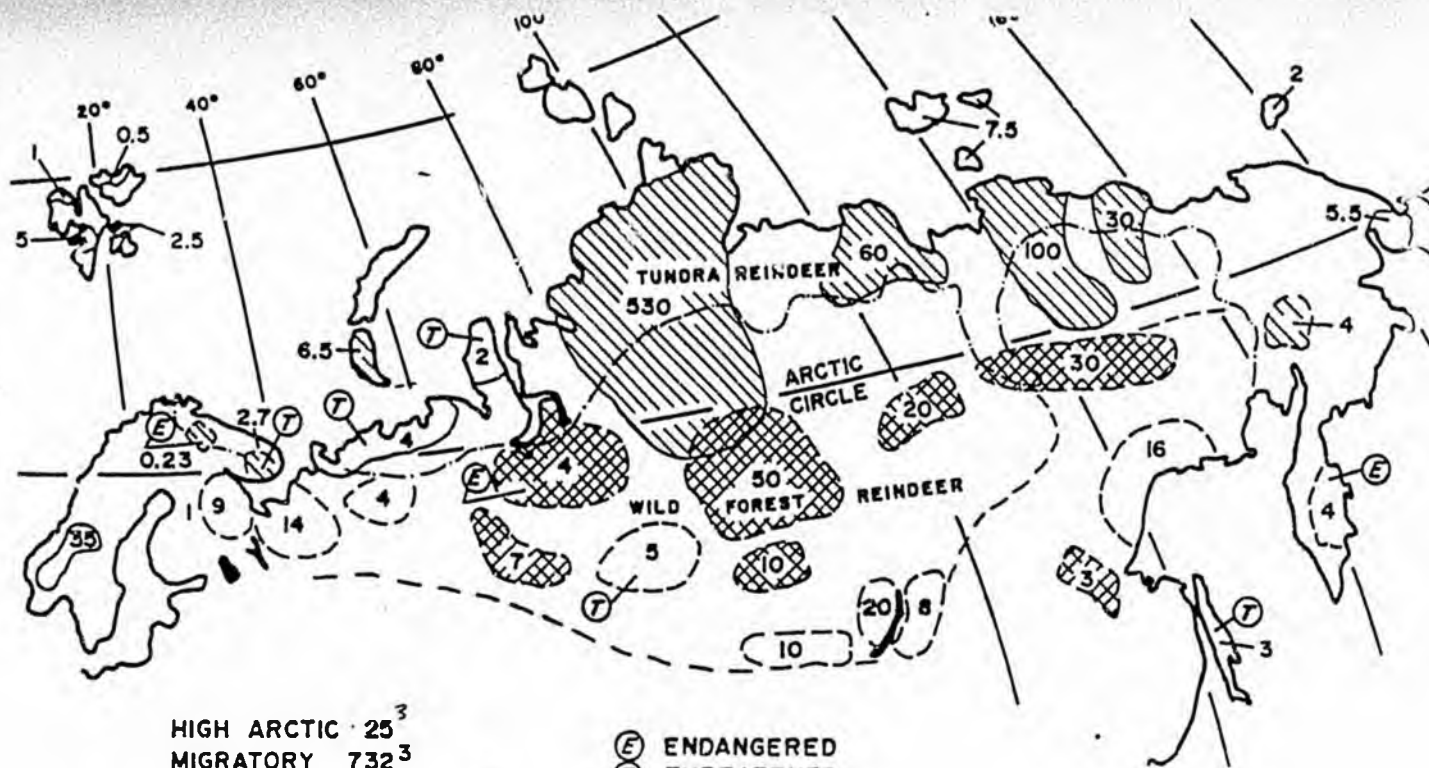
Ecotype, Area & Herd Name	N. Latitude /Longitude	Thousands of Caribou			Recent Recruitment % calves \pm S.E. (years)
		1963-70	1977-78	1983-85	
<u>Migratory, USSR^a</u>					
Taimyr	73°/ 95°E	333	460	530	26 ^b
Lower Lena R.	73°/125°E	} 95	50	60	?
Yana-Indigir	72°/145°E		109	100	?
Sundrun	70°/156°E		21	30	?
<u>Migratory, Canada</u>					
George R.	58°/ 65°W	>63	178	600	24 \pm 1.0 (8)
Bathurst	65°/110°W	145	150 ^c	385 ^c	20 \pm 0.9 (5)
Beverly	63°/105°W	159	124 ^c	335 ^c	19 \pm 2.0 (6)
Bluenose	67°/120°W	19	40	65	21 \pm 3.1 (2)
Kaminuriak	60°/ 98°W	63	44 ^{c,d}	230 ^{c,d}	25 \pm 1.7 (5)
<u>Migratory, Alaska</u>					
Nelchina	62°/147°W	25	14	25	22 \pm 1.9 (6)
Porcupine	68°/144°W	100	100	150	24 \pm 3.4 (3)
Western Arctic	69°/156°W	242	75	200	23 \pm 1.3 (7)
Mulchatna	62°/156°W	8	10	37	28 \pm 0.8 (2)
Alaska Penn.	57°/159°W	14	18	30	25 \pm 1.4 (3)
Fortymile	65°/144°W	10	4	13	18 \pm 1.2 (6)
Central Arctic	70°/149°W	3	>5	13	21 \pm 1.7 (5)
<u>Sedentary, Canada</u>					
Spatsizi-Lawyers	58°/128°W	more ^e	2.4	1.1	12 \pm 1.4 (8)
Level-Kawdy	59°/131°W	more	1.4	0.8	12 \pm 2.7 (7)
Horseranch	59°/129°W	more	<0.3	<0.3	11 \pm 2.1 (7)
W. C. Alberta	54°/119°W	more	more	<0.3	15 \pm 1.3 (3)
Finlayson	64°/129°W	?	?	2.1	12 \pm 2.5 (2)
Burwash	61°/139°W	?	same	0.3	12 \pm 1.5 (3)
Red Wine	54°/ 62°W	?	more	0.8	17 \pm 2.0 (4)

^a Annual harvest of 4 USSR herds top to bottom are 13.8%, <11%, <15%, <15%. ^b Only for 1966 & 1977. ^c Census techniques have changed in Canada between periods and may account for some of the apparent increase. ^d There may have been ingress. ^e Authors listed herds as declining.

Figure 1. Status and population trends of the world's population of caribou/wild reindeer in the 1980's. Numbers represent 1000's of animals. Nearly all the largest herds have been counted or estimated since 1980. Migratory caribou/reindeer are those that travel to and aggregate at calving grounds north of tree-line and include barren-ground caribou in North America and wild tundra reindeer in Eurasia. Sedentary caribou/reindeer are those that scatter at calving time (space-out) in remote locations south of the arctic tree-line. However females in some of these herds do calve above the alpine tree-line in mountains. Included in this ecotype are the woodland caribou in North America (excluding the George River herd in Ungava and herds in Newfoundland that migrate to calving grounds) and wild forest or mountain reindeer in Eurasia. The high arctic caribou live on islands in the Arctic Ocean, excluding those animals on Baffin Island that migrate to calving grounds.

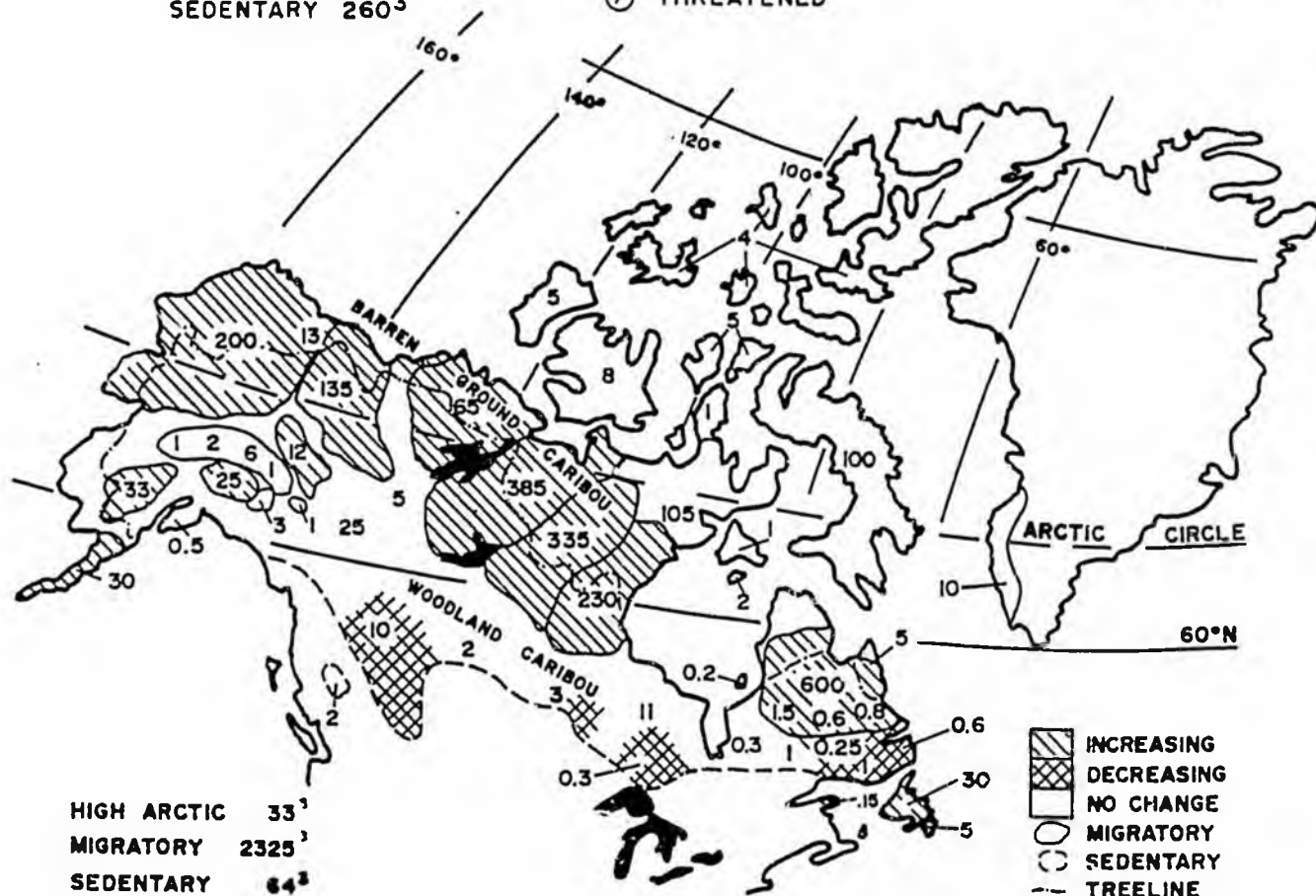
Figure 2. The natural annual mortality of adults regressed on recruitment (% calves at 5-6 months or short-yearlings at 10-11 months-of-age) for 17 herds totaling $\sim 1380^3$ caribou. Some herds are represented by two data points at different time periods. Natural mortality is based on the death of radio collared animals, estimated by the authors, or calculated by $M_n = 1 - [\lambda (1-R)] / 1 - M_h$, where: M_n = natural mortality, λ = finite rate of increase, R = recruitment, and M_h = hunting mortality. N. Latitude and W. longitude locations of the herds are: 54°/119°, 57°/113°, 58°/65°, 58°/128°, 59°/129°, 59°/131°, 61°/139°, 62°/147°, 64°/126°, 64°/129°, 64°/147°, 65°/144°, 68°/144°, 69°/156°.

Figure 3. The regressions of annual natural mortality and recruitment on wolf densities for herds in North America where wolf numbers have been estimated. Recruitment is greater than mortality for many migratory-tundra herds at this time, that coinhabit ranges where wolf numbers are $<6.5/1000 \text{ km}^2$. Recruitment is less than natural mortality for several sedentary-woodland herds who interact with wolf densities $> 6.5/1000 \text{ km}^2$. In the past 100 years moose have extended their range north in both North America and USSR. This range extension has augmented the prey biomass permitting wolf densities in some regions south of the tree-line to exceed the levels at which recruitment and mortality parameters in woodland caribou are adequate to maintain numbers, especially when wolves are $>14/1000 \text{ km}^2$.



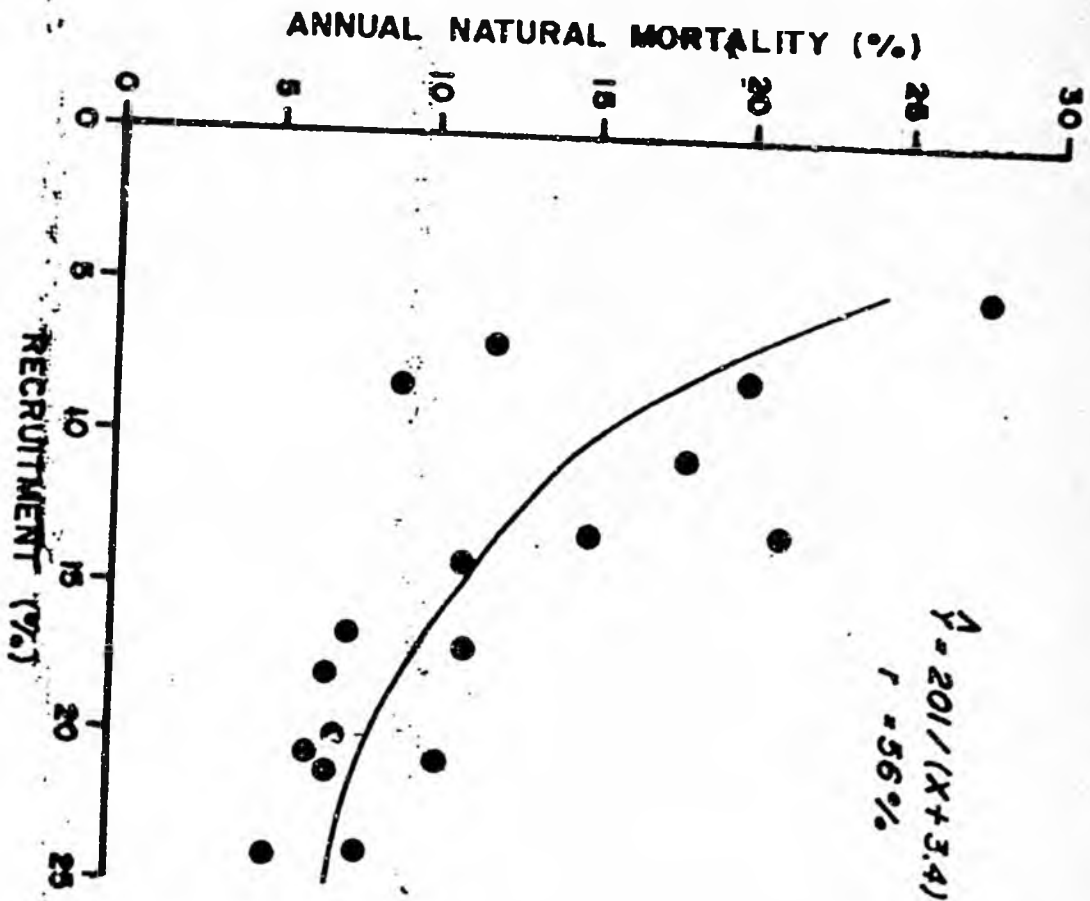
HIGH ARCTIC 25³
 MIGRATORY 732³
 SEDENTARY 260³

(E) ENDANGERED
 (T) THREATENED



HIGH ARCTIC 33³
 MIGRATORY 2325³
 SEDENTARY 64²

INCREASING
 DECREASING
 NO CHANGE
 MIGRATORY
 SEDENTARY
 TREELINE

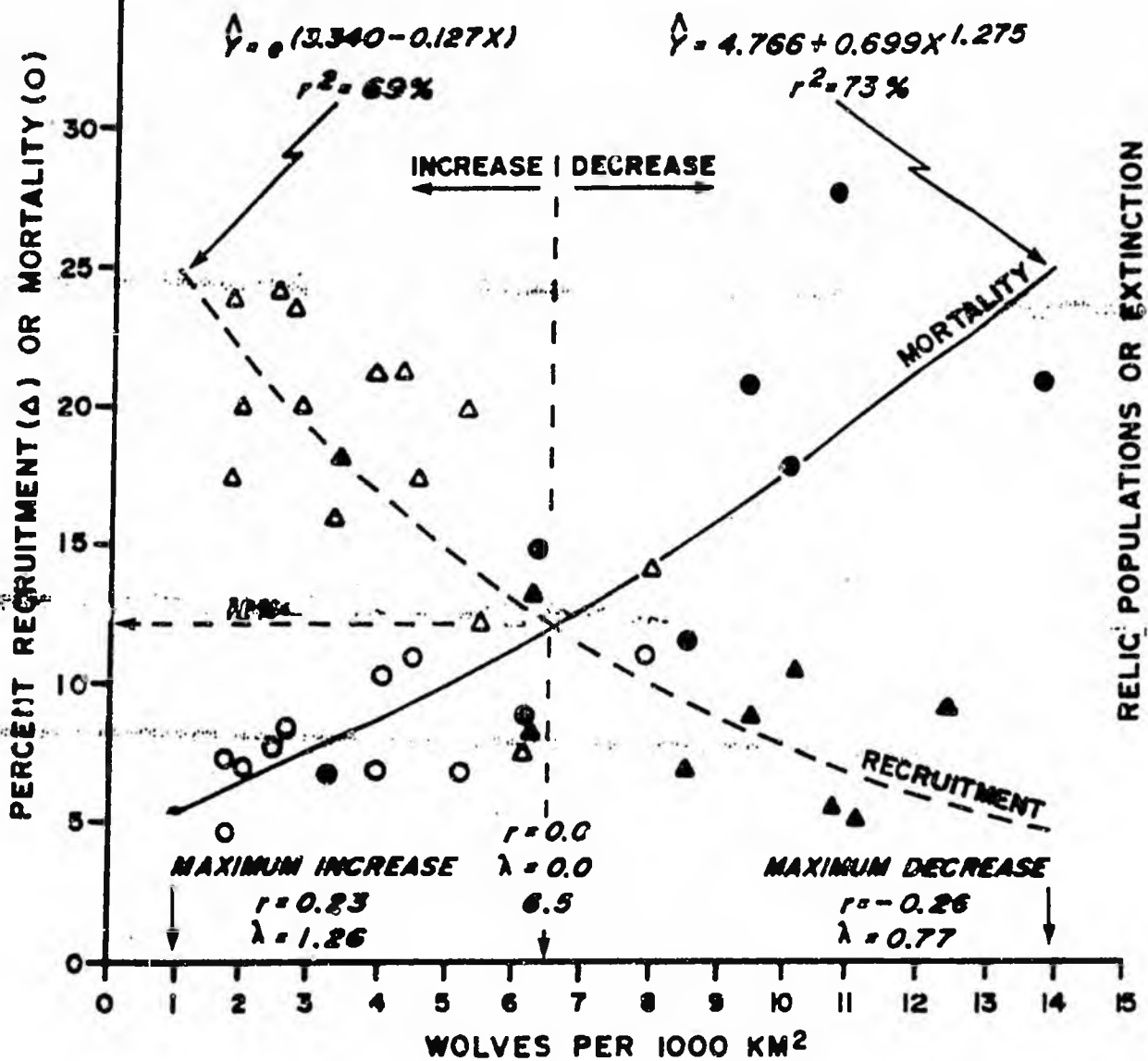


○ MORTALITY, n = 18

OPEN SYMBOL = TUNDRA

△ RECRUITMENT, n = 23

CLOSED SYMBOL = WOODLAND



THE NORTHERN LINE

"Behind is a forest that goes to the Arctic ...
And here we must draw our line."

Gary Snyder



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National Parks:

Management decision process review

by Randy R. Rogers

Decisions on the management of Alaska's National Parks are currently being made through several different processes. The General Management Plans will soon be finalized; Subsistence Hunting Plans are being proposed; wilderness recommendations are being formulated; Environmental Impact Statements on mining in three parks are underway; and final regulations on cabins within parks have been released. The outcome of each of these programs is vitally important to protection of the conservation values of Alaska's National Parks.

This article gives a brief rundown on the major activities currently taking place within the National Park Service (NPS) that will guide the management and protection of Alaska's National Parks. For more information on any of these topics, please call or write the Northern Center.

General Management Plans

The General management Plans (GMP) for Alaska's National Parks should be finalized and signed within the next few weeks.

According to a recent NPS memo from the Washington D.C. office to Alaska Regional Director Boyd Evison, the NPS does not have the authority to prohibit recreational use of snowmachines and motorboats in Alaska National Parks. The memo indicates that the NPS must pursue congressional legislation to protect wilderness values from the proliferation of such use. This position is contrary to Title XI of the Alaska National Interest Lands Conservation Act



CHARLIE OTT

(ANILCA), and directly contradicts the final regulations implementing Title XI which have just recently been released.

The Gates of the Arctic National Park and Preserve GMP will be changed to allow recreational use of snowmachines and motorboats throughout the park. This plan revision runs counter to a large number of public comments on the plan, many of which were submitted by members of the Northern Center. On the positive side, language in all the GMPs will be revised to clarify that recreational use of off-road vehicles is prohibited off established roads or designated routes.

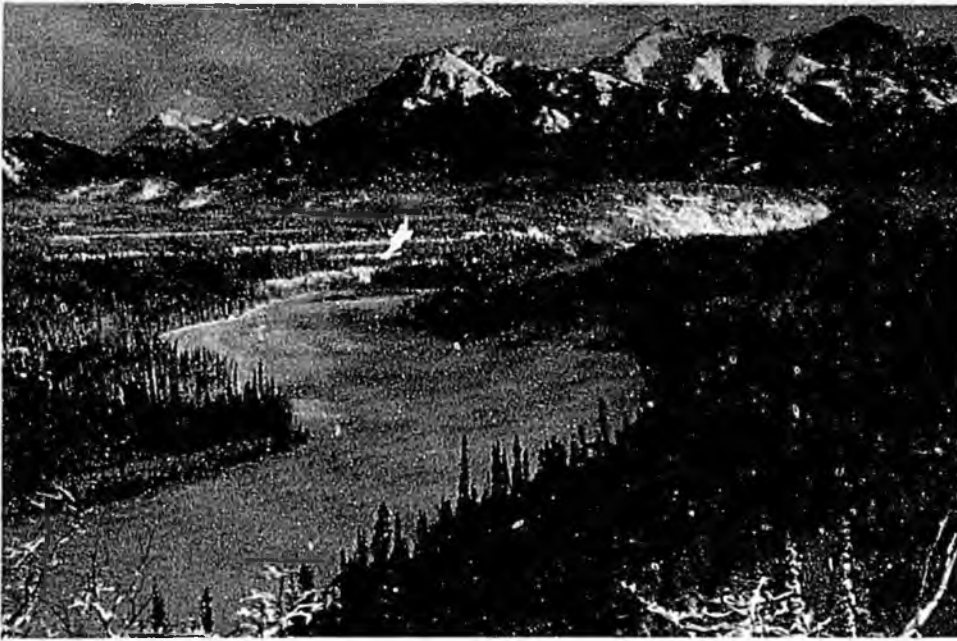
Subsistence Hunting Plans

In each of the parks where subsistence hunting is authorized by

ANILCA, a subsistence resource commission is charged with the duty of preparing a subsistence hunting program for that park. The Secretary of the Interior is required to promptly implement the program unless he or she finds the program threatens conservation of healthy populations of wildlife or is contrary to the purposes for which the park was established.

The Northern Center has been actively involved in the discussions of the Subsistence Resource Commission for Gates of the Arctic National Park. We have encouraged the commission to steer away from advocating parkwide use of all-terrain vehicles for subsistence purposes. We have supported attempts to negotiate a land exchange

Parks continued on page 3



No more wilderness:

Policies defy Congress

by Randy R. Rogers

It has been several years now since James Watt left his post as Secretary of the Interior. During this time there has been little or no change in the policies he established. The Department of the Interior, under the guidance of Donald Hodel and his Alaska ax-man, Bill Horn, continue to subvert the intent of Congress in the implementation of the Alaska Lands Act.

One of the most outrageous examples of this abuse of power is the policy currently applied by Interior regarding wilderness review in Alaska. During Watt's reign a policy was issued, and still remains, forbidding the BLM to consider any further wilderness review not specifically required by ANILCA. In March 1985, the director of the Fish and Wildlife Service issued a memo instructing the Alaska region to only consider minimal wilderness recommendations in the refuge planning process. Most recently, Bill Horn wrote a memo to the director of the National Park Service instructing the Park Service to adopt essentially the same anti-wilderness policy for the wilderness review process that is being applied in the National Wildlife Refuge planning process.

The "no more" wilderness policy is based on the premise that since Congress conducted an exhaustive

wilderness review during the Alaska Lands Act debates, only minor boundary adjustments or small additions with unique characteristics should be made.

This directly contradicts Section 1317 (a) of ANILCA, which states: "the Secretary shall...review, as to their suitability or unsuitability for preservation as wilderness, all lands within units of the National Park System and units of the National Wildlife Refuge System in Alaska not designated as wilderness by this Act..." It is ludicrous to suggest that Congress could have accomplished a thorough wilderness review during the ANILCA debates, given the number of devious issues which had to be dealt with in order to pass the legislation.

Conservationists who fought to see portions of Alaska protected through the Alaska Lands Act must wonder how long Congress will tolerate disregard of the law by Interior. We must hope that this abuse of power will be accompanied by a major backlash to rectify the situation.

The Northern Alaska Environmental Center would like to suggest

CORRECTION

Apologies to Liz Peltola and Malcolm Rogers, whose names were incorrectly rendered by the editor in the last issue of *Northern Line*.

wilderness designation of the Arctic Refuge coastal plain as the 2x4 to hit the mule between the eyes. Affirmative action by Congress on this issue will surely gain the attention of Interior, industry, and all those opposed to conservation of Alaska's wilderness. In this manner Congress can convey the message that when ANILCA was passed, there indeed was a serious intent to protect the Alaska wilderness legacy for future generations.



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of
Arctic and Interior Alaska

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Letters should bear the writer's signature, but names may be withheld upon request. We reserve the right to edit letters to fit space requirements.

NAEC is a nonprofit, educational organization dedicated to the preservation of the environment of the Arctic and interior Alaska and the wise management of our natural resources.

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Alaska bull moose in winter.

CHARLIE OTT

PARKS

continued from page 1

to resolve subsistence access questions in the Anaktuvuk Pass area, while at the same time, insisting on protection of park values.

Recommendations of the subsistence resource commissions have varied widely, from encouraging the NPS to establish permit programs to limit eligibility of new residents, to advocating aerial wolf control and aircraft access for subsistence purposes. According to NPS officials, any recommendations accepted by the secretary which are not allowed under existing regulations must undergo a formal rule-making process, including public hearings, before they can be implemented. We will inform Northern Center members when public comment opportunities are scheduled for proposals which threaten the integrity of the parks.

Wilderness Recommendations

The NPS has recently initiated preparation of recommendations for wilderness designations for non-wilderness portions of Alaska's National parks. The GMPs just being completed include an assessment of which lands within the parks are suitable for wilderness designation. The wilderness review process now underway will determine which lands declared "suitable" for wilderness will actually be recommended by the Secretary of Interior for congressional wilderness designation.

Until recently the NPS wilderness

review was looked upon as the most promising opportunity for major wilderness additions since passage of ANILCA. The NPS considers 17.9 million acres of nonwilderness lands suitable for designation. A September memo issued by Assistant Secretary for Fish and Wildlife and Parks, Bill Horn, instructs the NPS to focus on unique resources or characteristics that may have been overlooked by Congress. Horn states: "In view of the thorough review conducted by Congress, I would not anticipate there to be a significant amount of land proposed for wilderness designation."

Notwithstanding the biased policy direction given the NPS by the Department of Interior, the Northern Center supports major wilderness additions in Alaska's National Parks. Wilderness designation provides the greatest possible protection to the outstanding natural characteristics for which the parks were established. Maps outlining different NPS wilderness alternatives in each park are available at the Northern Center office. Public hearings on the NPS preferred alternative will be scheduled sometime in 1987. It will be important to establish a strong record of public support for wilderness so that Congress may make significant wilderness designations, despite the recommendations of the Secretary of the Interior.

Mining in the Parks

As a result of the lawsuit filed by Sierra Club Legal Defense Fund on behalf of the Northern Alaska En-

vironmental Center and other environmental organizations, the NPS is required to prepare Environmental Impact Statements on the cumulative effects of mining in Denali, Yukon-Charley, and Wrangell-St. Elias National Parks and Preserves. Through this process the NPS intends to prepare comprehensive mineral management plans for mining in each park. Scoping meetings took place this fall and public hearings on the NPS preferred alternatives will occur in 1987. This October, the 9th Circuit Court of Appeals upheld the decision of the Alaska District Court, once again ruling in favor of the environmental organizations.

NPS Cabin Regulations

Final regulations concerning the use of cabins in Alaska National Parks have recently been released. While these regulations include some improvements over previous drafts, significant deficiencies still exist. The final regulations continue to provide for legitimizing trespass that occurred between 1973 and 1978 when the areas were withdrawn from entry. The regulations are still being reviewed by the Northern Center and other environmental groups.

What You Can Do

We cannot afford to be intimidated by the onslaught of plans and regulations which have deluged the Alaska conservation community since the passage of ANILCA. Proposed regulations become so complicated in some instances that dealing with them may be better left to professional environmentalists and attorneys. But in the majority of situations, the input of individual citizens is more important than that of professionals, and has a greater effect on the outcome.

If each person concerned with the future of Alaska's wildlands can choose one conservation unit or one particular issue to concentrate on, the tasks before us can be broken into more manageable, less overwhelming portions. It is relatively easy for the average citizen to become involved in issues such as the NPS Wilderness Review. In this case, an opinion expressing support for wilderness is just as valuable as an analytical comment.

The Northern Center encourages its members to adopt an issue or area on which to focus. The staff will be happy to provide information or assistance in any way we can.

Where to recycle in Fairbanks

by Betsy Chronic

The old newspapers are taking over the arctic entry and the aluminum cans have rattled around the back of your truck for over a month. What are you going to do with them? Here are some answers. No doubt our list is incomplete. Please let us know of other locations and options.

Newspapers

At present these are collected by the Boy Scout Varsity Team 4. The only drop site is the Box Boy on Chena Pump Road. If you have a large amount, call them at 479-0037 and they will pick it up. Please bag or bundle the papers and keep them free of trash.

Computer Paper and Waste Paper

The Boy Scouts will also take non-glossy, non-waxed computer paper and used paper, like stationary and cereal boxes, at the Box Boy collection point, or you may call them for a large pick up. Please bundle or bag and keep free of trash.

Aluminum

K & K Recycling, 8.5 mile Old Richardson Highway (488-1409) currently pays \$.14/pound for aluminum. Several local non-profits are collecting aluminum to help raise money for their organizations. Drop sites are located at 726 17th Ave., outside the Market Basket store at Gavora Mall, and on the side of Fred Meyers. In addition, the Arctic Audubon Society collects aluminum at their monthly meetings and the first grade class at Weller Elementary School is in the business. Aluminum should be free of trash and bagged in plastic bags.

Batteries

Alaska Battery Enterprises Inc., at 157 Old Richardson Highway, (452-2202) will pay \$.25 for your used car battery. If it leaks, please wrap it up.

Used Oil

Dumping of waste oil (such as on the ground, into rivers and ponds or into the sewer system) is unsafe and illegal. The Fairbanks North Star Borough landfill on the South Cushman Extension (452-7290) will accept waste oil. It is kept in a storage tank and hauled to Anchorage, where it is used for

heating. Less than five gallons is free, amounts above that cost 35 cents a gallon. K & K Recycling will take used oil for 40 cents a gallon.

Brass, Copper, Steel, Iron

K & K Recycling will pay for these materials. Call for current prices.

Junk Cars

The Fairbanks North Star Borough no longer hauls away junk cars. The landfill will accept them.

Hazardous Waste

Currently the state of Alaska does not have a permanent hazardous waste management facility. The Alaska Department of Environmental Conservation is working on identifying potential sites and technologies for handling

hazardous waste. Borough residents can take advantage of Spring Clean-up Day for disposing of household hazardous wastes (Borough Environmental Services, 452-4761). For more information on what is hazardous and how to handle these materials, contact the Alaska Department of Environmental Conservation (452-1714).

Each of us generates waste on a daily basis. Recycling is one way of reducing the amount of waste that we need to handle. Basic separation of waste materials in our homes is the first step, proper disposal comes next. Alaska is having to deal with increasing amounts and types of waste and each of us has a role in making sure that it is done in a safe and sound manner.

Power from the people: least-cost energy



According to alternative energy producers, Alaska's utilities have used only a few supply-side resources such as gas, hydro, diesel, and coal to provide electric service, although there are many other resources available.

Power From the People (PFP) is a group whose goal is to catalyze a shift in Alaska's energy policy toward a least-cost planning strategy. The Northern Center is one of five organizations involved in this project.

Under the least-cost planning strategy, all types of supply- and demand-side resources are considered. Demand-side resources include techniques to decrease current and future electrical consumption.

In terms of delivered services, a lighting efficiency program that saves forty megawatts of electricity is equivalent to building a forty-megawatt power plant, according to John Hines, PFP coordinator. The criteria for judging which resources provide the best electrical service is least cost.

To illustrate the savings potential of energy efficiency, PFP has completed what is known as an avoided cost study. The study compares the cost-per-kilowatt of reducing energy demand by using more efficient commercial and industrial lighting techniques with the cost-per-kilowatt of satisfying energy demand by building and operating an electrical generator powered by natural gas.

To compare energy efficient lighting and a gas-fired generator, the PFP study looked at energy costs and capacity costs. Energy costs include fuel (about 90 percent) and variable operating and maintenance costs. The energy efficient lighting techniques have an advantage over a generator in the area of energy costs because lighting techniques have no fuel cost.

Capacity costs are the costs paid by the utility to produce a kilowatt over the useful life of the gas-fired generator, or efficient lighting techni-

continued on page 4

Power

continued from page 4

ques. The study found that in the area of capacity costs, lighting techniques are again less costly than those of the generator.

The cost of each kilowatt produced by the generator over its useful life is \$56.81, while the cost of a kilowatt produced by lighting techniques is \$52.66. The \$4.15 difference in the cost of a kilowatt produced by each method becomes a \$3.3 million difference for the production of forty megawatts.

The PFP study also illustrated how a lighting efficiency program benefits both consumers and utilities. The study reports that consumers who participate in a lighting efficiency program will enjoy lower electricity bills with no loss of comfort or welfare. As an example, Hines pointed to the energy audits performed on the Anchorage school district. Savings of over one million dollars a year were found. This type of savings can be extrapolated to every city or village in the state.

According to Hines, lighting efficiency benefits to a utility are best perceived when the utility needs new energy. The avoided costs of implementing a lighting efficiency program as opposed to other resources can be substantial. A lighting program has been shown to be a low-cost, if not the lowest-cost, available resource. Also, an efficient lighting program can be implemented in incremental amounts, allowing the increase in electrical demand to be precisely correlated with energy savings. Utilities will not have unused or idle power plants.

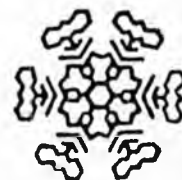
The PFP group believes that lower capital costs and incremental installation gives utilities a lower risk factor. This in turn is reflected back to the consumer through lower electrical rates. This enhances a utility's economic stability. After all, utilities exist to provide reliable energy services at the lowest possible cost. Least-cost energy planning helps them to attain this goal.

For more information contact John Hines at 278-3661.

This article first appeared in "ACAP Update," the newsletter of the Alaska Consumer Advocacy Program, a project of the Alaska Public Interest Research Group, 513 W. 7th, Anchorage, AK 99510.

Yes you can . . .

renew your own commitment to the north,



Enclosed is my tax-deductible check to:
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- Family \$35
- Donor \$100
- Friend of the Center \$250
- \$500
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encourage a friend to join, and remember someone this year with NAEC membership.



I would like to give a gift membership in NAEC to:

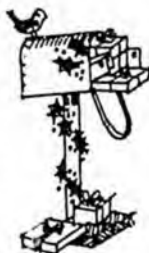
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- Family \$35
- Donor \$100
- Friend of the Center \$250
- \$500
- Friend's Pledge \$20/month
- Other \$ _____



Refuge update:

Comments due on management policies

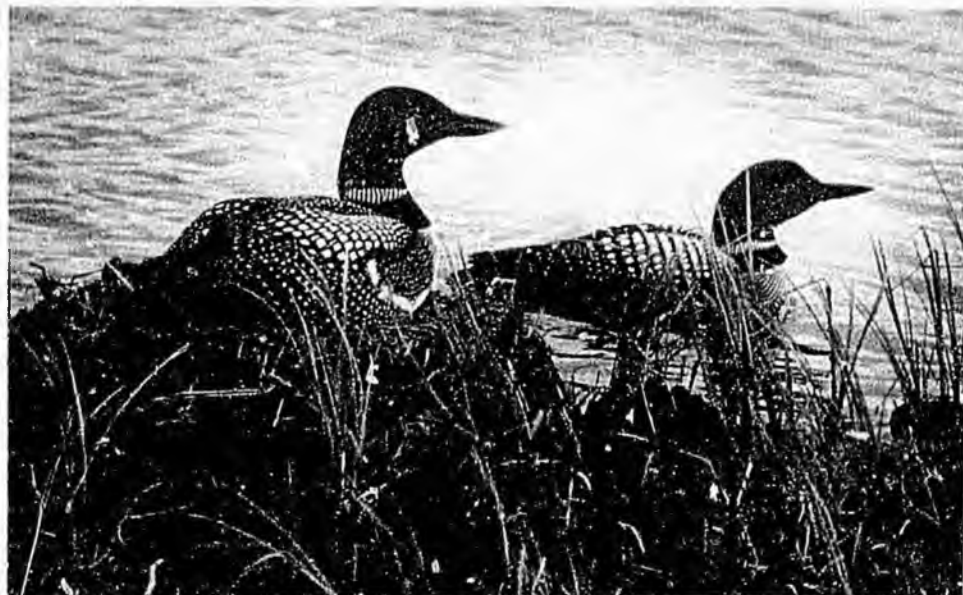
by Larry Sutton

If the draft Comprehensive Conservation Plans that have recently been issued for several National Wildlife Refuges (NWR) are any indication, Alaska already has all the refuge wilderness acreage it's ever going to get.

Public comment periods end for the Nowitna and Selawik National Wildlife Refuges December 24, 1986, and for the Koyukuk National Wildlife Refuge January 20, 1987. All are administered by the U.S. Fish and Wildlife Service (FWS) in western Alaska. The Nowitna refuge lies south of the Yukon River, east of the village of Ruby, and has more than 2 million acres of land within its boundaries. The Selawik refuge is east of Kotzebue, south of the Kobuk River, and contains over 3.2 million acres of land, although only 65 percent of that acreage is in undisputed Federal ownership.

The namesake rivers of both refuges were designated as National Wild Rivers by Congress when it passed the Alaska National Interest Lands Conservation Act (ANILCA) in 1980. The Koyukuk NWR consists of nearly 4.5 million acres north of Galena, but the plan also covers 750,800 acres of the Kaiyuh Flats area east of Galena, currently part of Innoko NWR.

These refuges have all the characteristics of true wilderness: vast tracts of undeveloped land where the laws of nature prevail, where people may visit to enjoy primitive recreation and solitude or provide for their own subsistence. Wildlife is varied and abundant on these refuges. The Selawik Refuge is an important migration and



Common Loon at nest.

CHARLIE OTT

wintering area for the Western Arctic Caribou Herd, with many of its 200,000-plus animals moving through the area each fall and spring. The refuges are breeding grounds for hundreds of thousands of waterfowl, from Trumpeter Swans to Arctic Loons. Salmon, sheefish, and whitefish spawn in the rivers. Moose, black bears, and brown bears thrive in their as yet unspoiled habitats. Until now, the remoteness and inaccessibility of these areas has ensured their preservation as de facto wilderness.

There are many potential threats to these refuges. The Selawik plan contains scenarios for oil and gas production and construction of a transportation corridor across the refuge. Although the Selawik plan finds gas production and pipeline construction to be incompatible with the purposes for which the refuge was established, FWS could not decide about a possible 125-mile road through the refuge. They can't make a compatibility determination yet about a road that would take 350 people two years to build, and require up to 600 million cubic yards of material. Perhaps a name change would help: Selawik National Gravel Pit (and Wildlife Refuge).

The Nowitna plan explores the possibility of commercial timber production on islands in the Yukon River; off-refuge mining threatens water quality. The Nowitna refuge contains excellent moose and black bear habitat, while furbearers such as marten, beaver, wolf, mink, otter and wolverine provide the basis for a healthy subsistence trapping

economy. People from the villages of Galena, Ruby, and Tanana all use the refuge for various subsistence purposes.

The Koyukuk refuge probably receives the heaviest subsistence use of any of these three refuges, with people from the villages of Huslia, Galena, Koyukuk, Nulato, and Kaltag using the refuge extensively for subsistence. Here Fish and Wildlife faces the problem of balancing increasing subsistence demands (as village populations rise) with increasing non-local use, while at the same time conserving fish and wildlife populations and habitats in their natural diversity. Water quality on this refuge is also threatened by placer mining.

ANILCA allows for oil and gas exploration on wildlife refuges in Alaska. Such exploration, particularly seismic testing, will adversely affect the wilderness values that the Fish and Wildlife Service claims to be protecting under their "no more wilderness" policy. The environmental consequences of explosions, habitat alteration, garbage dumps, accidental fuel spills, and other impacts associated with exploration seem a high price to pay for assessing the oil and gas potential of areas that are not expected to contain much in the way of commercially viable deposits. One benefit of wilderness designation is that it prohibits surface-disturbing activities such as seismic testing and oil and gas development.

When ANILCA established these three refuges in 1980, some portions were also designated as components

of the National Wilderness Preservation System (NWPS). In the Koyukuk NWR, 400,000 acres were set aside as wilderness, while 240,000 acres of wilderness were designated in the Waring Mountains of Selawik NWR. This 640,000 acres of wilderness constitutes a paltry 6 percent of the acreage of these three refuges.

The contention that Alaska already has enough wilderness is made laughable by such statistics. Obviously, Congress realized in 1980 that other lands in Alaska were deserving of preservation as units of the NWPS, or it would not have included a provision of ANILCA requiring the Fish and Wildlife Service to conduct a wilderness review of all refuge lands in Alaska. Wilderness designation of refuge land would, in the words of FWS itself, "maximize the protection of natural values and fish and wildlife populations and habitats."

Draft plans such as the ones now out for Selawik, Nowitna, and Koyukuk refuges contain outlines of several management alternatives, with one of these designated as the Fish and Wildlife Service Preferred Alternative. All of the plans are supposed to incorporate a wilderness review and subsequent recommendations for congressional wilderness designation. Not a single one of the 10,519,300 acres reviewed by these plans is proposed for wilderness designation under the Fish and Wildlife Service Preferred Alternatives (also known, accurately, as the "no action alternative").

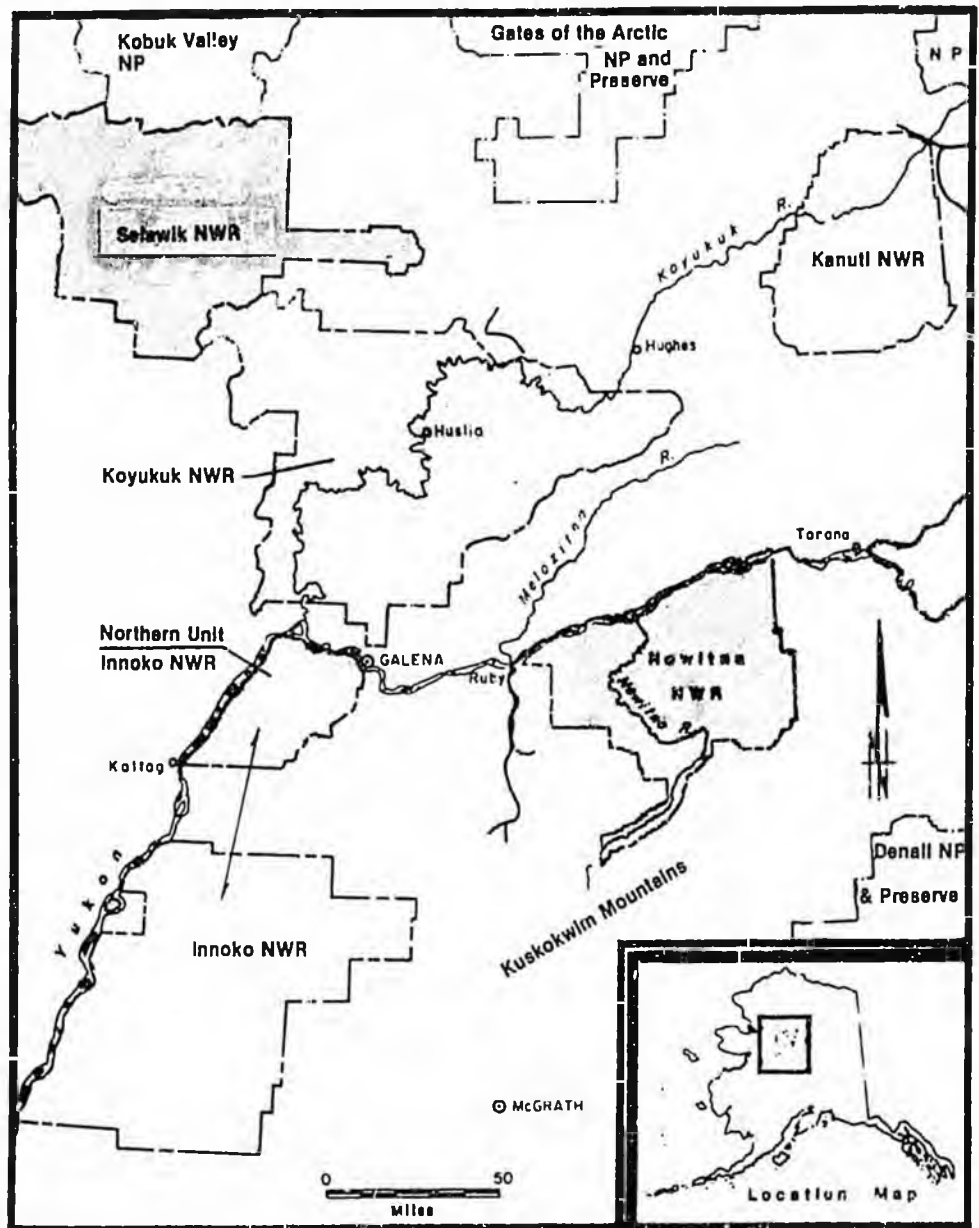
The lack of acreage to be proposed for wilderness designation is quite remarkable, in view of the many millions of acres considered "suitable," even by Fish and Wildlife's restrictive definitions. Only a bureaucratic directive from the rarefied top could so stymie the intent of Congress in ANILCA. The Fish and Wildlife Service claims it can protect the wilderness values of its refuges without congressional designation by placing lands in a Minimal Management category. This claim lacks credibility in view of the current situation on the Arctic National Wildlife Refuge.

While the Northern Center would like to see all the acreage of these refuges designated as wilderness, we also have our own minimum acceptable wilderness proposal. For the Selawik and Koyukuk refuges, wilder-

ness designation of approximately the eastern third of Selawik, along with designation of the Purcell Mountain unit of Koyukuk, would create a contiguous wilderness area stretching from the Nogahabara sand dunes east of Huslia to the Kobuk River. The minimum acceptable wilderness recommendation for the Nowitna refuge is the Nowitna River unit. Wilderness designation of this area would ensure protection of the wilderness values of the Nowitna Wild River. The Nowitna meanders radically, altering its bed on an annual basis. Wilderness designation would protect Nowitna's Wild River values even if it meanders out of its present Wild River Corridor.

Another effect of ANILCA was to ensure the continuation of subsistence uses of public lands. Machinery such as snowmobiles and motorboats may be used for the purposes of subsistence hunting, trapping, woodgathering, and so on. Other means of surface transportation may be employed, provided they were traditionally used for subsistence prior to 1980.

NAEC director Randy Rogers and other conservationists recently met with Robert Gilmore, Fish and Wildlife regional director for Alaska. In that meeting, Gilmore acknowledged that while subsistence use of ATVs is limited by ANILCA to areas where the *Refuge continued on page 8*



Location of Koyukuk Refuge and the northern unit of Innoko Refuge.

ANWR—the “unimproved” experience

by Roger Kaye

“An experience in the Arctic National Wildlife Refuge is one you must search out yourself,” states the form letter the U.S. Fish and Wildlife Service sends potential visitors to the refuge. “You will find no packaged trip plans nor trail maps pointing the way....perhaps more than anywhere in America, the Arctic National Wildlife Refuge is a place where the sense of unknown, of horizons unexplored, of nameless valleys remains alive.”

Opportunities for self-reliance, independence, challenge, discovery and adventure—finding one’s own way in a setting unsurpassed in beauty and vastness—make the Arctic Refuge a unique recreational experience. Refuge visitors can enjoy climbing a nameless peak and looking upon a pristine and undisturbed portion of the world from a perspective perhaps no one else has shared. The mystique owes its existence to the absence of recreational “improvements”—no campgrounds, signs, trails, visitor

REFUGE

continued from page 7

use is traditional, the FWS has no criteria to define traditional use, and currently assumes all ATV use in refuges is traditional.

This is another blatant example of FWS ignoring ANILCA mandates to the detriment of refuge lands. The common misconception that wilderness designation would prohibit or restrict hunting and traditional access has been responsible for much opposition to wilderness in the past—the opposition coming, ironically, from those people who have the most to gain from added legal protection of natural resources.

The public comment periods now open for these draft comprehensive conservation plans are your opportunity to provide input to the Fish and Wildlife Service about how you would like to see Alaskan refuges managed. To obtain copies of the draft plans, or to submit written comments, write to the U.S. Department of the Interior, U.S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, AK 99503, Attention: William Knauer. For more information, stop by the Northern Center at 218 Driveway in Fairbanks. Your involvement will make a difference!

cabins or facilities; no brochures featuring attractions or handouts pointing the way.

At the extreme end of the paved-to-pristine spectrum of the nation’s conservation areas, the Arctic Refuge is not a convenient place to visit. As the letter reminds potential visitors, the rare qualities of the Arctic Refuge place the symbolism of real wilderness before the visitor, not as an abstract image, but as decisions with consequences.

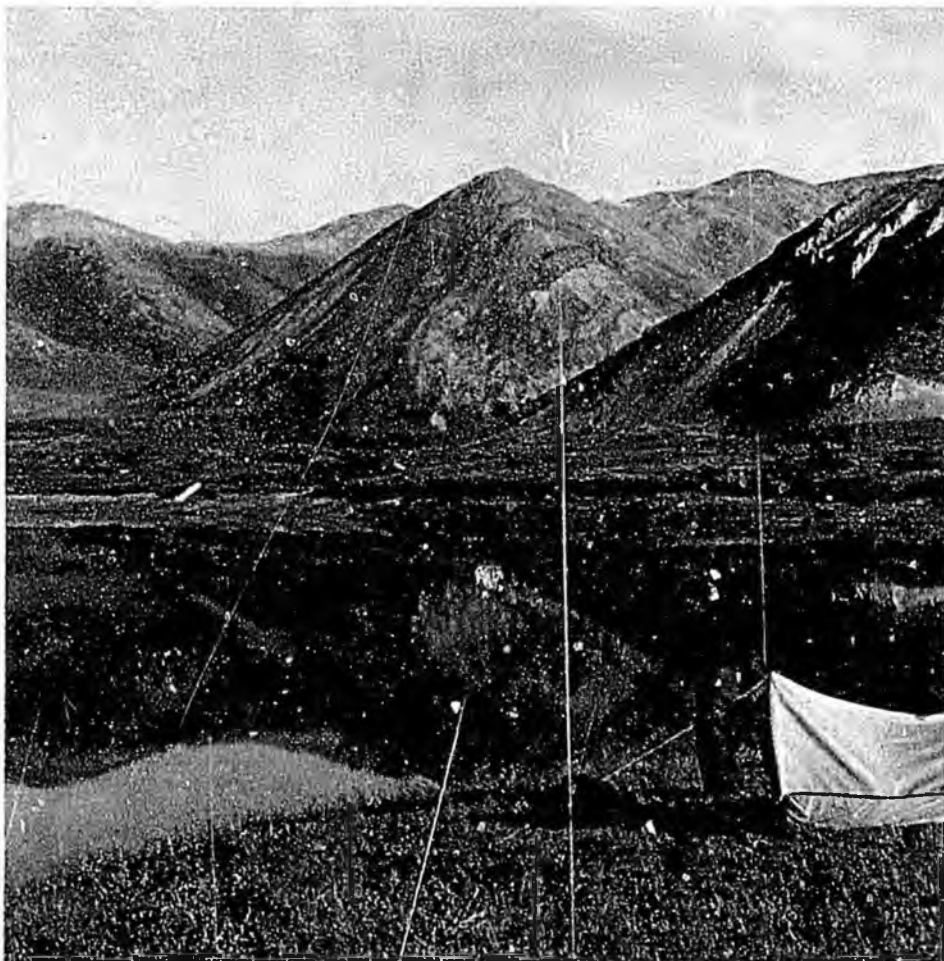
“Be aware that where the wild has not been taken out of the wilderness, there are risks. Where freedom, discovery and exploration prevail, experience and self reliance are required.”

For those who seek this most authentic condition of wilderness, and who are willing to make the necessary mental, physical, and material preparation, the refuge offers a variety of trip options.

Numerous rivers on both the north and south slopes of the Brooks Range

can be traveled by canoe, kayak or raft. Trips can be made in as little as eight days, but most take two weeks. Journeys from the Yukon River across the range to the Arctic Ocean can take an entire summer. There is an infinite variety of backpacking routes available. Short day hikes can be made from a fly-in base camp. More arduous two- or three-week treks can be made along rivers or across the divide, either by foot or on cross-country skis in spring. Mountains and glaciers offer both technical and non-technical opportunities.

The Arctic Refuge does not and should not provide for every type of recreational use. Those who desire a more casual and convenient experience would be better served by one of the many other conservation units in the state. For those who seek what the visionary Olaus Murie described as “the use of wilderness as wilderness, not as make believe,” there can be no finer opportunity than the Arctic National Wildlife Refuge.



The wilderness features of the Arctic are its most important resource to man.



From the woodpile

by Ginny Hill Wood

I guess the following ramblings could be titled "In Defense of Bleeding Hearts."

The other day I got to musing on the news stories about the surging Hubbard Glacier in southeastern Alaska, and attempts of members of the Whale Museum on San Juan Island in Washington state to rescue the sea mammals trapped in the newly formed land-locked lake. Until the glacier dammed it, the lake was a saltwater inlet. This sudden transport of glacier ice and till created a barrier across Russell fjord behind which meltwater was rapidly changing the seawater to fresh water—a condition that would eventually mean certain extinction for the eighty seals and twenty-five porpoises impounded there.

Like the publicity given the efforts to get Humphrey the Whale headed back downstream to San Francisco Bay after he took a wrong turn up the Sacramento River, the attempts to help the seals and porpoises get back to the ocean tugged at the heart strings of many readers. But not all.

Most biologists considered the project futile and a waste of time and money (albeit, entirely financed by private donations). They felt nature should be left to take its course (a reversal of Department of Fish and Game guidelines that wildlife is a crop to be harvested for man's benefit, to be managed and manipulated for the maximum yield of the "good" animals at the expense of the "bad" ones—i.e., moose versus wolves).

Fishermen in the area derided the whole endeavor. Seals and porpoises ate fish and were therefore varmits to be exterminated anyway. The residents of nearby Yakutat were more concerned over what would happen to their fishery if the rising waters behind the dam drained off down the Situk River. They were also amazed and amused by the sudden influx of journalists from news syndicates all over the country who jammed the small town's meager hostelry facilities vying to cover the story. Local bush pilots reaped unexpected profits providing aerial views of the situation. Larry Mayo, a Fairbanks glacier geologist with the US Geological Survey, sat gleefully perched in his camp overlooking the scene, waiting to witness and record for science whatever the denouement of this drama of Nature might be.

Meanwhile, back at the dam, a few seals rescued themselves by flopping over the ice and rubble barricade to the saltwater below. Poor weather, lack of funds, and a shortage of aircraft to provide the airlift, coupled with lack of expertise in just how to go about snaring the porpoises stalled the rescuers.

Nature solved the matter in favor of the sea mammals (and the Situk River fishery) when the rising waters breached the dam, spewing icebergs, debris, and the seals and porpoises

out to sea. Russell lake is now a saltwater fjord again, at least for the time being. If the Hubbard Glacier continues to surge, the whole geological process could be repeated again, perhaps with a different ending. For now, the headlines are back to the usual—politics, international atrocities, and the economy. And Larry could come back to Fairbanks to help wife, Gail, with the fall chores.

I guess I have to applaud the efforts of the "do-gooders" in their attempts to save the critters, futile and unnecessary as their efforts may have been. I know one must never anthropomorphize if you want any credibility in wildlife matters. But in this troubled world where so much money, effort, intrigue, and propaganda goes toward perpetuating man's inhumanity to man, to say nothing of his fellow creatures—be it with bullets, time bombs, ballistic missiles, or pesticides—I cannot deride or censure those who try to save a few beasts as well as beings.

We could do with more "bleeding hearts" in these unstable times of self-proclaimed "practical realists." And who is to say which of us is misguided.





the kitchen sink

We are working diligently to find new NAEC members. One way to do this is for you to organize a gathering of people, perhaps a potluck dinner, and invite the NAEC staff to talk about the Northern Center and issues. We can't grow without your help.

Wondering when your membership expires? Check the month and date on the mailing label on your newsletter.

Membership Drive continues—we're working on our goal of a 15 percent increase and we need your help. Please renew your membership and encourage a friend to join. A gift membership will make a great present this holiday season, forms are in this issue.

The Alaska Environmental Lobby welcomes **Gail Gatton** as the new Executive Director. We look forward to working with her this next session.

Notable quotables: At the conclusion of Stuart Udall's recent lecture, after several questions by local placer miners, Bob Weeden closed the evening by saying, "I hope you will join me in applauding the placer miners who created Alaska, we used to give God credit for that."

In the 1986 voter information pamphlet, Senator Frank Murkowski notes that he is a member of the Alaska Conservation Society. So that's how Frank keeps in touch with the environmental concerns in the state. Guess he doesn't realize ACS disbanded in 1980.

A big Thank You to our loyal volunteers: Marilyn Kosick, who was our membership coordinator for over a year, Larry Sutton, Bob Lance,

Laura Jacobs, Tamiko Gross, and Betsy Chronic.

Refuge Plans: written comments on the Selawik and Nowitna refuge plans are due by Dec. 24, 1986. There will be a public hearing on the Koyukuk refuge plan Dec. 10, 7 p.m. at the Noel Wien Library. The deadline for comments on this plan is January 20, 1987.

Arctic National Wildlife Refuge comprehensive conservation

plan is back in the works. There will be a consultation committee meeting on November 25, 9 a.m. in the Federal Building.

Trustees for Alaska has published 67-page guide to wetlands protection in Alaska. This guide is designed to provide a basic introduction to the complex array of laws and regulations that govern activities in wetlands. The guide also provides practical advice on how citizens can participate effectively in government decisions on projects that affect wetlands, and suggests other strategies for wetlands protection as well.

"A Guide to Wetlands Protection in Alaska" is available free of charge by calling or writing Trustees for Alaska, 725 Christensen Dr., Suite 4, Anchorage, AK 99501 (276-4244). Trustees for Alaska is a nonprofit, public interest environmental law firm.



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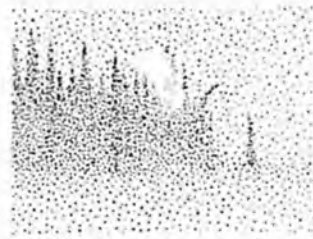
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conservation abstracts

by Florence Collins



U.S. BIRDWATCHERS totalled 83 million in 1980, and they spent at least \$6.6 billion on related transportation, lodging, food, and equipment. In the same year, 42 million anglers spent \$10.2 billion, and hunters spent \$8.5 billion. More than twice as high a proportion of Alaskans are "birders" than people in the Lower 48, and an even higher proportion of tourists to Alaska are birders. Most of the larger Alaskan communities are not aware of the increasing numbers of birders among their visitors. *Alaska Fish and Game*, July-August 1986, p. 24-25.

CORRECTION: The Alaska Conservation Foundation has given away more than \$1 million, not "more than \$1," as stated in the June 1986 *Abstracts*.

WOLVES in the Lower 48 total 12-15 lone wolves in Idaho, none in Yellowstone or the rest of Wyoming, possibly 25 in Montana, of which a pack of 12 recently migrated into Glacier National Park from Canada. Northern Minnesota has perhaps 1,200. A Wolf Recovery Plan is complete, but not yet "approved and implemented" for the northern Rockies. *Idaho Conservation League News*, August 1986, p. 1.

A SUBMERGED LANDS BILL submitted by senators Stevens and Murkowski would make land under non-navigable lakes and rivers not counted in calculating the acreage granted to the state and to Natives as settlement of the Statehood and ANCSA Acts. Under ANILCA these areas were added to the total, but Secretary Watt gave some (out of a possible total of 1-2 million acres to Natives and 4-6 million acres to the state) without

counting it. This allowed them to claim that many more acres of unsubmerged land. Watt's decision was challenged in a lawsuit, but this bill would change ANILCA to "incorporate the Watt formula and preempt any court action." Lands under dispute include protected acreage in refuges, wild rivers, and other conservation units. *Alaska Report*, September 1986, p. 1.

FISHING IN THE NORTH PACIFIC causes what is probably the "most devastating effect" of plastic trash in the open sea. Fishermen from the Orient set out nets that are 28 miles long and 26 feet deep, with a total 20,000 miles of invisible nylon net set each night. An average of 10 miles of net is lost each day, and thousands of miles of deteriorated nets are abandoned or dumped overboard each year. The "ghost nets" collect fish until they sink from the load or are washed ashore. Alaskans have objected to this practice because it catches salmon which then cannot return to spawn. A recent agreement with Japan "will have little effect beyond moving the fishery to inshore waters" and postponing phase-out for five years. The nets plus those from bottom-fish trawling in the Bering Sea are also a major threat to fur seals. Present laws are both inadequate and poorly enforced, and most do not address plastic pollution specifically. Some eight states require biodegradable six-pack holders, others are proposing similar laws, and some firms make biodegradable plastic products; but durability is a major selling point for plastic, inhibiting the use of biodegradable types. *Audubon*, September 1986, p. 18-23.

THE FOREST SERVICE has withdrawn decision notices for roading and logging at Berner's Bay, north of Juneau, and will prepare an EIS for the area. It will take one to two years to complete, and will include a "No Action" option. The service, however, wants the court's injunction against future development lifted; the injunction was requested by conservationists and others to stop construction of a "pre-roading" project and proposed timber sale. *Ravencall*, July-September 1986, p. 3.

GATES OF THE ARCTIC National Park Superintendent Roger J. Siglin, formerly of Canyon de Chelly National Monument, Arizona, has recently replaced Richard Ring, who has gone to Delaware Water Gap National Recreation Area. *Alaska Report*, September 1986, p. 6.

THE U.S. FOREST SERVICE builds and maintains more roads than any other agency in the world. It has built, or permitted building, 350,000 miles of roads in National Forests—nearly 10 times as many miles as there are in the Interstate Highway System. *In Brief*, Summer 1986, p. 1. The U.S. House of Representatives cut road building funds by \$44 million recently, but the Senate Appropriations Committee increased their budget, adding \$75 million to the \$178 million asked for by the administration. The service proposes building 580,000 more miles of roads by the year 2030, and road building has exceeded their own goals for each of the past five years. Conservationists hope to reduce the appropriation by \$142 million before final passage. *National News Report*, August 26, 1986, p. 2-3.

A much more complete set of Conservation Abstracts is available each month from the Northern Alaska Environmental Center, upon request. Contact us if you would like to be added to the mailing list.

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Ned --

Here is some information on the Arctic National Wildlife Refuge from our perspective.

Please do not hesitate to call for more information or clarification of these materials.

We would greatly appreciate a copy of your proposed resolution when you are finished.

Thanks.

Kate Pendleton

THE NORTHERN LINE

"Behind is a forest that goes to the Arctic ...
And here we must draw our line."

Gary Snyder



The journal of the Northern Alaska Environmental Center

Volume VIII, No. 6, December 1986

Action Alert: Oil lease proposal threatens Arctic National Wildlife Refuge

Director's note: This special edition of the Northern Line is designed to encourage public comment on the fate of the Arctic National Wildlife Refuge coastal plain. The issue includes an overview of the refuge, facts about the coastal plain, and detailed information on the contents of the draft 1002 Report. Please take a moment to read through this information and voice your concerns.

YOUR INPUT WILL MAKE A DIFFERENCE.

The Arctic National Wildlife Refuge is our nation's most northern unit of the National Wildlife Refuge System. No other refuge or park encompasses such a continuum of undisturbed, biologically intact, Arctic and Subarctic habitats—from the interior boreal forest and the central Brooks Range, to the coastal plain bordering the Arctic Ocean. No other area protects habitat for so many healthy populations of national interest species, including grizzly and polar bear, caribou, muskox, Dall sheep, wolf, wolverine, peregrine falcon and gyrfalcon. The annual migration of the 180,000 member Porcupine Caribou Herd between the Arctic Refuge and adjacent areas of Canada is considered by many to be the most spectacular wildlife phenomenon on American and Canadian soil.

When the Arctic National Wildlife Range was established in 1960, the action was seen as the culmination of extensive preservation efforts begun more than a decade earlier. In 1980, Congress passed the Alaska National Interest Lands Conservation Act (ANILCA) which increased the size of the range to 19 million acres and renamed it the Arctic National Wildlife Refuge. Eight million acres of the original wildlife range was designated as wilderness. Twice the House of Representatives voted overwhelmingly to designate the coastal plain, the 1.5 million acres wedged between the Brooks Range and the Beaufort Sea, as wilderness. In the Senate version of the Alaska Lands Act, which finally became law, the coastal plain wilderness was deleted.

In its place, ANILCA called for an assessment of the fish and wildlife resources, and the oil and gas potential of the coastal plain. This provision of the law also required the Secretary of the Interior to assess the likely impact of oil and gas development on refuge values and submit a report and recommendation to Congress. This report, required by Section 1002(h) of ANILCA, (hence the name ten-o-two), is now out for public comment before being finalized and submitted to Congress. It is important to keep in mind that

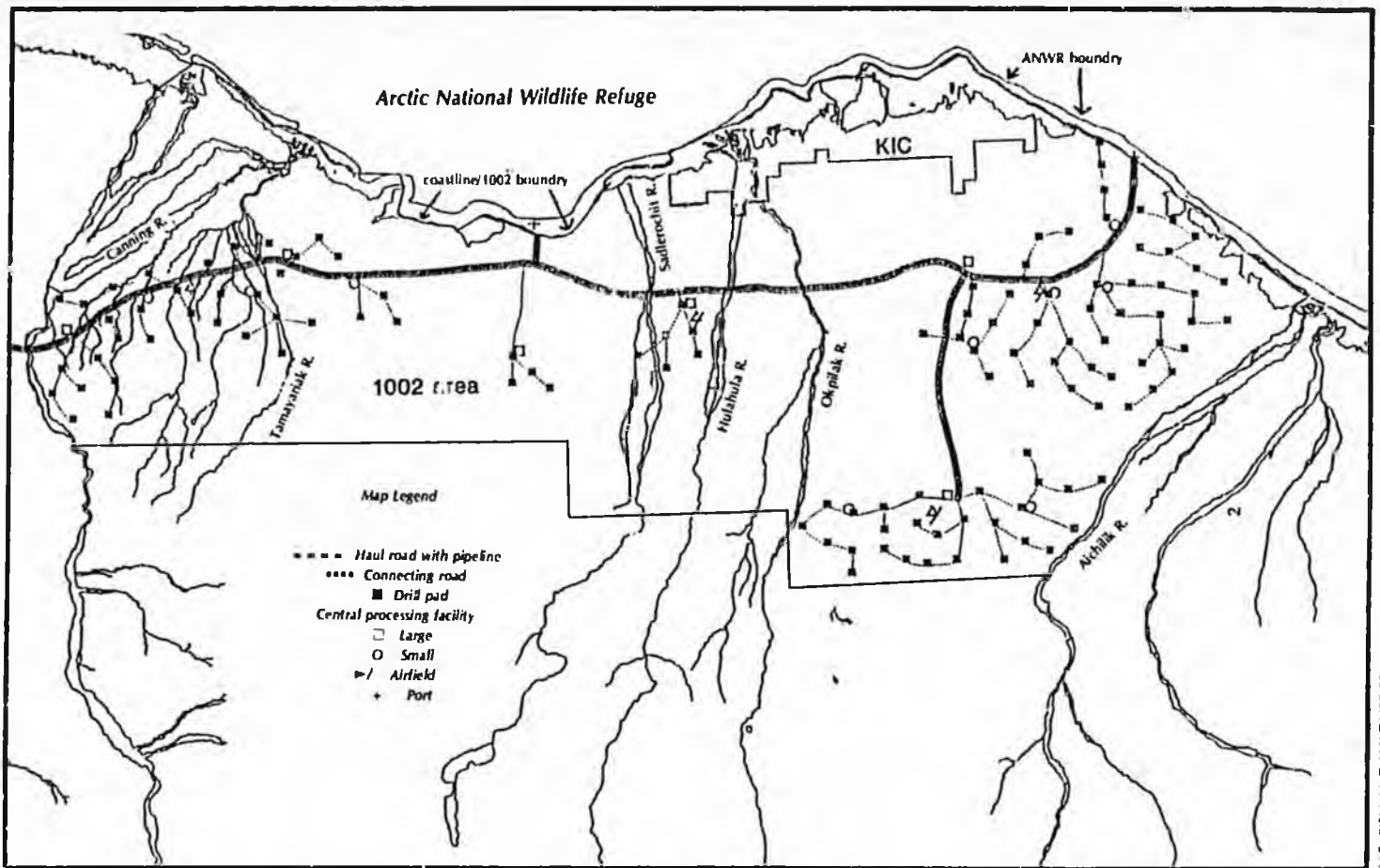
Section 1003 of ANILCA prohibits further oil exploration and development in the coastal plain unless Congress passes specific legislation to open the area for such use.

When the draft 1002 Report was finally released in November 1986, it recommended that the entire coastal plain be opened up for full oil and gas leasing. **The nation is being given a clear choice: preserve intact the unique ecosystem that is the Arctic Refuge, or hack off a crucial chunk of it for environmentally destructive resource development.**

Full oil and gas leasing of the Arctic Refuge coastal plain will completely subvert the purposes for which the refuge was established, which include: a) to conserve fish and wildlife populations and habitats in their natural diversity; b) to fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats; c) to provide the opportunity for continued subsistence uses by local residents, and; d) to ensure, to the maximum extent practicable, water quality and necessary water quantity within the refuge. This basic mandate for management of the refuge should be kept in mind when reviewing the recommendations of the draft 1002 Report.



The foothills of the Brooks Range at the edge of the Arctic Refuge coastal plain.



U.S. FISH AND WILDLIFE SERVICE

Map of the 1002 area and hypothetical development scenario

The 125 mile stretch of coastline along the Arctic Refuge, most of which is in the 1002 area, is the only section of Alaska's 1100 miles of Arctic Ocean coastline that is currently protected from the environmentally damaging effects of oil development.

Impact of alternatives

The draft 1002 report presents and analyzes five management alternatives for the coastal plain. The five options are: 1) full leasing of the entire 1002 study area; 2) partial leasing within the 1002 area; 3) additional oil and gas exploration including exploratory wells (currently prohibited by ANILCA); 4) no action which would include the 1002 area in the refuge comprehensive planning process currently underway; and, 5) federal wilderness designation for the entire coastal plain. Signed by Assistant Secretary of the Interior Bill Horn, **the draft 1002 Report recommends full leasing of the coastal plain for oil and gas production.**

Resources and the Price of Extraction

On the North Slope of Alaska, there are over 23.6 million acres of federal land in the National Petroleum Reserve-Alaska already committed to oil development. This figure does not include the vast oilfields around Prudhoe Bay or state and federal Outer Continental Shelf (OCS) oil leases.

No one knows conclusively how much, if any, oil actually lies beneath the coastal plain. The draft 1002 Report predicts that **there is only a 19% chance that any economically recoverable oil deposits lie beneath the coastal plain.** This 19% chance is called the marginal probability, and makes recoverable oil estimates

"conditional"; that is, based on the rather important condition that there is any oil there at all. It is against this one in five chance for economically recoverable oil that the American public is being asked to sacrifice internationally significant wildlife and wilderness resources.

The rationale provided in the draft report to justify the full leasing recommendation includes the national need for domestic sources of oil and gas and the need to provide for national security. Information included in the draft 1002 Report does not provide sufficient evidence to demonstrate that development of the Arctic Refuge coastal plain would provide enough oil to significantly alter the nation's dependence on foreign oil.

Two kinds of oil resource estimates are frequently made: estimates for oil "in place" (how much oil is down there), and estimates for "economically recoverable oil." Not all the oil in the ground can be extracted, given current technology.

The report presents a range of conditional probabilities of how much oil might be recoverable. Many of the wildly optimistic figures cited by the Department of the Interior in the press are for estimates of oil in place with low probabilities of occurrence. The mean estimate of oil cited in the draft is 3.2 billion barrels with a 40% probability of occurrence. This figure is used in the report as the basis for economic predictions. Using this mean figure, production from the Arctic Refuge under full leasing would equal only

4.17% of projected U.S. oil demand by the year 2005, 2.57% by 2010.

The report bases its economic predictions on optimistically high oil prices of \$33 and \$40 per barrel, while recent oil prices have been in the neighborhood of \$14 to \$18 per barrel. These calculations produce correspondingly high figures with which to bolster arguments relating to the national interest.

Environmental Damage

One reason cited by Assistant Secretary Horn for proposing full leasing is "the ability of industry to minimize damage as learned from oil and gas activities elsewhere in the Alaskan Arctic." From the same report: "Accidental spills of crude oil and refined petroleum products are an inevitable consequence of oil field development."

Since 1972, there have been 23,000 oil spills *that were reported* to the Alaska Department of Environmental Conservation. The largest spill was 658,000 gallons. This does not indicate a good industry track record and represents a serious threat to the fragile life forms of the arctic tundra.

Hazardous waste disposal is another serious problem that remains unsolved: there is currently no permitted hazardous waste disposal site on the North Slope. Studies of reserve pit fluid discharges (which occur at every drill pad) at Prudhoe Bay indicate increases in the levels of heavy metals such as zinc, arsenic, and aluminum. The studies note that "along with deteriorations in water quality, the quality and quantity of organisms used as food by North Slope bird species may be decreasing."

Caribou

The Porcupine Caribou Herd stands as a symbol for this threatened ecosystem. Two extremely critical phases of caribou life history take place in the 1002 area: the calving and post-calving periods. Caribou cows with new-born calves are particularly sensitive to disturbance. During the post-calving period caribou store energy for winter survival; disturbances from human activity can cause stress and energy loss at this crucial time. Also at this time, hordes of insects, mainly mosquitoes, emerge to plague the caribou. To avoid the insects, caribou seek out the windy and cool Beaufort Sea coast. The 1002 area provides the most important calving, post-calving and insect relief habitat for the Porcupine Caribou Herd.

Other Species

The 1002 area also provides essential habitat for a variety of other wildlife species. Muskoxen were exterminated from the North Slope by the late 1800's. Today's healthy population in the 1002 area is a result of a reintroduction in 1969 and 1970. The area provides important habitat as well for wolves, arctic foxes, wolverines, brown bears, and polar bears. One hundred and eight species of birds have been recorded on the Arctic Refuge coastal plain, including the threatened arctic peregrine falcon. Most of these birds nest on the coastal plain, others feed, nest, molt, or prepare for the fall migration on the rich tundra vegetation. As many as 300,000 snow geese, or approximately 50% of the Pacific Flyway population, stage on the coastal plain to prepare for their long migratory flight south. Twelve species of fish frequent the rivers and streams of the 1002 area, while many more species inhabit the waters

It is against this one in five chance for economically recoverable oil that the American public is being asked to sacrifice internationally significant wildlife and wilderness resources.

offshore. In summary, the coastal plain is the most biologically important part of the Arctic Refuge because it provides critical habitat for so many resident and migratory species.

Direct Impacts to Fish and Wildlife

The report projects a "population decline or distribution change for 20-40 percent of the Porcupine Caribou Herd." The report also indicates that caribou may be forced to avoid 72,000 acres of insect relief habitat under full leasing. "Depending upon design, pipelines may create a barrier. Those adjacent to or close to active roadways would probably most impede free movement...This is of particular concern in the 1002 area because the probable pipeline/haul road route would bisect the area," said the report.

"Increased noise and disturbance level displacing wildlife throughout the 1002 area..." is one of the unavoidable impacts listed in the report. Another is direct loss of habitat due to ground being physically covered by structures, roads, and other facilities. Displacement and increased harvest of wolverines, direct loss of moose habitat, direct mortality of birds, a decline or change in distribution of golden eagles, a decline in the wolf population: the list goes on and on. "A major reduction or change in distribution of snow geese using the 1002 area could occur through the cumulative effects of habitat loss, indirect habitat loss due to disturbance, and direct mortality," is also indicated by the report.

The coastal plain is vital to the ecological integrity of the Arctic Refuge. It is not a separate entity which can be conveniently sliced off without major adverse effects to the whole system.

Mitigation

Measures proposed for mitigation of impacts associated with oil production represent wishful thinking at best. For example, the report says that "...negative effects to muskoxen could be mitigated by standard stipulations prohibiting disturbance, implementing necessary time and area closures, and requiring on-site monitoring." Yet in the next paragraph, the report admits that "...major negative effects upon the muskoxen population from oil and gas development could occur, considering the present management objectives for continued population growth of the herd under natural regulation and the displacement from habitat likely to occur."

Subsistence Values

Native people in both Alaska and Canada depend on Arctic Refuge resources for both cultural and nutritional sustenance. This includes the Inupiat people of the village of Kaktovik and the Athabaskan people of Arctic Village,



Environmental organizations working for the Arctic Refuge

The following groups are working together to save the Arctic National Wildlife Refuge:

Alaska Center for the Environment
Defenders of Wildlife
National Audubon Society
National Parks and Conservation Association
Northern Alaska Environmental Center
Sierra Club
Southeast Alaska Conservation Council
The Wilderness Society
Trustees for Alaska

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U.S. FISH AND WILDLIFE SERVICE

Porcupine Caribou Herd crossing a coastal plain river.

Venetie, Chalkyitsik and Fort Yukon in Alaska and the village of Old Crow in Canada. The most important subsistence resource of all is the Porcupine Caribou Herd. "Caribou is the most important food source for the people of Arctic Village..." according to the 1002 Report. Other refuge species used by the people of Kaktovik include Dall Sheep, Arctic Char, Arctic Cisco, ptarmigan, polar bear, numerous species of waterfowl, bearded seal, spotted seal, ringed seal, wolf, wolverine, brown bear, and Arctic-ground squirrel.

Recreational Values Would be Compromised

"An experience in the Arctic National Wildlife Refuge is one you must search out yourself", states the form letter the U.S. Fish and Wildlife Service sends to potential visitors to the refuge. "You will find no packaged trip plans nor trail maps pointing the way...perhaps more than anywhere in America, the Arctic National Wildlife Refuge is a place where the sense of the unknown, of horizons unexplored, of opportunities for self reliance, independence, challenge, discovery and adventure...finding one's own way in a setting unsurpassed in beauty and vastness...make the Arctic Refuge a unique recreational experience." If the 1002 area is developed, the sights and sounds of oil drilling and transportation will dominate the visitor's sensual experiences anywhere from the coast to the Arctic Divide. Aesthetic impacts will extend beyond the 1002 area itself.

Other Problems the Report Fails to Address

Two major problems immediately meet the eye. One is the lack of sufficient water quantity in the 1002 area. The other is the enormous requirement for gravel necessary for building drilling pads and roads on permafrost. The report says " Specific locations and sources of water and gravel for exploration and development activities have not been

identified; and it is understood that these resources, especially water, are not readily available on the 1002 area." The report states that "...as much as 15 million gallons of water may be needed to drill one exploratory well." As for gravel, "Each mile of road occupies about 5 acres and requires approximately 40,000 cubic yards of gravel." In all, 40 to 50 million cubic yards of gravel would be required for construction, operation, and maintenance. "Gravel might have to be mined from upland sites, river terraces, streambeds, lagoons, or other potential sites." How this is to be accomplished without causing severe adverse impacts to fish and wildlife populations and their habitats is not addressed.

The Managing Agency's Biased Record

Throughout the decision making process on the 1002 area, the Department of the Interior and the U.S. Fish and Wildlife Service have demonstrated tremendous disregard for the intent of Congress and have done everything possible to minimize public involvement.

Contrary to the intent of Congress as expressed in ANILCA and appropriation bills, the Department of the Interior has spent over \$300,000 appraising land values in order to develop land exchange agreements with private Native corporations. These proposed exchanges would remove subsurface mineral rights from the public domain in the 1002 area. These secret negotiations, known within the Department as "Project M or Megatrade", have compromised the objectivity of the 1002 report and created additional vested interest pressures to open up the area.

Originally, the agency had no intention of allowing a public review of the draft 1002 report. A successful lawsuit undertaken by Trustees for Alaska with the support of many other local and national conservation groups, required the Department of the Interior to hold public hearings and take public testimony before submitting the

final report to Congress. The public involvement opportunities currently established are the Department's attempts to minimally comply with the mandate set forth by the courts as a result of litigation.

Comments desperately needed

Key points to include in your comments:

- ★ Support Alternative E which recommends wilderness designation for the entire Arctic Refuge coastal plain.
- ★ The report finds that there is only a one in five chance of finding economically recoverable oil beneath the coastal plain. Moreover, these estimates assume that oil would be priced at *more than double* what it is now.
- ★ Despoiling Alaska's premier wilderness refuge and jeopardizing its internationally significant wildlife and wilderness resources is *not in the national interest*.
- ★ Full oil and gas leasing of the coastal plain could be disastrous for the more than 180,000 caribou that use the area for calving and post-calving insect avoidance. This is the nation's only opportunity to protect virtually the entire range of one of the largest and only internationally migratory caribou herd in the world.
- ★ Caribou are vital to the subsistence way of life of Native people in both Canada and Alaska; adverse impacts on the caribou population will result in adverse impacts on subsistence.
- ★ The report looks at the 1002 area in isolation, rather than examining in detail the cumulative effects of oil and gas development on adjacent state and federal leases and offshore on the outer continental shelf.
- ★ The disposal of hazardous wastes associated with oil development presents a serious long term problem that has not yet been adequately addressed.
- ★ Further efforts towards energy conservation and creating viable alternative energy sources can better provide for our future energy needs than sacrificing the Arctic Refuge for a few days supply of oil.

The 60-day comment period for the draft 1002 report ends January 23, 1987.

Three public hearings, where people can voice their concerns, are scheduled for Kaktovik, Anchorage, and Washington, D.C. on January 6, 5, and 9 respectively. The public hearing in Anchorage will be located in spaces 1 and 2 of the Egan Convention Center. The hearing will begin at 9:00 a.m. and continue until all testimony is received. Please arrive early to be sure you can testify!!

December 1986



U.S. FISH AND WILDLIFE SERVICE

The glacial headwaters of a coastal plain river.

For more information contact the Northern Alaska Environmental Center.

Legislation was introduced in the House of Representatives by Morris Udall during the 1986 Congressional session to protect the coastal plain as wilderness. The bill is expected to be reintroduced early in 1987, and we hope a similar bill will be introduced in the Senate. If you can, please send a copy of your letter to Senator Bennett Johnston, Chairman of the Senate Energy and Natural Resources Committee, with a note asking him to sponsor legislation to include the area in the National Wilderness Preservation System. Also, a copy to Governor Cowper will help show him there is support inside the state for preservation of these wildlands.

Mail Your Comments To:

U.S. Fish and Wildlife Service
Attn: Division of Refuge Management Resources
2343 Main Interior Building
18th and C Streets, N.W.
Washington, D.C. 20240

Senator Bennett J. Johnston
Senate Energy and Natural Resources Committee
Senate Office Building
Washington, D.C. 20510

Honorable Steve Cowper
Governor, State of Alaska
Pouch A
Juneau, Alaska 99801

Interior report takes a cut at refuge pitch for oil

I call them "seams." When you're reading a government analysis and you see a difference between what the staff wrote and what their bosses concluded, that's a seam.

Lately I've been reading the Arctic National Wildlife Refuge (ANWR) Coastal Plain Resource Assessment, and it's full of seams.

The Interior Department recommended to Congress that the ANWR be opened to oil development. The common pitch is that ANWR contains another Prudhoe Bay, and it represents the econo-

mic salvation for Alaska's troubled oil industry.

But the body of the report gives a very different story. Let's look at what's behind it.

The executive summary of the document says there is 13.8 billion barrels of oil in ANWR, and we should want to sell the oil companies leases for the rights to that oil. That figure is what has been most widely reported.

Then the report says the most optimistic figure is 4.8 billion barrels, but that doesn't take into account the fact that more than half



**Fred
Pratt**

on a price of \$33 per barrel of oil. That's more than twice the current price of North Slope oil and, it's considerably higher than any price projection for the next decade. But let's look even deeper into the question.

The Interior analysis, which can be obtained from the local U.S. Fish and Wildlife Service office, breaks the geologic data from ANWR into 26 potential petroleum "prospects." In turn, these are grouped into seven "plays" showing similar geologic characteristics.

The first thing I noticed in this

analysis is the bald statement, "If recoverable oil resources are present in the prospects there is a five percent chance that the two largest prospects contain economically recoverable resource: equivalent to those found at Prudhoe Bay."

The next thing I noticed is that in the geologic area considered the most likely source for ANWR oil, "None of the sampled oils are similar to Prudhoe Bay oil."

The charts in the report show this clearly. The zone that contains the oil we produce at Prudhoe Bay dis- (See REFUGE, Page B-2)

the oil will be left in the ground after it's developed.

The report's most likely estimate of what might be discovered and drawn from the ground is 3.2 billion barrels, and that estimate is based

Daily New Miner
12/21/86

REFUGE

(Continued from Page B-1)

appears as one moves east, apparently because it was eroded before it could be buried by later deposits all those millions of years ago. It's also lost from well records as one moves from south to north along the ANWR boundary.

"Seismic and surface data indicate that all but the northwestern quadrant of the area is complexly folded and faulted," the report states. "This complexity is vastly different from the relatively simply structure that underlies the coastal plain west of the Arctic Refuge, such as the Prudhoe Bay area."

According to the report, this small northwest quadrant contains the same oil-bearing structures as the shallow West Sak and Ugnu oil deposits at Prudhoe Bay.

In the Prudhoe Bay area these zones contain more oil than the Prudhoe Bay reservoir itself, although the oil is thicker and harder to develop. The Interior report says this region in ANWR has half the potential oil reserves of the entire ANWR coastal plain.

Now from a strictly narrow Alaskan point of view, why should we want to open up federal land with oil deposits identical to those the oil companies have already discovered on state land? The oil companies at the Kuparuk Field are already installing special casings to keep West Sak oil from flowing into their wells, and they want to go look for the same structures 60 miles away?

Then, let's look at the rest of ANWR.

The Interior report says potential oil reservoirs could be found at depths of up to 26,000 feet, more than three times the depth of the Prudhoe Bay reservoir. Since wells of more than 12,000 feet can require more than one winter drilling season to drill, the ANWR exploration could stretch out for many years and many tens of millions of dollars.

Add to that the more complex geology, and we have a situation that will require more exploratory wells to find smaller oil reservoirs that are harder to get into production.

The report says its estimates of recoverable oil reserves are "con-

ditional upon the occurrence of at least one economic size oil accumulation in the area, the probability of which is about 19 percent."

Even then, ANWR does not have anywhere near the water or gravel resources that are found on the parts of the North Slope that are already being developed.

"... the water needed for drilling, and more particularly the ancillary needs such as ice roads and airstrip construction, poses the major engineering problem," the report states. "Water in the area is confined to surface resources, and there are few lakes of appreciable size within the area."

It can take as much as 15 million gallons of water to drill one exploratory well, in an area with few lakes and where all but two rivers are dry during the winter.

"The availability of adequate gravel supplies in the area is uncertain," the report adds.

The less said about the greater water and gravel supplies for development, the better. When we look at ANWR, we discover how lucky we were that the first oil discovery on the North Slope was so near the Sagavanirktok River Delta on Prudhoe Bay.

I won't go into the environmental or wildlife aspects of the ANWR question at this time, except to note that there is a great misconception about that topic. We often hear it said that the experience at Prudhoe Bay proves that oil development and caribou can coexist peacefully, but the wildlife studies in print show that's not the case.

You can't equate the survival of the tiny caribou bands around Prudhoe Bay with the giant Porcupine caribou herd in ANWR, and what we do know from the Prudhoe Bay experience that development of ANWR would have a major effect on wildlife. That is spelled out more fully in the Interior report.

It's puzzling why Alaskans would support ANWR development when it would draw industry attention from oil reservoirs already discovered on state land nearer to the trans-Alaska pipeline. The more I read the Interior report, the more puzzling this question became.

Fred Pratt is free-lance journalist who covers Alaska business and politics.

Opinion

Thursday, January 15, 1987

Why develop ANWR with oil prices low?

I am unequivocally opposed to the Interior Department recommendation of full leasing of the coastal plain of the Arctic National Wildlife Refuge for oil and gas production. My reasons for arriving at this decision are based on my primary concern for the environmental integrity of this unique area and the preservation of the wildlife populations dependent upon it, both for themselves and the subsistence needs dependent on them.

However, the national and international debate now going on over whether oil and gas leasing and development should occur will be decided primarily on economic grounds. With the current state of Alaska's economy, it is natural that the governor and the Legislature will be desperately thrashing around to come up with any possible sources of state income.

Under current formulas, the state of Alaska would be awarded 90 percent of oil royalties from production within a federal wildlife refuge. This is a big carrot for state endorsement of opening up ANWR, even if it doesn't take into account the limited probabilities of finding another Prudhoe Bay there, the long delay in obtaining returns, nor the far greater certainty of unacceptable negative impacts on every major wildlife species found within ANWR. (It is highly probable that this present Alaskan oil formula will be revised to concur with other state formulas should oil be found in ANWR.)

Under ANILCA, Section 1002(h), a full assessment of the fish and wildlife resources, as well as the oil and gas potential of the coastal plain was required.

The process, initiated under the Reagan administration, had a distinct bias from the beginning toward opening up the coastal plain.



Celia Hunter

Views expressed here do not necessarily represent those of the Daily News-Miner

As a matter of fact, the Alaska regional director of USF&WS has issued a virtual "gag order" to all his employees, ordering them to make no public comments on any matters relating to the 1002 report.

If we look at the current oil and gas situation on the North Slope, the arguments for immediate opening up of the ANWR coastal plain don't make good sense. In the central part of the North Slope, where state land ownership has encouraged intensive oil development, Conoco Inc. notified the state of Alaska in November 1986 that it would be shutting down its Milne Point operation because of slumping oil prices. Estimates of recoverable oil from Milne Point exceed 100 million barrels.

Other fields on the North Slope with known reserves are being kept out of production because of low oil prices. Obviously the oil industry knows how to manage its own resources for maximum profits to themselves. Isn't it interesting that they seek early leasing of the coastal plain—while oil prices are low and lease prices could be obtained for extremely low figures?

On another front, the Reagan administration has consistently opposed all oil and gas conservation measures passed by Congress. The most recent example of this bias against oil conservation was

Reagan's veto of the bill to require use of energy efficient standards for all electrical appliances manufactured in the United States. Electrical appliances consume 30 percent of the electrical output of the United States.

The bill would save the United States approximately 20,000 megawatts of electric power by the year 2000. The total energy savings from the bill would exceed the amount of oil that could be produced reliably from a field similar to the proposed coastal plain field.

In addition, this administration is attempting to remove the restrictions on the manufacture of large gas-gobbling automobiles, as well as the 55 mph speed limit, both of which account for large savings of oil. At the same time, filling up of the reservoirs of the strategic oil reserve has been terminated by presidential order. With present cheap oil prices, this reserve could be maintained at capacity and afford a U.S.-controlled supply protecting us from another oil embargo impasse.

While the state of Alaska is pressing for opening up the coastal plain, it also is lobbying Congress to permit the export of North Slope oil to Japan, and it is pushing for a right of way permit for the gas pipeline between Prudhoe Bay and Valdez, to feed an LNG plant designed solely for export.

Where does the national interest come into all of these machinations? U.S. national energy policies diametrically oppose all oil and gas conservation, while they favor exploitation of every possible oil source within federal conservation units. Oil fields all over the United States have been shut down because of low oil prices, and the oil glut, but still the push for exploitation of the Arctic coastal plain of ANWR is full speed ahead.

The economics used in the USF&WS 1002 Report use oil prices between \$33 and \$40 per barrel to justify development of this field. Oil experts continue to doubt that such oil prices will be reached in this century. If realistic oil price figures are used, then the economics of ANWR development lose much of their appeal.

What will Alaska lose if development of ANWR is pushed? The body of the 1002 Report, written by USF&WS biologists, doesn't track with the executive summary produced by Interior officials.

The report projects a "population decline or distribution change for 20-40 percent of the Porcupine caribou herd" due to oil field development. The same sad story concerns each of the major wildlife and bird populations which use the coastal plain. The negative impacts defy mitigation, because the area involved is irreplaceable.

Musk oxen have recently been transplanted to the coastal plain herd after being exterminated in the 19th century. The herd has been slowly increasing, and is in excellent condition. This entire herd will probably be eliminated, since wild musk oxen are highly intolerant of human activities, and extremely vulnerable to predation by humans.

The subsistence economies of Native peoples of Arctic Village, Venetie, and Canadian Natives throughout the upper Yukon Territory are highly dependent upon the Porcupine caribou herd. For this reason, Canadian biologists testifying on the 1002 Report opposed opening up of the coastal plain for oil development.

The most vital area of the coastal plain is the caribou calving grounds. At a recent conference involving biologists from all major agencies and industries, the vir-

tually unanimous finding was that under no circumstances should leasing occur within these calving grounds. It was agreed that exploiting the calving grounds would decimate the Porcupine caribou herd.

Many other important questions dealing with oil and gas development have not been adequately addressed in the Interior 1002 Report. Among these are the scarcity of available water and gravel sources, both items essential to oil field roads, pads, and drilling operations.

Obtaining these essential items could create far greater havoc with the natural environment of the coastal plain than has occurred in the Prudhoe Bay area, which happens to have handy sources for both gravel and water.

In short, basing a demand for exploitation of the oil and gas resources of the ANWR coastal plain on either national security or the national interest fails to take into account a whole range of alternatives, primarily conservation measures, which would effectively replace whatever oil may exist in the coastal plain.

We aren't losing any oil that may exist there. We can defer its use until we have a much greater need for it in the future, when hopefully technology will have been developed enabling oil extraction with far less impacts than present methods.

Our national interest and our state interest in maintaining the integrity of this last small portion of the only Arctic coastal area within U.S. boundaries far outweigh the transient short-term benefits to be derived from oil and gas exploitation now. Failing to protect these irreplaceable values will indict this generation for a deplorable lack of responsible stewardship of our land.

National security and the Coastal Plain

Sunday, January 4, 1987, The Anchorage Times

Editor's Note: This is the second of three columns devoted to the issue of developing oil and gas resources of the Arctic National Wildlife Refuge.

Any possible oil reserves in the Arctic National Wildlife Refuge, with only a one in five chance of being found, could well be uneconomical to produce at current and realistically projected oil prices. My last column examined the reasons and noted that the same dilemma prevents several proven North Slope fields from being tapped or from continuing production.

Nevertheless, this reality did not stop the Department of Interior from proposing that the entire Coastal Plain be opened to oil and gas leasing. Nor does this situation dampen the oil industry's interest in drilling for oil in that wildlife-rich area.

The reason?

National security.

The claim goes something like this: As domestic oil production rapidly declines, the United States becomes increasingly dependent on foreign sources of oil. This subjects the nation to the possibility of a severe interruption of oil supplies, which jeopardizes the nation's security.

Simplistic and emotional rhetoric like this is meant to play on the patriotic fervor of every citizen. The presence of the Soviet hockey team last week in Sullivan Arena posed more of a threat to national security than a future without unproven oil from ANWR.

In fact, our national security (whatever that truly means) is seriously threatened by exhausting the last of our domestic supplies because this brings us closer to the inevitability of complete dependence on foreign oil.

Each day, the United States demands about 16 million barrels of oil, and domestic supplies can only satisfy half that. At those consumption rates, the mean estimated supply of 3.2 billion barrels that might be found across the Coastal Plain would provide the U.S. with about six months worth of oil. I personally don't feel that nominal amount of oil is worth risking internationally significant wildlife and wilderness resources.

But whatever your personal beliefs, you have to admit a six-month supply of oil doesn't secure the nation for very long. It's

Environmental perspective



by
Mike
Matz

a sad fact, but we will always be largely dependent on the two-thirds of the non-communist world's oil supply that comes from the Middle East.

However, the oil flow from the Middle East is now stable. Thanks to a dying OPEC cartel, current oil prices are rock-bottom low, and predicted to stay low into the next century.

Common sense therefore dictates stockpiling foreign oil in our nation's Strategic Petroleum Reserve, which could be tapped if foreign supplies are interrupted. At the same time, we should continue aggressive energy conservation programs, while industry strives to improve technology to enhance oil recovery.

In the last year, however, the Reagan administration halted deposits into the Strategic Petroleum Reserve at a level less than half the minimal 750 million barrel target. Reagan also vetoed an energy conservation bill that would have saved a billion barrels of oil annually.

Now, instead of encouraging industry to improve oil recovery techniques so more oil can be pumped out instead of wastefully left in the ground, the administration wants to allow draining every last drop of the nation's presently recoverable oil.

The undeveloped oil that may or may not lie underneath ANWR is not the last barrier that stands in the way of a Russian invasion or that prevents long lines at the gas pumps.

But emotional rhetoric is a very persuasive tactic. If development advocates persuade Congress to open the coastal plain because otherwise the country is in peril, what does it mean to Alaska?

Anchorage environmentalist Mike Matz is a field representative for the Sierra Club.



by
Mike
Matz

ANWR and economics

Editor's note: This is the first of three columns pertaining to the recently released 1002 Report on the issue of developing oil resources on the Arctic National Wildlife Refuge. A public hearing on the report will be held Jan. 5 in Anchorage. Written comments may be sent to the U.S. Fish and Wildlife Service, 2343 Main Interior Building, 18th and C Sts., N.W., Washington, D.C. 202409, until Jan. 23.

Christmas came early to the oil industry.

The Interior Department's draft 1002 report on the Coastal Plain of the Arctic National Wildlife Refuge contains an anticipated recommendation that Congress allow full leasing of its oil reserves, which "could be the largest discovered since Prudhoe Bay and Kuparuk River," according to the biased report.

With the report's release, a large lump of coal was dropped by the Department of Interior into the Christmas stockings of environmentalists, natives who pursue subsistence lifestyles, and millions of Americans who care about protection of wildlife and its habitat. The report acknowledges that "long-term losses in fish and wildlife resources, subsistence uses, and wilderness values would be the inevitable consequences of a long-term commitment to oil and gas development, production, and transportation."

As a reminder, ANWR was established by executive order in 1960, and expanded in 1980 by law, for the purposes of "conserving fish and wildlife populations and habitats in their natural

diversity," and "providing the opportunity for continued subsistence uses by local residents."

But dollar signs dance like sugar plums in the heads of development advocates. The resource losses that would be incurred from development means very little to the oil industry's bottom line, and thus very little to them.

So in arguing against development, I will not discuss any aspect of biology, despite the existence of very convincing evidence that development should not proceed on those grounds. From standpoints of economics, national security, and the state's interest, it is simply absurd to be extracting whatever oil may lie underneath the flat tundra of the Coastal Plain.

The report estimates a range of possible in-place reserves of oil, the average being 13.8 billion barrels (BBO) scattered in 26 prospective areas across the coastal plain. The estimates are largely speculative, and what's more, the report frankly admits that the "in-place resource includes many deposits well below any economic size limit."

In fact, the report says the probability of actually finding economically recoverable deposits is only one chance in five.

But let's pretend the oil companies get lucky.

An economist with the Institute of Social and Economic Research crunched some numbers, and found that at current prices of \$15 per barrel, oil produced from ANWR would yield disappointing rates of return in the range of minus 2 percent to 4 percent. Not very encouraging, and there's more.

Most realistic projections don't foresee oil prices rising above \$20 a barrel over the next 20 years. The report assesses the economic viability at a dreamy price of \$33 per barrel. Even if exploration found significant pools of oil, it wouldn't be worthwhile to pump it out.

That's why the Milne Point field is shutting down. That's why the West Sac field, which holds nearly 1 billion barrels of oil, and the Seal Island deposit of 350 million barrels, haven't been developed. Neither have the Sandpiper and Colville Delta pools been tapped. It's too costly, the market is glutted, and the price doesn't justify it.

So how exactly does the oil industry and its Department of Interior supporters justify cracking open the coastal plain for oil development? The nebulous "national security" argument

Key Points in the 1002 Report:

- p. 29 Talks about subsistence use of the Porcupine Caribou Herd. Central Arctic Herd - para. 3 on right-hand side of page, indicates "little or no calving" at Prudhoe
- p. 33 Polar bears - see para. 4 on left re. importance of 1002 area
Second to last paragraph on right re. international treaties
- p. 34 Endangered species - whales
- p. 35 Geese - left hand side of page
- p. 45 Wilderness values
- p. 49 20% chance of finding economically recoverable oil
- p. 50 Figure III-2: graphs cannot be compared because they are based on different kinds of data
- p. 72 Table III-4 Significant economic assumptions: \$33 and \$40 per-barrel oil price ??!!
Also, natural gas economics - what if they build TAGS?
- p. 75 Right-hand side, top of page: sources for water and gravel undetermined
- p. 100 Para. 2, left re. pollution from reserve pits at Prudhoe. (note these are "preliminary results", we're just beginning to learn about some of the impacts of oil development)
Also, the para. above "Consequences of Development Drilling" = year round exploratory drilling would have far greater impacts than winter drilling
- 103 Last para. re. fuel spills → p. 104
- p. 108 Para. 2: reasons why central Arctic Herd has not declined even with development at Prudhoe

1002 Report

- p. 113 Last para. on left-hand side re. Muskox impacts
- p. 128 Second to last para., right hand side of page: oil development equals a lock-up in terms of sport & subsistence hunting
- p. 131 Summary of Unavoidable Impacts
- And remember, this report represents a best-case scenario, not Prudhoe-scale development that would be likely

See Jan. 2, 1987 Memorandum (and attachments) re. ADFEG's comments on Interior's proposed mitigation measures; they feel them to be inadequate

p. 162 Table VII-2

Does not indicate "significant" contributions to domestic energy



**WILDLIFE
FEDERATION
OF ALASKA**

The Alaska Affiliate of the
National Wildlife Federation

February 6, 1987

U.S. Fish and Wildlife Service
ATTN: Division of Refuge Management
2343 Main Interior Building
18th and C Streets NW
Washington, D.C. 20240

Re: Comments and Recommendations Pertaining to Draft "Arctic National Wildlife Refuge, Alaska, Coastal Plain Resource Assessment", November 1986

The Wildlife Federation of Alaska (WFA) is the state affiliate of the National Wildlife Federation, an organization with 4 1/2 million members nationwide, 8,000 of whom are Alaskans. We have reviewed the above referenced report and recommendation to the Congress of the United States and the legislative environmental impact statement prepared in accordance with Section 1002(h) of the Alaska National Interest Lands Conservation Act (ANILCA) and the National Environmental Policy Act (NEPA). The Wildlife Federation of Alaska recommends that no oil and gas leasing or development activities be allowed on the Coastal Plain of the Arctic National Wildlife Refuge until the issues and deficiencies identified in our comments and recommendations are adequately addressed.

The Wildlife Federation of Alaska offers the following comments on the 1002 process, the Coastal Plain Resource Assessment, and the recommendation of the Department of Interior proposing full leasing of the coastal plain. We have previously offered testimony at a public hearing on the Coastal Plain Resource Assessment held in Anchorage, Alaska, on January 5, 1987. We wish to expand upon selected concerns and issues identified in that testimony by addressing the following topics:

- o 1002 Evaluation Process
- o Coastal Plain Resource Assessment
- o Mitigation
- o Recommendations

1002 EVALUATION PROCESS

As stated previously in our public testimony, the coastal plain of the Arctic National Wildlife Refuge must always be viewed first as a wildlife refuge. The assessment report recognizes the value of this conservation unit when it states (p. 45) "...The Arctic Refuge is the only conservation system unit that protects, in an undisturbed condition, a complete spectrum of the various arctic ecosystems in North America." The important values of the coastal plain are also acknowledged by the report's observation that "...The 1002 area is the most biologically productive part of the Arctic Refuge for wildlife and is the center of wildlife activity on the refuge" (p. 46).

The establishment of the refuge in 1960 to preserve its unique wildlife, wilderness, and recreation values resulted in the remainder of Alaska's North Slope and adjacent offshore waters being made available for petroleum exploration and development. Passage of the Alaska National Interest Lands Conservation Act (ANILCA) in 1980 created a requirement under Section 1002(h) of the Act to prepare the Arctic National Wildlife Refuge Coastal Plain Resource Assessment. The analyses and evaluations required for the Section 1002(h) Report to Congress are clearly intended to provide an assessment of the biotic resources, oil and gas production potential, and compatibility of exploration and development in view of impacts to fish, wildlife, and habitats of the area.

The Department of the Interior, and the Draft Resource Assessment before us at this time, would have benefitted significantly from a more open public process that included conservation groups, industry, the State of Alaska, and Canada. Lacking this input, the report exhibits critical deficiencies in adequately addressing the requirements of Section 1002(h)(1-6). We are particularly concerned that the Secretary's recommendation to pursue full leasing of the 1002 area (Alternative A) is not supported by the information and analyses presented in the report. To the contrary, our examination of the baseline information, recognized values of fish and wildlife habitats, and environmental consequences of oil and gas development as presented in the Resource Assessment clearly identifies a level of adverse impact to national and international wildlife populations which is unacceptable and clearly not compatible with the purposes for which the refuge was established. We find it incongruous that this report, recognizing the anticipated loss of unique wildlife use areas and irreplaceable habitats, still concludes that this significant level of adverse impacts is justified. While espousing adherence to the Fish and Wildlife Service Mitigation Policy (46 F.R. 7644-7663, January 23, 1981) in the report's assessment process, the Department of Interior has failed to comply with the criteria for treatment of unmitigable impacts to Resource Category 1 habitats. For those

habitats, the policy direction is clear; "...all losses of existing habitat be prevented as these one-of-a-kind areas cannot be replaced..." (46 F.R. 7657, January 23, 1981). If the Mitigation Policy is truly an integral part of the 1002 area evaluation process and not just a placebo, Resource Category 1 habitats must not be impacted, and the ecological function and access to these areas must be maintained.

As an organization principally concerned with maintenance of fish and wildlife resources and the habitats upon which they depend, the Wildlife Federation of Alaska will attempt to focus their comments in this area of primary interest. However, we feel compelled to briefly express our concerns relating to the economic and social issues addressed in the report.

The Department of Interior predictions of oil and gas potential, estimates of contribution to domestic energy supplies, and projections of net national economic benefits are subjective and highly speculative. Lacking exploration confirmation of oil or gas discoveries, location and size of reservoirs, and a highly optimistic assumption of \$33 per barrel for oil, the economic benefits and national need for exploration and production of petroleum from the 1002 Area is not well supported.

This is particularly true in light of the fact that President Reagan recently vetoed the National Appliance Energy Act of 1986. Passed overwhelmingly by both houses of Congress, this act would have saved the nation millions of barrels of oil and billions of dollars on utility bills by the year 2000. In addition, the Reagan Administration has opposed establishment of fuel efficiency standards for automobiles and continuance of the 55 mile/hour speed limit.

No development in the Coastal Plain should be allowed until the concept of national energy security is more clearly defined, including a full discussion of economic forecasts, domestic oil consumption, the projected need for domestic oil reserves in the 1990's, and national strategies for energy conservation such as efficiency standards for home appliances and fuel economy standards for automobiles.

COASTAL PLAIN RESOURCE ASSESSMENT

The Description of the Existing Environment (Chapter II) provides a reasonably good summary of available information and research results for fish and wildlife distributions, populations, and seasonal use of terrestrial and aquatic habitats within the 1002 area. However, discussions of the coastal habitats, their occurrence within and outside the 1002 area, and ecological relationships to fish and wildlife populations are generally not adequate to define specific habitat affinities and habitat

characteristics. This short-coming is particularly important when evaluating opportunities for maintaining no net loss of in-kind habitat values, an important consideration in the mitigation process.

The Evaluation of Environmental Consequences (Chapter VI) is seriously limited since its assessment is dependent on hypothetical development scenarios derived from insufficient geological information. The general locations of oil and gas development activities may be reasonably accurate, but the scenarios are dependent on additional information which is not currently available, including the depth of structures containing oil or gas, the type of recovery methods, well spacing, the need for water injection or gas lift, and other factors specific to the petroleum field. Lacking more dependable geological information which may only be attainable through selected exploratory drilling, the locations, routing, and density of development facilities as shown in the proposed scenarios are meaningless.

The evaluation process and analysis of anticipated impacts to fish, wildlife, and habitats as presented in this report is highly influenced by the presence and precise siting of facilities in relation to important habitats and use areas, including migration corridors. Relatively minor relocation of facilities in the scenario could physically impact comparable acreages, but have drastically differing effects on fish and wildlife populations, their use of habitats, and access to those habitats. The Evaluation of Environmental Consequences should identify facilities and structures which are not site-dependent and which could potentially be relocated as part of the mitigation process. The evaluation must acknowledge that a significant portion of the oil and gas development facilities are site-dependent and do not have the flexibility of relocation to minimize adverse impacts to important habitats.

The Evaluation of Environmental Consequences also suffers from an excessive dependence on mitigation techniques utilized in the Prudhoe Bay development area (which may not be applicable to resources and habitats in the 1002 area) and the assumption that mitigation technology to be developed in the future will reduce anticipated impacts to an acceptable level. When considering the irreplaceable values of some of the fish and wildlife resources at stake, we are not confident that "...performance standards ...developed for safety and environmental requirements rather than adherence to highly specific design or operational procedures..." (p. 97) is an appropriate approach to mitigation. It is perhaps more important to recognize that a Prudhoe Bay scale development may not be acceptable within a national wildlife refuge.

Consideration of cumulative impacts of oil and gas development in the 1002 area with other existing and proposed onshore and

offshore developments has not been adequately addressed in the Evaluation of Environmental Consequences. In addition, the national and international range and human use of migratory wildlife resources which are highly dependent on habitats available in the 1002 area has not been adequately recognized for the Porcupine Caribou Herd (PCH) or snow geese. Some of our concerns regarding the treatment of these key species are presented below:

PORCUPINE CARIBOU HERD:

A great deal has been learned about the effects of oil and gas exploration and production on caribou in the Prudhoe Bay area, e.g. levels of road traffic that can occur without adversely affecting free passage of caribou or the minimum distances required to separate roads and pipelines to cause minimal disturbance to caribou. However, we must be careful not to extrapolate from all of the Prudhoe Bay conclusions when estimating impacts in the Arctic National Wildlife Refuge because the refuge must accommodate a very large number of animals in a small space. In comparison, Prudhoe Bay supports a relatively small caribou herd in an area of very extensive suitable habitat.

The available literature concerning the Central Arctic Caribou Herd suggests that portions of the herd have been displaced from the Prudhoe Bay and Kuparuk areas during part of their annual cycle with no obvious effect on herd growth. However, within the Arctic National Wildlife Refuge the Coastal Plain is extremely narrow when compared with the Prudhoe - Kuparuk area. The Arctic Refuge Coastal Plain is 6 times larger than the Prudhoe Bay field, but there are approximately 12 times more caribou in the Porcupine Caribou Herd than the Central Arctic Herd. In addition, the PCH appears to be reaching maximum herd size. Most large mammal biologists would conclude that a herd approaching a peak population within its range would occupy essentially all suitable habitat available. Therefore, the opportunity for displacement of the PCH during calving is probably limited, and such displacement could result in a net loss to the caribou population. Although the projected 20-40% decline in PCH population estimated by FWS under a full development scenario (p. 112) is impossible to verify considering all the variables associated with preferred calving and insect relief habitats and migration movement areas, it strongly indicates that displacement of the PCH could cause a significant decline in population.

We heartily concur with the designation of approximately 242,000 acres of the PCH core calving area as Resource Category 1 habitats, recognizing that the 1002 core calving area represents approximately 80% of the total core calving area used by the Porcupine Caribou Herd (p. 106). The assessment also notes (p. 108) that "...measuring the probable population decline from complete loss of habitat values in calving areas is impossible

and the ultimate effects of displacement are unknown...". Under the full development scenario, the FWS has appropriately recognized that "...mitigation of the loss of caribou habitat in Resource Category 1 ... is not possible..." (p. 111). Following the premise (p. 98) that "... the FWS normally recommends that all losses of Resource Category 1 habitat be prevented, as these one-of-a-kind areas cannot be replaced...", the logical conclusion is that the PCH core calving habitats within the 1002 area should be justifiably excluded in the Secretary's recommendation for oil and gas development.

As spring progresses on the coastal plain and the weather warms following completion of calving activity, conditions are ripe for the emergence of swarms of mosquitos. As harassment by these insects increases, caribou form dense aggregations and move rapidly toward the coast to seek relief in cooler, windswept areas such as river deltas, mudflats, aufeis, large gravel bars, barrier islands, and in the shallows of lagoons (p. 29). At this time, parturient cows are particularly stressed from the rigors of pregnancy, migration, birth, lactation, hair molt, antler growth, and the the ever-present insect harassment.

The Resource Assessment noted that "...the entire 180,000-member PCH may use the area in some years, mainly during the late June/early July insect-relief period..." (p. 105). The FWS observation that "...access to insect relief habitat and forage resources during this period may be critical to herd productivity..." (p. 29) recognizes the significant importance of insect relief areas to the post-calving aggregations of the PCH. The availability of forage resources and the physical features which make up insect relief areas comprise a specialized habitat that may not be replaceable. We recommend designation of primary insect relief habitats in the Coastal Plain of the 1002 area as Resource Category 1 habitats which are unique and irreplaceable components of the Porcupine Caribou Herd use area. In addition to maintaining the function of insect relief areas, access to these habitats from the core calving area must be assured.

Contrary to the facts and analyses presented in the Environmental Consequences and Mitigation discussions, the Secretary's Recommendation (Chapter VIII) to make the entire 1002 area available for oil and gas leasing, even with the caveat that "...leasing would be phased so the core calving area of the PCH would be last to be explored and developed..." (p. 170), is in direct conflict with the findings of the Resource Assessment and the procedures of the FWS Mitigation Policy which "...guided the assessment team in identifying appropriate measures for mitigating avoidable adverse impacts so there would be no unnecessary adverse effects" (p. 97). In this light, we can only conclude that the Secretary has determined "avoidable adverse impacts" to the Porcupine Caribou Herd are the "necessary adverse effects" of oil and gas development.

SNOW GEESE:

Critical fall staging habitats of snow geese from the Banks Island population have not received adequate attention in the report discussions and evaluation of environmental consequences. The Resource Assessment should be expanded to include greater detail on the importance of fall staging activities to the welfare of migrating snow geese, the characteristics of preferred staging habitats, and the human use values of this resource outside the boundary of the 1002 area. An average of 105,000 snow geese, and as many as 325,000 snow geese, have historically staged on the 1002 area in the fall to feed intensively and build energy reserves prior to their southward migration. These fat reserves are considered by waterfowl biologists to be necessary energy reserves to successfully complete migration, particularly for female snow geese recovering from the stress of reproduction activities.

Chapter VI recognizes that "...reduced time spent feeding and lost habitat in which to feed would result from petroleum development, adversely affecting the accumulation of energy reserves essential for migration" (p. 121). In addition, "...a major reduction or change in distribution of snow geese using the 1002 area could occur through the cumulative effects of direct habitat loss, indirect habitat loss due to disturbance, and direct mortality" (p. 122). Based on the report's assumed displacement of snow geese from 45% of their preferred staging habitat, a reduction in the Banks Island snow goose population of 5-10% could occur and the number of snow geese annually staging in the 1002 area could be reduced by almost 50 percent (p. 122). We are not impressed by the statement that "...staging snow geese are highly mobile..." (p. 121) as it indicates a lack of insight into the concepts of preferred habitat and carrying capacity.

The potential reduction in numbers of Banks Island snow geese would be 15-30,000 birds. Approximately 60-70,000 snow geese are harvested annually in the Pacific Flyway with 80-90% of this harvest occurring in California. An additional 30-50,000 snow geese are harvested annually in Alberta and western Saskatchewan. A draft management plan for the Pacific Flyway identifies protection of the Arctic National Wildlife Refuge and Yukon staging areas as an important need. The potential reduction in Banks Island snow geese numbers from loss or disturbance of fall staging habitats in the 1002 area could be equivalent to 50% of the total Pacific Flyway harvest or essentially all of the Alberta and western Saskatchewan hunting harvest in a given year. Based on the important value of this species to national and international uses, we would not consider potential impacts of oil and gas development in the 1002 area to be insignificant.

The report does not demonstrate the availability of alternate staging habitats which could be utilized for in-kind replacement of habitat values, an important consideration for these staging

areas which are currently designated Resource Category 2. The baseline studies for snow geese conducted on the 1002 area do not define the habitat characteristics which were representative of preferred staging areas, although they noted a heavy dependence on cottongrass (Eriophorum sp.) and speculated that annual shifts in preferred staging areas may be related to heavy utilization of previously used staging areas. If this annual shift to allow recovery of staging habitat vegetation is verified, it would suggest the necessity of considering all fall staging areas used by snow geese in the 1002 area as a part of an annual habitat rotation.

The significant segment of the snow goose population which could be adversely affected or displaced by oil and gas development, the vulnerability of staging snow geese to disturbance, and the undefined unique habitat characteristics of traditional staging areas supports the WFA recommendation to include snow goose fall staging areas within the coastal plain as Resource Category 1 habitats.

PERENNIAL SPRINGS AND FRESHWATER OVERWINTERING AREAS FOR FISH:

Perennial springs and freshwater overwintering areas for resident and anadromous fish have not been adequately addressed in the Resource Assessment. Suitable overwintering habitats in freshwater systems of the refuge are concentrated at a limited number of locations where adequate flow, water quality, dissolved oxygen, and benthic food organisms are available. Perennial ground water sources (springs) are found on most of the major drainages in the 1002 area.

Within the Arctic National Wildlife Refuge, "...overwintering habitat is probably the greatest limiting factor for Arctic anadromous and freshwater fish populations..." (p. 37). The Alaska Habitat Management Guide for the Arctic Region (Alaska Department of Fish and Game, 1986) notes that in smaller North Slope drainages it is conceivable that a single spring-fed site might harbor virtually all members of a particular Arctic char population from eggs to mature adults during the winter period.

Due to the limited occurrence of spring-fed overwintering areas for fish and their importance in maintaining anadromous and freshwater fish populations in the 1002 area, the Wildlife Federation of Alaska recommends that perennial ground water sources which support overwintering fish be designated Resource Category 1 habitats. Protection of these vulnerable habitats must also include appropriate protection of the groundwater source which supplies the overwintering use areas and prohibition of water removal for domestic or industrial use during the winter period. We also request that FWS identify the location of known, spring-fed overwintering areas, suspected but unsubstantiated

overwintering areas, and necessary mitigation measures to avoid adverse impacts to these irreplaceable habitats.

MITIGATION

The WFA has previously identified serious concerns with the approach to mitigation of impacts to fish, wildlife, and their habitats in our January 5, 1987 testimony. We wish to expand upon those concerns and the mitigation process as it applies to the resources and proposed activities identified for the 1002 area.

As examples of the important fish and wildlife habitat values of the 1002 area, the report recognizes intensively used calving, postcalving, and insect-relief habitats for a significant portion of the Porcupine Caribou Herd and sensitive fall staging areas for a large segment of the Banks Island, Canada, snow goose population. The sensitivities of these species and the unique factors of the habitats they utilize are documented. Approximately 78 percent of the PCH core calving area is within the 1002 area, and disturbance of the cow-calf groups on the calving grounds may interfere with bond formation and can increase calf mortality (p. 28).

In addition, the limited availability of these habitats is acknowledged with statements such as "...Geography apparently limits the availability of suitable alternative calving or insect-relief habitats for the herd..." (p. 6) and "...Access to insect-relief habitat and forage resources...may be critical to herd productivity" (p. 28).

Summary statements also reflect the importance of the 1002 area to a wide spectrum of wildlife resources by stating "...The 1002 area is the most biologically productive part of the Arctic Refuge for wildlife and is the center of wildlife activity on the refuge" (p. 46).

The evaluation of Irreversible and Irretrievable Commitments of Resources for Alternatives A and B recognizes the significant impacts attributed to oil and gas development:

- o declines in population, herd vigor, and behavioral patterns due to disturbance and displacement of PCH (p. 142)
- o long term losses in fish and wildlife resources, subsistence use, and wilderness values as the inevitable consequence of long term development

- o lack of relative experience regarding the responses or adaptability of the PCH to intensive development activities
- o unknown capacity of the PCH to utilize undisturbed areas in greater concentrations for calving
- o acknowledgement that EVEN WITH EFFECTIVE MITIGATION (emphasis added), PCH displacement or reduction could be as great as 20-40 percent
- o recognition that Alternative A development will result in a loss of, at minimum, a significant part of the PCH calving grounds and other use habitats, a limit to continued expansion of 1002 area muskoxen herds, and a loss of notable staging habitats for internationally important migratory snow geese.

A summary of biological effects of Alternative A on the 1002 area identifies major effects on caribou (PCH), muskox, and snow geese (p. 149). Major environmental effects were previously defined (p. 96) as "...Widespread, long-term change in habitat availability or quality which would likely modify natural abundance or distribution of species using the 1002 area".

The Secretary's Recommendation (p. 170) to make the entire 1002 area available for oil and gas leasing includes the control of development by imposition of appropriate mitigation measures to insure "...no unnecessary adverse effects on the refuge's fish and wildlife and their populations..." and with assurance "...that any unavoidable habitat losses are fully compensated" (p. 170). Additionally, the Secretary indicates that "...Development would proceed with the goal of no net loss of habitat quality...", a goal discussed in greater detail in Chapter VI, Environmental Consequences.

The Fish and Wildlife Service Mitigation Policy (46 F.R. 7644-7663, January 23, 1981) recognizes four resource categories with corresponding mitigation planning goals to insure that the level of mitigation is consistent with the fish and wildlife resource values involved. Within the 1002 area, the FWS analysis designated the PCH core calving area as Resource Category 1 based on its unique and irreplaceable values; the remainder of the 1002 area has been designated Resource Category 2 for its importance to five evaluation species used in the analysis.

Resource Category 1 is defined as habitat of high value for evaluation species which is unique and irreplaceable on a national basis or in the ecoregion. The commensurate Mitigation Planning Goal is no loss of existing habitat value. Development of the rationale for mitigation planning goals (46 F.R. 7645, January 23, 1981) included a fundamental principal "...that avoidance or compensation be recommended for the most valued

resources..." and that "...the degree of mitigation requested correspond to the value and scarcity of the habitat at risk".

The Secretary's Recommendation (Chapter VIII) proposes making the entire 1002 area available for oil and gas leasing based on the assumption that most adverse environmental effects would be minimized or eliminated through mitigation based on information from prior oilfield development at Prudhoe Bay, or through additional, ongoing studies and assessments conducted during phased leasing. The FWS Mitigation Policy Guideline for Resource Category 1 habitats states "...The Service will recommend that all losses of existing habitat be prevented as these one-of-a-kind areas cannot be replaced" (46 F.R. 7657, January 23, 1981). Where there is likely to be a significant fish and wildlife resource loss (Resource Category 1), the FWS Mitigation Policy (46 F.R. 7659, January 23, 1981) provides criteria to be addressed in evaluation of projects. Of significant importance is criteria (2) to select the least environmentally damaging reasonable alternative, and criteria (4) which states "...All important recommended means and measures have been adopted with GUARANTEED IMPLEMENTATION (emphasis added) to satisfactorily compensate for unavoidable damage or loss consistent with the appropriate mitigation goal." Since the mitigation goal for Resource Category 1 is no loss of existing habitat value and no means and measures have been identified to achieve that goal in the 1002 Report, we believe that any proposal to permit oil and gas development in or adversely affecting Resource Category 1 habitats is not in compliance with the FWS Mitigation Policy.

Finally, the mitigation measures identified in Chapter VI (p. 145) are more appropriate for protection of discrete location habitats and use areas which can be addressed by development buffers, timing of activities, and performance criteria within the scope of technical concerns addressed in prior North Slope oil and gas developments. In particular, the calving, post-calving, and insect relief habitats of the PCH are more extensive, and currently available information indicates unique characteristics which may not be replaceable or available in alternate habitats. The important issue of free movement between seasonally-important use areas of the PCH has not been adequately addressed in the evaluation process. Wildlife movements and migration are recognized as a part of habitat values which must be addressed during the mitigation process (46 F.R. 7645, January 23, 1987).

RECOMMENDATIONS

The Wildlife Federation of Alaska recommends that no oil and gas leasing or development activities be allowed on the coastal plain of the Arctic National Wildlife Refuge until the issues and deficiencies identified in our comments and recommendations are

adequately addressed. In summary, these include the following:

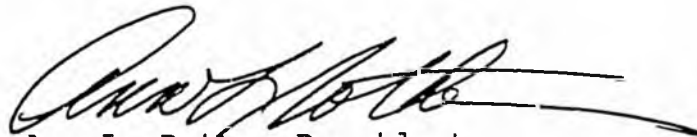
- o National energy security should be clearly defined, including a full discussion of economic forecasts, domestic oil consumption, the projected need for domestic oil reserves in the 1990's, and national strategies for energy conservation such as efficiency standards for home appliances and fuel economy standards for automobiles.
- o Decisions on the use of the coastal plain should be delayed until biological research on the characteristics of the Porcupine Caribou Herd calving habitat can be clearly defined. The conclusions of our nation's leading caribou biologists at a workshop entitled "Demography and Behavior of the Central Arctic and Porcupine Caribou Herds in Relation to Oil Field Development" conducted in October 1986 was that scientists do not yet have a clear understanding of the ecological attributes of caribou calving areas on the Arctic Slope. (This workshop was sponsored by the Alaska Oil and Gas Association and the Alaska Department of Fish and Game.) Until critical calving habitat boundaries can be delineated, all land use decisions within the 1002 area should be deferred.
- o Insect relief habitats used by the Porcupine Caribou Herd in the Coastal Plain of the 1002 area should be designated Resource Category 1 habitats with specific provision made for adequate access by the PCH to these use areas.
- o Fall staging areas for snow geese in the Coastal Plain of the 1002 area should be designated Resource Category 1 habitats.
- o The Coastal Plain Resource Assessment should clearly describe appropriate mitigation measures for each development alternative that would result in no net loss of critical fish and wildlife habitat. How will the Department of Interior determine whether appropriate technology is available to restore or revegetate plant communities which occur on the coastal plain, particularly those which comprise caribou calving habitat, caribou insect relief habitat, and snow goose staging habitat?
- o The following criteria should be incorporated into the mitigation process for all oil and gas development alternatives considered:
 - no net loss of caribou calving or insect relief habitat is justified in any of the alternatives;

- free passage of caribou must be provided to all insect relief habitats;
- no net loss of snow goose fall staging habitats is justified in any of the alternatives;
- o The Wildlife Federation of Alaska opposes any land trade actions that precede or circumvent completion of the 1002 process or any land trade actions that would remove Resource Category 1 habitats (including caribou calving and insect relief areas, snow goose staging areas, and fish overwintering areas) from the Arctic National Wildlife Refuge.

If these issues and deficiencies are addressed in the context of an open public process, then the Fish and Wildlife Service, conservation groups, the oil industry and Congress would have the tools necessary to make well-reasoned decisions about oil and gas development and the protection of wildlife, recreation, subsistence, and wilderness values on the Coastal Plain of the Arctic National Wildlife Refuge.

Thank you for your consideration of these comments.

Sincerely,



Ann L. Rothe, President
WILDLIFE FEDERATION OF ALASKA

cc: Senator Ted Stevens
Senator Frank Murkowski
Congressman Don Young
Jay Hair, National Wildlife Federation
Bruce Apple, National Wildlife Federation

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Mary Van Nimwegen

JOINT Senate - HOUSE RESOURCES
February 4, 1987
1:32 p.m.

C: COTTEN. GTK (DGM)

February 26, 1987

The Honorable Sam Cotten
Co-Chairman
Resources Committee
P.O. Box V
Juneau, AK 99811

Re: 90-10 Revenue distribution
for federal lands

Dear Representative Cotten:

INSERT on tape

~~Ned Farquhar of your staff informed me that United
Lundquist
States Senator Ted Stevens had told you that, under current
law, Alaska would be entitled to no share of revenues re-
ceived by the federal government from federal oil and gas
leasing in the Arctic National Wildlife Range ("ANWR") if
ANWR is open to such leasing by Congress. Senator Stevens
apparently is of the view that, because federally owned
lands in ANWR have been withdrawn from the public domain and
reserved as a wildlife refuge, removes them from the class
of federal lands from which the state receives 90 percent of
oil and gas revenues:~~

I represented Alaska in Watt v. Alaska, 451 U.S.
259 (1981). The precise issue in that case was whether the
90-10 revenue distribution formula in section 35 of the

Mineral Leasing Act, 30 U.S.C. § 191, applied to the withdrawn and reserved lands of the Kenai National Moose Range.

no new A

In a 5-3 decision, the United States Supreme Court held that the 90-10 revenue distribution formula applied to oil and gas revenues from federal leasing in the Moose Range. Like the lands in ANWR, the lands in the Moose Range were withdrawn and reserved from the public domain for refuge purposes. In my opinion, there is absolutely no substantive distinction between the Moose Range lands and the lands in ANWR, and there is no substantive legal basis for concluding that federal oil and gas leasing revenues from ANWR would be distributed differently than those from the Moose Range under current law.

To my knowledge,

A the only ~~instance~~ *situation* where a state is not entitled to share in the benefits of oil and gas production from lands reserved from the federal public domain ~~that I am aware of of~~ *relates to* ~~is in the case of~~ the four naval petroleum reserves created early in this century (Elk Hills, Buena Vista, Teapot Dome and Naval Petroleum Reserve No. 4 ~~which was~~ *"Pet. 4"* redesignated in 1976 as the National Petroleum Reserve in Alaska or *withdrawals* "NPRA"). In those four specific ~~reservations~~ *reservations* from the federal public domain, the United States expressly reserved the

~~and reservations of the oil and gas~~

The Honorable Sam Cotten
Co-Chairman, Resources Committee

February 26, 1987
Page 3

oil and gas to itself for national defense purposes and, generally, receives all financial benefits from oil and gas development and production from those reserves. As you know, Congress ^{in 1976} provided in 42 U.S.C. § 6508 that 50 percent of federal oil and gas revenues from NPRA are to be transferred to the State of Alaska; however, to our knowledge, none of the federal revenues from the other petroleum reserves are shared with the states in which they are located.

The petroleum reserves constitute a very specific and limited exception to the general revenue-sharing policy governing federal lands. The general revenue distribution scheme under the Mineral Leasing Act represented a historical trade-off in the history of public land law. In enacting it, Congress terminated its historic policy of disposing of the public lands. Instead, it determined that the federal government should retain those public lands remaining in the states, but should use most of the mineral revenues from those lands for ^{those} the state's benefit. This ~~X~~ "was to compensate for the state's inability to tax the lands to pay for governmental services." Fairfax and Yale, The Financial Interest of Western States in Non-Tax Revenues From the Federal Public Lands (manuscript copy published by the Western

The Honorable Sam Cotten
Co-Chairman, Resources Committee

February 26, 1987
Page 4

Legislative Conference, Council of State Governments, and the Lincoln Institute of Land Policy in 1985) at 19.

To summarize, there is no substantive ground to distinguish the lands in ANWR from any other federal lands in Alaska, with the exception of NPRA. Alaska is entitled to 90 percent of federal oil and gas leasing revenues from all federal lands in the state, including those in ANWR, with the sole exception of those in NPRA where Congress independently has elected to share 50 percent of the revenues. With respect to wildlife refuges in particular, Watt v. Alaska makes it absolutely clear that the state is entitled to 90 percent of the revenues from federal leasing from lands withdrawn from the public domain and reserved for that purpose.

If I can be of any additional assistance or answer any further questions in this regard, please contact me at your convenience.

Sincerely,

GRACE BERG SCHAIBLE
ATTORNEY GENERAL

By:

The Honorable Sam Cotten
Co-Chairman, Resources Committee

February 26, 1987
Page 5

G. Thomas Koester
Assistant Attorney General

GTK:dlm

cc: Lieutenant Governor Stephen McAlpine
Commissioner Judy Brady, DNR
Commissioner Don W. Collinsworth, F&G
Commissioner Dennis Kelso, DEC
John Katz, Office of the Governor
Bob Grogan, Office of the Governor
Senator Ted Stevens

REPRESENTATIVE
SAM COTTEN
DISTRICT 15



P.O. BOX 296, EAGLE RIVER, AK 99577
P.O. BOX V, JUNEAU, AK 99811

ALASKA STATE LEGISLATURE
HOUSE OF REPRESENTATIVES

February 6, 1987

The Honorable Bill Horn
Assistant Secretary for
Fish, Wildlife and Parks
U. S. Interior Department
Washington, D. C. 20240

Dear Secretary Horn:

I am writing with regard to the draft 1002(h) study which presents alternatives for management of the coastal plain of the Arctic National Wildlife Refuge (ANWR).

The interest shared by Alaskans in the decisions about ANWR are fairly clear: we need to maintain a clean, healthy environment and provide jobs and revenue for Alaska's people. These are national interests as well.

Toward achieving these goals, the U. S. Congress should promptly open the coastal plain of the ANWR to oil and gas exploration, production, and transportation under conditions that are in the interest of the nation and the state; reserving the leasing of land in the core caribou calving grounds until a later date. Although, at this time, there is some controversy about the location of the calving ground, we are hopeful that the research data can be put to good use in the near term to define it. Protection of the Porcupine herd is in the interest of American and Canadian citizens. Other environmental issues such as air and water quality, waste management and disposal, and development coordination also need attention.

The Interior Department should desist from discussing land trades that would eliminate the State of Alaska's revenue share from oil and gas activity in the Refuge and that could reduce the ownership influence of the state and federal governments.

Unless the state concurs, the U. S. Congress should not allow measures or actions that reduce the state's entitlement to oil

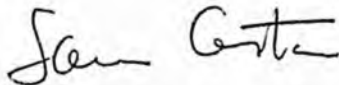
and gas revenue from the Refuge. The Congress should require the protection of the environmental and subsistence resources of the Refuge, including habitat, air, and water, in the event of oil and gas development on the coastal plain of the Refuge.

In recognition of Alaska's economic situation and the need for long-term economic development in the state, the Congress should require that exploration and development activity in the Refuge be conducted by Alaska work forces.

The Congress also should amend the Export Administration Act to reduce America's trade problem and energy costs by allowing the export of new production from Alaska's North Slope.

Thank you for considering these concerns. I hope that the Interior Department will work toward accomplishing these objectives during the Congressional debate on ANWR.

Sincerely,



Representative Sam Cotten
co-Chairman, House Resources Committee
(907) 465-3711/15/99

SC:smc

STATE OF ALASKA

OFFICE OF THE GOVERNOR
JUNEAU

STEVE COWPER
GOVERNOR

NEWS RELEASE



FOR INFORMATION CONTACT
David Ramseur
Press Secretary
Office of the Governor
Box A, Juneau, AK 99811
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FOR IMMEDIATE RELEASE
February 6, 1987
No. 87-11

STATE URGES EXPLORATION IN ANWR MORATORIUM IN CARIBOU "CORE" CALVING AREA

JUNEAU--Oil and gas exploration should be permitted in the Arctic National Wildlife Refuge, but delayed in the "core" caribou calving area for at least 10 years pending a study of the impact of exploration on the Porcupine caribou herd, according to the state of Alaska's response to a federal report on ANWR.

In a nine-page letter to the U.S. Interior Department, the state says oil and gas potential in the refuge is extremely promising and therefore, exploration should proceed. At the same time, the state says not enough is known about the potential impact exploration may have in the area of most concentrated caribou calving.

As a result, the state proposes creation of a group composed of federal, state, university and private researchers to study the issues and offer recommendations to the Interior secretary and Alaska's governor about future exploration in the core calving area.

The proposal is contained in the state's formal response to the Interior's Draft Arctic National Wildlife Refuge Coastal Plain Resource Assessment 1002 report. The response, delivered to Interior officials in Washington, D.C., today, details the state's concerns with the draft report.

-MORE-

The comments follow testimony offered by the state in Anchorage on Jan. 5 in which Gov. Steve Cowper said he supports exploration in ANWR with the proper environmental protections.

"Alaska's coastal plain contains the best prospects in this country for a significant oil and gas find," Cowper said, upon release of the state's comments. "I think we can go after it responsibly and with a minimum of disruptions if we follow the guidelines outlined in our response to the federal report."

The state says two key facts are at issue in the debate over development of the coastal plain: (1) ANWR is home to fish and wildlife resources which are of significant national and international importance as well as necessary to the subsistence way of life of those who live in and near the refuge, and (2) the area contains the most outstanding oil and gas frontier remaining in the U.S.

State officials point out that Alaska has more than two decades of experience with oil exploration and that, using the best and latest technology, safe development of the coastal plain is possible. One way to ensure minimum disruption of the caribou is a thorough report on the potential impacts of the core calving area.

After seven years of careful study, the Interior secretary and governor would submit a report to Congress for a decision on whether to open or defer leasing in the core area, under the state's proposal. That study would seek to document the biological importance of the core calving area, the effects of oil and gas activities and the effectiveness of mitigation measures.

The state's comments are the result of months of discussions among state resources agencies, the oil industry and environmental groups. A final 1002 report is expected to be delivered in April to Congress, which then begins debate on opening ANWR to exploration.

-30-

(A copy of the state of Alaska's response to Interior's 1002 report is attached.)

STEVE COWPER
GOVERNOR



STATE OF ALASKA
OFFICE OF THE GOVERNOR
JUNEAU

February 6, 1987

The Honorable Donald P. Hodel
Secretary
Department of the Interior
Interior Building, Room 6151
C Street between Eighteenth
and Nineteenth Streets, NW
Washington, DC 20240

Dear Mr. Secretary:

I wish to take this opportunity to thank you for providing the state with the additional two weeks to review and comment on the draft Arctic National Wildlife Refuge, Alaska, Coastal Plain Resource Assessment. The additional time enabled us to conduct a more thorough and useful review of this important document. Enclosed is a copy of the state's comments on the draft assessment.

Like you, I feel it is extremely important that Congress be persuaded to open the coastal plain to oil and gas leasing consistent with the purposes of the refuge to preserve its fish and wildlife values. The state is committed to this objective and with your cooperation will work to see that it is accomplished. I look forward to reviewing the final report to Congress and hope to meet with you in the near future to discuss how we might best advance a cooperative effort to move forward with oil and gas leasing in the Arctic National Wildlife Refuge.

Sincerely,

A handwritten signature in black ink, appearing to read "Steve Cowper".

Steve Cowper
Governor

Enclosure

The Hon. Donald P. Hodel

-2-

February 6, 1987

cc/enc: Senator Ted Stevens
Senator Frank Murkowski
Representative Don Young
William Horn, Department of
the Interior, Washington, DC
John Katz, Office of the
Governor, Washington, DC
Alaska Senate Resources Committee
Alaska House Resources Committee

MEMORANDUM

State of Alaska

TO: Robert L. Grogan
Associate Director
Division of Governmental
Coordination

FROM: Dennis D. Kelso
Commissioner
Department of Environmental
Conservation

DATE: January 12, 1987

FILE NO:

TELEPHONE NO: 465-2600

SUBJECT: ANWR

The Department of Environmental Conservation (DEC) has completed a review of the draft Arctic National Wildlife Refuge Coastal Plain Resource Assessment prepared by the Department of the Interior. As mandated in Section 1002(h) of the Alaska National Interest Lands Conservation Act, the report is intended to provide a recommendation to Congress on whether to open the coastal plain for leasing. Consequently, the bulk of the report is devoted to descriptions of the biological resources and estimated geological potential of the area at question. Review of this information is primarily within the purviews of the Departments of Natural Resources and Fish and Game. Similarly, the selection of an alternative that represents the best balance between the need to preserve essential habitat and the need to develop energy resources is an area outside this agency's direct expertise.

In summary, DEC has four major concerns. One is that air and water quality issues have not been addressed. The second is that it is essential for Interior to define a process during which these issues, as well as others, can be addressed. The third is that the report does not reflect the need to improve upon certain practices that have been employed elsewhere on the North Slope in defining acceptable practices in ANWR. The fourth is to ensure that full consideration is given to protecting special values of ANWR.

The role of this department in discussions of exploration or development of the Arctic National Wildlife Refuge (ANWR) is to ensure that an appropriate degree of environmental protection is provided for any exploration or development scenario that is to be implemented. Our comments on this document are focused on air, land and water quality issues. It is crucial to ensure that any exploration or development is conducted properly and in accordance with environmental standards appropriate for the coastal plain of ANWR. The State must emphasize this point in its comments on the 1002(h) report.

DEC Issues Are Not Addressed

The 1002(h) document is extremely inadequate in its treatment of air, land and water quality issues. It is essential that the Department of Interior recognize and become familiar with State authority in this area and the body of regulations and requirements associated with sound environmental practices. It does not appear that this has occurred to date. The narrative descriptions of issues and past experiences related to physical emissions are also seriously deficient.

It is essential that the Department of Interior address, at a minimum, the following key issues:

a. Air Quality Management

Particular attention should be paid to emissions associated with start-up and upset flaring, emissions of nitrogen oxides, and the best available technology review process associated with "prevention of significant deterioration" review.

b. Solid Waste Management

Major waste streams include garbage, drilling wastes, metal wastes, and oily wastes. It is very important that proper management of all these wastes be addressed from the beginning. Drilling wastes are of particular concern. Recent efforts by the State to complete a workable set of regulations governing these activities should be viewed as a starting point. Provisions for pickup of windblown litter and other debris must be addressed by stipulation. Planning for sound disposal of each waste stream will lead to the best environmental results.

c. Liquid Waste Management

Possible liquid waste discharges include domestic wastewater, reserve pit fluids, brine discharges, hydrostatic test discharges, vessel rinsates, radiographic wastes, etc. Each needs to be identified and provision made for proper disposal. The existing State and federal regulatory structure, ranging from plan review to best practicable technology, needs to be addressed.

d. Hazardous Waste Management

No discussion of hazardous waste management is included in the 1002(h) report. Hazardous waste

management is governed by stringent requirements under the federal Resource Conservation and Recovery Act. Transportation of hazardous substances is regulated by the federal Department of Transportation. Proper management must be addressed.

e. Oil Spill Prevention and Response

The report refers to the need to address oil spill control requirements at page 84. More detailed plans will be required under the cited State and federal statutes. Provision for a coordinated response capability should be provided by stipulation.

None of these environmental concerns has been addressed at an acceptable level of detail at this point in the process. Concerns related to regulation and development of the support industry and fuel transportation should be addressed by stipulation. As mentioned previously, the document represents only a small step towards identifying topics for which environmental stipulations are needed. The State must be assured that these concerns will be addressed.

Improvements to Past Practices

Decisions on the exploration or development of ANWR will be influenced, to a large extent, by the experience and information gained by the State and the industry during operations at the Prudhoe Bay, Milne Point, and Kuparuk River oil fields. Mitigating measures, regulations, and procedures implemented successfully in these areas should be employed in exploration or development at ANWR. However, the Department believes that it is inappropriate simply to assume that all practices employed at Prudhoe and adjacent fields will be appropriate in ANWR.

Experience gained in monitoring past operations has shown that there are North Slope practices that could and should be improved. Key areas where improvements need to be considered include the management and disposal of drilling wastes, solid waste, hazardous wastes, oily waste, and produced fluids and gas. The Department will want to ensure that the management regime selected for ANWR incorporates proper practices and disposal methods in these areas and provides for appropriate reclamation at the conclusion of operations. In the area of air quality, greater attention to flaring, open burning, visibility impairment and ambient air monitoring will be needed. The management regime will need to ensure that appropriate monitoring is conducted at all stages, including verification of the effectiveness of

stipulations and operating procedures to protect values in question.

The Department of Interior needs to fully evaluate existing practices and determine where improvements are needed. The proper approach is for the Department of Interior to use the body of regulations and stipulations that already exist, particularly those associated with recent State oil leasing on the North Slope, in developing stipulations. Interior should explicitly define those areas where practices at North Slope oil fields should be improved.

Special Values of ANWR

The purposes for which the Arctic National Wildlife Refuge was established must be recognized in developing the appropriate environmental protection standards. In some areas, a particularly high degree of environmental protection may be warranted to protect special values such as wilderness or wildlife values, of ANWR. It could be appropriate, for example, to provide for a greater degree of removal of wastes from areas that are especially valuable. A decision on this issue will require discussions on specific areas to be explored or developed. DEC will work with the Department of Interior to identify appropriate stipulations or requirements to provide the level of protection deemed necessary to protect the values of any areas leased. The review period provided has obviously not been adequate to complete this exercise at this time.

Consultation and Resolution of Issues

The Department believes it is essential for Interior to identify when environmental issues will be addressed. To provide for environmental protection Interior should establish a formal consultation procedure with the State and other parties in order to establish at what points in the process different issues and authorities will be addressed and at what level of detail. This would also allow the opportunity to clarify respective authorities, permitting, and field procedures to avoid duplication or conflicting efforts. The agreement on a process should identify or acknowledge existing regulatory requirements and authorizations. It should address different agencies' review times and public notice requirements. Agencies with jurisdiction include the Alaska Oil and Gas Conservation Commission, Alaska Departments of Natural Resources, Fish and Game, and Environmental Conservation; the U.S. Environmental Protection Agency, Corps of Engineers, U.S. Department of Transportation, North Slope Borough, as well as the Division of Governmental Coordination. Issues that should be addressed are the timing of the various phases of review for

this project and the level of detail to be addressed at each, and coordination of permitting, review of plans of operations, field surveillance, and field approvals. Experiences associated with the Pipeline Coordination Office and the Department of Interior's pre- and post-leasing procedure under the Minerals Management Service could provide useful models. A coordinated process for design review, permitting, field surveillance, compliance and enforcement, and reclamation would serve the State, Interior, and industry well. Failure to provide for coordinated environmental review will not be acceptable to this agency.

Detailed comments on the document are included as Enclosure 1. A summary of key requirements is included as Enclosure 2.

Enclosures

cc/enc: Lieutenant Governor McAlpine
Commissioner Judy Brady
Department of Natural Resources
Commissioner Don Collinsworth
Department of Fish and Game
John Katz, Office of the Governor
Washington, D.C.
Lennie Gorsuch, Office of the Governor
Juneau
Rod Swope, Special Assistant to
the Governor
Tom Koester, Department of Law

bc/enc: Amy Kyle/DEC
Keith Kelton/DEC
Doug Redburn/DEC
Bob Martin/DEC
Larry Dietrick/DEC
Mike Wheeler/DEC
Stan Hungerford/DEC
Bob Butts/DNR
Tom Hawkins/DNR
James Eason/DNR
Norm Cohen/DF&G
Al Ott/DF&G
Lance Trasky/DF&G

DK/ADK/mt

ENCLOSURE 1

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PAGE-SPECIFIC COMMENTS ON THE 1002(h) REPORT

Chapter II Existing Environment.

A section on water quality should be added.

Pages 12-13 Standards for Environmental Protection.

This section provides a general description of standards for environmental protection. It should be noted that the U.S. Fish and Wildlife Service mitigation policy provides for protection of habitat and is useful for that purpose. However, it is less applicable to the standards associated with environmental protection enforced by this agency. At page 13, the list of statutes applicable to development is not complete. It is essential that the Department of Interior identify and address all pertinent environmental authorities.

Page 23 Air Quality.

This section does not reflect current conditions or information. The substantial air emissions occurring in the Kuparuk/Prudhoe area are not described at all. Data sources cited predate development at Prudhoe Bay.

The issue of "Arctic haze" should be described more completely. Arctic haze was first reported as early as the 1950's. Recent efforts to "fingerprint" and track Arctic haze have provided more detail about the sources of these particulates, which appear to originate from sources in Eastern Europe and the Soviet Union. Dr. Glenn Shaw at the University of Alaska's Geophysical Institute in Fairbanks could provide current information on this subject.

The data source cited for carbon dioxide predates development at Prudhoe Bay and, consequently, is in no way representative of current conditions. Monitoring data collected in the late 1970's on nitrogen oxides, particulates, carbon monoxide, sulphur dioxide, and meteorological conditions should be cited. In addition, comprehensive ambient monitoring was initiated by the Department and industry in the fall of 1986. Data from these efforts should be considered in the description and

subsequent evaluation, as these data are most representative of current conditions.

Department staff in Prudhoe have observed a noticeable increase in visibility impairment. The exact causes are not currently known, but should be better understood after current monitoring is completed. It is extremely unlikely that sea spray is a main contributor to particulate levels, as is suggested in the report. The implication that air quality impacts of human activities in the villages is equivalent to those at the Prudhoe/Kuparuk development area (in paragraph three) is misleading at best and should be deleted.

Page 76 The description of reserve pit practices is no longer appropriate under proposed changes in the State solid waste management regulations. If a determination is made that ANWR warrants a higher degree of protection than does Prudhoe Bay, stipulations in addition to the proposed regulations should be developed.

Page 95 Chapter VI Environmental Consequences.

Like the rest of the report, the chapter on environmental consequences focuses primarily on habitat and wildlife issues. The requirements associated with this agency must also be meaningfully addressed during the planning for the project.

Page 97, paragraph four.

The process of consultation should be formalized, as described in our general comments.

Page 97, paragraph six.

The assumption in this paragraph is that technology is the limiting factor in environmental practices on the North Slope. This is not necessarily the case. While air emissions and wastewater discharges are required under federal law to be regulated according to some version of "best available technology" this is not necessarily true for other types of waste disposal.

Page 98, Assumption 2.

The mitigation measures defined at the end of the chapter are by no means adequate to fulfill the requirements of this agency.

Page 98, Assumption 4.

The implication here is that the standards governing seismic exploration and the land use stipulations in the land exchange will provide appropriate guidance for several issues of concern to this agency. We have not had the opportunity to review this issue in detail. The stipulations would obviously be appropriate only at an exploratory stage.

Page 99, last paragraph and page 100.

The treatment of practices and issues associated with disposal of drilling wastes is grossly inadequate and misleading here and elsewhere. As in other areas, a careful review of practices to date and careful consideration of needed improvements is called for. The option cited of simply leaving pits open is unequivocally unacceptable to the State. The description on the following page of impacts should not be considered "unavoidable."

Page 145 Summary of Recommended Mitigation Measures.

Measures 27, 30, 31, and 32 pertain to DEC issues. These measures represent a very small step toward defining what will be needed to provide an appropriate level of environmental protection if the project is to go ahead. The necessity for Interior to become acquainted with the extensive body of environmental regulation and to provide appropriate forums for decisions about stipulations, plans of operations, permits and so on cannot be overstated. The stipulations represent an understanding of these issues that is rudimentary at best.

ENCLOSURE 2

SUMMARY OF MAJOR DEC AUTHORITIES PERTINENT TO ANWR

The State of Alaska defines and regulates the following:

1) <u>Type of Waste</u>	<u>Statutes</u>	<u>Definitions</u>	<u>Regulations</u>	<u>Definitions</u>
SOLID WASTE	AS 46.03.100-120 800-810	AS 46.03.900(24)	18 AAC 60 (draft)	18 AAC 60.910(49)
Construction Waste				(Not defined)
Industrial Waste		AS 46.03.900(10)		-- --
Other wastes		AS 46.03.900(16)		-- --
"Drilling Wastes"		AS 46.03.900(31-32)		18 AAC 60.910(16)
Putrescible Waste		-- --		18 AAC 60.910(40)
Septage, Sewage Sludge, Sludge		-- --		18 AAC 60.910(46) to (48)
Sanitary Waste		-- --		-- --
2) LITTER	AS 46.06	AS 46.06.150(4)		
3) HAZARDOUS WASTE	AS 46.03.296-308 830-833	AS 46.03.299(a)-(b)	18 AAC 62	

<u>Type of Waste</u>	<u>Statutes</u>	<u>Definitions</u>	<u>Regulations</u>	<u>Definitions</u>
4) OIL and HAZARDOUS SUBSTANCES*	AS 46.03.740 758-760 780-790 822-826 AS 46.04		18 AAC 20 18 AAC 75	
Oil		AS 46.03.758(6) AS 46.03.826(4) AS 46.04.120(9) AS 46.08.900(7)		
Hazardous Substances		AS 46.03.826(3) AS 46.08.900(6) AS 46.09.900(4)		
5) WASTEWATER	AS 46.03.100-120		18 AAC 72	
Domestic Wastewater		-- --		18 AAC 72.990(16)
Graywater		-- --		18 AAC 72.990(24)
Non-domestic Wastewater		-- --		18 AAC 72.990(29)
Other Wastes		-- --		18 AAC 72.990(32)
Septage		-- --		18 AAC 72.990(44)
Sludge		-- --		18 AAC 72.990(50)
Spoils		-- --		18 AAC 72.990(52)
6) TOXIC MATERIALS and WASTES are a "special" class regulated under the Federal Toxic Substances Control Act and National Emission Standards for Hazardous Air Pollutants.				

* Note new legislation adding AS 46.08, AS 46.09, and amending AS 46.03.745, 758(k), 760(a), 765, 780(a), 790(a)(b)(d) and AS 46.04.010 and 090(b).

MEMORANDUM State of Alaska

ALASKA DEPARTMENT OF NATURAL RESOURCES

TO: Robert Grogan
Division of Governmental
Coordination

DATE: January 6, 1987

FILE NO:

TELEPHONE NO:

FROM: *JMB*
Judith M. Brady
Commissioner

SUBJECT: Comments on the ANWR
Section 1002(h) Report

Presented below are the Department of Natural Resources' comments on the draft U.S. Department of the Interior report titled Arctic National Wildlife Refuge, Alaska, Coastal Plain Resource Assessment. General comments are presented first, followed by two enclosures. The first enclosure includes comments on the three unresolved issues that were identified by state agencies during discussion on the exchange agreement. The second enclosure includes specific comments on the document and recommended mitigation measures.

General Comments

In responding to the Department of Interior, the state's comments must be clear: the state supports the opening of the coastal plain, and that with proper mitigation, oil and gas exploration, development, and production can occur in a manner compatible with the purposes of ANWR. Accordingly, the department recommends that the state's comments clearly reflect this policy, and that we not send DOI pages and pages of comments informing DOI and Congress of all the flaws in the report. The state's letter will likely be included in the an appendix to the 1002 (h) report where it will be very visible and widely circulated.

The Report's Conclusions

The department concurs with the report's findings that the 1002(h) area "...is clearly the most outstanding oil and gas frontier remaining in the United States, and could contribute substantially to our domestic energy supplies." We also concur with the Department of Interior's (DOI) conclusion that "...most adverse impacts would be minimized or eliminated through carefully applied mitigation, using the lessons learned and acquired from development at Prudhoe Bay and from the construction of the Trans-Alaska Pipeline System."

In addition, we agree with DOI's selection of Alternative A as the preferred course of action. This alternative would allow oil and gas leasing to occur throughout the 1002(h) study area,

with the caribou calving area in the southern portion of the area to be leased last.

This alternative has the greatest potential of resulting in enormous benefits to the nation and the residents of Alaska. As discussed in the Chapter VII of the report, allowing oil and gas exploration and development on the Arctic Plain of ANWR under this proposed alternative gives the greatest promise of:

- 1) making a significant contribution to the nation's oil reserves;
- 2) reducing the nation's dependence on foreign oil;
- 3) enhancing national security;
- 4) providing net economic benefits to the nation on the order of \$79 to \$325 billion (1984 undiscounted dollars)
- 5) providing sizable economic benefits to the residents of Alaska in terms of jobs and state and local government revenue;
- 6) extending the life and amortizing the investment in the Trans-Alaska pipeline, which also will result in increased production from other North Slope fields; and
- 7) greatly enhancing the economic feasibility of oil production from reservoirs found to the north of ANWR in state and federal OCS waters, and those found onshore to the west of ANWR.

In brief, the potential economic and social benefits to the state and nation of allowing oil and gas leasing to occur throughout the 1002 area are substantial, and the state should strongly advocate that the entire plain, including the caribou calving area, be opened for leasing subject to adequate environmental safeguards.

Provision for the Siting of Support Facilities for Offshore Development

It is important that the state urge Congress to allow the siting in ANWR of oil and gas facilities needed to support offshore oil and gas development occurring north of ANWR on state-owned submerged lands and on the federal Outer Continental Shelf. As written, none of the alternatives specifically state that support facilities, if needed, would be permitted. This provision would be compatible with Alternatives A, B, C and D, and accordingly, should be added to these alternatives.

Disputed Acreage

Although the draft report recognizes the submerged lands ownership dispute between the state and federal government regarding the coastal lagoons between the mainland and offshore barrier islands (page 42), it does not address the navigability status of inland waterways. The state also asserts ownership of the submerged lands underlying the Aichilik, Jago, Okpilak, Hulahula, Sadlerochit, Staines and Canning Rivers within the 1002 area. The maintains that these are navigable waterbodies, in which the title of the beds were vested to the state at the time of statehood.

Unresolved Issues

In reviewing the proposed stipulations, and as a result of the interagency discussions on the proposed exchange agreement, three major issues were not resolved at the director level. A brief discussion of our position on these issues is presented below. A more comprehensive discussion is included in Enclosure 2 of our comments.

The three issues involved requests by ADF&G to: 1) defer oil and gas leasing in the "core" calving area, 2) prohibit surface entry, with the exception of one transportation corridor, within three miles of the coast, and 3) prohibit surface entry within 3/4 mile of selected rivers and 500 feet from other waterbodies.

According to preliminary estimates of the Division of Mining and Geological and Geophysical Surveys, the three-mile surface entry restriction along the coast would result in 19% of the ANWR acreage with the highest rated oil and gas potential being placed under severe land-use restrictions. The deletion of the caribou calving area would result in 10.8% of the highest potential area, and 16.5% of the second highest rated acreage, being placed offlimits. Combined, these two measures would preclude 30.1% of the highest rated acreage, and 16.5% of the second highest rated potential acreage, from oil and gas activity, with a substantial corresponding reduction in potential economic and social benefits to the nation, state, and Native corporations.

Caribou Calving Area

In the department's view, there is little evidence, that oil and gas development activity in the calving area will have an adverse impact on the Porcupine caribou herd population if adequate measures are taken to allow caribou passage through developed areas, and if measures are taken to reduce disturbance during calving periods. The department agrees with the Department of Fish and Game that some caribou displacement has

occurred in the Prudhoe Bay Field due to the very large amount of traffic and low pipelines in that particular field. In the Milne Point and Kuparuk Fields, where extensive mitigation measures have been employed, displacement has been much more limited, and has occurred most often in the vicinity of facilities in which high levels of noise are produced, or near roads with high levels of vehicle traffic.

However, even if some displacement of caribou from calving areas does occur, based on our review of the scientific literature and after consulting with recognized caribou biologists, we remain unconvinced that this displacement will likely result in reductions in the caribou population. Based on a review of the literature, we have yet to find a study in which it has been documented -- or even strong evidence presented -- that caribou displacement and disturbance occurring in a calving area has led to a reduction in the size of a caribou herd population.

We understand that ADF&G wants to take a very conservative management approach, and not lease the calving area. However, if this area is rich in petroleum resources, such an approach would result in sizable foregone social and economic benefits in exchange for uncertain benefits to the caribou population.

The department also is seriously concerned with the prospect of the State of Alaska taking a position on caribou calving in ANWR that is inconsistent with policies and actions taken by the state on state-owned lands. On the North Slope, the State of Alaska has leased both core calving areas of the Central Arctic Caribou Herd. Unless there are compelling reasons for adopting a different state policy for ANWR calving areas, the department urges the state to support leasing of the caribou calving areas with the mitigation measures that are required in state leases.

Three-mile buffer Adjacent to the Coast

With respect to the proposed prohibition of facilities within three-miles of the Arctic coast, the department has similar concerns as those expressed above. This buffer is intended to maintain caribou access to and along the coast, and to protect waterfowl, nesting birds, and polar bears from potential impacts. First, it has been shown that mitigating measures, such as pipeline elevation, ramps, and seasonal restrictions on traffic, are effective in achieving the objective of maintaining caribou access to and along the coast. Second, we have not heard any compelling reasons to have a policy in ANWR that is substantially different from that applied to state-owned lands. Third, if and when facilities are proposed, the facilities can be sited and designed to minimize impacts on waterfowl, nesting birds, and polar bears.

Buffers Adjacent to Streams and Rivers

The adoption of a proposed policy of requiring a 3/4 mile buffer adjacent to selected streams, and a 500 foot buffer adjacent to all other waterbodies, would be another case of the state advocating a different standard for federal lands than that used on state-owned lands. On state-owned North Slope acreage, a 500 foot buffer is required for selected major rivers, and a 100 foot setback is required for all other fish-bearing streams and lakes. In both instances, smaller buffers may be allowed if the "...Director, Division of Oil and Gas, after consultation with the Department of Fish and Game, determines that such facility placement will not significantly disturb sensitive wildlife habitats or that such a requirement is not feasible or prudent."

We are not aware of deficiencies with the 500 foot/100 foot setbacks, which have been developed over the years as a result of considerable interagency discussion and debate, and represent a careful balancing of habitat protection requirements with the economics of oil and gas field design and siting requirements. We agree that there may be site specific cases in which a larger setback is necessary, but as a general rule, the 100/500 foot setbacks are adequate.

It should be noted that if the larger setbacks are advocated, the state would be arguing for a 3/4 mile setback for the federal land on the east side of the Canning River, while it has adopted a 500 foot setback on its lands on the west side of the Canning River.

In our view, the state should not adopt the 3/4 mile buffers unless it can clearly be shown that there are compelling reasons for having larger buffers in ANWR relative to the buffers that have been used for years on state-owned lands on the North Slope.

Conclusion

In summary, the department urges the Governor to adopt and convey a strong, positive position towards the report. Alaska's response should state that we support Alternative A, that oil and gas activity can occur with minimal impacts to fish and wildlife resources as evidenced by the Prudhoe Bay experience, and that the social and economic benefits to the nation and state far outweigh any potential environmental costs.

cc: Lieutenant Governor McAlpine
Commissioner Collinsworth
Commissioner Kelso
Deputy Commissioner Arnold
Deputy Commissioner Barnett

ENCLOSURE 1

UNRESOLVED ISSUES
Arctic National Wildlife Refuge

Oil and Gas Leasing in the "Core" Caribou Calving area

Issue: Should the State of Alaska request that the Department of Interior and Congress continue to prohibit oil and gas leasing in the "core" calving area of the Porcupine caribou head.

ADNR's Position: Oil and gas leasing should be permitted in the calving area. The oil and gas potential of the area is high, and mitigation measures can be taken to minimize, and perhaps eliminate, adverse impacts on the caribou population.

Rationale:

1. The concept of a area-specific critical "core" calving area is not supported by the facts. Caribou calving has taken place throughout the area north of the Brooks Range. While it is true that caribou calving frequently occurs in the "core" area, there are years in which it is not used, and other years in which only a portion of the "core" area is utilized.

2. Only moderate amounts of caribou displacement has occurred to date on the North Slope where state-of-the-art mitigation measures have been employed. In the Kuparuk Milne Point areas there is evidence of displacement of maternal cows and calves in the immediate vicinity of pads and roads with high levels of vehicle traffic and activity. However, no regional displacement has occurred. Once development and construction activity and subsides, the current amount of displacement will likely be reduced.

- A. If mitigation measures are taken (roads are separated from pipelines, pipelines are elevated, well-designed ramps at appropriate locations are provided, and traffic is minimized) caribou will cross pipelines and roads.
- B. Displacement in the vicinity of structures and roads is largely a function of the level of activity and noise generated from the facilities and roads, not their physical presence.
- C. Mitigation measures can reduce disturbance-producing activity when caribou are present to minimize potential displacement.

3. Even if one assumes displacement is occurring, there is no scientifically supportable evidence that displacement of the herd from the calving area will, or is even likely to, effect the size of the caribou population.

A. Case histories relied upon by biologists to argue that displacement of caribou from calving areas will result in population effects are not comparable to the ANWR situation. Population declines in these case studies can largely be attributed to greater hunting pressure and physical barriers that are difficult, if not impossible, to cross.

B. Other studies have indicated that the maintenance of disturbance-free calving ground habitat does not appear to be critical to the health of the population.

C. The basis for claiming that caribou calving areas have unique biological features different from other areas has never been documented, and based on the large and varying areas in which calving takes place, it can be assumed that these core areas must not be critical to the animal's survival.

D. The department is not aware of any studies that show herd productivity is reduced in cases where disturbance has taken place in calving areas.

E. Reputable scientists have concluded that the controlling factors have the greatest affect on caribou population size are predation and hunting, not minor losses of habitat in calving areas

4. Mitigation measures to reduce or eliminate the amount of displacement on caribou are available, and have been largely successful in the Milne Point and Kuparuk areas. Measures that are used include: 1) separation of pipelines and roads, 2) elevated pipelines, 3) consolidation of facilities, 4) flight restrictions, 5) restrictions on non-essential activities during calving periods, and 6) traffic controls. These same measures can be successfully applied to the "core" calving areas of the Porcupine herd.

5. Deletion of the "core" caribou calving area will foreclose oil and gas leasing opportunities in approximately 10.8% of the 1002 area with the highest ranked oil and gas potential, and 16.5% of the 1002 area with the second highest ranked potential, with no certain benefits to the caribou herd.

6. A state recommendation to delete the caribou calving area would be inconsistent with state policy applied to state-owned lands on the North Slope. The state of Alaska has leased both "core" caribou calving grounds of the Central Arctic Herd.

7. The department recommends that the state support Management Alternative A in the 1002 report, which would not delete the caribou calving area from oil and gas leasing. This recommendation is based on the low risk of adversely affecting the caribou population, the need to have a consistent state position in regards to calving areas, and the potential large economic and social benefits to the nation and the state of leasing the calving area.

Surface Entry Restriction within Three Miles of the Coast

Issue: Should the State of Alaska request that the Department of Interior (DOI) and Congress restrict surface entry, with the exception of transportation corridors and facilities needed to support offshore development, within three miles of the coast? The restriction is intended to preserve insect relief habitat for caribou and to protect waterfowl, bird nesting, and polar bear denning habitat.

ADNR's Position: The state should not request that DOI prohibit surface entry in this area. The oil and gas potential of the area is high, the area encompassed by the restriction is extremely large, and mitigation measures can be taken to minimize, if not eliminate, adverse impacts on caribou and waterfowl populations.

Rationale:

1. Mitigation measures are available to ensure that caribou access can be maintained. As discussed in the previous issue, if measures are taken to separate roads and pipelines, if ramps are provided, and if traffic is minimized, caribou will cross pipelines and roads. Restrictions on activities during insect relief periods can reduce disturbance producing activity when caribou are present.

2. Even if caribou access to the coast is not provided in limited, site-specific areas, there will continue to be large portions of the the Beaufort coast in which access will be possible. The coast in ANWR is over 150 miles long, and a large portion to the east of the 1002 area is designated wilderness. It is extremely unlikely that oil and gas facilities will occupy more than a small fraction of the coastline.

3. However, even if site specific access was prevented, no scientifically supportable evidence exists that this lack of access would likely affect the size of the caribou population.

A. The department is not aware of any studies that show that herd productivity is reduced when insect relief habitat is slightly reduced.

B. Reputable scientists have concluded that the controlling factors largely affecting caribou population size are predation and hunting, not minor losses of habitat in calving and insect relief areas.

4. Mitigation measures to reduce or eliminate the impacts of oil and gas activity on waterfowl, and nesting birds are available, and have been successfully on the North Slope which have higher waterfowl and bird nesting habitat values.

These same measures can be successfully applied to waterfowl and nesting habitat on the coastal plain of ANWR.

5. A surface entry restriction within three miles of the coast will preclude, or seriously restrict, oil and gas development in approximately 19.3% of total 1002 acreage designated as having the highest oil and gas potential.

6. A restriction on the siting of onshore support facilities for offshore development could have an adverse impact on feasibility of production from offshore state-owned and OCS acreage.

7. A state recommendation to prohibit surface entry in this area would be inconsistent with state policy applied to state-owned lands on the North Slope. When facing this same question, the State of Alaska has leased caribou insect relief habitat and "critical" waterfowl areas on the North Slope adjacent to ANWR. Instead of large scale surface entry prohibitions, mitigation measures have been developed and successfully employed.

8. The department recommends that the state not support a restriction on surface entry within three miles of the coast. This recommendation is based on the low risk of adversely affecting the caribou and waterfowl populations, the need to have a consistent state position in regards to insect relief and waterfowl habitat areas, and the potential large economic and social benefits to the nation and the state of allowing surface entry in this area.

3/4 mile Buffer Adjacent to Specified Streams

Issue: Should the State of Alaska request that the Department of Interior (DOI) and Congress restrict surface entry, with the exception of transportation corridors, within 3/4 mile of specified streams, and 500 feet from other streams, lakes, and other water bodies? The restriction is intended to protect riparian habitat and minimize pollutants from entering the water bodies.

ADNR's Position: The State should not request that DOI prohibit surface entry within 3/4 mile of specified streams, and 500 feet of other waterbodies. Instead, the setbacks should be 500 feet from specified streams, and 100 feet from other water bodies. Provisions could be made to require larger buffers when it is determined to be necessary on a site-specific basis.

Rationale:

1. As a result of the extensive discussions, the State of Alaska has established setbacks of 500 feet from specified streams (such as the Canning River), and 100 feet from other waterbodies.
2. The established setbacks of 500/100 feet resulted from a careful balancing of habitat protection requirements and the economics of oil field design and economics. The department is not aware of problems that have arisen from these setbacks.
3. Accordingly, the department has not seen any compelling reasons to enlarge the setbacks.
4. A setback of 3/4 miles on each side of a river will likely increase the cost of developing a field, and could reduce the amount of oil and gas ultimately recovered.
5. Larger setbacks have been agreed to in the Cook Inlet and Bristol Bay Region in order to protect popular fishing streams and critical habitat areas. However, setbacks on the North Slope have consistently been 500/100 feet. And, the department does not object to larger setbacks on a case-by-case basis adjacent to critical habitat areas.
6. A state recommendation to prohibit surface entry in this area would be inconsistent with state policy applied to

state-owned lands on the North Slope. If 3/4 mile buffers are adopted in ANWR, there will be a 3/4 mile buffer on the east bank of the Canning River, and a 500 foot buffer on the west bank.

7. The department recommends that the State support a position consistent with state policy on state-owned lands. This recommendation is based on the lack of evidence that 500/100 foot buffers are inadequate, the additional development costs associated with larger buffers, and the need to have a consistent state position on stream setbacks.

ENCLOSURE 2

Specific Comments on the draft

Arctic National Wildlife Refuge, Alaska
Coastal Plain Resource Assessment

Specific Comments
Alaska Department of Natural Resources

Overall, the Department of Natural Resources found that the U.S. Fish and Wildlife Service did an excellent job in compiling and summarizing a large amount of information.

Presented below are the department's specific comments on the contents of the report. Only comments that were considered to be of substantial importance have been included.

Chapter III - Assessment of Oil and Gas Potential

The department found this discussion to be well written, comprehensive, and based on what is known regarding the geology of the area, well-founded forecast. While the resource estimates developed by the department vary from the estimates presented in the report, the overall conclusions are very similar: the coastal plain of ANWR has the highest known oil and gas potential of any unexplored area on the North American Continent.

Chapter IV - Development and Transportation Infrastructure

This chapter was also well-written. The department's only comment is that based on the experience of oil and gas development near the village of Nuigsut, it is likely that Kaktovik residents will want to have access to a road system built in the vicinity of the village.

Chapter V - Alternatives

As noted in our earlier comments, the department supports Management Alternative A - Full Leasing of the 1002 Area.

In the discussion of potential development scenarios, readers should be cautioned that the scenarios presented in the text are only one possible set of outcomes, and that there are a multitude of additional possibilities. It is possible that no oil will be found, and that the only trace of oil activity will be the minor traces of exploratory drilling activity. It also is possible that sizable geological structures were not identified, and that oil and gas may be found in other areas than those identified on the maps. Until actual drilling takes place, we will not know if, or where, oil exists.

Chapter VI - Environmental Consequences

Page 97 - The department has serious reservations regarding the need to "compensate" the loss of habitat on the North Slope. According to the USF&WS policy, habitat impacted by oil and gas

activity which is located in the caribou calving area must be replaced, or substitute resources or environments provided. While we fully understand the need for this in wetlands and coastal areas found in heavily populated and impacted areas in which habitat is limited, we are not convinced that there is a scarcity of caribou habitat on the North Slope. Based on our review of the literature, the loss of several thousand acres of caribou habitat, even if it occurs in the "core" calving area, is inconsequential to the health of the population.

We also have reservations concerning the designation of the calving area as "Resource Category 1," and all other areas in the refuge as "Resource Category 2." Based on the definitions and the habitats of the 1002 area, the department does not think that the vast majority of the 1002 lands qualify for such a high level of protection and mitigation as defined by the current USF&WS Mitigation Policy.

Page 97 - This section should also recognize the multitude of other permits that will be required for oil and gas operations in ANWR. In addition to the USF&WS Special Use Permit, operators also will be required to obtain state and federal permits for drilling wells, disposing of solid wastes, air emissions, placement of fills in wetlands and coastal waters, water appropriations, oil spill contingencies, and a host of other activities. In addition, all activities impacting the coastal area must be consistent with the Alaska Coastal Management Program.

Summary of Recommended Mitigation for the 1002 Area

In reviewing the proposed stipulations, it was assumed by the department that this summary was not intended to be all inclusive, and that more detailed stipulations would be developed prior to any lease sales or transfer of subsurface rights. We found this to be a reasonable approach, and therefore limited our comments to those items that were especially troublesome.

Item 4 - Rehabilitation Plan Requirement

The need for rehabilitation plans is clear, but the timing of their submittal and measures necessary to ensure that they will be implemented need further consideration. First, a overall rehabilitation policy should be developed early in the leasing process so that lessees are aware of what degree of rehabilitation will be required. Based on the policy, a very general rehabilitation plan could be submitted with a proposed plans of operation. Detailed specific plans would then be required several years before operations are to be abandoned.

Item 6 - Limits on oil exploration

This policy would limit exploratory activity, with the exception of geology studies, to November 1 - May 1, although "local exceptions could be made." While we agree in principle with this stipulation, as written it is too restrictive. It may be necessary to conduct summer site surveys and summer drilling activities, and it may be desirable to have operations start-up prior to November 1 at pre-existing drill sites. Assurances should be made that these activities will not be precluded.

Item 8 - Pipeline elevation

This policy requires that pipelines allow "free passage" of caribou. Because of the problems of defining "free passage," the department recommends that just "passage" be used.

Item 10 - Pipeline Burial

Instead of requiring that pipelines be buried where "possible," we strongly recommend that they be buried "where feasible and prudent."

Item 12 - Surface occupancy restriction within three miles of the coast

For the reasons cited earlier, the department strongly recommends that this stipulation be deleted.

Item 13 - Monitoring and Research Requirements

If monitoring and research is to be a useful management tool, the objectives of the research must be clearly and specifically identified prior to the research being conducted. Without this occurring, the monitoring and research efforts are useless. Also, who will pay for this research, and how extensive a program is anticipated?

Items 16 and 17 - Peregrine Falcon and Raptor protection

Since peregrine falcons are endangered, the department concurs with the recommended setbacks from known peregrine nests. However, we are not convinced that the same high level of protection should be provided for all raptors. The department recommends that raptors be deleted from these stipulations.

Item 19 - Polar Bears

In our view, it is not clear that denning polar bears are bothered by anything other than very loud noises, such as that emitted during geophysical operations. Accordingly, this stipulation should be modified to apply only to geophysical operations. Also, it should be made clear that if a bear builds a new den adjacent to existing structures, the activity associated with the structure does not have to be suspended.

Item 21 - Discharge of firearms

A restriction on the discharge of firearms in the vicinity of structures is necessary to protect human safety and oil field operations, but the five-mile prohibition is excessive.

Item 23 - Protection of *Thaspi arcticum*

This stipulation causes the department concern for several reasons. First, it is not known to the department how widespread this plant is, so it is impossible to determine how large an area will be placed off limits by this stipulation. Second, at this point in time the plant is a candidate for the endangered species list, it is not on it. This stipulation should be dropped.

Item 24 - Causeways

This stipulation should be modified with "To the extent feasible and prudent,..."

Item 25 - Time and Area Closures for wildlife

The department has no objections to the concept of closures and activity restrictions for exploratory activities and certain activities associated with development and production, such as vehicle movement. As written, this stipulation should apply only to exploratory activities, vehicle movements, and other activity than can reasonably be rescheduled for another period of time.

Item 26 - Overflight Restrictions

These restrictions should be consistent with the elevations used by the state. In addition, it should be made clear that human safety takes precedence over the restrictions.

Item 27 - Reduction of human/bear conflicts

This stipulation should be modified to read:

"Measures must be taken to minimize human/bear interaction and conflict. These measures may include, but not be limited to, the use of bear-proof fencing around certain facilities, special waste management plans (such as incineration of putrescible wastes), and employee education programs."

Item 31 - Reinjection of drilling wastes

The department recommends that "cuttings" be deleted from this stipulation. The advantages of reinjecting cuttings would be negligible, and unless the cuttings were crushed (which could be very expensive), reinjection of cuttings is not technically feasible.

10/6 - MMF - 1002 Report.

Russell (Lowe) - w/ Al Emery -

re Alt v A - air; water + gravel; marine transport - partic. causeways; calving areas;
fish - CESCO - range of alt vs; redun of core calving area for draft.

Don Yang - elaborate the impacts; what's a CESCO?; fish don't know the
difference b/w a bridge + a culvert; argue to rely on knowledge of
state/fed'l wildlife experts (at EPA wh. is stip'g on fish protection);

Thomas - classif'n of o/g wastes (muds/cuttings) as nonhaz's in draft resp.
water quality at Pothole Bay.

Savids - DOI pol'itized through 1002 LEIS, but State + EPA appear to hv
big resvns.

Maggie - 1) core calving area - about 19% of o/g POT (1); 2) waste stream
mgmt issues;

oppos'n to land trades -

Maggie Moran

witness list for Sen. Gr ANSWR legs?

- agenda - 13th - EPA, USFWS, DOI, state of AK, Senators, congress.
- 14th - Murk's support by OH/Mietuch/Eason -
- 15th - opposed

will prob'ly be another round

Sen. E + PW - Maggie will know more - poss'ly not get Roth's bill -

Lindsey Thomas + ^{Walter Jones} ch. 1 are exp'd to do a bill - allow expl'n -
4-6 wells -

Coalition mtg 10/8 S-207 in Capitol at 3:00 -

LGIS trades - no axn -

10/17 Katz -

- ✓ ANCSA lunches
- ✓ Nat'l Treasury Inspector
- ✓ lawsuit

land exchanges

- ✓ has enough sense of ANCSA/DOI lobbying to be able to judge the dangerous times -
- ✓ Mobil/Sun oppos'n
- ✓ 7(i) - NANA - Sulaska -
- ✓ McClure hated the trades -
- ✓ moratorium language in submgd lands - Murk sez OK - submgd lands -
- ✓ He's out 11/17 - Gov testify - Sam same day - Jeff Petrich. -
- ✓ Basin/Bus trip. - me/here?
- ✓ Rota bill -
- ✓ won't pursue now but maybe

4/3

Bob Gilmore

land trades - no lobbying, just ans'g q's -

non-duplication - in steps prob'ly -

leasery - stand-alone - reg's + steps wd be based on ex'g prac's -
wd need new resp for coastal plain log system -

Is supervision - don't know wh'r it's to

R/W's - new act'g - sep. act'g fr. Pipeline R/W Log - ANILCA
or Refuge Admin Act - both wd be very cumbersome -

NEPA - exp'd jud'l now as in TAPS -

*2-4b - excluding - 89% of value is still available w/ trades -

EIS - wants Congress to use LEIS/1002 as basis for 1st lease
sale - based on prospectiveness -

Solizator's Opinion is on hold - it was finished + then discussed

w/ AG

won't move on LEIS until Bennett Johnston nodes
mark-ups wait happened bec. of budget stuff -

10/13 1

Call Tom Canby.

Gail Galtan

Bart Watson

Budrick

Bumpus Bradley, Ford Johnson, McBurne, Murkowski, Heston, Evans, Pingaman

10/12 Sen Energy - Domenici ~~Conrad~~ Fowler Conrad

Horn speaks against explor'n prog. bec. it cd affect the
pot'l bonus revenue fr. adj. tracts (analog - land exchanges)
"no unnec'y adv's ^{effects} ~~imp~~" - The st^d offered in 1002 for any dev't, lsg
on coastal plain

Refuge Admin'n Act -

1002 contains 29 rec'd env't strips on lsg. - "starting point", will dev.

Other strips in NEMA process -

water + gravel a major concern -

want new auth's re duplic'n of similar facilities, R/W est. -

want ^{low priced} cash, royalties, bidding

1002 LEIS shd be programmed EIS but there shd be 18-24 mos. of
lsg. EIS work bef. lsg occurs - can't meet S 1217's 12 mo. deadline

Johnson issues:

- 1) exploration-only phase? he doesn't support - no Ct. members seem to supp.
- 2) core-calling area set-aside - State interest
- 3) st^d for prot'n of f+w - what does no unnec'y adv's effect mean
- 4) lease all, save some for later?
- 5) expedited judicial revs on EIS
- 6) lease strips
- 7) R/W with: under no unnec'y adv's impx st^d -

8) wastes, gravel, water

9) special liability provisions

10) lease terms - beyond activity or > specific -

5735 - need legal opinion fr. DOI solicitor on legality of reducing

Act's entitlement -

ali of coastal plain? Horn - yes. NEPA process might result in some
staying. EIS for lsg process - strips, areas

how define "reasonable" on strips, impact?

pot-grn?

→ want activity to be able to suspend leases if there's no transport system
available - (what a scam!) - (Horn)

new length of lease - not a 10-yr std - due diligence (Johnston)

lease sale revenues of \$2-4b, acc. to Horn - how arrived at? (trades mid?)

std ls terms? what price of oil? what date of ls sale? discounted \$?

Horn - State will not hv a strong case if challenging unilateral rden of 90/10 -

→ want stand-alone lsg activity, not MLA 1920 -

Bradley - EPA 6/1 let - Blueprint EIS record - cumulative effx - impact aid for

locals (Horn opposes) - can rank stress by pot'l? (Horn sez yes by region,

might hv missed a lot) 2 most impact are 18/19 + Tago River

→ area ^{2d/21} + 75% of pot'l in ANWR - diff's btw draft + final 1002 impact

analysis +

(scribbles)

Evans -

State

planning

waste mgmt

jt fed-state coop in monitoring / stip dev't -

monitoring + enforcement

explor only wd be unfair to adj. owners, wd red. bonus revs, wd be

exp. dozens of wells wd be need

Johnston wants larg. fr. state on jt. state-fed coop

10/15 - 1

Sea Energy - ANWR - env't groups

Janston, Benjamin, Wirth, Meizenbaum, Fowler, Mukli,

DOE - compl'g - problems?

steps - enforceability, economics, effectiveness

constitutionality of steps as - taking - courts are divided

steps are often waived.



ADGA attitude tow. steps. - working gov;

prev'r measures aren't proven after fail.

Joe Fisher - Winers Socy.

Lisa Speer - NRDC/NWF/Trustees

"disturbing record of non-compliance" @ Prudhoe

air/water poll'n, absence of habitat

data gaps bec. of inad. monitoring

burden of proof is on agencies - indy -

Milton Freeman - subsistence -

1002 Ind. ^{to meet} NEPA req'ts. - DOE/SOLDF

Celia -

Debbie Miller - her 1-yr old daughter spoke up a wolf on coastal plain this summer

THE FOLLOWING PAGES WERE TREATED AS
A UNIT IN THE ORIGINAL FILE.

MEMORANDUM

State of Alaska

DEPARTMENT OF FISH AND GAME

TO: Robert L. Grogan
Associate Director
Division of Governmental
Coordination
Office of Management
and Budget

DATE: January 2, 1987

FILE NO.:

TELEPHONE NO.: 465-4100

SUBJECT: ANWR 1002 Report

FROM: Don W. Collinsworth
Commissioner
Department of Fish and Game

DWC

The Alaska Department of Fish & Game (ADFG) has reviewed the Draft Arctic National Wildlife Refuge, Alaska, Coastal Plain Resource Assessment 1002 report, and the accompanying cover memo by William Horn. The 1002 report contains a substantial amount of information that is useful for guiding the U.S. Fish & Wildlife Service (USFWS) and other agencies in protecting fish and wildlife resources should Congress open the area for oil and gas leasing.

We have predicated this review on the fact that the Arctic National Wildlife Refuge (ANWR) is a unique part of the national wildlife refuge system and furthermore, as stated on page 46 of the 1002 report, "The 1002 area is the most biologically productive part of the Arctic Refuge for wildlife and is the center of wildlife activity on the refuge." We have conducted an extensive review of the resource information and have summarized this review in Enclosure A. Data on distribution and abundance of fish and wildlife are presented, and areas of special concern are highlighted.

The ADFG's major comments on the adequacy of the 1002 report, including our recommended alternative, are summarized below. It should be recognized that there are a number of major resource issues and that time did not allow a full evaluation of the 1002 document:

(1) Selection of Alternatives

Based upon the state's interest in having exploratory drilling proceed but in a manner that affords protection of the Porcupine caribou herd, ADFG recommends support of Alternative B, limited leasing of the 1002 area. Under Alternative B, oil and gas leasing would be allowed in the 1002 area with the exception of losses to habitats placed in Resource Category 1, as defined in the USFWS Mitigation Policy. ADFG supports the placement of the Porcupine Caribou Herd (PCH) core calving area in Resource Category 1 as noted in the 1002 report. Furthermore, ADFG recommends that spring-fed overwintering areas used by fish be added to Resource Category 1, thereby precluding loss of these important fish habitats during leasing. Further discussion of these recommendations is presented in Enclosure B (Major Fish and Wildlife Issues).

(2) Mitigation Measures

ADFG concludes that the 1002 report does not adequately address mitigation of oil and gas impacts on fish and wildlife resources. This conclusion is based on the following: (1) there is no forthright commitment in the report by the Department of Interior (DOI) to incorporate any or all of the mitigation measures mentioned in the report; and (2) the mitigation measures in the report are inadequate to prevent significant adverse effects on fish and wildlife resources and their human uses. A glaring example that there is no assurance that DOI will incorporate meaningful mitigation measures is that William Horn, Assistant Secretary of the Interior, recommends that Congress approve leasing in the entire 1002 area. This recommendation was given in spite of statements in the report that significant adverse effects on the PCH would occur if the core calving area were developed.

As a partial improvement to the mitigation measures in the report, ADFG has revised the summary of recommended mitigation (pages 145-147 in the report), and suggested additional topics to be covered (Enclosure C, Summary of ADFG Comments on the ANWR 1002 Mitigation). Considerable work and additional time will be needed in order to develop an adequate set of terms and conditions designed to ensure protection of fish and wildlife resources.

(3) Land Exchanges

The 1002 report is flawed because it does not evaluate the effects on fish and wildlife resources and their human uses caused by potential land exchanges between DOI and private landowners. Such land exchanges are currently being negotiated. Preliminary review by ADFG of a draft land exchange agreement and attached terms and conditions indicates that there are substantial differences among the mitigative measures in the 1002 report and those in the draft land exchange agreement. Terms and conditions applied to the draft land exchange agreement appear inadequate to prevent significant adverse effects on fish and wildlife resources and their human uses. ADFG recommends that the final draft of the 1002 report contain an evaluation of the effects of the proposed land exchanges, and that terms and conditions for 1002 lands involved in the exchanges and for those retained by USFWS reflect the best mitigation measures to protect fish and wildlife resources and their human uses.

(4) Joint Federal/State Review

The 1002 report makes a general statement that oil and gas development will adhere to applicable state and federal laws, but does not discuss the process by which such adherence will be assured. ADFG recommends that a joint state/federal interdisciplinary team be established to participate in strategic and project planning, and for project design review, permit monitoring, and compliance. This recommendation is discussed further in Enclosure D, General Issues.

(5) Subsistence

The 1002 report does not address the process by which the impacts of oil and gas development on subsistence activities will be identified and mitigated. Such an analysis is required by section 810 of Alaska National Interest Lands Conservation Act (ANILCA). ADFG recommends that a requirement for such an analysis be included in the final report, and ADFG further recommends procedures for such an analysis. Additional discussion of this recommendation is included in Enclosure E, Subsistence.

As previously stated, a number of major resource issues are discussed in the enclosures to this memo. Examples include ADFG recommendations on insect relief habitat for caribou (Enclosure B), use of Prudhoe Bay as the Industry Standard (Enclosure D), stream buffers and setbacks (Enclosure B), and Transportation Routing Considerations (Enclosure D). Please refer to the Table of Contents which identifies specific subjects addressed in each enclosure. Questions on major issues may be addressed to Norman Cohen or Bruce Baker (465-4107), or Al Ott (452-1531) of the Habitat Division. Al and his staff will be able to respond to questions of a specific nature.

Enclosures

- A - Fish and Wildlife Habitat and Resources in the Arctic National Refuge
- B - Major Fish and Wildlife Issues
- C - Summary of ADFG Comments on the ANWR 1002 Mitigation (Pages 145-147 of DEIS)
- D - General Issues
- E - Human Uses of Fish and Wildlife
- F - Specific Comments on 1002 Report and Stipulations

cc w/enc: Commissioner Judy Brady, Department of Natural Resources
Commissioner Dennis Kelso, Department of Environmental Conservation

Robert L. Grogan

-4-

January 2, 1987

bcc w/enc: Norman Cohen
Lew Pamplin
Steve Behnke
Bruce Baker
Al Ott
Lance Trasky
Dick Bishop
John Clark
Fred Andersen

C2098

TABLE OF CONTENTS

Enclosure A - Fish and Wildlife Habitat and Resources in the Arctic National Refuge

- Fishes
- Caribou
- Muskox
- Moose
- Bowhead whale
- Peregrine Falcon
- Waterfowl
- Shorebirds
- Wolf
- Wolverine
- Fox
- Polar Bear
- Brown Bear
- Ringed Seal

Enclosure B - Major Fish and Wildlife Issues

- Resource Category 1
- Core Calving Area of the Porcupine Caribou Herd
- Caribou Insect Relief Habitat
- Stream Buffers and Setbacks
- Water Availability and Use
- Gravel Sites
- Marine Facilities/Causeways
- Mud Pits

Enclosure C - Summary of ADFG Comments on the ANWR 1002 Mitigation (Pages 145-147 of DEIS)

Enclosure D - General Issues

- Decision-Making Process (Mitigation Standard)
- Strategic Planning
- Joint State/Federal Project Review
- Transportation Routing Considerations
- Use of Prudhoe Bay as the Industry Standard

Enclosure E - Human Uses of Fish and Wildlife

- Basic Requirements of ANILCA Section 810 Attached

Enclosure F - Specific Comments on 1002 Report and Stipulations

Enclosure A

FISH AND WILDLIFE HABITAT AND RESOURCES IN THE ARCTIC
NATIONAL WILDLIFE REFUGE

The ADFG has conducted an extensive review of the resource information as collected by the USFWS, the ADFG, and industry for the ANWR and adjacent lands. This enclosure consists of a summary of the key fish and wildlife resources in the general area of the ANWR coastal plain. Data on distribution and abundance of fish and wildlife are presented, and areas of special concern (e.g., calving areas, insect relief habitat, staging areas, overwintering, and spawning habitats) are highlighted for each species or species group. Fish and wildlife groups and species of importance in the ANWR include fishes, caribou, muskox, moose, bowhead whale, peregrine falcon, waterfowl, shorebirds, wolf, wolverine, foxes, polar bear, brown bear, and ringed seal. Discussions on the various fish and wildlife species are not limited geographically to the 1002 lands but include data pertinent to areas that would be affected by transportation corridors and support activities associated with the exploration and development of oil/gas resources.

FISH

AC	arctic char	LT	lake trout
ACI	arctic cisco	NSB	ninespine stickleback
BB	burbot	PS	pink salmon
CS	chum salmon	RS	red salmon
FSC	fourhorn sculpin	RWF	round whitefish
GR	grayling	SSC	slimy sculpin

Distribution and Abundance

There are ten streams in the 1002 area that are known to contain fish. Twelve species of freshwater or anadromous fish have been identified in these waterbodies. The following is a listing of the streams containing fish and the species present (Bendock 1984, Sonnichsen 1985):

Canning River	AC, ACI, BB, CS, GR, LT, NSB, PS, RS, RWF, SSC
Tamayariak River	GR, NSB
Katakturuk River	AC, NSB
Marsh Creek	AC
Sadlerochit River	AC, GR, LT, NSB, PS
Hulahula River	AC, GR
Okpilak River	AC, GR, LT
Jago River	AC, NSB
Kogotpak River	AC, GR
Aichilik River	AC, ACI, FSC, GR

The Canning River drainage supports the greatest diversity and abundance of fish species in the 1002 area. An aerial survey of the Canning River conducted in September, 1982 upstream of the Marsh Fork resulted in an estimate of 39,000 arctic char (Smith and Glesne 1982). The Canning River differs from other rivers in the 1002 area due to the number and magnitude of perennial ground water sources flowing into the river.

The Aichilik and Hulahula River drainages also support populations of anadromous arctic char. An aerial survey conducted in September, 1982 on a section of the Aichilik documented a large concentration (2,000-4,000) of arctic char located downstream from a spring (ibid.). In 1983 surveys of the Hulahula River, arctic char were found to be widely distributed throughout the drainage. Arctic char were collected in almost all of the areas surveyed as far upstream as East Patuk Creek (Daum, Rost and Smith 1984). Fall concentrations of Arctic char were observed at three holes on the Hulahula River that have historically been used by villagers from Kaktovik (ibid.). Arctic grayling have also been reported from the Canning/Tamayariak River system, the Hulahula/Okpilak River system and the Aichilik River.

No systematic abundance surveys for arctic grayling have been conducted in the 1002 area (ADFG 1986). Some information on catch per unit effort is available from the U.S. Fish and Wildlife Service (USFWS) lake and stream surveys in the area. The Sadlerochit River drainage contains populations of lake and stream resident arctic char and arctic grayling. A dwarf form of arctic char is present in the vicinity of Sadlerochit Springs (Smith and Glesne 1982). Lake resident arctic char, along with arctic grayling and lake trout, are found in Peters and Schrader lakes. Anadromous arctic char have not been positively identified in the drainage (ibid.). Although arctic char are identified as occurring in the Katakaturuk River, Marsh Creek and the Jago River, studies conducted by the USFWS indicate that abundance is very low. Those fish captured most likely reflect summer excursions from neighboring drainages.

The lagoon and nearshore waters adjacent to the 1002 study area represent important summer feeding habitat for anadromous arctic char and whitefish. Fish from North Slope drainages disperse along the coast and utilize lagoon and nearshore waters as summer feeding areas. The warmer, less saline nearshore habitats are areas of high seasonal abundance for anadromous fish.

Areas of Special Concern

Overwintering areas probably are the greatest single limiting factor for anadromous and freshwater fish populations because severe winter conditions in the arctic drastically reduce available water supplies. Many sections of river channels and coastal lakes (less than 3 m in depth) freeze solid. Winter flow is generally immeasurable (USFWS 1982). During the winter, water sources are limited to spring areas, deep isolated pools, deep lakes, and brackish river delta areas (ibid.). Most of the spring water sources, as identified below, have been surveyed by the USFWS:

Shublik Spring - 24 cubic feet per second (cfs) of water
Red Hill Spring - .85 cfs
Katakaturuk River Tributary Spring - 4.28 cfs
Sadlerochit Spring - 35 to 38.7 cfs
Hulahula River Spring - 4.6 to 7.3 cfs
Okerokivik River Spring - 26 cfs
Aichilik River Spring - 1.5 cfs

Stream channels in the 1002 area exhibit a high degree of braiding and have relatively steep gradients. Pools suitable for supporting overwintering are rare (Smith and Glesne 1982). Perennial ground water sources (springs) are found on most of the major drainages in the 1002 area.

These springs are essential for the spawning and overwintering of arctic char and other resident freshwater fish species. In the 1002 area, arctic char rely extensively on spring-fed habitats at particular stages in their life. Springs are used as spawning grounds, summer rearing areas of fry and juveniles, and as overwintering areas. In smaller North Slope drainages, it is conceivable that a single spring-fed site might harbor virtually all members of a particular arctic char population, from eggs to mature adults during the winter period (ADFG 1986). Perennial groundwater sources generally are discrete areas associated with the foothill and mountainous regions south of the coastal plain.

The Canning River drainage differs to some degree from other rivers in the 1002 area due to the number and magnitude of perennial ground water sources flowing into the river. The cumulative discharge of the springs on the Canning River drainage is one of the largest on the North Slope (USFWS 1982). The largest of these is Shublik Springs located at the southwest end of Coplestone Mountain in the Shublik Mountains. Spawning arctic char appear to be located primarily in the Marsh Fork and the main river above the Marsh Fork confluence (Smith and Glesne 1982). Red Hill Spring located at the western end of the Sadlerochit Mountains, is the only spring identified on the Tamayariak River. It is a hot spring with temperatures at the orifice reported to be between 29.3 and 32.9°C (USFWS 1982). Overwintering habitat has not been documented in the drainage. In the Sadlerochit River system the Sadlerochit spring located at the eastern end of the Sadlerochit Mountains is the only identified spring area. Two large lakes, Lake Peters (775 ha) and Lake Schrader (1450 ha) are located in the headwaters of the Sadlerochit drainage and provide overwintering habitat. Three springs have been identified on the Hulahula River, one of which is located in the 1002 area. These areas are located at the confluence of the Hulahula River and the East and West Patuk creeks, one mile above Old Man Creek and at a location 25 miles downstream from Old Man Creek. Two springs have been identified in the Aichilik River. The springs are located at 69° 31' N latitude and 143° 02' W longitude and 20 km upstream at 69° 22' N latitude and 143° 05' W longitude (Smith and Glesne 1982).

Literature Cited

- ADFG. 1986. Alaska Habitat Management Guide, Arctic Region, Volume II. Alaska Department of Fish and Game, Juneau, AK. 605 pp.

- Bendock, T.M., and J. Burr. 1984a. Index to North Slope streams and lake surveys. ADF&G, Div. Sport Fish, Fairbanks. 22 pp.
- Daum, D., P. Rost, and M. Smith. 1984. Fisheries studies on the North Slope of the Arctic National Wildlife Refuge, 1983. Fairbanks Fishery Resources Progress Report No. FY 84-1. Fishery Resources, U.S. Fish and Wildlife Service, Fairbanks, AK. 58 pp.
- Smith, M.W., and R. Glesne. 1982. Aquatic studies on the North Slope of the Arctic National Wildlife Refuge 1981 and 1982. Fairbanks Fishery Resources Progress Report No. FY 83-1. Fishery Resources, U.S. Fish and Wildlife Service, Fairbanks, AK. 173 pp.
- Sonnichsen, S. 1985. Arctic Region fish distribution list, ADF&G, Div. Sport Fish, Anchorage.
- USFWS. 1982. Arctic National Wildlife Refuge coastal plain resource assessment. Initial report baseline study of fish, wildlife, and their habitats. U.S. Department of Interior, U.S. Fish and Wildlife Service, Region 7, Anchorage, AK. 507 pp.

CARIBOU (Rangifer tarandus)

Two caribou herds are found in the ANWR and its environs. The Porcupine Caribou Herd (PCH) consists of approximately 150,000 animals (Whitten 1985) and is one of two international herds ranging between Canada and Alaska. The Central Arctic Herd (CAH) consists of approximately 15,000 animals (Cameron 1986), and is resident on the North Slope between the Canning and Colville Rivers.

Distribution and Movements

Porcupine Caribou Herd

Unless otherwise noted, the following discussion is from ADFG (1986).

The PCH ranges in Alaska between the Canning and Chandalar rivers on the west, east to the Richardson Mountains and Peel River in Canada, and south as far as the Ogilvie Mountains in the Yukon Territory. The PCH winters in the Chandalar, Coleen, and Sheenjek river drainages in Alaska, and in the Ogilvie and Richardson Mountains and Peel River drainages in Canada. During spring of most years, the herd follows traditional migration routes through the British and Davidson Mountains and Firth River valley onto the northern foothills and coastal plain between the Katakturak River in the ANWR and the Babbage River in Canada. During the past 15 years calving has occurred on the coastal plain and northern foothills between the two drainages noted above, although calving has been concentrated in several locations. In most years following calving, cows, and newborn calves form dense aggregations on the coastal plain near Camden Bay. Although these aggregations often form in June prior to significant mosquito emergence, mosquito harassment probably influences the size and movement of these aggregations. During severe mosquito harassment periods, large numbers of caribou (tens of thousands) can be found along the coast, on beaches, shorefast ice, and coastal lagoons (USFWS 1982). Caribou in these aggregations tend to move eastward along the coast, and southeastward into foothills and the mountains and into Canada.

By late July and August, most of the PCH are in the foothills and mountains of the south slope of the Brooks Range, or in Canada (USFWS 1982). A small proportion of the PCH resides on the North Slope year-round, but little is known about these animals.

Central Arctic Herd

Unless otherwise noted the following discussion is from Shideler (1986).

The CAH ranges on the North Slope primarily between the Colville and Canning rivers, although a small proportion of CAH winters in the 1002 area between the upper Sadlerochit and Canning Rivers (Whitten et al. 1985). Movements of the CAH are generally north/south between wintering areas in the foothills, and calving and mosquito relief areas along the coast. Concentrated calving occurs on the coastal plain in two areas--a western concentration between Oliktok and Milne Points, and an eastern concentration between Bullen Point and the Canning River delta. Only the latter calving concentration area is of concern here.

In some years following calving, CAH caribou move eastward across the Canning River toward Camden Bay in the 1002 area, then reverse and head west again. Under severe mosquito harassment, CAH caribou remain near the coast, moving to coastal deltas, points, and other promontories for relief from mosquitos. As mosquito activity abates in late July, CAH animals drift southward toward the foothills, although a small proportion of animals remain as year-long residents on the coastal plain.

Areas of Special Concern

Two types of caribou use areas in the ANWR region merit special concern--calving areas and coastal mosquito relief areas. Although much of the coastal plain between the Babbage River in Canada and the Shavirovik River in Alaska has supported at least some calving in the past, several areas of concentrated calving have been used repeatedly over the years by a large proportion of the PCH and CAH respectively (ADFG 1986). These concentrated calving areas deserve special protection because of their traditional use by caribou. Topographic and climatic effects in the foothills and coastal plain of the upper Jago River, for example, have often resulted in early snow ablation and subsequently early green-up of cottongrass (Eriophorum vaginatum) tussocks (USFWS 1982). PCH caribou use this area heavily during calving, at least in part due to the abundance and availability of this important forage species, as well as forage on nearby riparian benches and associated uplands (Whitten 1985). Although there are no easily identifiable habitat characteristics that explain the use of the CAH concentrated calving area along the Canning and Staines rivers, caribou have traditionally used that area (Shideler 1986) suggesting that it is important.

Coastal mosquito relief habitat, and continued access to that habitat, are especially important to the CAH because it does not use areas of altitudinal variation which can aid in relief from mosquito harassment (Shideler 1986). Thus the coastline between Camden Bay and Prudhoe Bay along with the area within several kilometers are important as mosquito

relief habitat, but also as movement corridors back and forth to optimal relief areas (ibid.).

Coastal areas are also important to the PCH because, although some portions of the herd use wind-swept foothills and mountains as mosquito relief areas, a considerable portion, often numbering in the tens of thousands, uses coastal areas as mosquito relief as well as movement corridors back into Canada (ADFG 1986). Much of this use during the post-calving season occurs east of Camden Bay, and inland for several kilometers (Whitten et al. 1985). In general, these areas are used for a shorter period of time than is mosquito relief habitat used by the CAH, but because of the larger size of the PCH access to this habitat in the ANWR is particularly important.

Literature Cited

- ADFG. 1986. Alaska Habitat Management Guides--Arctic Region, Vol. 2. Alaska Department of Fish and Game, Juneau. 465 pp.
- Cameron, R.D. 1986. Personal communication. Game Biologist, Alaska Department of Fish and Game, Fairbanks.
- Shideler, R.T. 1986. Impacts of human land developments and land uses on caribou: a literature review. Volume 2. Impacts of oil and gas development on the Central Arctic Herd. Tech. Rept. 86-3, Alaska Department of Fish and Game, Habitat Division, Juneau. 128 pp.
- USFWS. 1982. Chapter 5: Mammals. Pages 166-199 in USFWS, preps. Initial report, baseline study of the fish, wildlife, and their habitats: Arctic National Wildlife Refuge coastal plain resource assessment. U.S. Fish and Wildlife Service, Anchorage, AK. 507 pp.
- Whitten, K.R. 1985. Personal communication, ANWR Caribou Workshop, Fairbanks. Game Biologist, Alaska Department of Fish and Game, Fairbanks.
- _____, F.J. Mauer, and G.W. Garner. 1985. Calving distribution, initial productivity, and neonatal mortality of the Porcupine Caribou Herd, 1984. ANWR Progr. Rept. FY85-18. U.S. Fish and Wildlife Service, Fairbanks, AK. 94 pp.

MUSKOX (Ovibos moschatus)

Muskoxen were indigenous to the eastern North Slope of Alaska until they were extirpated there in the late 1800s (Gunn 1982). In 1969, 52 muskoxen from Nunivak Island were released at Barter Island (Gunn 1982, Lent 1978). In 1970, an additional 13 animals were released near the mouth of the Kavik River (ibid.). The descendants of these animals comprise the population of muskoxen that is resident on the eastern North Slope.

Distribution and Abundance

Since the initial reintroduction, the eastern North Slope population of muskoxen has increased to 450 animals (Whitten 1985). This is the second largest muskoxen population in the state, and comprises almost one-third of the state's total number of wild muskoxen (Hinman 1985). This population has exhibited a high growth rate compared to other muskox populations (Robus 1984). Demographic parameters such as an early age at first breeding (2 years old as opposed to three or four years old in other populations), calving in successive years (as opposed to every second or third year in other populations), and high calf survival attest to the excellent habitat quality in the 1002 study area (Jingfors 1984, Robus 1984).

The major areas of muskox distribution on the eastern North Slope are all within the 1002 study area, and are inhabited by approximately 400 animals. An additional 50 animals (approximately) are located outside the study area, with some ranging as far west as the Trans-Alaska Pipeline System (TAPS) and others ranging east into the northern Yukon Territory. Of these 50 or so animals, one herd of approximately 10 animals of mixed sex ranges along the middle and upper Kavik River (Reynolds et al. 1985, Whitten 1985); the remainder are solitary, adult bulls which wander widely, but probably serve an important role in pioneering new winter ranges which are eventually occupied by larger groups.

There are three major areas of muskox distribution on the eastern North Slope (Jingfors and Klein 1982). These areas are centered along three of the river systems within the 1002 area--the Tamayariak, Sadlerochit, and Okerokovik rivers. All or part of each of these three areas have been used by muskoxen since the early 1970s (Reynolds et al. 1985). Muskoxen movements within these areas are influenced by forage availability and quality during most of the year; however, mosquito harassment in July and the disruption of herd cohesiveness by rutting bulls in August may influence local movements during these seasons.

Within each of the three major areas, calving areas have overlapped considerably. Jingfors (1984) documented repeated use of the same calving area by the Sadlerochit herd between 1978 and 1980. Reynolds et al. (1985) documented repeated use of the same general area for calving in all three major areas between 1982 and 1984. The size of the calving areas appears to have expanded as the herd has increased. The calving areas are located along the Coastal Plain, generally within 15 miles of the coast, and in upland areas characterized by newly emergent cottongrass tussocks (Eriophorum vaginatum) and/or wind-blown upland areas where snow has ablated.

Although there is a tendency for mixed sex and age herds to remain within the same major area, this affinity is not absolute; there is some movement by these herds into the other major areas. Much of the movement between areas is by adult bulls that tend to remain solitary, or in small (2-5 individuals) groups, and to wander back and forth throughout the region rather than to remain associated with any particular area (Reynolds et al. 1985).

Seasonal Movements and Habitat Use

Muskoxen are generally associated with riparian areas and adjacent uplands. Seasonal movements are mostly in a north/south orientation following the phenology and availability of forage plants along the major river systems with which muskoxen are associated. Localized elevational movements following the seasonal availability of forage occur during the general movements. During the mosquito season muskoxen may move temporarily to windy areas to avoid mosquito harassment but these movements are not comparable to the extensive latitudinal movements of caribou to coastal areas. During the rut, competition between muskox herd bulls and potential interlopers may result in herds fragmenting into small harems until the breeding activity declines and the harems coalesce again into herds. During winter herd size reaches a maximum as individual herds encounter each other on winter range and join and split.

The general pattern of habitat use is for muskoxen to be distributed during winter in mixed herds of 20-30 (occasionally up to 100) animals that remain on wind-blown upland and bench areas along riparian systems where the animals can minimize the amount of energy expenditure that would be caused by cratering for forage. As spring approaches and cottongrass tussocks (Eriophorum vaginatum) begin to green up, muskoxen move to these tussock areas where most of the herd feeds and where calving takes place. The herds remain sedentary near the calving area until the calves are old enough to travel. As spring progresses muskoxen move to river bars and riparian benches where forbs

such as oxytrope (Oxytropis), mountain-avens (Dryas integrifolia), and fireweed (Epilobium) become available. Muskoxen remain in these riparian areas and gradually shift to feeding on willow in late June and through July as the leaves begin to emerge. Riparian willow remains a mainstay of the summer diet until August when rutting commences and herds move to side drainages and creeks and leave the major river systems. During the rut muskoxen feed on sedges that are just greening up in marshy areas along these smaller creeks. During fall, muskoxen move from the side drainages back to the major river systems where they remain feeding on riparian willow until snow becomes deep enough that they must move to adjacent upland areas.

Areas of Special Concern

Although much of the riparian and adjacent upland habitat of the Coastal Plain portion of the Tamayariak, Sadlerochit, and Oklerokovik rivers may be used by muskoxen, two types of use areas are of special concern. These are calving areas and winter feeding areas. Calving areas are a concern not only because they appear to be associated with unique habitat characteristics--i.e., south-facing slopes where early snow-melt allows green-up of cottongrass tussocks (Eriophorum vaginatum)--but also because human disturbance during the calving period can result in calves or cow/calf pairs being abandoned by the remainder of the herd. Because muskoxen rely on herd defense against predators rather than on escape by flight, the survival of young calves is dependent on their being able to remain with the herd.

Winter feeding areas are found along upland benches and ridges along the major river systems with which muskoxen are associated. These areas occur where snow depth is shallow due to the topographic features, and forage composition is sufficient to provide nutrition over the winter. Because almost the entire herd of each major area can use these wintering areas, destruction of these areas can have far-reaching effects.

Literature Cited

- Gunn, A. 1982. Muskox (Ovibos moschatus). Pages 1021-1035 in J.A. Chapman and G.A. Feldhamer, eds. Wild Mammals of North America: Biology, Management, and Economics. Johns Hopkins Press, Baltimore. 1147 pp.
- Hinman, R.A. 1985. Statewide harvest and population status. Page iii in B. Townsend, ed. Ann. Rept. Surv. Invent. Activ., Vol. XVI. Part X. Muskoxen. Fed. Aid. Wildl. Restor., Proj. W-22-4, Job 16.0. Alaska Department of Fish and Game, Juneau.

Jingfors, K.T. 1982. Seasonal activity budgets and movements of a reintroduced Alaskan muskox herd. J. Wildl. Manage. 46(2):344-350.

_____. 1984. Home range affinity in a recently established muskox herd in Arctic Alaska. Pages 89-92 in D.R. Klein, R.G. White, and S. Keller, eds. Proceedings of the first international muskox symposium. Biol. Pap. Univ. Ak. Spec. Rept. No. 4. 218 pp.

_____, and D.R. Klein. 1982. Productivity in recently established muskox populations in Alaska. J. Wildl. Manage. 46(4):1092-1096.

Lent, P.C. 1978. Musk-ox. Pages 135-147 in J.L. Schmidt and D.L. Gilbert, eds. Big Game of North America: Ecology and Management. Stackpole Books, Harrisburg, PA. 494 pp.

Reynolds, P.E., L.D. Martin, G.L. Weiler, J.M. Noll, and J.M. Norton. 1985. Population, herd dynamics, distribution, movements, and habitat use of muskoxen in the Arctic National Wildlife Refuge, Alaska, 1982-1984. ANWR Progr. Rept. No. FY85-1. Pages 43-96 in USFWS, preps. 1984 update report baseline study of the fish, wildlife, and their habitats, Vol. I. Arctic National Wildlife Refuge coastal plain resource assessment. U.S. Fish and Wildlife Service, Anchorage. 361 pp.

Robus, M.A. 1984. Summer food habits of muskoxen in northeastern Alaska. Pages 81-85 in D.R. Klein, R.G. White, and S. Keller, eds. Proceedings of the first international muskox symposium. Biol. Pap. Univ. Ak. Spec. Rept. No. 4. 218 pp.

Whitten, K.R. 1985. Muskoxen survey-inventory progress report, Game Management Units 26B and 26C. Pages 24-25 in B. Townsend, ed. Ann. Rept. Surv.-Invent. Activ., Vol. XVI, Part X. Muskoxen. Fed. Aid. Wildl. Restor., Proj. W-22-4, Job 16.0. Alaska Department of Fish and Game, Juneau.

MOOSE (Alces alces gigas)

Distribution and Abundance

Unless specifically noted, information presented below is from the Alaska Habitat Management Guide for the Arctic Region (ADFG, 1986).

Moose (Alces alces gigas) occur throughout most of the Arctic Region, and are seasonally distributed over the Arctic Coastal Plain. They have been counted in most of the major river drainages from the Kongakut (on the east) to the Utukok (on the west). The seasonal distribution of moose is affected by factors such as the quantity and quality of riparian willow (winter habitat), snow conditions, and insect harassment, among others. Only winter concentration areas are delineated in the ANWR area, and movements between seasonal ranges have not been documented. Even in non-winter months, when moose are distributed north onto the coastal plain, riparian zones in river valleys remain important to moose. Major drainages such as the Canning, Jago, Hulahula, and Aichilik Rivers (within the ANWR 1002 area) and the Sagavanirktok, Kavik, and Shaviovik Rivers (between Prudhoe Bay and ANWR), as well as smaller creeks and rivers, probably comprise the most valuable habitat areas.

Historical and archeological evidence suggests that moose, once rare on the Arctic Coastal Plain, became more abundant during the 1940s. Numbers continued to increase from the 1950s into the 1970s, with little change in distribution. Densities on Alaska's North Slope appear highest between the Colville and Canning rivers, although moose occur outside this zone, along most major stream corridors. In the area between the Dalton Highway and the Canning River, the ADFG in 1985 estimated moose numbers at 600-650 animals, based upon 1984 aerial surveys. In the area east of the Canning (ANWR), 330-360 moose were estimated. Aerial surveys conducted in the spring have documented higher numbers of moose, indicating that these units have supported greater numbers of moose than previously thought. These increases were attributed to excellent sighting conditions, since productivity and survival are insufficient to support rapid population growth (Whitten, 1986).

Surveys indicate a high degree of utilization of annual growth of browse species, and population trends show an inverse relationship between total numbers of adults and percentages of calves. This suggests that browse may limit moose populations here.

Areas of Special Concern

Habitats associated with riparian corridors are of particular value to moose. These areas provide shrubby browse, cover, insect relief areas, and probably serve as movement corridors to and from winter concentration areas which lie in major drainages upstream (south) of the study area.

Literature Cited

ADFG. 1986. Alaska Habitat Management Guides--Arctic Region, Vol. 2. Alaska Department of Fish and Game, Juneau. 465 pp.

Whitten, K.R. 1986. Moose survey-inventory progress report, Game Management Units 26B and 26C. Pages 142-143 in B. Townsend, ed. Ann. Rept. Surv.-Invent. Activ., Vol. XVI, Part VIII. Moose. Fed. Aid. Wildl. Restor., Proj. W-22-4, Job 1.0. Alaska Department of Fish and Game, Juneau.

BOWHEAD WHALE (Balaena mysticetus)

Distribution and Abundance

Unless specifically noted, information presented below is from the Alaska Habitat Management Guide for the Arctic Region (ADFG, 1986).

Bowhead whales are distributed in arctic and subarctic waters adjacent to the northern and western coasts of Alaska. They migrate in association with the seasonal movement of sea ice, traveling from wintering areas of the west central Bering Sea through the eastern Chukchi Sea and Beaufort Sea into summering areas in Alaskan and Canadian waters.

Interest in this species has increased in recent years because of its endangered status, its importance to subsistence hunters, and the large increase in exploratory and industrial activities in arctic waters.

Most bowheads are believed to winter probably winter (January-March) in the west central Bering Sea adjacent to the pack ice edge, which usually occurs between St. Lawrence and St. Matthew islands. The summer range (June-August) of the bowhead whale extends throughout the eastern Beaufort Sea; major concentrations occur in Amundsen Gulf and the Canadian Beaufort Sea east of Herschel Island and northward. Some bowheads do not complete the spring migration into Canadian waters, and instead spend the summer months in the northern Chukchi and/or the western Beaufort Sea. These whales are suspected to be late migrants that feed and summer in Alaskan waters.

In September and October, bowheads begin to migrate westward over a broad front along the Alaskan coast, sometimes in shallow, nearshore waters (10-50 m), apparently feeding along the way. Autumn feeding concentration areas are: 1) east of Barter Island to at least the United States-Canada demarcation line (141°W); and 2) east of Barrow to Pitt Point.

The bowhead whale is one of the few marine mammals that spends all or most of its life in or near the edge of the arctic ice pack, migrating north in the spring as the ice recedes and moving south as pack ice reforms in winter. The migration route, their distribution along the migration pathway, and the rate of migration are influenced primarily by ice conditions and the presence or absence of open water areas.

The predominant activity of bowheads in summer and autumn is feeding (Richardson et al. 1983). Copepods and euphausiids are the main food items for bowheads in the Alaskan Beaufort Sea during early autumn and presumably are also important to bowheads in summer. Thus, factors affecting the availability of these and other foods in the eastern Beaufort Sea probably have a strong influence on the distribution of bowheads.

Bowhead whales of the western arctic population begin to leave their wintering areas between St. Lawrence and St. Matthew Islands in the central Bering Sea in April and May. The northward movements appear to be timed with the development of shore leads and the breakup of pack ice, and they vary considerably from year to year. Migration occurs along at least two routes to the Bering Strait: one route close to the western end of St. Lawrence Island and another farther offshore. A smaller number of bowheads may travel past the eastern end of St. Lawrence Island, but this route does not appear to be a major one.

Most bowheads have arrived at Bering Strait by early May, depending upon ice conditions. North of Bering Strait, bowheads move northeast across outer Kotzebue Sound, with some using a recurring polynya between Kivalina and Point Hope and others travelling up to 45 km offshore. Bowheads follow open leads north past Cape Thompson and then northeast past Cape Lisburne in the nearshore lead. Past Barrow the principal migration takes place from the last week of April through May. The earliest and latest recorded dates of bowhead northward migration past Barrow are March 29 and June 19, respectively.

Past Point Barrow, bowheads migrate northeast in the extensive lead system and shear zone in the northern Beaufort Sea. This system may occur up to 600 km north of the Canadian Beaufort Sea coast, and therefore whales may migrate well offshore. Bowheads reach Banks, Prince Albert, and Victoria islands in Canadian waters in late May and early June, and as the ice further recedes they move south and east as far as Amundsen Gulf. The spring bowhead migration past Point Barrow appears to occur in three or four pulses. Younger individuals are the earlier migrants, and larger, older males and females with calves compose the later waves. These pulses in migration are closely related to weather and ice conditions. Whales appear to congregate in open water areas until leads in the ice appear offshore.

In July, bowheads are present throughout the Amundsen Gulf area; however, current information is insufficient to precisely identify bowhead distribution in this area. Bowheads also occur in the eastern Beaufort Sea waters of Prince of Wales Strait between Banks and Victoria islands and may occur in McClure Strait and Viscount Melville Sound.

They have been observed in water depths of 50 m near Cape Bathurst (Northwest Territories). There appears to be a southwestward shift in the bowhead range during August, with many whales occurring in the shallow waters of the Mackenzie River delta region.

Bowheads begin to move out of their summering grounds in the Canadian Beaufort Sea in mid August, with the major portion of the migration occurring in September. This westward movement occurs over a broad front, with swimming speeds estimated at up to 4 km/hr. Bowheads are found at all depths during this time; however, a shift in distribution occurs in mid September as more bowheads are found in shallower water (20-50 m) nearshore. It has been suggested that this nearshore movement occurs because of pelagic prey concentrations found at this time.

Based on the 1981 aerial surveys of the eastern Beaufort Sea and data collected from shore-fast ice counting stations, the International Whaling Commission (IWC) in 1982 established a minimum population estimate for the western arctic bowhead whale at 3,857 animals. The 1985 IWC official estimate was 4,417 whales, with a 95 percent confidence interval (2,613-6,221).

Bowhead whales are classified as endangered and are protected under the Endangered Species Conservation Act (ESA) of 1969 (PL 91-135) and Marine Mammal Protection Act of 1972 (MMPA, PL 92-522). The National Marine Fisheries Service (NOAA, U.S. Department of Commerce) oversees bowhead whales for the federal government. Bowhead whales have been completely protected from commercial whaling since 1946 by the International Convention for the Regulation of Whaling, the same treaty that set up the IWC. The MMPA restricts the importation of marine mammal products and allows only Alaskan Natives to take bowhead whales for subsistence and for creating handicraft items and clothing for personal use and sale. The MMPA and ESA allow for regulation of subsistence take if the stock is declared depleted.

Areas of Special Concern

With regard to the present oil/gas leasing decisions (i.e., ANWR, Sale 50, 55) an area of particular interest and concern for bowhead whales is the area east of Barter Island used for feeding. Additionally, the whales use shallow nearshore Alaska coastal waters (20 m and deeper) as a fall migratory corridor under some ice conditions. Thus, the nearshore coast from the Alaska/Canada border well past the ANWR area (as far west as Camden Bay) must be considered as important for the whales and for subsistence whaling activities.

Literature Cited

ADFG. 1986. Alaska Habitat Management Guides--Arctic
Region, Vol. 2 Alaska Department of Fish and Game.
465 pp.

PEREGRINE FALCON (Falco peregrinus tundrius)

Peregrine falcons, the arctic subspecies, are presently classified as a threatened species by the USFWS.

Distribution and Abundance

Except as specifically noted, the information presented below is drawn from the Initial Report Baseline Study of the Fish, Wildlife, and their Habitats, Arctic National Wildlife Refuge Coastal Plain Resource Assessment (USFWS, 1982).

The peregrine falcon is a rare summer resident and possible breeder within the ANWR coastal plain. During migrations, it is not uncommon to see peregrine falcons along the coast, where they probably prey upon shorebirds and passerines. Migration routes for peregrine falcons using the North Slope probably lie both along the Brooks Range and the arctic coast, so many more birds than the resident population probably move through the ANWR, especially during the fall.

The current status of this species within the 1002 area of the ANWR is uncertain. Poor habitat quality, relative to areas further south with greater relief, limits the potential of the area to support nesting peregrine falcons. At the current time, no nesting pairs are known within the ANWR 1002 area, although one male bird has been seen defending a territory near the southern boundary of the area in the Jago River drainage (R. Ambrose, 1986). This is a sign that nesting could take place in this location, given the dispersal of birds from other habitat areas saturated to capacity with peregrine falcons. The coastal plain between Prudhoe Bay and the Canning River represents a major data gap in knowledge of the distribution of this species. Surveys to gather this information may be conducted in the summer of 1986 (R. Ambrose, 1986).

Although little "classic" nesting habitat exists in the area between the Sagavanirktok River and the Canadian boundary, the present general rising trend in population level for peregrine falcons makes it likely that marginal habitats (e.g., dirt bluffs) may be occupied in the near future. Therefore, some establishment of nests within the area under consideration can be expected, although potential sites are, at this time, unknown (R. Ambrose, 1986).

Peregrine falcons are known to nest along the Sagavanirktok River. Multiple eyries are located along Franklin Bluffs on the east side of the river, and again at two bluff areas on the west side of the river near Sagwon.

Areas of Special Concern

There are no areas of special concern within the immediate area of the 1002 lands. Multiple eyries do exist along the Sagavanirktok River and these eyries plus the riparian habitat of the Sagavanirktok River in the general vicinity of these nest sites is considered essential for peregrine falcons.

Literature Cited

Ambrose, R. 1986. Personal communication. Biologist, U.S. Fish and Wildlife Service.

USFWS. 1982. Chapter 4: Birds. Pages 60-165 in USFWS, preps. Initial report, baseline study of the fish, wildlife, and their habitats: Arctic National Wildlife Refuge coastal plain resource assessment. U.S. Fish and Wildlife Service, Anchorage, AK. 507 pp.

WATERFOWL

Unless specifically noted, information presented below is from the Alaska Habitat Management Guide--Arctic Region (ADF&G 1986), or the 1002 baseline report (USFWS 1982).

Tremendous numbers of waterfowl move into the coastal areas of arctic Alaska in the spring. Timing of migration is related to the pattern of spring breakup, and birds move into the nesting areas via the MacKenzie and Yukon rivers and along the coastlines. Around mid-July, many waterfowl species shift from breeding areas to lakes, ponds, and coastal areas to molt. As freeze-up approaches, birds generally move out of the north along the same routes used in spring.

Distribution and Abundance

Tundra (Whistling) Swans

Approximately 800 tundra swans summer on the North Slope, 200 or more of which are found in the ANWR. Nesting occurs in river delta areas, especially ponds and lakes in and near drained-basin complexes. Tundra swans nest and reside in traditional concentration areas on the coastal plain. The major concentration areas in the ANWR are the Canning-Tamayariak, Hulahula-Okpilak, and the Aichilik-Egaksrak-Kongakut river deltas, and the Demarcation Bay and Barter Island lakes. The overall density of swans is lower on the coastal plain of the ANWR than elsewhere on the North Slope. However, the density of nesting swans in the ANWR, especially the Canning-Tamayariak river delta, is equal to or higher than nesting densities elsewhere on the North Slope.

Canada Goose

This species migrates to the ANWR in late May from the east and departs to the east during late August.

Canada geese have been reported nesting in few locations on the arctic coastal plain. Approximately 200-300 pairs of Canada geese nest along the Colville River. A few pairs nest on islands (e.g., Howe Island, Duck Islands, Tigvariak Island) near Prudhoe Bay. In the Canning River drainage, the Canada goose is a fairly common breeder and a common migrant. Following the breeding season a molt migration to the west is apparent in late June to early July as nonbreeders and failed breeders vacate tundra habitats and migrate west, probably to the Teshekpuk Lake goose molting area. Birds which do not reach Teshekpuk Lake before becoming flightless often spend the feather molting period

in July in river delta habitats. About 15,000 Canada geese molt along the Beaufort Sea coast from Smith Bay in the National Petroleum Reserve-Alaska to the Canning River.

Black Brant

During spring migration (eastward) along the ANWR coast, brant tend to follow lagoon shorelines and cut across points of land, sometimes leading them 1-5 kilometers inland. The tendency for brant to use the lagoon shorelines in spring may be related to their use of the coastal vegetated mudflats which are usually located on gradually sloping lagoon shorelines.

Brant breed sparingly on the Alaska Beaufort Sea coast, apparently more commonly in the western portion than the eastern segment. A total of 293 nests have been observed in the Colville River delta. In the Prudhoe Bay area, a few brant nest in the river delta areas and on some offshore islands. In the ANWR, a colony of 15 pairs was documented nesting at the Okpilak River Delta. In the Canning River drainage, the black brant is an uncommon breeder and common-to-abundant migrant (+24,000).

In fall, brant appear to be confined to a narrow corridor along the Beaufort Sea coast. General movement is to the west.

White-fronted goose

The estimated breeding population of white-fronted geese on the Arctic slope is 50,000 birds. White-fronted geese are a fairly common breeder from the central arctic slope (Sagavanirktok River region) to the west. White-fronted geese molt in small flocks throughout much of the arctic coastal plain, although they are most concentrated on a few lakes near Teshekpuk Lake in National Petroleum Reserve, where up to 4,900 geese have been counted during the molt period. East of the Sagavanirktok River drainage, this species seems to be much less common. In the ANWR, this species is commonly observed in spring, is absent by mid-summer, and is again commonly observed as an eastward fall migrant.

Snow Goose

The only known breeding colony of snow geese in the United States is located on Howe and Duck islands in the outer Sagavanirktok River delta in the Prudhoe Bay area where approximately 60 pairs nest. Scattered pairs are found nesting in other locations, such as Flaxman Island. In the ANWR, there are typically small flocks of snow geese (five to 75 birds) noted in June, with the net direction of movement often uncertain. In August, there is a massive

influx of snow geese into the coastal plain of the ANWR from the Northwest Territories. The most consistently used areas in the ANWR are east of the Hulahula River in the vicinity of Barter Island. However, this westward influx of snow geese occasionally extends to the Canning River. During a normal year, this westward movement is followed by a one or two week period of predominantly resting and feeding (staging) activities. Snow geese normally depart the ANWR by late September but have been observed in the area as late as mid October. The geese apparently remain in the staging areas long enough to accumulate sufficient energy reserves for fall southward migration, regardless of weather conditions.

The maximum estimated number of snow geese occurring on the ANWR was 325,760 in 1978. During the period 1973-1984 there were 3 years in which the estimated numbers were greater than 190,000, there were 4 years in which there were between 40,000 and 110,000, and 4 years in which there were 20,000 or fewer birds. Annual variation occurs in the staging areas used, the numbers of snow geese using each area, and the duration of use. Weather most likely exerts the major influence upon timing and extent of movements from the breeding areas to the staging areas (Garner and Reynolds 1985 Appendix 7 - Table 3).

Pintail

The pintail is considered to be the most numerous duck on the arctic coastal plain, although in the ANWR it usually is not as common as the oldsquaw. The breeding population of pintails on the arctic slope has been estimated at 120,500 birds. In years of drought in the southern prairies, pintail occur in greater numbers in the arctic. Nesting seems to be more frequent in the western portions of the arctic coastal plain than in the eastern portions. However in the ANWR, pintails are fairly common breeders and fall migrants in the Okpilik River area, common summer residents and fairly common breeders on the Jago River, and are uncommon breeders and spring migrants on the Katakurak River area. In the Canning River drainage, pintails are considered very common migrants, a common summer resident, and a rare breeder.

Green-winged Teal

Green-winged teal are relatively rare on the North Slope but occur throughout the area in small numbers. The breeding population of teal has been estimated to be 4,200 birds on the arctic slope. Green-winged teal breed in the interior arctic coastal plain.

American Widgeon

This species has been described as having a widely scattered light population. In the ANWR, widgeon appear to be frequent migrants.

Oldsquaw

Oldsquaws are the most numerous duck in the ANWR, but to the west they are outnumbered by pintails in some sites. Widespread breeding is recorded across the arctic coastal plain and into the Brooks Range. Oldsquaws are abundant during the molt period on the coastal lagoons and on large lakes of the arctic coastal plain.

Common Eider

Common eiders are found nesting on spits and beaches along the entire Alaska Beaufort Sea coast, and they nest colonially on barrier islands. Small numbers are sometimes seen on the tundra in spring, and small flocks have been seen flying west in mid-to-late June in the ANWR. In the Canning River drainage eiders are considered to be an uncommon breeder but a fairly common migrant.

Mallard

Mallards have been regularly recorded in small numbers over various parts of the North Slope. At the Jago River in the ANWR, mallards are a rare summer visitant and breeder. The mallard breeding population is estimated to be about 500 birds on the entire arctic slope.

Areas of Special Concern

Several habitat areas are identified as essential to the well-being of waterfowl.

Barrier island areas are important to eider duck nesting. Vegetated islands such as Earter, Flaxman, and Tigvariak are attractive nesting areas to many species of waterfowl.

Protected waters (lagoons, bays, estuaries, and coastal lakes) are important resting, feeding, and molting areas for the majority of waterfowl species.

Lagoon shorelines are important resting and feeding areas for waterfowl. Vegetated coastal mudflats are believed to be essential feeding areas for arriving black brant during the spring migration.

River delta areas are favored by all waterfowl as nesting, resting, molting, and feeding areas. Coastal spits and mudflats are also favored resting and feeding areas for waterfowl.

The entire arctic coastal plain of the ANWR has been utilized by snow geese for feeding and resting activities. The most consistent area of use in the ANWR 1002 area, however, has been from the Hulahula River (Barter Island vicinity) east to the Aichilik River. The area of use extends from the coast inland to about the 305 meter (1,000 ft) elevation contour line.

Literature Cited

- ADFG. 1986. Alaska Habitat Management Guide-Arctic Region, Vol. I. Alaska Department of Fish and Game, Juneau. 465 pp.
- Garner, G.W., and P.E. Reynolds, eds. 1985. 1985 update report baseline study of the fish, wildlife and their habitats: Arctic National Wildlife Refuge coastal plain resource assessment, U.S. Fish and Wildlife Service, Anchorage, AK. 379 pp.
- USFWS. 1982. Initial Report, baseline study of the fish, wildlife, and their habitats. Arctic National Wildlife Refuge coastal plain resource assessment. U.S. Fish and Wildlife Service, Anchorage, AK. 507 pp.

SHOREBIRDS

Distribution and Abundance

Unless otherwise noted in the text, the following material has been paraphrased from the Initial Report Baseline Study of the Fish, Wildlife, and Their Habitats, Arctic National Wildlife Refuge Coastal Plain Resource Assessment (USFWS, 1982).

Shorebirds of the families Charadriidae and Scolopacidae are the dominant breeding birds of the Alaskan Arctic Coastal Plain. Studies from the coastal and inland areas of the region, as well as across its east-west extent have investigated aspects of life history, habitat use, energetics, etc. However, much remains to be discovered, and insufficient data exist at present to make estimates of total population size for most species. More than 100 species of birds have been recorded within the ANWR 1002 study area, with at least 26 shorebird species being represented. Of these, the golden plover, ruddy turnstone, red-necked phalarope, red phalarope, semipalmated sandpiper, Baird's sandpiper, pectoral sandpiper, dunlin, and buff-breasted sandpipers are the most common breeders and residents. Several other species (e.g. sanderling, long-billed dowitcher) are uncommon in the ANWR coastal plain during the breeding season, but increase in numbers dramatically during migration periods. This portion of the coastal plain is important to some species only because it serves as a migration corridor for birds on their way to summering areas elsewhere.

Breeding bird studies from different locations along the Alaskan Arctic Coastal Plain indicate that the densities in the eastern portion (i.e., ANWR) are lower than elsewhere, especially near Barrow (although methodological differences may contribute to the apparent magnitude of these results). Also, topographic and geomorphologic differences between the ANWR study area and regions further west tend to restrict the amount of good shorebird habitat available in the 1002 study area. The width of the coastal plain is much narrower on ANWR than further west, and a larger proportion of upland, mesic tundra inland from the coast reduces the value of the eastern coastal plain to most shorebird species. Although nesting shorebird species differ in specific habitat preferences, they in general prefer wetter sites. Since inland areas in ANWR have more relief, better drainage, and more shrubs, areas suitable for nesting are less available than near the coast. As a result, breeding shorebirds are nearly twice as dense at the coast than inland.

Few studies of shorebirds have been undertaken between the Canning and Sag Rivers. However, the general relationships of shorebirds to their habitat on the North Slope seem to be consistent, based on the observations made at widely separated points, and it is assumed that the same patterns of use exist in this area.

Perhaps the most striking aspect of summer use of the coastal plain habitats by shorebirds is the shift of birds from inland to the coast which begins after courtship is completed. In several species, one sex of each pair leaves the nesting area and moves to premigration areas on the coast. These birds are joined successively by unsuccessful breeders, females that have completed breeding, non-breeders, and young-of-the-year. This results in a gradual shift in the center of distribution and in habitat use, beginning in late July and continuing through the early and middle parts of August. Thus, while a variety of habitats are used for courtship and breeding (including uplands), wet habitat types, and especially wet areas near the coast are important for shorebirds using the ANWR study area and adjacent lands to the west. One study found that wet sedge meadow was the most important habitat both in terms of numbers of species and individuals. However, it was noted that often the importance of these areas was enhanced by the presence of other habitats ("very wet sedge meadow" and "moist sedge meadow") nearby. Like many wildlife species, shorebirds seemingly benefit from habitat diversity. Another important habitat for shorebirds was "wet saline tundra."

Shorebird concentrations in coastal habitats double or triple after late July, and then decline steadily (with the exception of pulses as migrations move through the area) as birds emigrate.

Areas of Special Concern

Shorebirds dominate the use of mainland shore habitats while waterfowl tend to dominate spit and lagoon areas. Of these areas, river "dunes" which were windswept and snow-free early in the season, and "wet saline tundra" at the head of bays (except during spring migration when these areas were ice-covered), were the areas of most importance to shorebirds. Brackish mudflats in the littoral zone are important to migrating shorebirds, and are used heavily as the shoreward shift described above takes place. Turnover rates are high at this time, indicating that birds are continually moving through the area and being replaced by newcomers.

Literature Cited

USFWS. 1982. Chapter 4: Birds. Pages 60-165 in USFWS, preps. Initial report, baseline study of the fish, wildlife, and their habitats: Arctic National Wildlife Refuge coastal plain resource assessment. U.S. Fish and Wildlife Service, Anchorage, AK. 507 pp.

WOLF (Canis lupus)

Distribution and Abundance

Observations of wolves within the 1002 study area are sparse. Weiler et al. (1985) summarize reported wolf sightings on and adjacent to the coastal plain of the ANWR occurring between 1969 and 1984. The majority of such sightings occurred to the south of the coastal plain in the foothills and mountain valleys of the Brooks Range.

Radiotelemetry studies of wolves were initiated in 1984 by the USFWS and ADFG. Eleven wolves were collared between May 19 and July 5, mostly on an opportunistic basis during caribou surveys (Weiler et al. 1985). Activity areas were identified for the Sadlerochit, Aichilik, and Kongakut packs. The Aichilik pack showed the greatest use of the 1002 study area (primarily between the Aichilik and the upper Okerokovik rivers), but the majority of its range fell outside the 1002 boundary. The Kongakut pack was found well to the east of the 1002 area, while a very small proportion of the Sadlerochit pack's activity area fell within the 1002 boundary. Observations of the Canning River and Old Man Creek packs placed them well south of the 1002 boundary. Weiler et al. (1985) observed individual wolves within the 1002 area on several occasions in 1984 but concluded that there appeared to be little use of the coastal plain west of the Aichilik River, at least during mid- and late summer. Coastal plain use by wolves was much higher east of the Aichilik.

Telemetry work continued during the 1985 field season with the collaring of 15 wolves, mostly incidental to grizzly bear studies (Weiler 1986). The distribution of wolves once again showed that identified packs had activity areas lying largely outside the 1002 study area, with occasional lone or dispersing individuals found on the coastal plain. The loss of one pack in 1984 from hunting mortality (Weiler et al. 1985) and the loss of two packs in 1985 from rabies and hunting mortality, along with the appearance of two new packs in 1985, indicates a dynamic situation with regard to wolf distribution on the ANWR (Weiler 1986).

The overall abundance of wolves on or adjacent to the ANWR coastal plain was similar in 1984 and 1985. Weiler et al. (1985) reported a minimum of 27 adult wolves and seven pups using the northern portion of the ANWR in late summer 1984. Twelve mortalities were known to have occurred during the winter of 1984-85, leaving a minimum late summer population of 22 adults and 14 pups in 1985. These authors also report that wolf populations on the North Slope are considered low as compared to their abundance prior to the intensive aerial wolf hunting and predator control that occurred in the early

to mid-1950s. Weiler et al. (1985), citing a series of authors, state that "prey abundance, social dynamics of packs, human disturbance and harvest levels, diseases, and other ecological factors . . ." apparently influence wolf density in a given range. Mortality data reported by Weiler (1986) indicate that of 34 wolves alive in late summer 1984, 12 died during the winter of 1984-85 from hunting, disease (rabies), and unknown causes. Subsequently, 14 pups were produced in 1985, which provided a rough balance between population additions and losses, if documented emigration and potential immigration are assumed in balance. Seven mortalities documented during the winter of 1983-84 were all hunter kills, but losses from disease and other causes, if any, were unmeasurable in the absence of collared individuals during this period. We may conclude on the preceding evidence that hunting and disease have influenced wolf abundance on the ANWR over the last several years.

Areas of Special Concern

Wolves are highly mobile predators. Their distribution seems to depend upon prey availability rather than upon the physical structure of their habitat (Paradiso and Nowak 1982). Nevertheless, one component of physical habitat, the availability of den sites, is important to wolf reproduction. Wolf dens in arctic Alaska may be excavated in thawed ground found in "cut banks, escarpments, dunes, kames, and moraines . . ." (Weiler et al. 1985). Haugen (1985) studied den sites on the Canning and Kongakut rivers during 1983 and 1984. The Canning River den site consisted of six major holes in a mound lying 15-25 m from the river and measuring 50 m long by 4 m high, and the Kongakut River den site consisted of two dens in a southfacing ridge within 300 m of the main river channel. Weiler (1986) reported that all den sites located during recent ANWR wolf studies have been found in the mountains rather than the coastal plain; however, wolves do "den on the coastal plain to the west of ANWR" (Weiler et al. 1985).

Dens are used by the parturient female and pups for 8 to 10 weeks (Paradiso and Nowak 1982). Haugen (1985) observed the dominant male, the maternal female, and a subdominant female present at the Kongakut den site for several weeks (presumably after parturition had occurred) before seeing two subdominant males and another subdominant female near the den. The subordinate wolves visited the den on a regular basis, although at a lower appearance rate than the dominant pair. Thus, during the denning period, breeding pairs appear to have limited mobility, and the successful rearing of offspring may depend on free and undisturbed use of key denning habitat.

Literature Cited

- Haugen, H.S. 1985. Prey utilization by wolves in two drainages within the Arctic National Wildlife Refuge, and a preliminary description of wolf pack behavior around the den in the Kongakut River drainage. ANWR Progr. Rept. 85-4. Arctic National Wildlife Refuge, U.S. Fish and Wildlife Service, Fairbanks, AK. 25 pp.
- Paradiso, J.L., and R.M. Nowak. 1982. Wolves: Canis lupus and allies. Pages 460-474 in J.A. Chapman and G.A. Feldhamer, eds. Wild Mammals of North America: Biology, Management, and Economics. The Johns Hopkins Univ. Press, Baltimore and London. 1,147 pp.
- Weiler, G.J. 1986. Personal communication. Arctic National Wildlife Refuge staff. U.S. Fish and Wildlife Service, Fairbanks, AK.
- Weiler, G.J., G.W. Garner, L.D. Martin, and W. Regelin. 1985. Wolves of the Arctic National Wildlife Refuge: their seasonal movements and prey relationships. ANWR Progr. Rept. 85-5. Arctic National Wildlife Refuge, U.S. Fish and Wildlife Service, Fairbanks, AK. 34 pp.

WOLVERINE (Gulo gulo)

Distribution and Abundance

Wolverines occur across the northern United States and Canada at relatively low densities (Wilson 1982). In Alaska, wolverines are found in both tundra and taiga regions (Mauer 1985). Of 11 observations of wolverines on the ANWR in 1984, four were within the 1002 study area and the remainder were in foothills or mountains south of the coastal plain (Mauer 1985). Aerial observations made in 1985 in conjunction with grizzly bear and wolf research failed to reveal any wolverines; however, five or six incidental observations of wolverines (including those made in the mountains outside the 1002 area) were recorded on the northern portion of the ANWR in 1985 (Mauer 1986). Observations prior to 1984 indicate few wolverines on the coastal plain. Only one of 10 sightings made north of the continental divide during baseline studies by Arctic Gas Limited in the early 1970s occurred on the coastal plain, but wolverines apparently occur in all types of arctic terrain (Mauer 1985).

Although wolverines occur at densities ranging from 1/55 km² to 1/74 km² in the arctic foothills of northwestern Alaska (Mauer 1985), the difficulty in observing, and failure to capture, wolverines in the northern portion of the ANWR may indicate that wolverine densities there are considerably lower than in other areas of northern Alaska (Mauer 1986).

Areas of Special Concern

Wolverines exhibit considerable mobility. In northwestern Alaska, female wolverines had home ranges averaging 115 km² and male wolverines had home ranges averaging 666 km² (Mauer 1985). When pursued, individual wolverines have moved up to 65 km without resting (Wilson 1982). Thus, wolverines may avoid most disturbances by using their mobility. Nevertheless, lactating females may restrict their range of movement "during March and April when young are born and reared" (Mauer 1985). Therefore, denning may be the most sensitive life function of wolverines.

In Lapland, wolverines den in tunnels up to 40 m long dug beneath the snow, often in ravines (Wilson 1982). In northwestern Alaska, "remnant snow drifts in small drainages with associated meltwater caverns were an important rearing habitat used by maternal females and their offspring" (Mauer 1985). It is reasonable to expect that similar denning and rearing habitat is used by wolverines on the ANWR; however, no denning studies have been done on the refuge. Although at least one author cited in Wilson (1982) believed that the

availability of wolverine denning sites influenced territory size, it is not known whether or not such availability affects wolverine abundance on the ANWR.

Literature Cited

- Mauer, F.J. 1985. Distribution and abundance of wolverines in the northern portion of the Arctic National Wildlife Refuge. ANWR Progr. Rept. 85-16. Arctic National Wildlife Refuge, U.S. Fish and Wildlife Service, Fairbanks, AK. 14 pp.
- Mauer, F.J. 1986. Personal communication. Arctic National Wildlife Refuge staff. U.S. Fish and Wildlife Service, Fairbanks, AK.
- Wilson, D.E. 1982. Wolverine: Gulo gulo. Pages 644-652 in J.A. Chapman and G.A. Feldhamer, eds. Wild Mammals of North America: Biology, Management, and Economics. The Johns Hopkins Univ. Press, Baltimore and London. 1,147 pp.

FOXES (Vulpes vulpes and Alopex lagopus)

Two species of fox occur on Alaska's North Slope: the red fox (Vulpes vulpes) and the arctic fox (Alopex lagopus). The following discussion will treat both species; however, most available information addresses arctic foxes.

Distribution and Abundance

Red Fox

The red fox occurs throughout most of the United States and nearly all of Canada. In Alaska, the northern limit of red fox distribution appears to be the arctic coastal plain (Samuel and Nelson 1982). Eberhardt (1977) found red fox dens as far north as Alyeska Pump Station #2 near the boundary between northern foothills and the arctic coastal plain. Chesemore (1967) stated that few red foxes occurred in the Teshekpuk Lake area and were among species of furbearers that either were sparsely distributed or tended "to concentrate in the foothills and mountains of the Brooks Range." Red fox distribution in the ANWR has not been studied; however, aerial surveys related to pipeline baseline studies in the early 1970s did locate the dens of red foxes "along or near rivers in the mountains and foothills" (Eberhardt 1977). Based on the preceding references, it appears that red foxes may be largely absent from the coastal plain and the 1002 study area but likely occur in the foothills and mountains to the south. Eberhardt's (1977) work showed that red fox dens were located along river valleys; thus, mid- and upper portions of the drainages between the Sagavanirktok and the U.S.-Canada border may be assumed to support red foxes.

The abundance of red foxes in northeast Alaska is unknown. In the lower 48 states, home ranges of radio-collared foxes in diverse habitat varied from 57.5 to 161.9 hectares but increased to "5.12 km² for an adult male in a less diverse farming area" (Samuel and Nelson 1982). It is unlikely that red foxes reach these densities at the northern extreme of their distribution in Alaska. Eberhardt (1977) found a mean distance of 6.1 km between occupied dens in the Sagavanirktok River valley, which is a crude indication of red fox abundance in riverine habitats of northern Alaska.

Arctic Fox

The arctic fox has a circumpolar distribution which includes the northern portion of Alaska (Underwood and Mosher 1982). Chesemore (1967) cites several references describing the general occurrence of arctic foxes in Alaska along the arctic coast to the U.S.-Canada border. Specific studies of

arctic foxes have been conducted in the Teshekpuk Lake area (Chesemore 1967), the Prudhoe Bay area (Eberhardt 1977, Fine 1980), the Sagavanirktok River valley (Eberhardt 1977), and Demarcation Bay in the ANWR (Burgess 1984). Eberhardt (1977) found that "arctic foxes denned only on the level tundra plain north of the confluence of the Sagavanirktok and Ivishak rivers and west of Franklin Bluffs." The general limitation of arctic foxes to the coastal plain may be influenced by red foxes preying upon them and by interspecific competition between arctic and red foxes (Chesemore 1967; Eberhardt 1977).

Arctic foxes exhibit highly adaptive physiological and morphological characteristics for life in the arctic (Underwood and Mosher 1982) which allow them "to move seasonally between summer breeding habitats in wet tundra and winter habitats, where they are widely dispersed on the coast and far out on the sea ice" (Burgess 1984). Observations of radio-collared arctic foxes in the Demarcation Bay area of the ANWR coastal plain indicated that medium-relief, low-center polygon and meadow habitats received use in proportion to their occurrence on the study area. Foxes selected against tussock slope and low-relief, low-center polygon habitats while they selected for gravel beach and high-relief, high-center polygon habitats. The remaining, less common habitats were also selected by foxes (Burgess 1984). In summary, within the area of interest, arctic foxes are distributed across the coastal plain from the U.S.-Canada border westward to the Sagavanirktok River, and most commonly available habitats within the region are used by these foxes.

Estimates of arctic fox abundance are difficult to obtain. Burgess (1984) reported minimum home range sizes of 23.9 km² and 18.5 km² for two female foxes near Demarcation Bay. A mean home range size of 20.8 km² has been reported for the Prudhoe Bay area (Burgess 1984). Fine (1980) observed at Prudhoe Bay that "at least 26 dens occurred in approximately 390 km², an average of one den per 15 km²." Fifty percent of these dens "had pups present sometime during the summer" of observation. Eberhardt (1977) reported a mean distance of 7.1 km between occupied arctic fox dens in the Prudhoe Bay and lower Sagavanirktok River areas. Macpherson (1969) found a mean density of one den per 36 km² in the Aberdeen Lake area of the Canadian Northwest Territory. None of the preceding indicators of density provide direct estimates of arctic fox abundance in the 1002 study area or on the coastal plain between the Canning and Sagavanirktok rivers. In addition, arctic fox numbers may fluctuate by a factor of ten between consecutive years (Underwood and Mosher 1982), which limits the usefulness of single-year data. Nevertheless, we may assume that arctic foxes are moderately abundant on the arctic coastal plain between Prudhoe Bay and the U.S.-Canada border.

Areas of Special Concern

Foxes, like other terrestrial carnivores exhibit considerable mobility. Accounts of movements up to 1,120 km in a two-year period exist for arctic fox, and migrations over hundreds of kilometers have been recorded for this species in the USSR (Underwood and Mosher 1982). In spite of this mobility, denning and rearing of young is a life function for which foxes have specific habitat requirements and are constrained in their movements.

Red Fox

Literature accounts of red fox reproduction state that breeding occurs from December to March with a 52-day gestation period (Samuel and Nelson 1982). In northern Alaska, red foxes complete den selection by early May. Dens in the Sagavanirktok drainage were located in small mounds on river terraces, in river banks, and "in the edges of ravines which faced the river valley"; were characterized by tall willow cover; and were excavated in fine to medium sand or silty loam soil (Eberhardt 1977). Eberhardt (1977) concluded that den sites for red foxes were numerous in the foothills portion of the Sagavanirktok River drainage. The abundance of potential den sites in drainages to the east of the Sagavanirktok is not known.

Red fox pups begin walking at three weeks of age and do not leave the den site (unless moved by the parents) for the first month of life. Unaccompanied movements of pups away from the den site begin at 10 weeks of age and become much longer after 12 weeks of age. Juvenile dispersal of first-year foxes begins in September and October (Samuel and Nelson 1982). Based on the preceding discussion, it appears that denning red foxes (parents and offspring) have limited mobility during the months of May through July and thus may be more sensitive to disturbance than during other portions of the year.

Arctic Fox

Breeding in arctic foxes occurs March through April and gestation takes 52 days (Chesemore 1967, Burgess 1984). Eberhardt (1977) noted that den selection by arctic foxes in the Prudhoe Bay and lower Sagavanirktok River area was "apparently complete by early May." Arctic fox dens in these areas were excavated in pingos, low ridges, sand dunes, and river terraces. Soil at den sites ranged from fine to coarse sand as well as stones, silt, and loam. Arctic fox den sites supported much more grassy cover than surrounding terrain; den vegetation was generally less tall and lush than that associated with the dens of red foxes. Most arctic fox dens in Eberhardt's (1977) study area were classified as "mature" indicating repeated use, perhaps resulting from scarcity of suitable den locations. Chese-

more (1967) concluded that a minimum mound height of one meter was necessary for successful den excavation, and 49 of the 50 dens examined by this author were in mounds from one to four meters high. The abundance of potential den sites for arctic foxes in the 1002 study area and westward to the Sagavanirktok River is unknown.

Arctic fox pups have been observed outside their den at three to four weeks of age (Eberhardt 1977), but do not spend much time there until they are more than eight weeks old (Fine 1980). At 11 weeks of age, arctic fox pups spend little time within the den. Periodic visits to the den site occur through August (Fine 1980), but by late summer juveniles disperse from the natal den (Burgess 1984). Based on the preceding discussion, it appears that denning arctic foxes, like red foxes, have limited mobility during the months of May through July and thus may be more sensitive to disturbance than during the remainder of the year.

Literature Cited

- Burgess, R.M. 1984. Investigations of patterns of vegetation, distribution and abundance of small mammals and nesting birds, and behavioral ecology of arctic foxes at Demarcation Bay, Alaska. M.S. Thesis. Univ. of Alaska, Fairbanks. 191 pp.
- Chesemore, D.L. 1967. Ecology of the arctic fox in northern and western Alaska. M.S. Thesis. Univ. of Alaska, Fairbanks. 148 pp.
- Eberhardt, W.L. 1977. The biology of arctic and red foxes on the North Slope. M.S. Thesis. Univ. of Alaska, Fairbanks. 125 pp.
- Fine, H. 1980. Ecology of arctic foxes at Prudhoe Bay, Alaska. M.S. Thesis. Univ. of Alaska, Fairbanks. 76 pp.
- Macpherson, A.H. 1969. The dynamics of Canadian arctic fox populations. Can. Wildl. Serv. Rept. Series No. 8. Ottawa. 52 pp.
- Samuel, D.E., and B.B. Nelson. 1982. Foxes: Vulpes vulpes and allies. Pages 475-490 in J.A. Chapman and G.A. Feldhamer, eds. Wild Mammals of North America: Biology, Management, and Economics. The Johns Hopkins Univ. Press, Baltimore and London. 1,147 pp.
- Underwood, L., and J.A. Mosher. 1982. Arctic fox: Alopex lagopus. Pages 491-503 in J.A. Chapman and G.A. Feldhamer, eds. Wild Mammals of North America: Biology, Management, and Economics. The Johns Hopkins Univ. Press, Baltimore and London. 1,147 pp.

POLAR BEAR

Distribution and Abundance

Unless otherwise noted, the following discussion has been abstracted from the Alaska Habitat Management Guide for the Arctic Region (ADFG 1986) or USFWS 1982.

Polar bears (Ursus maritimus) are found in and adjacent to the ANWR 1002 study area, but precise abundance and distribution data are not available. These bears belong to the northern Alaska population, which extends westward to approximately Point Lay. In 1978, this population was estimated to consist of 2500 to 3000 animals. Mark and recapture studies are currently underway to better define the population limits and abundance of Alaskan polar bears.

Except for some denning females, Alaskan polar bears remain associated with sea ice throughout the year, unless they are attracted onshore by carrion. Polar bears are most abundant in drifting pack ice where they feed on ringed seals, their primary food source. Polar bears are found in the ANWR vicinity from fall through spring in association with the sea ice and within 40 km inland from the Beaufort Sea. Bears also may be present during the summer depending on the location of the sea ice relative to the coastline. Shorefast ice is used as a travel route by some pregnant females in September or October as they move to denning sites on land. A high but unknown percentage of the pregnant females den on the sea ice. Other members of the population travel across the shorefast ice when attracted to carrion on land or on the barrier islands. Female polar bears den in October and November, and cubs are born in December or January. The sow and cubs emerge from the den in March or April, remain near the den for one to two weeks, then move onto the shorefast ice zone where they feed on ringed seals.

Areas of Special Concern

The onshore polar bear denning habitat in the ANWR region merits special concern. The main habitat requirement for a maternal den site is snow of sufficient depth for den excavation and protected enough to remain in place during the denning period. Drainages and cut banks provide the best den site locations because adequate snow accumulations occur in conjunction with these topographic features. Of 35 maternity dens found onshore in Alaska by researchers, seven were on land within the ANWR study area. Three confirmed dens and two possible dens also were found just north of the ANWR on the shorefast ice. The locations of these den sites are identified in the USFWS's 1982 Section

1002 report. Additionally, six drainages with good to excellent potential denning habitat were identified, including the Katakturuk, Anjun, Okerokovik, and Jago rivers and Carter and Marsh creeks.

Literature Cited

ADFG. 1986. Alaska Habitat Management Guide - Arctic Region, Vol. 1. Alaska Department of Fish and Game, Juneau, AK. 465 pp.

USFWS. 1982. Arctic National Wildlife Refuge Coastal Plain Resource Assessment: Initial Report Baseline Study of the Fish, Wildlife, and their habitats. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Region 7, Anchorage, AK. 507 pp.

BROWN BEAR

Distribution and Abundance

Unless otherwise noted, the following discussion has been abstracted from the ADFG 1986 or USFWS 1982.

Precise population estimates are not available for brown bears (Ursus arctos) inhabiting the ANWR 1002 study area. However, between 1982 and 1984, 103 brown bears were captured and marked on the coastal plain, adjacent foothills, and in the mountains of northeastern ANWR (DOI 1985). The age structure of the captured bears suggests that the population is stable or increasing (ibid).

Detailed studies of brown bears that seasonally occupy the ANWR coastal plain have not been conducted. General observations indicate that brown bears move to the coastal plain in late May or early June, with the majority of sightings occurring during June and July. Bear sightings are common in the foothills extending from south of Barter Island west into Canada. The highest number of sightings has usually been in the area between the Aichilik River and the Canadian border.

Habitat use patterns are seasonal and begin each year when bears emerge from their winter dens. Adult males emerge first in mid-April while females with new cubs often remain in dens until mid-May. Preliminary data indicate that brown bears move from denning areas in the foothills and mountains south of the ANWR to the coastal plain in June and early July. This timing coincides with the presence of calving and post-calving caribou, and observations suggest that caribou are an important food source for the ANWR brown bears. In October and November the bears again move south into the foothills and mountains to den. Only two bears in 1983 and two bears in 1984 denned in the 1002 study area. The locations of the 1984 den sites are identified in the DOI's 1985 1002 study report.

Areas of Special Concern

River drainages in the coastal plain appear to play an important role in seasonal movements of brown bear. Upon emerging from their dens, bears tend to move downstream through major river drainages. Early emergent vegetation and carrion appear to be important food sources during the spring period. During the summer months, many bears move out of the river drainages to forage in upland areas. In fall, bears move back into the river valleys and travel upstream to denning areas. River drainages appear to provide both a travel corridor and important spring and fall foraging habitat for brown bears.

Literature Cited

- ADFG. 1986. Alaska Habitat Management Guide - Arctic Region, Vol. 1. Alaska Department of Fish and Game, Juneau, AK. 465 pp.
- USFWS. 1982. Arctic National Wildlife Refuge Coastal Plain Resource Assessment: Initial Report Baseline Study of the Fish, Wildlife, and their habitats. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Region 7, Anchorage, AK. 507 pp.

RINGED SEAL (Phoca hispida hispida)

Distribution and Abundance

Unless otherwise noted, the following discussion has been abstracted from ADF&G 1986 and USFWS 1982.

Ringed seals occur along the arctic and subarctic coasts of North America. Because they are associated with ice year-round, the seasonal ice cycle has an important effect on their distribution and regional abundance. Within the 1002 study area, ringed seals are found in waters of the ANWR that are claimed by both the federal and state governments. Population estimates for the 1002 study area are not available, however Alaskan waters may contain as many as 1.5 million ringed seals.

Ringed seals are the most ice-adapted of all northern pinnipeds and are the only seals in the Northern Hemisphere that regularly inhabit the fast ice. During the winter and spring, the highest densities of breeding adult seals have been found on stable land-fast ice; subadults are more numerous in adjacent flaw zones.

Ringed seals use open leads and cracks in the ice to surface and breathe during freeze up. As the ice mass solidifies the seals use their claws to actively keep breathing holes open. When drifted snow covers breathing holes, some holes are enlarged and seals haul out and excavate lairs in the snowdrifts. Lairs are used by males and females of all ages for resting and by adult females for pupping. Sufficient snow for lair construction (20 cm) is usually found only to the lee of ice hummocks or along pressure ridges. In flat areas little or no snow accumulates and few lairs are constructed.

During the late spring and early summer, ringed seals haul out on the ice to complete their annual molt. They use the fast ice, as well as relatively large flat floes in the pack ice, and are usually seen near cracks, leads, or holes where they have rapid access to water. Feeding is greatly reduced during the molt and the amount of time spent on the ice increases as the molt season progresses.

In summer, most ringed seals of all age classes and both sexes are found along the edge of the permanent ice pack and near nearshore ice remnants. A small portion of the population, mainly subadults, may be found in ice-free areas. Ringed seals spend most of the summer and early fall in the water feeding intensively. They feed mainly on benthic and pelagic crustaceans and arctic cod.

Areas of Special Concern

Most of the lagoons in the ANWR study area are shallow and winter ice is usually anchored to the bottom. Therefore, they are not available to ringed seals as pupping or winter feeding habitat. Lagoons must be deeper than 2.5 - 3.0 m and there must be deep water connections with the ocean in order to provide suitable pupping habitat. Lagoons such as Nuvagapak, Angun, and Jago are 3.0 - 3.6 m deep in places, and are open to the ocean. These lagoons may provide suitable pupping and winter feeding habitat and should receive special consideration.

Literature Cited

- ADFG. 1986. Alaska Habitat Management Guide - Arctic Region, Vol. 1. Alaska Department of Fish and Game, Juneau, AK. 465 pp.
- USFWS. 1982. Arctic National Wildlife Refuge Coastal Plain Resource Assessment: Initial Report Baseline Study of the Fish, Wildlife, and their habitats. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Region 7, Anchorage, AK. 507 pp.

Enclosure B

MAJOR FISH AND WILDLIFE ISSUES

Resource Category 1 (USFWS Mitigation Policy)

The USFWS Mitigation Policy directs the USFWS to consult with the applicable state wildlife agency in developing recommendations for habitats to be included in Resource Category 1. To our knowledge, the USFWS has never formally consulted with the ADFG in regard to recommendations for habitats in ANWR to be included in this category. Although ADFG concurs with USFWS in placing the PCH core calving area in Resource Category 1, the department recommends that one additional habitat type be placed in this category: spring areas as documented by the USFWS (Shublik Spring, Red Hill Spring, Katakturuk River Tributary Spring, Sadlerochit Spring, Hulahula Spring, Okerokivik River Spring, and Aichilik River Spring). As stated on page 37 of the 1002 report, "overwintering habitat is probably the greatest limiting factor for arctic anadromous and freshwater fish populations." There are inadequate water supplies in the 1002 area to support even exploration activities such as exploratory wells. In order to provide a high degree of protection to this limiting habitat type, these springs and the water therein should be placed in Resource Category 1.

Core Calving Area of the Porcupine Caribou Herd

The department supports the placement of the "core calving area" of the PCH as defined in the ANWR 1002(h) report in Resource Category 1. Furthermore, the department's position is that this area should not be opened to oil and gas exploration and development (i.e., this area should not be leased). It is our interpretation of Resource Category 1 that these areas so designated cannot be opened for oil and gas leasing. The "core calving area" is defined in the ANWR 1002 report as that zone where calving densities have been equal to or greater than 50 caribou per square mile in five out of the last 14 years (Plate 2, Map A).

The ADFG's position is based on a number of factors, including the best professional judgment of departmental biologists who have extensive experience and expertise in assessing the potential effects of various activities on biological resources. It is our belief that the opening of the "core calving area" in the ANWR could result in a significant adverse effect to the PCH and that development, if it occurred within the "core calving area," could lead to a reduction in total numbers of caribou.

Our position is based on a number of factors, which we have summarized below:

- (1) The ANWR was established for the purpose of preserving unique wildlife, wilderness, and recreational values. ANILCA redefined the purpose to include the conservation of fish and wildlife populations and their habitats in their natural diversity including but not limited to the PCH;
- (2) The PCH is an internationally important herd consisting of 180,000 animals;
- (3) Caribou from the PCH are important to a number of communities for subsistence use. These communities are located in both Alaska and Canada;
- (4) The "core calving area" for the PCH has been documented based on 14 years of data collected by the USFWS, ADFG, and industry consultants;
- (5) Cows during calving are more sensitive to disturbance than other caribou groups;
- (6) Studies conducted by the ADFG have documented that oil and gas development and associated activities result in the displacement of cows during calving;
- (7) The recommendation from the ANWR caribou workshop (November 19-20, 1986) consisting of 14 caribou biologists was that the "core calving area" should not be leased (note, there was one dissenter from this view);
- (8) In the 1002 report, the Department of Interior postulated that development in the core calving area could include loss of 32 percent of the most critical PCH core calving areas as a result of displacement. Displacement was considered in the report to represent a complete loss of habitat values; and
- (9) Studies conducted by other researchers have demonstrated that roads, pipelines, and other land development activities have resulted in demographic effects (i.e., reductions in total numbers of animals in specific herds of caribou in Europe).

In summary, the ADFG firmly believes that the "core calving area" of the PCH should be retained in Resource Category 1 and that this area should not be leased for oil and gas exploration and development.

Caribou Insect Relief Habitat

The ADFG's position is that a three-mile terrestrial corridor along the coast should be maintained free of development in order to provide protection for insect relief habitat used by both the CAH and PCH, to maintain a zone for the movement of large aggregations of caribou, as well as to provide protection for calving areas of the CAH. The department's position is based on a number of factors, including the best professional judgment of its biologists who have extensive experience and expertise in assessing the potential effects of various activities on biological resources. Post calving aggregations of large numbers of caribou (e.g., greater than 10,000) utilize the coastal areas for insect relief and these large bands of caribou use the coast extensively for east/west movements. The department recognizes that some development may be essential in this three-mile buffer zone but these developments should be limited to two major port type facilities and a limited number of other oil transport systems. All pipelines and roads that may be deemed to be mandatory in this zone must be oriented north and south and fully designed to provide for the free movement of large bands of caribou (e.g., east/west movements). The department is extremely concerned that proliferation of facilities in the coastal area could dramatically alter caribou movement patterns and use of these areas.

The ADFG position is based on a number of factors which are summarized below:

- (1) The ANWR was established for the purpose of preserving unique wildlife, wilderness, and recreational values. ANILCA redefined the purpose to include the conservation of fish and wildlife populations and their habitats in their natural diversity. This includes but is not limited to the Porcupine Caribou Herd (PCH);
- (2) The PCH is an internationally important herd consisting of 180,000 animals;
- (3) Caribou from the PCH are important to a number of communities for subsistence use. These communities are located in both Alaska and Canada;
- (4) Access to coastal mosquito relief areas during the mosquito season is believed to be important especially to cows and calves. Survival of cows and calves over the ensuing winter can depend on caribou obtaining sufficient food during the summer when forage plants are at their nutritional peak. When caribou are harassed by mosquitoes, they move to coastal bluffs, dunes, and river deltas where winds tend to minimize mosquito harassment. As a result, maintaining caribou

access to mosquito relief areas is thought to be important to ensure that caribou do not unnecessarily use up important energy reserves essential to their winter survival;

- (5) The "insect relief habitat" for the PCH and CAH has been documented based on data collected by the USFWS, ADFG, and industry consultants;
- (6) The movement of large aggregations of CAH caribou has been altered by oil development in the Prudhoe Bay/Lisburne Development Area. Movement of large numbers of caribou along the coast in the Prudhoe Bay/Lisburne Development Area no longer occur;
- (7) The recommendation from the ANWR caribou workshop (November 19-20, 1986) consisting of 14 caribou biologists was that a 3 to 5-mile wide non-development buffer zone should be maintained along the coast to facilitate caribou movements and access to insect relief habitat (note, the majority of biologist supported this conclusion);
- (8) In the Department of Interior report (page 112), it is stated that 29 percent of the coastal insect relief habitat could be reduced or eliminated. Furthermore, it is stated that nearly 80 percent of the coastal insect relief habitat could be affected if development proves to be a barrier to caribou movements; and
- (9) The coastal zone east of the Hulahula River is used for post calving movements by tens of thousands of PCH.

In summary, the ADFG believes that the "insect relief area" of the PCH and CAH should be retained free of development to the maximum extent practicable. The department recognizes that corridors for access to the coast will be required (i.e., two major marine docks were identified in the ANWR 1002 report) and that there may be other special cases where other essential facilities may be permitted in this zone. The granting of such variances will be limited to those cases in which full mitigation is proposed by the applicant and the necessity for the facility is amply justified.

Stream Buffers and Setbacks

The ADFG position is that stream buffers should be established to protect waterbodies in the ANWR. The buffers should be 3/4-mile for specified streams and 500 feet for all other waterbodies. Buffers are recommended to protect waterbodies from pollution, to ensure that the habitats associated with waterbodies (i.e., riparian zones) are maintained to the fullest extent possible, and to mitigate

the effects of facilities and activities on wildlife species using these habitats (i.e., minimize displacement of wildlife from preferred habitats). There are a number of wildlife species which use the habitats associated with streams and providing for development free buffers will ensure continued protection of these habitats and the use of these habitats by these species. It is recognized that transportation corridors (roads, pipelines) will traverse streams and riparian habitats and that in specific cases, variance procedures may be necessary for certain facilities. Therefore, the department also recommends that a variance procedure be established by which allowances can be made for the placement of some essential facilities (e.g., pipelines, roads, drill pads) in these valuable habitats. Non-essential facilities would include such things as camps and support facilities (i.e., facilities which can be sited in other areas to avoid valuable habitats).

Buffers to protect riparian habitat associated with some of the major stream systems in ANWR are required in order to protect a variety of fish and wildlife species. Muskoxen use these habitats for movements, calving, and feeding, particularly in those stream systems to the west of the Hulahula River. Caribou from the PCH use the riparian habitats for calving and as migration corridors during their movements to coastal insect relief habitats. Polar bear den sites are most commonly found in snow drifts along cut banks of these stream systems. Shorebirds, wolverines, foxes, and moose also utilize these habitats. In summary, these habitats are unique and utilized by a variety of species including the key species of ANWR as identified in the ANWR 1002 report (e.g., polar bears, caribou, muskoxen, and arctic char).

The 3/4-mile setback should be applied to the following streams:

- (1) Canning River - buffer will protect fisheries resources, caribou, muskox, waterfowl and loon nesting areas, polar bear denning habitat, and moose;
- (2) Tamayariak River - buffer will protect fisheries resources, caribou, muskox, and waterfowl and loon nesting areas;
- (3) Katakturuk River - buffer will protect caribou, muskox, cliff nesting raptors and ravens, and moose;
- (4) Sadlerochi River - buffer will protect fisheries resources, caribou, muskox, cliff nesting raptors and ravens, polar bear denning habitat, and moose;

- (5) Hulahula River - buffer will protect fisheries resources, caribou, and waterfowl and loon nesting areas;
- (6) Okpilak River - buffer will protect fisheries resources, caribou, waterfowl and loon nesting areas, and moose;
- (7) Jago River - buffer will protect caribou, cliff nesting raptors and ravens, waterfowl and loon nesting areas, and moose;
- (8) Okerokovik River - buffer will protect caribou, muskox, and moose;
- (9) Niguarak River - buffer will protect caribou, muskox, and and polar bear denning habitat; and
- (10) Aichilik River - buffer will protect fisheries resources, caribou, and waterfowl and loon nesting areas.

These major river systems and adjacent riparian habitat are essential to a variety of wildlife species. Major movements of animals occur within these riparian corridors. Buffers along these systems will provide a certain degree of protection to those specific fish and wildlife species mentioned. These habitats also are used extensively by other species in the ANWR 1002 area such as snow geese, wolves, wolverines, shorebirds and passerines, and brown bears.

Water Availability and Use

The department recommends that all spring areas in the ANWR 1002 area be placed in Resource Category 1 and that water removal from these areas be prohibited. Ample evidence exists that this habitat type is limiting to fishes in the ANWR area, and these waters should not support exploration or development of oil and gas.

Water for industrial use on Alaska's north slope has been a resource issue beginning with the early development of the Prudhoe Bay oilfield. The conflicts result from the use of limited surface water sources which are also important overwintering habitat for several species of arctic fish. The north slope region is characterized by low annual precipitation and long periods of extreme cold. Groundwater is very limited due to the unique characteristics of the permafrost environment which prevents infiltration into groundwater aquifers. The groundwater that is available is generally unsuitable having a high salt content. As a result of these conditions, fresh water supplies are limited

to surface waters. The availability of surface water is greatly reduced during the winter season as many of the shallow lakes and ponds as well as small streams and significant portions of the larger rivers freeze solid by late winter. During late winter the available surface water sources on the North Slope consist of deep lakes, deep holes or pockets of water in large river systems and springs or perennial groundwater sources generally associated with the Lisburne formation in the foothills of the Brooks Range. These surface water areas along with brackish waters in deltas of the large river systems represent the pool of available habitat for overwintering anadromous and fresh water fish. Several fish biologists believe the availability of overwintering habitat is a key factor in the regulation of populations of arctic cisco. The available freshwater habitat in the large river systems is reduced by at least 95 percent from that available during the open water season. Any reduction in the quantity or quality of available overwintering habitat is likely to have serious impacts on arctic fish stocks.

Formerly, water for use in the Prudhoe Bay oilfield was taken from the Sagavanirktok River adjacent to the Deadhorse industrial area. This water removal resulted in dewatering of fish overwintering habitats and documented mortality of large numbers of fish. Currently, in order to provide fresh water for industrial uses in the Prudhoe Bay area several large surface water reservoirs have been developed. The majority of the reservoir sites are depleted deep gravel mine sites that have been flooded with surface water. Other sites are shallow tundra lakes that have been deepened to provide winter water supplies. These water reservoirs are filled either passively or actively from nearby drainages during the spring breakup period and are, in general, isolated from river and stream systems during the remainder of the year. Generally, seismic and exploratory drilling operations can operate in areas where developed water sites are not available by utilizing water provided by snow melting, saltwater desalination, or hauling from the large reservoirs or specified deep lake sites.

Surface waters in the 1002 area differ in character from those found west of the Sagavanirktok River. The 1002 river systems exhibit a high degree of braiding and have relatively steep gradients--i.e., fitting the commonly used descriptions of "mountain" type streams. Water depths are shallow and deep isolated pool type overwintering habitats are rare. Overwintering habitats consist of perennial ground water sources (springs) which are found on most of the major drainages in the 1002 area. Several large deep lakes also occur in the area which could provide winter water for oil and gas exploration and development activities. Spring water sources in these river systems are critical to the maintenance of fish stocks. Populations of

arctic char are dependent upon these discrete spring areas to provide spawning and overwintering habitat. Large aggregations of arctic char, arctic grayling and other resident freshwater fish species are confined to habitats created by spring areas are also important to other forms of aquatic biota, such as insects and other benthic organisms, and biomass is often high in these areas. Open water areas associated with springs also attract winter resident birds and mammals as a source of moisture. These areas can be described as biologically productive "cases" in the polar environment. Several drainages (Katakaturuk River, Marsh Creek and Jago River) within the ANWR 1002 area lack spring areas or other suitable overwintering habitat. Lack of adequate overwintering habitat limits fish abundance to very low levels in these drainages.

The departments recommended mitigation for protection of waters in the ANWR area consists of the following points:

- (1) The state water policy prohibiting water use during the winter from North Slope streams and rivers has been effective in reducing impacts to overwintering fish populations. A similar policy should be applied to any water use in the 1002 area;
- (2) Spring areas that provide fish overwintering habitat should be included in Resource Category 1. Instream flow allocations for the maintenance of fish habitat should be obtained; and
- (3) Large surface water reservoirs should be created to provide an adequate supply of fresh water for oil and gas related industrial activity. Deep pit type excavations adjacent to active channels of the streams identified as lacking suitable fish overwintering habitat could provide a winter water source and provide overwintering fish habitat. These reservoir sites should incorporate features that will enhance their value as fish and wildlife habitat (e.g., areas of shallow water, varying shoreline, provide for free movement of fish in and out of sites).

Gravel Sites

The ADFG position is that gravel sites in ANWR be sited, developed, and rehabilitated in such a manner that overall impacts to fish and wildlife resources are mitigated. Plans for gravel removal must include detailed plans for the rehabilitation of the site and rehabilitation must be conducted in phases concurrent with the removal of gravel. The importance of rehabilitation cannot be overemphasized, based on experiences to date in the Prudhoe Bay/Kuparuk development areas in which, to date, no material site has

been rehabilitated from the standpoint of improving the site for fish and wildlife resources. The department also recommends that gravel sites be developed in such a manner that they can be used as water sources for both the exploratory and developmental phases of oil and gas activities.

Gravel mining can result in adverse impacts to fish and wildlife habitats with direct effects on individual fish and wildlife species. Use of upland gravel sources can result in habitat loss through surface disturbance, interference with drainage patterns, and the loss of upland/wetland habitats. Gravel removal from floodplain environments can result in the disruptions of flow patterns leading to channel diversions, increased sedimentation of waterbodies, fish blockages and entrapment, increased potential for aufeis formation, and other floodplain alterations that reduce overall habitat quality. For example, at a gravel site located on the Kavik River, just west of the 1002 area, removal of stream bank cover led to a reduction in the number of arctic char juveniles as compared with control areas located downstream of the gravel removal site.

Large quantities of gravel are required for any major development and the selection of sites (upland versus floodplain) should be based on a thorough knowledge of the overall gravel needs for a development project, the mineral resources available, and the fish and wildlife resources and their habitats potentially affected by the gravel operation. Specific data on gravel resources including locations of alternative sites, type and quantity of material present, depth of deposits, amount of overburden and method of disposal, quantity of surface organics and anticipated uses, and the potential rehabilitation options of gravel sites are needed. Combining the mineral resource data with the known fish and wildlife resources in the various alternative sites should be used as the basis for determining which sites should be mined, how they should be mined, and what the specific restoration requirements will be for each specific site including a schedule for completing the various phases.

At a minimum, any gravel site whether upland and/or floodplain should be sited and designed (a complete and detailed mining plan should be required) to conform to the guidelines as defined in the Gravel Removal Guidelines Manual for Arctic and Subarctic Floodplains (USFWS, Woodward-Clyde Consultants, 1980). Information presented in these guidelines and supporting technical report deal exclusively with gravel sites in floodplain environments. Environmental changes associated with gravel removal are presented allowing the resource management agencies to assess and determine what levels of impact, both positive and negative, are acceptable for any given site.

Marine Facilities/Causeways

The department's position is that causeways constructed of gravel (i.e., solid filled causeways) should not be authorized in nearshore waters adjacent to ANWR. Solid filled causeways, including structures with minimal breaching, interfere with the free movement of wildlife and alter the water quality characteristics of the nearshore environment. These nearshore habitats are important to a number of anadromous fish species and other wildlife (e.g., waterfowl).

The design, location, and construction of marine facilities in the 1002 area will have consequences on marine and freshwater fish that are not limited to the 1002 area. Many of these marine and freshwater anadromous species utilize the Beaufort Sea nearshore environment over a wide geographic area. For example, arctic cisco migrate between the Colville River and Mackenzie River deltas. Arctic char (an evaluation species in the 1002 report) move back and forth along the coast. Therefore, the potential adverse effects of marine facilities including subsea pipelines, seawater treatment plants (STP's), and causeways should be thoroughly evaluated. The description in the DEIS of the marine facilities does not provide a clear picture from which to analyze the potential impact. For example, the "Environmental Consequences" section mentions that each marine port will will impact 20 acres, whereas table V-1 refers to two 200-acre sites. Without additional description of facility design and local bathymetry it is difficult to determine even what the gravel footprint of such a facility may be. Three types of marine facilities--seawater treatment plants (STP's) for waterflood, marine pipelines, and causeways--are discussed below.

In general, the operation of the Prudhoe Bay and Kuparuk waterflood STP's appears to have resulted in little impact to aquatic organisms. The potential impacts of entrainment and impingement have apparently been successfully mitigated; therefore, the current technology can be applied to similar facilities in the 1002 area.

Marine pipelines are an untested technology at Prudhoe Bay. During the deliberations regarding the Endicott causeway, evidence was presented that subsea pipelines are feasible in the Arctic, and may be cost-effective. Two constraints on the construction of subsea hot oil pipelines--ice scour and burial in permafrost--are mentioned in the 1002 report. Ice scour in the nearshore area generally is less than that offshore because of the extensive shore-fast ice zone along the former, and multi-year ice grounds out in relatively deeper water. Therefore, sufficient burial depth may eliminate this constraint. Research has shown that permafrost under the sea often begins at a greater depth than that on

land; therefore, burial of a hot oil pipeline may not result in thaw/stability pipeline integrity problems. Further evaluation of the feasibility of subsea pipelines should be completed before this alternative is rejected.

One of the major environmental issues regarding oil development at Prudhoe Bay has been the construction of solid-fill gravel causeways offshore. The issue has not been the effects on nearshore fish habitat and movements; rather, the issue has been the significance of these effects on fish populations--essentially, the definition of "impact." The DEIS for the Endicott project, for example, concluded that solid-fill causeways would impede fish movements and cause changes in the temperature and salinity regimes and circulation of nearshore waters. These effects have since been empirically demonstrated, as in the case of the West Dock causeway. A variance was issued by the state for the Endicott project to account for the projected area of impacts, deemed to be a "mixing zone." Although the effects mentioned above have been corroborated by extensive monitoring studies, there remains sufficient dispute over the interpretation of these results and the significance of these effects that the Corps of Engineers announced in May 1985 that construction of solid-fill causeways would be suspended until the results of monitoring studies are completed.

Using the standard of the USFWS Mitigation Policy that impact is defined in terms of habitat modification as well as population changes, there appears to be sufficient evidence that solid-fill causeways will impact fish species that use the nearshore environment. Minimization of some of these impacts (e.g., breaches as mitigation for impedance of fish movements) is possible, but other impacts (e.g., degradation of water quality) may only be mitigated by selecting alternatives other than solid-fill causeways. Feasible alternatives exist, and include pile-supported structures, concrete "honeycomb" structures, or buried pipelines.

Mud Pits

ADFG recommends that prior to approval of the use of reserve pits for exploratory and production drilling, a program for evaluating the impacts of reserve pits on biological resources be undertaken, and the results of that program be applied as the basis for authorizations for the use of reserve pits during drilling.

Current petroleum industry practice for North Slope exploratory and production drill sites is to construct an adjacent reserve pit ("mud pit" or "sump") into which spent drilling muds and cuttings from the well hole and other byproducts

from the drill rigs (e.g., oily wastes, solvents) are discharged. At typical North Slope drilling depths the total volume of muds and cuttings from each well may reach 12,000-15,000 barrels. In addition to muds and cuttings, other waste products from drilling as well as meltwater and precipitation accumulate in the pit to increase the volume of material that must be contained and disposed. Because of the large volume of disposal material and the potentially toxic nature of the compounds in this material (e.g., heavy metals, brines, hydrocarbons, corrosives), ADFG is concerned that inadequate containment and disposal methods can result in this material reaching the surrounding environment and impacting North Slope fish and wildlife and their habitat.

ADFG's concerns fall into two general categories: (a) mechanical destruction of wetland habitat, and (b) chemical destruction of or damage to aquatic and wetland habitat and animals due to discharge of reserve pit supernatant. The latter can result in chronic and/or acute contamination of wetland organisms by heavy metals, hydrocarbons, or salts, and the introduction of excessive turbidity or settleable solids into an aquatic system. ADFG is also concerned about the potential contamination of upland as well as wetland habitat along the road system where reserve pit supernatant has been applied as dust control. "Fugitive dust" and water runoff could spread contaminants such as heavy metals to adjacent areas.

Mechanical destruction of habitat by construction of a reserve pit is unavoidable due to the "footprint" of gravel and overburden that is necessary to construct the pit. Given the vast amount of terrestrial habitat on the North Slope, the loss of such small areas due to gravel overlay is not a significant problem. However, most of the production reserve pits are concentrated in coastal wetland areas, and many of these are interconnected with other coastal wetlands. Coastal wetland habitat is one of the most productive on the North Slope, and is more scarce on ANWR than in areas further to the west. The only effective mitigation of the impact of mechanical destruction is to minimize the number and spatial extent of reserve pits.

A more important biological concern is the effect on water quality and wetland habitat and animals as a result of reserve pit contents entering surrounding wetland areas, and the potential for chemical contamination of plants and animals with hydrocarbons, heavy metals, and other compounds. Most of the several hundred North Slope production reserve pits are located in wetlands and near ponds where reserve pit compounds may accumulate in the water column, in sediments, plants, or animals. The few water quality comparisons between reserve pits, adjacent ponds receiving direct or indirect discharge, and controls indicates that water quality in ponds near the pits is lower than controls,

and that the effects are attenuated with further distance from the pits. Water quality studies have identified elevated levels of alkalinity, turbidity, pH, aliphatic hydrocarbons, chromium, cadmium and nickel in ponds 100-200 m away from the reserve pits.

Studies of the effects of reserve pits on vegetation have been few, and the scope has been limited to gross phytological changes. Chemical destruction of vegetation immediately adjacent to North Slope reserve pits has been observed, and is thought to be due to the seeping of contaminants such as hydrocarbons and brines from the pits. Differences in tolerances of plants to reserve pit contaminants has been demonstrated; however, definitive studies have not been performed. Research in arctic Canada has demonstrated that upland vegetation around reserve pits has been destroyed, but plant mortality and community changes due to contamination could not be conclusively separated from those due to mechanical destruction. These studies deal with gross phytological changes; however, studies of the effects of reserve pit discharge on phytoplankton and other smaller forms of plant life have not been undertaken. Effects on these forms may be more serious than effects on larger plants.

Studies on the biological effects of reserve pit supernatant on animals have also been limited. Toxicity studies with a several fish and macroinvertebrate species and aquatic invertebrate community structure indicate that discharge of reserve pit fluids can affect aquatic life. Although absorption of toxic compounds by grayling in laboratory studies has been documented, no acute toxic effects were shown. Chronic effects on grayling have not been studied. In situ studies on aquatic invertebrates that are important components of the coastal wetland ecosystem have shown significant mortality, prolonged immobility, and reduced fecundity and growth when exposed to various concentrations of reserve pit supernatant. Investigations of aquatic invertebrate community structure at sites varying in distance from reserve pits indicate that reserve pits were devoid of any invertebrate life, and that the number and diversity of invertebrates decreased significantly as proximity to the pit increased.

Although the data are strongly suggestive that impacts to fish and wildlife habitat and to lower food-chain organisms are occurring as a result of reserve pit discharges to the surrounding environment, the conclusive link, that of effects on higher food-chain organisms, remains to be proven. However, all indicators suggest that such impacts can and probably do occur--water quality degradation around the pits has been documented, uptake of compounds known to be detrimental to organisms in laboratory conditions has been found, an important aquatic food-chain organism has

been effected, and aquatic invertebrate community structure has been changed.

In light of the results of the studies alluded to above, ADFG recommends that prior to approval of the use of reserve pits for exploration and production drilling, a program for evaluating the impacts of reserve pits on biological resources be undertaken, and the results of that program be applied as the basis for authorizations of use of reserve pits during drilling. This program should contain at a minimum: (1) a comprehensive biological program to evaluate the effects of reserve pit contaminants on aquatic ecosystems and upland habitats to which reserve pit contaminants may be applied; and (2) an examination of operational changes that will minimize the possibilities of reserve pit contents reaching the surrounding environment.

A comprehensive biological program to determine the effects of reserve pit contamination on higher organisms should have, at a minimum, the following objectives: (1) document the extent of contamination by sampling water, soils, plants, and animals potentially affected by reserve pit discharges including potential contamination of upland areas by reserve pit supernatant used as dust control; (2) conduct lab and in situ studies of chronic and acute effects of reserve pit supernatant and contaminated receiving water on selected indigenous animals; and (3) determine the changes in aquatic plant and invertebrate community structure around reserve pits, and the effects of these changes on selected species of fish (e.g., sticklebacks) and wildlife (e.g., shorebirds).

The evaluation of operational methods to prevent reserve pit contaminants from reaching the surrounding environment should concentrate on methods to reduce the volume of contents required in the pits, and enhanced containment methods for those contents that must be disposed of in the pits. The evaluation should at a minimum include the following topics: (1) reducing the amount of contents to be placed in reserve pits (e.g., methods for enhanced solids recovery, improved reinjection technology); (2) improved snow removal techniques (e.g., use of blowers rather than dozers) to minimize the meltwater portion of supernatant; (3) design pits in "cellular" configuration to allow closeout of portions of pits immediately after each well is completed; and (4) the use of impermeable liners in pits.

SUMMARY OF ADFG COMMENTS ON THE ANWR 1002 MITIGATION (PAGES 145-147 OF DEIS)

Note: The following ADFG remarks are based on the assumption that the PCH core calving area will be closed to oil exploration and development and that spring areas in ANWR will be added to Resource Category 1 and will also be closed to oil and gas activities. These comments take into consideration that the 1002 area is a refuge.

Stipulations (from DEIS, pp. 145-147)

ADFG Recommended Changes and Additions

Recommended Additions: There are a significant number of terms and conditions which should be added. First, there are mitigative measures mentioned in the species discussions in the "Environmental Consequences" chapter of the 1002 report that are not contained in the summary section. These mitigative measures should be added to the summary section. Secondly, there are a number of factors which are either not addressed or not handled in sufficient detail in order to provide for an overall effective mitigation program. Examples include the following: coordinated state/federal process for design review, permitting, field surveillance, compliance, and enforcement; rehabilitation; maintenance of public fish and wildlife resource use; material exploration, extraction, and rehabilitation; solid waste management; timing, setbacks, and use of explosives; liquid waste management; hazardous waste management; stream crossings and fish passage; water management; bonding and financial responsibility; right of access; erosion control; oil spill planning; penalty provisions for non-compliance; definitions of key terms; identification of information needs; design criteria and compliance plans, quality assurance/quality control; air quality; and support service industries. These subject matters need to be addressed in a comprehensive manner and mitigative measures and processes developed.

1. Consolidate, site, construct, and maintain facilities and pipelines to minimize effects on sensitive habitats and species. Locate nonessential facilities outside caribou calving areas.
2. Design all bridges and culverts to handle at least 50-year flood events.

Expand to include locating nonessential facilities outside of caribou insect relief habitat and riparian zones.

All roads and associated drainage structures shall be designed so as to not interfere with or restrict the movement of water. All gravel fills shall be designed in such a manner that these structures are

stable under a variety of stream flow conditions. Unless it can be clearly demonstrated that other designs are acceptable from the standpoint of fish passage and cross drainage, all major stream and floodplain crossings will be bridged such that the entire floodplain width remains unrestricted. In-channel river-training structures that will adversely impact fish habitat or restrict fish passage will not be allowed. Design criteria and specifications for all cross-drainage structures will be developed and shall be reviewed and approved by the appropriate state and federal agencies. All roads will be sited so as to minimize the number of stream crossings and will include a detailed assessment of the streams and drainages to be crossed and on-site surveillance of crossing construction.

During development, bridges will be the preferred means of crossing streams containing fish. Culverts shall be considered for use in fish bearing waters where it can be demonstrated that these structures will not result in fish blockage or increased instream activities due to maintenance requirements. Placement of culverts in fish spawning or overwintering areas shall be prohibited. Bottomless arch culverts are preferable over either round or elliptical culverts. Burial depths for all culverts, except bottomless arch culverts, shall be a minimum of 0.31 m (12 inches) below the stream thalweg. Burial depths for round or elliptical culverts shall be equal to 20 percent of the diameter of the culvert or eighteen inches, whichever is less.

Criteria for sizing of the culvert structure will be the responsibility of the applicant.

3. Use ice or gravel-foam-timber pads, where feasible, for exploration wells.
4. Develop and implement an approved rehabilitation plan as part of leasing program.
5. Prohibit off-road vehicle use within 5 miles of all pipelines, pads, roads, and other facilities, except by local residents engaged in traditional uses or if otherwise specifically permitted.

Expand to state that all exploration facilities will be temporary in nature and will not be constructed of gravel.

Expand to require rehabilitation plan for exploration, development, and abandonment. Also, include requirement for conducting necessary research to develop techniques and measures for the rehabilitation of specific sites (e.g., gravel pads, seismic lines, material sites, etc.).

Modify as follows: Prohibit off-road vehicle use, except for travel by snowmachines, unless otherwise specifically permitted.

6. Limit oil exploration, except surface geology studies, to November 1- (exact dates to be determined by Refuge Manager). Cease exploration activities and remove or store equipment at an approved site by May 15. Local exceptions may be made.
7. Prohibit: gravel removal from active stream channels on major fish-bearing rivers; winter water removal from fish-bearing rivers, or springs and tributaries feeding into fish-bearing waters; spring, summer, or fall water removal from fish-bearing waters at levels that will not easily pass fish or maintain quality rearing habitat.
8. Elevate pipelines to allow free passage of caribou in areas without ramps or buried sections.
9. Place ramps over pipelines at natural crossings or where development tends to funnel animals.
10. Bury pipeline where possible.
11. Separate roads and pipelines 400-800 feet, depending on terrain, in areas used for caribou crossing.
12. Restrict surface occupancy in the zone from the coastline inland 3 miles to marine facilities and infrastructure necessary to support

Revise beginning to read "Limit oil exploration and exploration May 1 activities, except..."

Separate and address separately gravel removal-vs-water removal. Support prohibition of winter water removal from fish-bearing waters, springs, tributaries, etc. Modify summer/fall water removal language to read: During summer and fall, water removal shall be restricted to those operations that will maintain instream flows at levels necessary to provide optimum fish passage and rearing habitat, and water quality.

With respect to gravel removal, prohibit removal in all fish spawning and overwintering areas. Additionally, gravel removal from all fish-bearing rivers/streams prohibited unless approved on site-specific basis.

Modify by adding a general statement of intent, then incorporating items 8-11 under that statement, and add an additional item regarding traffic control. The suggested language is as follows:

- a. [No. 8]
- b. [No. 9]
- c. [No. 10]
- d. Separate roads and pipelines. Offset distances shall be optimum for preventing synergistic effect of roads and pipelines, based on most current relevant research.
- e. A surface traffic control plan shall be prepared, approved by the Regional Directors, and implemented. The plan shall consider such measures as convoying, pulsed traffic, and seasonal or daily restrictions.

Modify as follows: "Restrict surface occupancy in the zone from the coastline inland 3 miles to marine facilities and two transportation corridors (i.e., Camden and Poktok Bays) necessary to support activities outside the restricted zone. Provide a mechanism by which other essential facilities could be authorized using a variance type procedure within guidelines established to ensure that coastal habitat remains relatively free of development and that movement patterns of caribou are not adversely affected.

13. Monitor populations, productivity, movements, and general health of key species. Research measures to further minimize adverse effects of development; implement corrective actions.
14. Close areas within 3/4 mile of high-water mark of specified water courses to permanent facilities and limit transportation crossings. Gravel removal may occur on a site-specific basis.
15. Acquire authority to require aircraft to maintain 1,500 feet altitude above nest level within 1 mile horizontal distance of historic peregrine or other raptor nest sites April 15-August 31 (June 1 if nest is unoccupied).
16. Prohibit use of explosives or other noisy activities within 2 miles of raptor nest sites April 15-August 31 (June 1 if nest is unoccupied), unless specifically authorized by the FWS.
17. Prohibit ground level activity, permanent facilities, and long-term habitat alterations (material sites, roads, and airstrips) within 1 mile of known peregrine or other raptor nest sites. April 15-August 31 (June 1 if nest is unoccupied) unless specifically authorized.
18. Survey suitable habitat annually to locate nesting peregrines and other raptors.
19. Track radio-collared female polar bears. Establish no-activity zone of at least 1/2 mile around any den.

Modify to make two separate terms. One that states: "Monitor populations, productivity, movements, and general health of key species in relation to ANWR oil and gas activities." Then add a separate requirement to: "Monitor impacts of oil and gas activities on selected species, their habitats and human uses to evaluate effectiveness of mitigation employed and develop corrective actions, including improved mitigative techniques, as necessary."

Modify to specify that 3/4 mile setback will, at a minimum be applied to the Canning, Tamayariak, Katakturuk, Sadlerochit, Hulahula, Okpilak, Jago, Okerckovik, Niguarak, and Aichilik Rivers. Also should be modified to require 500 foot setback of permanent facilities from all other streams and waterbodies. A provision should be made which would allow for transportation corridors across streams and a variance procedure should be developed to handle other site specific actions that may be required (e.g., material sites, drill pads). If sited within 500 feet of waterbodies or within 3/4 mile of specified rivers, other mitigation measures will be required.

Modify to incorporate language developed by federal peregrine falcon recovery team. Apply to all raptors as in 1002 report.

Same as comments on 15.

Same as comments on 15.

Support.

Expand to require annual fall monitoring program to follow bears moving ashore and identify den site locations.

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| 20. Avoid construction in coastal areas near river systems with topographic relief of bluffs. Minimize activities along the coast during late October-early November when polar bears come ashore to den. | Support. |
| 21. Close area within 5 miles of development and associated infrastructure hunting, trapping, and discharge of firearms. | Additional discussion is needed on this subject and the potential to effects on human use of resources in the ANWR 1002 area. |
| 22. Prohibit surface occupancy in the Sadlerochit Spring Special Area (pl. 1A). | Support. |
| 23. Define range of the candidate plant <u>Thlaspi arcticum</u> . Minimize surface occupancy in immediate vicinity of areas identified as supporting the plant. Position pads, collecting lines, and associated roads at least ½ mile from candidate plan locations. | Support. |
| 24. Construct docks and causeways so that fish movements are not impeded and lagoon water chemistry is basically unchanged. | Solid fill causeways will be prohibited. All causeway structures needed for logistical support, waterflooding, or oil and gas transportation should be designed in such a manner that these structures do not alter nearshore water circulation patterns. In addition, these structures should be designed and constructed such that changes in water quality characteristics (e.g., salinity, temperature, suspended solids) are not induced or maintained in an unnatural state by the structure. In general, this will mean that the causeway will have to be a pier-supported elevated bridge structure, or in the case of an oil or gas pipeline, that facility would be either elevated or buried beneath the seafloor. |
| 25. Establish time and area closures or restrictions on surface activity in areas of wildlife concentration during muskox calving, April 15-June 5; caribou calving, May 15-June 20; caribou insect harassment, June 20-August 15; snow goose staging, August 20-September 27; and overwintering and spawning. | Support. |
| 26. Acquire authority to establish time and area closures and minimum aircraft altitude of 2000 feet above ground level (AGL) during muskox and caribou calving and caribou insect harassment, April 15-August 15; and snow goose staging, August 20-September 25. At other times the minimum altitude generally will be 1000 feet AGL over areas of animal concentrations. | Expand to include aircraft overflight restriction above barrier islands, lagoons, river deltas, and wetlands within one mile of coast between May 1 and September 30. |

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| 27. Fence camps and pump stations; incinerate garbage daily; prohibit wildlife feeding. | Modify to prohibit new solid fill disposal sites during exploration. Also, specify that fences must be designed to be bear proof (i.e., require the development of design standards for fences to minimize human/carnivore interactions). |
| 28. Limit use of development infrastructure, roads and airstrips, to persons on official business. | Support. |
| 29. Inventory project areas for cultural resources, evaluate resources and implement mitigation to avoid or minimize impact. | Defer to DNR |
| 30. Develop and implement plans for control, use, and disposal of fuel and hazardous wastes. | Defer to DEC |
| 31. Reinject drilling muds, cuttings, and other wastes where geologically feasible. Remove hazardous wastes to an approved disposal site. | Defer to DEC |
| 32. Provide: environmental orientation briefings for workers; program for monitoring development activities; continuation of fish and wildlife population monitoring; follow-up programs to evaluate effects; and adequate staffing for full and effective enforcement of mitigation. | Support. |

Enclosure D

GENERAL ISSUES

Decision-Making Process (Mitigation Standard)

The department proposes that a memorandum of understanding be developed between the USFWS and the Division of Governmental Coordination to facilitate the review of permits, plans of operations, and other federal, state, and local authorizations. The general standard for the review of these authorizations should be one which is consistent with the provisions of ANILCA concerning ANWR (16 USC 3142) and the existing standard used by resource agencies of the State of Alaska: An activity should be conducted in such a manner that it does not have a significant adverse effect (including any cumulative effects from a series of activities) upon the environmental values which will be impacted. Environmental values include both individual fish and wildlife species as well as their habitats. In order to comply with this general standard, the activity must, at a minimum, be conducted in accordance with the specific mitigation measures adopted for ANWR (e.g., stream setbacks, seasonal restrictions, etc.). In those instances where variances to specific mitigation measures are requested by the applicant, a detailed and complete justification for the variance must be completed by the applicant and approved by the appropriate resource agencies.

If upon review of a plan of operations or permit application, it is determined by reviewing agencies that the proposal will have significant adverse effects upon environmental values (e.g., fish, wildlife, and water quality) at risk, then mitigation measures must be incorporated into the plan of operations such that negative effects will be insignificant. The procedure used to develop the proper mitigation measures is identified in the USFWS mitigation policy (i.e., the five-step definition of mitigation found at 46 CFR 7657, January 23, 1981). In order to meet these overall goals, it should be necessary for the applicant to enter into preapplication negotiation and conference with state and federal agencies regarding both individual permits and overall exploration and development plans. The objective of these preapplication conferences should be to ensure, to the maximum extent practicable, that the plans of operations, permits, and similar applications that are submitted will contain the necessary mitigative measures (e.g., design considerations, specifications, and timing). This procedure places emphasis on developing a plan that addresses environmental values and minimizes the need for the agencies to add specific stipulations or conditions to the permits issued by the appropriate agency. This process also recognizes the fact that it is the applicant's, not the agencies', responsibility to develop an acceptable plan.

Only when a plan of operations has been developed, which in the best professional judgment of the agencies will not have significant adverse effects, would it be approved. In the event that agreement could not be reached between the agencies and the applicant, then it should be the responsibility of the applicant to appeal the decision and to support the appeal with detailed information regarding the engineering, environmental, and cost aspects of the project. The agencies would, upon the request of the applicant, consider any appeal filed. In no case would cost be the sole criterion by which an appeal is judged.

In those cases where the agencies determine that the appeal filed by the applicant is not valid, the project should be amended by the applicant and authorized or the project would be denied. In those cases where the appeal is determined to be valid, the impacts to environmental values would be mitigated to the fullest extent possible. It should be assumed that for those instances where significant adverse impacts will occur and which cannot be mitigated because of cost, environmental, and engineering considerations and that the agencies would consider compensation for environmental losses for these projects.

Strategic Planning

The department recommends that there be a requirement for strategic planning for any oil and gas exploration and development activities in the 1002 area and that the planning should incorporate adjacent lands where applicable. The state has in the past used a planning process for such areas as Bristol Bay in which large geographical areas were addressed and specific zones were closed to oil and gas development to protect renewable resources. Another example is the Tanana Basin Area Plan which has established guidelines for a variety of land use activities.

Because fish and wildlife populations ignore political boundaries, this protection will be effective only if planning encompasses the 1002 area and adjacent federal and state lands. This would ensure that optimal mitigation is consistently applied throughout the region. This would not only benefit fish and wildlife resources but would also assist industry in its planning by ensuring consistency in the application of standards. A planning process would also prevent unnecessary duplication of facilities and/or service areas, thereby minimizing social, environmental, and economic costs.

A strategic planning process would provide a framework for the timely incorporation of new information on mitigation and fish and wildlife use as it becomes available, and would ensure that mitigation methods applied at one point in time

are not negated by later activities (e.g., the benefits of a caribou ramp constructed to facilitate passage are negated when a drill pad is later constructed immediately adjacent to the ramp).

The goals of this planning effort should be to ensure that fish and wildlife resource values are considered at every stage of exploration and development so that impacts are mitigated, and so that refuge values are retained. In addition, the process should ensure that mitigation is consistently applied throughout the 1002 area as well as on adjacent state and federal lands, and that updated information is incorporated as it becomes available.

The department recommends that at a minimum, a planning process include the following basic elements:

- (1) Habitat Classification System - Habitats should be typed and both quantitatively and qualitatively assessed in terms of their values to fish and wildlife species, based on an acceptable methodology that will provide the relative value of lands as fish and wildlife habitats, and the sensitivity of those habitats to oil and gas development. This system should be used to form the basis for mitigation methods (e.g., siting of facilities, seasonal restrictions) and should be completed sufficiently in advance of development to be used in planning of that development;
- (2) Facilities Siting Criteria - Criteria for siting of facilities needs to be developed to ensure that fish and wildlife as well as other aspects (e.g., geotechnical, air and water quality) are considered during planning for location of facilities (e.g, camps, disposal sites, transportation corridors);
- (3) Construction Scheduling - During exploration and development activities provisions should be made to minimize sensory disturbance to fish and wildlife as well as unnecessary destruction of habitat (i.e., terrain and vegetation damage), by meshing seasonal wildlife usage with "windows" of construction activities. Exploratory and development activities should be differentiated such that restrictions can be effectively and efficiently applied, consistent with the level of activity proposed;
- (4) General Issue-Specific Plans - Generic plans for oil and gas activities ("1.6.1 Plans as developed for the Northwest Alaska Pipeline Company proposed gas pipeline project) should be required in order to provide criteria for addressing a number of aspects of oil and gas exploration and development (e.g., material exploration and extraction, stream crossings, liquid waste management, solid waste management, air quality).

These types of plans can be prepared for each development under general guidelines that are applied region-wide, or can be prepared once at the start of development and replicated with updated revisions for each succeeding development.

The following discussion pertains to Stipulation 1.6.1 Plans as required for the Northwest Alaska Pipeline Company gas pipeline project. Environmental constraints for the gas pipeline project included an array of state, local, and federal permits and authorizations. Many of these constraints were summarized and outlined in a series of environmental plans. The plans as identified during the negotiation process were intended to fulfill a variety of functions such as the basis for facility design, support for permit applications, and the development of field workplans employing best management practices on a site-specific basis. Plans covering the following were required: air quality; blasting; camps; clearing; cultural resource protection; environmental briefings; erosion and sedimentation control; fire control; liquid waste management; material exploration and extraction; oil and hazardous substances control, cleanup, and disposal; insecticides, herbicides, and other chemicals; pipeline contingency; quality assurance/quality control; restoration; river training structures; solid waste management; stream, river and floodplain crossings; surveillance and maintenance; visual resources; wetland construction; seismic considerations; and human/carnivore interactions.

The concept of requiring environmental plans for certain topics evolved during the drafting of the federal right-of-way grant stipulations. The markup document used was the Department of Interior Grant of Right-of-Way (GROW) for the Alyeska Oil Pipeline project. The environmental stipulations in this document were carefully scrutinized and their efficacy on the TAPS project was reviewed. For the most part, there was a general consensus between the sponsors and governmental representatives that the environmental stipulations for TAPS afforded an adequate level of protection and were usable. They were, therefore, left largely intact for the gas pipeline GROW, with the exception of requiring environmental plans for the topics listed in the preceding paragraph.

The purpose of the plans was to provide the procedures and methods of action by which particular subject areas would be addressed by the project sponsor during design, construction, operation, and termination. Each plan was to contain all information, criteria, procedures, methods, best management practices, and

construction techniques pertinent to a particular topic. The plans were to include an identification of all codes, regulations, GROW stipulations, other stipulations and permits, and other applicable codes and project requirements.

The environmental plans described how environmental impacts were to be mitigated and how resources were to be protected. The plans constituted a separate set of documents and applied to the entire project. They also served as support documents for permit applications, notices to proceed, or field design changes.

The GROW also required the development of a set of basic design criteria for the pipeline system. These criteria, by definition, included what constitutes a preliminary design for the pipeline system.

- (5) Updating of Plans -- The department recognizes that planning and development of planning type documents is an iterative process that must incorporate new information from the standpoint of mitigation technology as well as well as oil field development (e.g., further delineation of reservoirs).

Joint State/Federal Project Review

The department strongly recommends that a joint state/federal project review team be established to handle all oil and gas exploration and potential development in the ANWR. This project team would address and be responsible for planning, design review, permit actions and approvals, field surveillance, compliance, and enforcement. In concept, this would be an interdisciplinary project team with expertise in many of the areas associated with oil and gas exploration and developmental activities. In assembling such a team, we believe, however, that at least state members should remain accountable to their parent organizational units within the various departments.

The department also believes that it would be beneficial for all parties to cooperate in coordinating the project review, permitting, field surveillance, and compliance and enforcement efforts of state, federal, and local authorities. The state's existing coastal management consistency process as well as the jurisdiction of such state agencies such as ADFG, the Department of Environmental Conservation, the Department of Natural Resources, and the Alaska Oil and Gas Commission need to be effectively brought to bear on the overall project. Lack of sufficient and effective coordination could lead to each agency dealing independently with applicants and could result in permitting inefficiencies and compliance and enforcement problems.

Transportation Routing Considerations

Statements in the 1002 report refer to a transportation corridor (road and pipeline) between ANWR and TAPS Pump Station (PS) in Prudhoe Bay. Implicit in these statements is the assumption that this route is the optimal route. ADFG questions this basic assumption, and we suggest that alternative routes, such as one to TAPS PS 2 or 3, should be investigated. An inland route between ANWR and PS 2 or 3 has several advantages over a more coastal oriented route to PS 1. Some of these advantages, from a habitat perspective, include but are not limited to the following:

- (1) A pipeline route over more upland terrain may traverse soil conditions that allow greater portions of the pipeline to be buried. Buried pipelines offer practically no impediment to free passage of big game;
- (2) An inland route would avoid the concentrated calving area and coastal insect relief areas of the CAH;
- (3) An inland route would provide more opportunities to cross fish streams in the upper portions where the channels are better defined and not as braided as along the coast. This would reduce the overall impacts to fish and riparian habitats; and
- (4) An inland route would avoid almost all impacts on nesting and staging waterfowl and shorebirds on ANWR and adjacent state lands.

Use of Prudhoe Bay as the Industry Standard

The 1002 report frequently refers to current industry practices in Prudhoe Bay as the standard against which industry practices in ANWR will be measured. For example, on page 2 the report states that "The evidence generated during the 18 years of exploration and development at Prudhoe Bay indicates minimal impact on wildlife resources." Likewise, on page 97 the report states that "Mitigation is considered in terms of current technology and standard requirements on previous oil developments in the Arctic." At a recent industry/agency caribou impact workshop in Girdwood, Alaska, representatives of industry and agencies agreed that caribou calving had essentially ceased, and that coastal insect relief movements were disrupted by Prudhoe Bay development. This does not appear to be "minimal impact," especially in view of the definition of impact in the 1002 report. Additionally, a number of air and water quality and hazardous waste problems have been identified at Prudhoe Bay. It is important to understand that oil production technology and "standard industry practices" have improved since the development at Prudhoe Bay. Likewise,

the industry's ability to mitigate many fish and wildlife impacts has improved. Given the incentive to do so, industry will likely be able to provide mitigation that is improved over current technology. It is the latter standard that should be developed and improved on a continuing basis. It also must be recognized that certain impacts are unavoidable in light of oil and gas development and that some of these impacts cannot be mitigated.

In the 1002 report, reference also was made to the ability of industry to mitigate adverse impacts to fish and wildlife resources as evidenced during construction of the TAPS. In contrast to the experiences at Prudhoe Bay, the ADFG acknowledges that a high degree of attention was given to resource protection during the TAPS construction and post-construction phases. It is worth noting, however, that a joint state/federal team was in place, terms and conditions were adequate to ensure protection of resource values, and that the terms and conditions were enforced. Examples of progress made during the TAPS experience include the rehabilitation of all disturbed areas (e.g., material sites were restored) and correction of drainage problems (e.g., over 70 percent of all cross drainage structures were reconstructed following construction to provide for free fish passage of fish and to prevent erosion). A process was in place for TAPS, the state and federal agencies had the resources (engineering and biological expertise and budget), a design review and approval process, and a substantial field presence with enforcement capability. With these key elements in place and working in cooperation with Alyeska, a high degree of protection was afforded fish and wildlife resources. Without similar mechanisms in place, fish and wildlife resource protection may not be achieved.

A similar type of process was established for the proposed Northwest Alaskan Pipeline Company gas pipeline from Prudhoe Bay to the Canadian Border. During the preconstruction phases of this project (project is on hold at this time) significant advances were made in addressing and resolving resource related issues. These two projects, more than any others in the arctic environment, should be viewed as basic building blocks for oil and gas development in the ANWR.

Enclosure E

HUMAN USES OF FISH AND WILDLIFE

Impacts of oil and gas activity in the 1002 area on fish and wildlife resources can adversely affect human uses of these resources. This is true both in the 1002 area and in other Canadian and Alaskan communities that rely on wildlife which use the 1002 area, most notably the Porcupine Caribou herd (PCH). Since human uses of fish and wildlife are important activities that are consistent with the purposes of ANWR, there should be extensive discussion of human uses and of potential impacts to fish and wildlife resources used for subsistence purposes.

The draft 1002 report does not present a complete picture of subsistence uses and potential impacts associated with oil and gas exploration and development in the 1002 area. The discussion focuses principally on subsistence uses in the community of Kaktovik, and makes only passing reference to some but not all other communities that use the PCH. A more comprehensive discussion of subsistence uses by communities that use the PCH is required in order to accurately assess the potential impacts of disruptions to the herd's migration pattern consequent to development on and near the 1002 area. More detailed information on the subsistence use patterns of other communities that use the PCH is available in reports prepared by state and federal agencies.

The draft report also fails to examine the potential cumulative impacts of state and federal oil and gas exploration and development in northeast Alaska on the subsistence harvest and use of fish and wildlife resources. Development of the 1002 area cannot be viewed in isolation, since such development will facilitate additional exploration and development of existing but currently unprofitable reserves. Such activities may cumulatively have substantial impacts on habitat, fish, and wildlife resources, access to these resources, and uses of these resources by local residents in the years ahead.

Significantly, the report does not discuss a strategy for identifying impacts to human uses and for mitigation of these impacts. The ANILCA Section 810 evaluation process, which requires federal agencies to consider the effects of proposed land actions upon persons engaged in subsistence uses, is not even mentioned in the report. The Section 810 evaluation and resulting mitigation measures are intended to provide for the continuation of subsistence hunting and fishing, which constitute a reliable economic base for rural communities in Alaska. Attachment 1 to this Enclosure describes the basic requirements of ANILCA 810 and provides a systematic approach for meeting these requirements when making a decision on a federal oil and gas lease sale.

March 14, 1986

Mr. Alan Powers
Regional Director
Alaska OCS Region
Minerals Management Service
P.O. Box 101159
Anchorage, AK 99510

Dear Mr. Powers:

The State of Alaska appreciates the invitation to attend the public hearings on the Minerals Management Service's (MMS) §810 analysis for Sale 89, St. George Basin under the Alaska National Interest Conservation Act (ANILCA). Although we were not able to attend the meetings, we wish to submit the following comments on the §810 analysis. For your information and future reference the Governor's Office of Management and Budget, Division of Governmental Coordination (DGC) communicates the State's response to implementation of ANILCA §810 by federal agencies. Although DGC should be viewed as the "appropriate State agency" for notification under §810, the State's response reflects a consensus of the State's resource agencies. We would therefore request that in the future when DGC is notified under §810, copies of that federal notice also be sent to the Alaska Departments of Fish and Game, Environmental Conservation and Natural Resources.

The Sale 89 §810 analysis does not provide enough detailed information to adequately evaluate the effects of the proposed action on subsistence uses and needs in localized areas. It relies upon data presented in the Final Environmental Impact Statement (FEIS), which in many cases is highly regional in nature and does not allow an accurate evaluation of the possible effects of oil and gas activities upon subsistence at the local community level. An adequate §810 analysis must include complete and accurate information on the biophysical effects of the proposed action, and on the people and socioeconomic systems which rely on fish and wildlife resources. In particular, the §810 analysis must identify all the subsistence uses of fish and wildlife resources which may be affected by the proposed action and determine whether significant restrictions to these uses may occur.

Mr. Alan Powers

- 2 -

March 14, 1986

Specifically, the Sale 89 §810 evaluation does not adequately assess how the major impacts to marine and coastal birds predicted in the FEIS will affect subsistence uses. The Sale 89 FEIS projects a moderate or major effect on marine and coastal birds depending on what mitigation measures are adopted. Birds and bird eggs are identified in the FEIS (III-63) as important subsistence resources, particularly for St. George Island residents. Consequently, we disagree with the omission of this potentially significant restriction of subsistence uses from the analysis.

The potential for oil spills to impact Unimak Pass resources and in particular, the large salmon runs that migrate through it are also not adequately evaluated in the §810 analysis. If oil is discovered, the Oil-Spill-Risk-Analysis for the proposal indicates a 12 percent chance of Unimak Pass being contacted by a 1,000-barrel or greater spill over three days (FEIS IV-38). Large numbers of salmon, including the majority of the Bristol Bay sockeye run and king and chum salmon destined for the Kuskokwim and Yukon rivers migrate through the pass. These salmon are major subsistence resources for the communities of the Alaska Peninsula, Bristol Bay, and the Kuskokwim and Yukon deltas. The FEIS (IV-39) states that "oil contacting salmon could, depending on its concentration, cause death or sublethal effects such as reduction in salmon food supply and alteration of migration with increased predation." Such effects are of special concern in Unimak Pass because salmon spawning populations occur in this area from early May through the end of July, and rearing immature salmon are estimated to be present from July through the end of November. Depending on the timing of potential oil spills in or affecting Unimak Pass, the effects on local salmon stocks could be significant. Consequently, this potential impact should be evaluated in the §810 analysis.

As previously noted, many of the salmon that migrate through Unimak Pass are destined for regions outside the sale area. Impacts to these salmon could affect villages of inner Bristol Bay and the Yukon - Kuskokwim Delta. The §810 analysis should, therefore, evaluate the potential impacts to these southwest Alaska villages that are located outside of the sale area.

We are also very concerned that no specific measures are proposed to minimize the projected impacts to northern fur seals. The adoption of such measures would reduce the potential for a significant restriction to subsistence uses. Failure to adopt specific measures to protect northern fur seals does not conform to §810(a)(3)(C) of ANILCA, which states that "reasonable steps will be taken to minimize adverse effects upon subsistence uses and resources resulting from such actions." The most "reasonable" step to minimize adverse effects to fur seals would be the adoption of Governor Sheffield's recommendation for Sale 89 under Section 19 of the OCS Lands Act to defer leasing within

Mr. Alan Powers

- 3 -

March 14, 1986

approximately 39 miles around the Pribilof Islands. This area contains negligible hydrocarbon resources and its deferral from leasing could substantially reduce oil spill effects on northern fur seals. The deferral of tracts around the Pribilof Islands would also be consistent with §810(a)(3)(B) which states that "the proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition." The proposed activity would not be negatively affected by deferring leasing around the Pribilof Islands because this area is projected to contain minimal hydrocarbon resource value (FEIS II-20). However, its adoption would reduce the amount of public lands necessary to conduct the proposed activity which would be in conformance with §810(c)(3)(B).

The benefit of conducting §810 analyses can only be realized if comprehensive measures are actively developed and adopted to minimize significant subsistence restrictions. Unfortunately, such measures have not been developed and proposed for adoption in the Sale 89 §810 analysis.

Finally, we do not believe that the MMS is conforming to §810(a)(3)(B), which states that "the proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition." The purpose of the proposed activity is to lease OCS lands that will lead to the production of hydrocarbon resources. The proposed Sale 89 lease sale configuration does not include the minimal amount of land necessary to meet this purpose. The lease sale configuration is an area-wide offering and it includes numerous tracts with no or negligible hydrocarbon potential. To conform with §810(a)(3)(B) of ANILCA, the MMS should adopt Governor Sheffield's Section 19 recommendations concerning the sale area configuration.

To assist the MMS in revising the Sale 89 analysis and implementing its Section 810 responsibilities in Alaska's other OCS planning areas, we are providing the enclosed guidelines which we believe meet the requirements of Section 810 of the Alaska National Interest Lands Conservation Act. It is our intention that these guidelines will assist you in meeting the requirements of Section 810 in a timely, thorough, and cost-effective manner. These guidelines incorporate the procedures developed by the Section 810 working groups of the Land Use Council.

We appreciate the opportunity to comment on the Sale 89 §810 analysis. Please call me if you have any questions regarding our comments. If you have any questions regarding our proposed

Mr. Alan Powers

- 4 -

March 14, 1986

guidelines for preparing Section 810 analyses, please contact Steve Babaka, Alaska Department of Fish and Game's Director of the Division of Subsistence. He may be reached at 465-4147 in Juneau.

Sincerely,

Robert L. Grogan for

Robert L. Grogan
Associate Director

Enclosure

cc: Irven F. Palmer, HMS, Anchorage

bs86030402kff

bcc: Commissioner Ross, DEC, Juneau
Commissioner Wunnicke, DNR, Juneau
Commissioner Collinsworth, DFG, Juneau
John Katz, Office of the Governor, Washington, DC
Laura Davis, Law, Juneau

A Recommended Approach to Implementation of ANILCA §810

March 14, 1986

§810 of ANILCA requires federal agencies to consider the effects of proposed land actions upon people engaged in subsistence uses. Specifically, it requires agencies to:

1. Evaluate the effects of the proposed action on subsistence uses and needs;
2. Determine the availability of other lands for the purposes sought to be achieved and assess whether other alternatives are available which would reduce or eliminate the use, occupancy or disposition of public lands needed for subsistence purposes;
3. Determine whether the proposed action would "significantly restrict" subsistence uses;
4. If the proposed action would significantly restrict subsistence uses, to:
 - a. Meet certain public notice and hearing requirements.
 - b. Determine that such a restriction meets certain standards, including involving the minimum amount of public lands and minimizing adverse impacts upon subsistence uses and resources.

This paper describes the basic requirements of §810 and provides a systematic approach to meeting these requirements when making a decision on an OCS oil and gas lease sale.

Evaluating Effects on Subsistence Uses

ANILCA §810 provides, as a starting point, that "in determining whether to...lease...public lands...the head of the federal agency having primary jurisdiction over such lands...shall evaluate the effect of such use, occupancy, or disposition...on subsistence uses and needs...."

This section is clearly intended to require a specific assessment of impacts on subsistence uses. An adequate §810 evaluation must include complete and accurate information about the proposed action and about the subsistence uses of potentially affected wild resources.

Information about the wildlife populations, fish stocks, and geographic areas which could be affected by the proposed action

are needed to determine the scope of potential effects on subsistence. Information about the specific subsistence uses of, and needs related to, these resources and areas is required to identify and evaluate these effects. This includes data on:

1. Who uses the resources which could be affected;
2. Where, when, and how the resources are harvested;
3. How much they use; and,
4. The significance of the harvested resources for meeting socioeconomic and cultural needs.

Maps of community subsistence use areas can provide valuable data about which communities and groups of people use fish and wildlife that could be affected. Each §810 evaluation should include a map and list of communities that use the stocks and populations of resources potentially affected by a proposed action. The Alaska Department of Fish and Game routinely develops maps of subsistence use as it conducts community subsistence studies. The state welcomes opportunities to cooperate with federal agencies in improving the subsistence data base.

Once the area and communities which could be affected by an action are identified, an assessment must be made of the potential effects of the action on uses of fish and wildlife. The potential linkages between the proposed action, fish and wildlife resources, and subsistence uses need to be clearly described. This can be accomplished through developing hypothetical scenarios, and tracing their implications out through the biological system to the people who rely on subsistence uses.

The evaluation of effects should address potential positive, neutral, and negative effects, as well as direct and indirect impacts on subsistence uses resulting from a proposed lease sale. The guidelines for implementation of §810 developed by the Alaska Land Use Council are helpful in identifying several effects which would restrict subsistence uses:

1. A reduction in subsistence uses due to direct impacts on the resource, adverse impacts on habitat, increased competition for the resources, or other factors;
2. A reduction in the subsistence uses due to changes in availability of resources caused by an alteration in their distribution, migration, or location; and
3. A reduction in subsistence uses due to limitations

on the access to harvestable resources, such as by physical or legal barriers.

An adequate §810 assessment must consider the potential effects of the proposed action in each community which would be affected. In some circumstances, however, it may be necessary to examine effects on the subsistence uses of "typical" communities or groups of people within the affected zone.

Biological and socioeconomic data need to be at a level of detail which will allow a meaningful assessment of potential impacts on the people who use resources for subsistence. These effects can occur at the individual, household, community and regional level.

A working document has been developed by the Alaska Land Use Council which identifies minimum data standards for making an adequate §810 assessment. (Alaska Land Use Council, Working Group II; November 28, 1984, Draft Standards and Guidelines for the Collection, Analysis, and Presentation of Subsistence Use Information for ANILCA §810 Determination, pp. 5-6.) In some cases existing data on subsistence uses may not be adequate to conduct a §810 analysis. Agencies must anticipate these special data needs at the earliest stages in the EIS process. Public meetings may be useful in compiling additional data on subsistence uses and needs. Additional research may also be necessary to address particular data gaps. New studies should be closely coordinated with the State of Alaska as required by ANILCA §812.

The §810 evaluation must thoroughly describe and document data about subsistence resources and uses so that all concerned parties can ascertain which resources and subsistence uses could be affected by a proposed action.

Identifying Alternatives

§810(a) also requires federal agencies to evaluate "...the availability of other lands for the purposes to be achieved, and other alternatives which would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes."

In ANILCA §802 Congress states its policy that the "...utilization of the public lands in Alaska is to cause the least adverse impact possible on rural residents who depend upon subsistence uses of the resources of such lands...." It is therefore important that §810 analyses fully identify and explore alternative areas and approaches which would minimize adverse impacts on rural residents.

Determining Whether Actions Would "Significantly Restrict"
Subsistence Use

Once the potential effects of the lease sale upon subsistence uses have been described, the next step required by §810 is to determine whether these effects could "significantly restrict subsistence uses...."

The legislative history of ANILCA gives no clue to the intended meaning of "significantly restrict." The closest parallel to the "significantly restrict" standard appears to be the requirement of the National Environmental Policy Act (NEPA) to analyze actions which may "significantly affect" the environment. Regulations of the Council on Environmental Quality (CEQ) for implementing NEPA state that both the context and intensity of impacts must be considered in deciding significance.

The people who would be affected, and the roles that the particular resources play in their lives provide the obvious context for evaluating significance in relation to restrictions on subsistence uses. The "intensity" of effects also has to be evaluated in relation to use of specific resources by people.

In §810 Congress recognized that subsistence uses are essential to many rural Alaskans, and intended federal land actions to have the least adverse impact possible upon them.

When considered in relation to this mandate, a "significant" restriction to subsistence uses is an effect which imposes a meaningful burden or hardship on particular people.

A determination of "significance" therefore requires discussion of such factors as socioeconomic circumstances, the degree to which harvest of particular resources could be reduced by the proposed action, and the consequences of the frequency, timing, and location of restrictive effects. These need to be evaluated in the context of the people who actually harvest and use the potentially affected resources, and in the context of what would constitute a meaningful burden to those people.

A hypothetical example may be useful in demonstrating the approach suggested above:

During an EIS study a proposed lease sale is determined potentially to affect local salmon stocks. The studies suggest that the activity will not have a major impact on regional salmon populations or regional harvest levels, but depending on its timing and precise location, it could reduce a particular stock or run. It is impossible, given uncertainty where or when the activity will occur, to predict exactly which salmon stock might be affected. However, the EIS has identified 20 communities and groups of people who make subsistence use of the

salmon runs which migrate through the general impact area and could be affected. The §810 evaluation therefore identifies these communities and the potential risks. It then examines what effect a reduction in a local salmon run could have for households within typical communities, perhaps dividing the communities into four or five categories, based on location, degree of reliance on subsistence resources, and so forth.

In the hypothetical example, the FEIS concludes that the proposed action could substantially reduce local stocks of king salmon for one or more seasons. As subsistence uses have been shown to occur on these stocks the §810 analysis would then identify this as a potential restriction and then go on to determine whether the action would "significantly restrict" the subsistence use of king salmon. In this analysis king salmon are one of the first fresh foods available to particular households in early summer, and the loss of king salmon for one or more seasons would be a meaningful burden on families in the communities. The §810 analysis, after weighing the risks to subsistence use of king salmon against the important role of king salmon to the people, might conclude that the action could "significantly restrict" subsistence use of king salmon in several of the communities.

Meeting Notice and Hearing Requirements

§810(a) requires the head of each federal agency to meet certain notice and hearing requirements before allowing an action which would significantly restrict subsistence uses. The appropriate state agency and appropriate local committees and regional councils established under §805 must be notified, and a hearing must be held in the vicinity of the area involved.

In ANILCA §801 Congress clearly stated its intent that rural residents, who have knowledge of local conditions and subsistence requirements, should have a meaningful role in decisions affecting subsistence uses and needs. The specific requirements of §810 are intended to ensure that federal agencies have the best available information about the potential effects of proposed actions on rural residents. They also seem, when taken in conjunction with §810(a)(3), to be intended to ensure that local knowledge and experience is brought to bear on the requirement that adverse impacts on subsistence be minimized.

Again, a community focus in evaluating effects would simplify the notice and hearing requirements. Each §810 evaluation should include a map and list of the communities potentially affected, and identify those where subsistence uses could be significantly restricted. In this way §810 assessment itself would indicate many of the groups which should be notified.

It is ~~acceptable~~ for agencies to follow the §810 procedures for public involvement in instances where a determination of significance is not clear or where there may be significant restriction even though certain data may not yet be available to support the finding.

Public notification of hearings following a determination of significant restriction should follow several avenues, including:

1. Notice published in local and regional newspapers;
2. Notice mailed to local fish and game advisory committees, regional councils, local governments, and Native organizations;
3. Notice aired on local radio and/or television broadcasts;
4. Notice posted in community halls and other local meeting places; and
5. Personal communications with individuals or groups known by the land manager to have an interest in the action.

Minimizing unavoidable adverse impacts upon subsistence uses and resources

§810(a)(3) requires three findings before an action which would significantly restrict subsistence uses can proceed.

1. That such a significant restriction of subsistence uses is necessary, consistent with sound management principles, for the utilization of public lands.

This finding of necessity should be specific to the proposed action, and should be based upon an analysis of the potential impacts upon subsistence uses and the relative value of the proposed action in meeting the goals for the use of public lands.

2. That the proposed activity will involve the minimal amount of public land necessary to accomplish its purposes.

The finding of necessity should exclude all public lands that are not necessary to achieving the proposed purpose.

3. That reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources.

Identification and consideration of possible mitigation measures are required to minimize the adverse impacts to subsistence uses that could result from the proposal to use, occupy, or dispose public lands. These can take many forms, and as noted above, public involvement can play a key role in developing suitable mitigation measures.

The following categories represent a broad range of types of mitigation measures:

1. Alternatives for deleting public lands from the proposed action to reduce the risk of potential subsistence resource restriction.
2. Alternatives for reducing impact to seasonal camps and other harvest and use locations;
3. Alternatives for reducing habitat changes that may reduce species abundance and decrease harvest opportunity;
4. Alternatives for reducing numbers of people living in, working in, or passing through area;
5. Alternatives for reducing numbers of people competing for resources;
6. Alternatives for reducing disturbance, roads, noise, water quality degradation, etc., that may affect distribution of species;
7. Alternatives for reducing land classification and ownership changes;
8. Alternatives for reducing changes in access routes to use areas; or
9. Alternatives for compensating people for losses.

Time and area restrictions on activity may frequently be useful in mitigating effects on subsistence uses.

Summary

Federal agencies can satisfy the requirements of ANILCA §810 by following the systematic approach outlined above. An adequate §810 evaluation for an OCS oil and gas lease sale would clearly meet the following standards:

1. Identify the people who make subsistence use of all wild resources which would be affected by the proposed action;
2. Identify the nature of their subsistence uses and needs for these resources;
3. Describe the potential effects of the proposed action on wild resources and upon community subsistence uses and needs, and identify which of these effects could be restrictions;
4. Make a determination of whether potential restrictions would be "significant" in the context of the meaning of the affected resources to the people who use them, and the role the resources play in their lives;
5. Identify alternatives that would minimize adverse impacts on rural residents;
6. If the proposed action could significantly restrict particular subsistence uses:
 - a. meet notice and hearing requirements;
 - b. make findings that:
 1. the necessity for the proposed action outweighs the risks to subsistence;
 2. the proposed action will involve the minimal amount of public lands needed to accomplish its purpose;
 3. reasonable steps will be taken to minimize adverse impacts upon subsistence uses and needs.
7. Thoroughly document all data and findings so that concerned parties have access to them.

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Enclosure F

SPECIFIC COMMENTS ON 1002 REPORT AND STIPULATIONS

Development and Transportation Infrastructure

page 76, Exploration: Unlike most other impacts, the impacts of water use during exploration are likely to be qualitatively similar to those during development. Therefore, since this Draft Environmental Impact Statement (DEIS) may not be amended until development, the discussion of "innovative" and other techniques to mitigate such impacts should be expanded.

page 78, Development: The assumption that a pipeline would be routed to Trans-Alaska Pipeline System (TAPS) Pump Station (PS) 1 does not appear to be warranted until all alternatives are evaluated.

page 82, Transportation Options: Again, there appears to be an assumption that a pipeline would be routed to PS 1, in spite of the environmental advantages of an inland route described in later sections of the report (e.g., page 84 of the 1002 report).

page 84, Inland Routes: The same advantages for inland pipeline routes can be expanded to an inland route across adjacent state land to TAPS PS 2 or 3.

Construction Camps: Additional discussion of design items such as bear-proof fencing, solid and liquid waste management, collocation with Central Processing Facilities (CPF's) and other service areas, and siting of facilities in areas of less importance to fish and wildlife habitat would be appropriate.

page 85, Subsea Marine Routes: The statement that "A marine pipeline presents significantly higher environmental risks than does an onshore pipeline." should be qualified. Although the consequences of an oil spill from a marine pipeline may be catastrophic, the probability of such a spill is very low. In contrast, the long-term environmental consequences of an aboveground onshore pipeline may be less on an individual occurrence basis, but cumulatively much more adverse to fish and wildlife than a marine pipeline. Furthermore, the discussion concerning construction problems associated with marine pipelines appears to be more pessimistic than warranted. For example, in many nearshore areas permafrost is deep enough that thermally-induced settlement of a pipeline is unlikely.

page 86, Other Transportation Methods: Although railroads may prove to be impractical from a logistical standpoint, the environmental impacts may be less than a combined pipeline-haul road complex such as that envisioned on page 84-85.

page 87, Natural Gas Transportation: The assumption that natural gas and oil facilities could be shared is not necessarily valid. For example, the oil pipeline route resulting in the least environmental impact may follow an inland route to PS 2 or 3, whereas the gas pipeline route resulting in the least environmental impact may follow a coastal route to Prudhoe Bay. Similarly, there are situations in which safety considerations preclude oil and natural gas systems being collocated. For example, the proximity of the TAPS pipeline with the proposed chilled gas pipeline by Northwest Alaskan Pipeline Company was eventually resolved by requiring that the two pipeline be separated by at least 200 feet.

Alternatives

page 89, Assumptions: Again, a route to TAPS Pump Station 1 is assumed, and mentioned several times later. Contrary to the Executive Summary, there is no mention of deferred leasing in the Porcupine Caribou Herd core calving area.

page 91, Table V-1: The numbers of drill pads and material sites are greatly underestimated. For example, Kuparuk oil field, which is similar to the projected size of one of the fields in ANWR, has over 40 drill pads now, and exploration and development is not completed. Although the final pad configuration cannot be determined now, upward revision of the pad estimate by a factor of at least 4 could occur as a result of development of West Sak Sands.

Environmental Consequences

page 95, Introduction: Although we recognize that the final development scenario cannot be determined, we believe that the statement "The effects would not increase proportionally with increased production" is somewhat misleading. The ultimate number and density of drill pads contributes significantly to the impacts on fish and wildlife; therefore, it is possible that the increase in pads could cause increase in impacts that is not a proportional relationship.

Likewise, development of gas reserves can cause an increase in impacts because of increased human activity in the then existing oil fields. In addition, there are impacts that are unique to gaslines (e.g., frost bulb around a chilled gasline causing ice damming of fish streams).

page 97, Mitigation Policy: The terms "avoidable adverse impacts" and "unnecessary adverse effects" are undefined, and do not appear in the USFWS Mitigation Policy (Federal Register, Vol. 46, No. 15). Adding further to the confusion is a list of "unavoidable effects" on page 101 that includes a mix of those that are truly unavoidable (e.g., loss of habitat by gravel overlay for roads and pads) with many that are avoidable with proper design (e.g., erosion and ponding along roads, water storage pits in streambeds).

The statement in paragraph 6, "Mitigation is considered in terms of current technology and standard requirements on previous oil developments in the Arctic. This includes safety and environmental stipulations that conform with available technology and industry practice" (emphasis added) is of particular concern. Statements elsewhere in the report allude to the unique nature of ANWR, and to the significant biological resources of the 1002 area. These resources provide justification for not treating oil development in this area as "business as usual," and for greater consideration of fish and wildlife mitigation on ANWR than on previous oil developments on the North Slope where current industry practices are used.

page 100, Reserve Pits: Techniques for abandonment of exploratory reserve pits should conform to Solid Waste Disposal regulations recently promulgated by the Alaska Department of Environmental Conservation.

page 101, Consequences of Developmental Drilling: This section needs to be greatly modified and expanded. Although a number of issues (e.g., gravel mining, water sources, and infrastructure) are mentioned, the discussion of each is inadequate or incorrect. For example, upland gravel sites may be more visually displeasing, but are often less destructive of fish and wildlife habitat. Removal of gravel from cutbanks along rivers can cause severe changes in river hydrology and result in impacts on aquatic habitat. In fact, this practice has been generally prohibited on state land for the past decade.

Additional impacts on aquatic systems include changes in stream bank configuration due to the installation of guide banks to protect bridges and pipelines, "piping"

of water along the buried pipe trench, and the "ice dam" across streams that is created by a buried, chilled gasline.

page 104, Sadlerochit Springs Special Area: We endorse restrictions on surface occupancy for this unique area.

page 105, Coastal and Marine, Mitigation: Experience gained from the West Dock and Endicott causeways indicates that significant water quality impacts resulted from these solid-fill causeways. We endorse the concept of using this information to plan marine facilities in the 1002 area so that such impacts do not occur.

Caribou: Although we agree that, in general, drill rigs and activity at the levels usually involved in exploration would result in only a short-term local avoidance of an area by caribou, the statement that exploratory drilling on state land has resulted in "no apparent conflict with the Central Arctic Herd...activities" should be qualified. Fancy (1982, 1983) documented localized avoidance by CAH caribou of two drill rigs on the east side of the Sag River delta, and Wright and Fancy (1980) also documented avoidance of an isolated drill rig. If exploratory rig densities were sufficiently high, large areas might be avoided by caribou.

page 110, last paragraph: This statement should be clarified. Strictly speaking, the harvest was not illegal if it conformed to Alaska hunting regulations; however, the means of access and transport may be illegal according to state law governing use of the Haul Road, and Bureau of Land Management off road vehicle regulations.

page 111, Mitigation, no. 1: Although opportunities for pipeline burial would be virtually nonexistent for a coastal route to PS 1, an inland route to PS 2 or 3 may provide numerous such opportunities for a buried pipeline.

Nos. 8 and 9: Monitoring is not a form of mitigation, unless used within the context of the USFWS Mitigation Policy (page 7660). Rather, monitoring can be used to document the effectiveness of various mitigative measures (e.g., causeway studies in the Prudhoe Bay area). Habitat use should be added to the scope of studies (ref. no. 9). Also surface traffic control measures (e.g., convoying, pulsed traffic) that can be applied within the major oil fields and transportation corridors should be added.

- page 113, Mitigation: Refer to comment regarding page 111, nos. 8 and 9.
- page 116, Brown Bears, Mitigation: A discussion should be added on bear-proof fencing of camps and incineration of putrescible wastes as mitigation measures. Refer also to the report recommendations for polar bear mitigation measures, page 118.
- page 121, Waterfowl, Mitigation: An inland transportation route in the 1002 area and across state land to TAPS would also minimize impacts on waterfowl, especially nesting tundra swans.
- page 122, Seabirds: An increase in the population of gulls (which prey on seabird and shorebird eggs and young) as a result of the availability of garbage as an alternate food source can be eliminated if all putrescible wastes are immediately incinerated [refer also to comments on Brown Bear Mitigation].
- page 125, Fish: Experience at Prudhoe Bay and Kuparuk oilfields has not demonstrated that culverts can be adequately designed and/or installed on the North Slope to assure fish passage. We recommend that drainage structures in fish streams be limited to bridges.
- page 142, Biological Resources: The estimate of loss of marine habitats due to marine facilities is extremely low if a solid-fill causeway is constructed.
- page 145, Summary of Recommended Mitigation: See Enclosure B of this memorandum. Additional mitigative measures are mentioned in the species discussions in the "Environmental Consequences" chapter of the 1002 Report. These should be incorporated in the mitigation recommendations summarized in the end of the 1002 report.

STATE OF ALASKA

11-20-93
BILL SHEFFIELD, GOVERNOR

OFFICE OF THE GOVERNOR

OFFICE OF MANAGEMENT AND BUDGET
DIVISION OF GOVERNMENTAL COORDINATION

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November 28, 1986

Dear Reviewer:

The U.S. Department of the Interior, Fish and Wildlife Service, has distributed a draft Arctic National Wildlife Refuge (ANWR) 1002(h) Report for a 60-day public review. The draft report contains information on: (1) the estimated geological potential of the area; (2) a description of fish and wildlife resources and their habitats; (3) an assessment of the potential effects of oil and gas development on fish and wildlife resources and their habitats; (4) a discussion of potential transportation and processing facilities; and (5) recommendations as to whether oil and gas leasing should occur in ANWR.

If you wish to receive the draft 1002(h) Report and have not received a copy of the document, please contact:

Mr. George Sura
U.S. Fish and Wildlife Service
1011 East Tudor Road
Anchorage, AK 99503
(907) 786-3486

In order for your views to be considered in preparation of the State of Alaska's response to the Department of the Interior on the draft ANWR 1002(h) Report, your comments must be received by January 2, 1987.

The following schedule will guide our review of the draft ANWR 1002(h) Report and preparation of the State's response to the Department of the Interior:

<u>Date</u>	<u>Action</u>
November 24	State of Alaska receives notification that the draft 1002(h) Report is available for review.
November 25	Letter to reviewers from Division of Governmental Coordination (DGC) requesting comments by January 2, 1987.

November 28, 1986

January 2 Comments due from public and government agencies.

January 3 - 12 Consider comments received and prepare draft state response letter.

January 5 Anchorage public hearing.

January 6 Kaktovik public hearing.

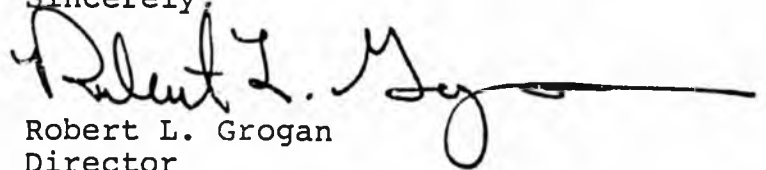
January 9 Washington, D.C., public hearing.

January 13 - 21 Prepare briefing documents and conduct interagency meetings to resolve any remaining issues in the state's draft response.

January 22 Submit state's formal written response to the Department of the Interior.

Thank you for your cooperation in this review process.

Sincerely,



Robert L. Grogan
Director

cc: Robert Gilmore, USFWS, Anchorage
George Sura, USFWS, Anchorage

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THE PRECEDING PAGES WERE TREATED AS
A UNIT IN THE ORIGINAL FILE.

TO: Distribution

DATE: June 27, 1986

FILE NO: dk86062701rse

Robert L. Grogan

TELEPHONE NO: 465-3562

FROM: Robert L. Grogan, Director
Division of Governmental
Coordination
Office of Management and Budget

SUBJECT: ANWR Policy
Statements

Attached is the most recent copy of a draft position paper regarding leasing in the coastal plain of the Arctic National Wildlife Refuge. The attached position paper will be discussed at the next resources cabinet meeting tentatively scheduled for Tuesday, July 1, at 7:00 am in the Governor's Conference Room.

Attachments:

- [255] The Honorable Don Collinsworth, Department of Fish and Game, Juneau
- [459] Mr. John Katz, Office of the Governor, Washington
- [1960] Ms. Molly McCammon, Office of the Governor, Juneau
- [254] The Honorable Bill Ross, Department of Environmental Conservation, Juneau
- [124] The Honorable Esther Wunnicke, Department of Natural Resources, Juneau

Distribution List.
June 27, 1986 :

DRAFT

Governor Sheffield's Position on
Leasing in the Arctic National Wildlife Refuge

Background Information

Pursuant to Section 1001 of the Alaska National Interest Lands Conservation Act (ANILCA), the Secretary of the Interior was mandated to assess the Arctic National Wildlife Refuge (ANWR) for potential oil and gas resources and to make recommendations concerning future use and management of those resources, including: (1) an evaluation of alternative transportation routes needed for oil and gas development; (2) review the wilderness characteristics, and make recommendations for wilderness designation of these lands; and (3) study, and make recommendations for protection of the wildlife resources of ANWR. During the course of the study, the Secretary solicited comments and consulted with the State of Alaska.

Section 1002 of ANILCA requires the Secretary, in consultation with the Governor, to conduct a continuing inventory and study of the fish and wildlife of the coastal plains of ANWR and to submit a final report (i.e., 1002(h) report) to Congress. It is our understanding that the 1002(h) report could be submitted to Congress in late November 1986 although several factors (e.g., pending lawsuit by Trustees for Alaska, politics, etc.) will likely affect this submission date. The report will contain information on: (1) the geologic potential of the area; (2) a description of fish and wildlife resources and their habitats; (3) an assessment of the potential effects of oil and gas development on fish and wildlife resources and their habitats; (4) a discussion of potential transportation and processing facilities; and, (5) recommendations as to whether oil and gas leasing shall occur in ANWR.

In order for the Governor to be as informed as possible and to enable him to participate knowledgeably and actively in any congressional debate that might occur this fall, state agencies have been directed to provide information on specific issues relating to ANWR.

Policy Statements

- ° In view of potential state revenues to be derived from any oil and gas produced from ANWR, the state supports oil and gas development in the coastal plain of the Arctic National Wildlife Refuge subject to the adoption of reasonable measures that will ensure protection to fish and wildlife resources of the area. Fish and wildlife resources of primary concern include the Porcupine and Central Arctic caribou herds, major stream systems and nearshore estuarine environments critical to spawning and overwintering fish, and coastal tundra habitats utilized by geese, swans and other major concentrations of waterfowl.

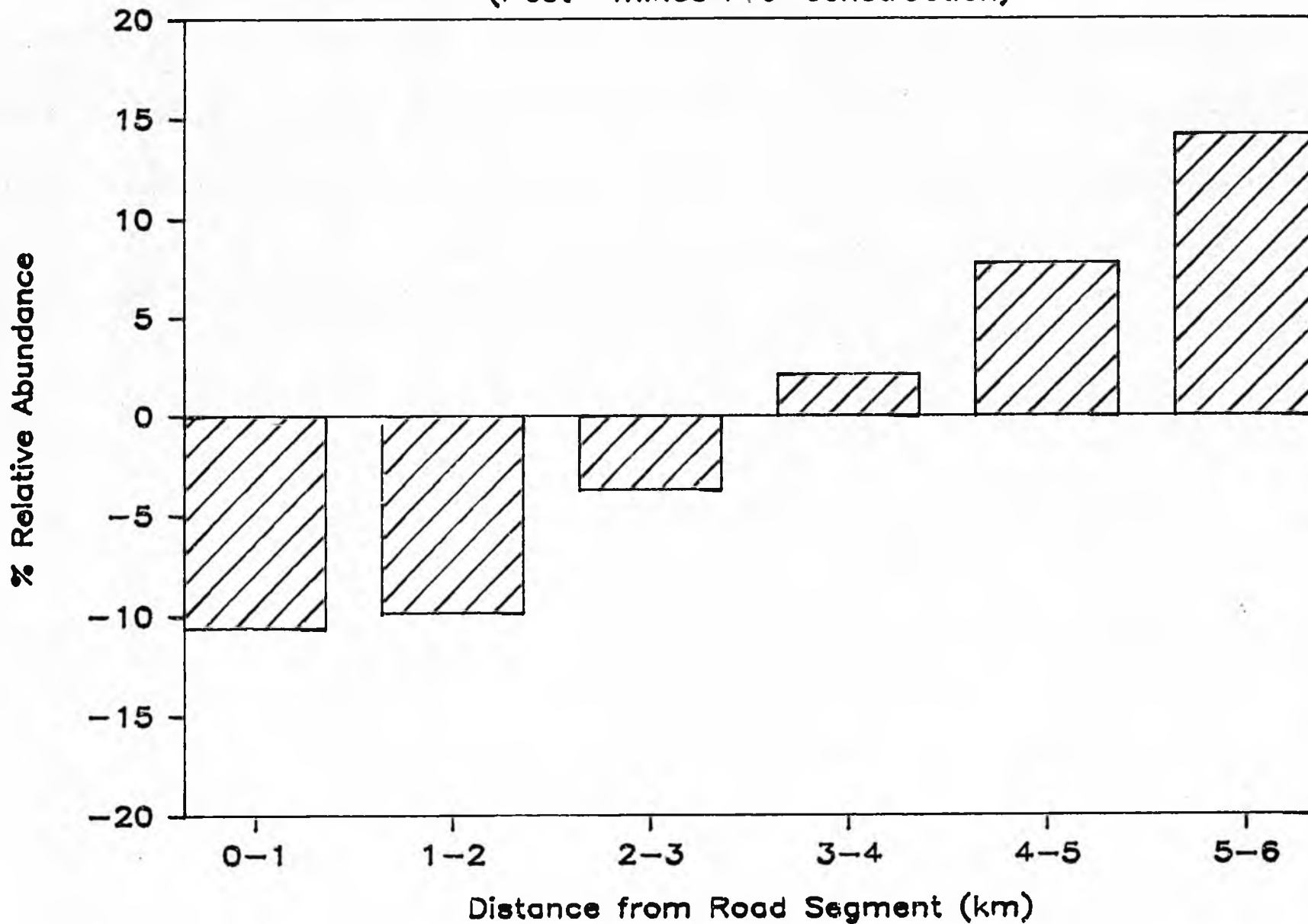
- ° The state has been an active participant in the 1002 ANILCA process which, to date, has provided for a baseline study and a comprehensive and continuing inventory and assessment of the fish and wildlife resources of the coastal plain of ANWR. It would be premature for the state to initiate a detailed and extensive review until we have sufficient information on the fish and wildlife values of the refuge and potential impacts from leasing. It is our understanding that this information will be provided in the 1002(h) report being prepared by the U.S. Fish and Wildlife Service for submission to Congress. Although the state has been an active participant in the ongoing assessment process, an extensive review of any proposal to allow leasing in ANWR will be conducted by the state in the context of the ANILCA 1002(h) report, when delivered to Congress.
- ° The state is currently entitled to 90 percent of the governmental share of royalties and bonuses derived from any oil and gas produced from ANWR. The state will make every effort to maintain this provision.
- ° The state does not support Representative Udall's bill (HR 4922) or any other legislation that would propose to designate the coastal plain of ANWR as wilderness.
- ° With regard to land exchanges in ANWR, the state is not aware of any specific areas that are being considered for trade at this time. At the urging of the state, the U.S. Department of the Interior has assured us that we will be kept apprised of any proposed land exchange under consideration and will be consulted before any final decision is made.

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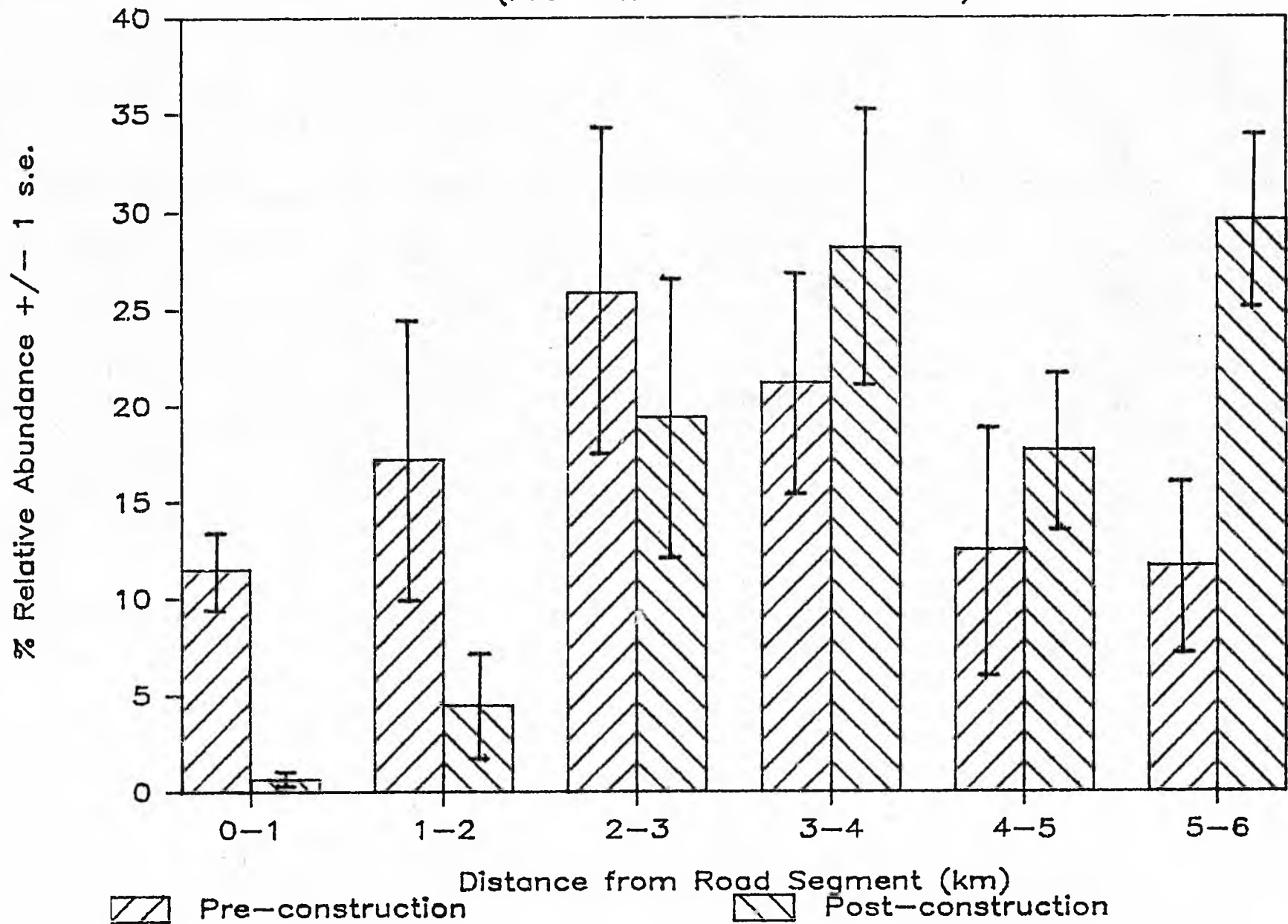
Fig 2

Adjusted Density Maternal Groups

(Post- minus Pre-construction)



Mean Adjusted Density Calf Caribou (Pre- and Post-construction)





National Audubon Society

ALASKA REGIONAL OFFICE

308 G STREET, SUITE 217, ANCHORAGE, ALASKA 99501 (907) 276-7034

TESTIMONY

ON BEHALF OF THE

NATIONAL AUDUBON SOCIETY

AT A PUBLIC HEARING ON THE

DRAFT

ARCTIC NATIONAL WILDLIFE REFUGE, ALASKA

COASTAL PLAIN RESOURCE ASSESSMENT

BY

DAVID R. CLINE

REGIONAL VICE PRESIDENT FOR ALASKA

NATIONAL AUDUBON SOCIETY

Anchorage, Alaska

January 5, 1987

AMERICANS COMMITTED TO CONSERVATION

My name is Dave Cline, and I am the Alaska Regional Vice President for the National Audubon Society. I am testifying today on behalf of the Society including its 2,600 members in Alaska.

After carefully examining the "Resource Assessment Report" for the coastal plain of the Arctic National Wildlife Refuge, we are convinced it is not in the long-term conservation, economic or national security interests of the United States to open the coastal plain to leasing at this time. We urge, therefore, that no leasing or land exchanges be permitted by Congress, and that the U.S. Fish and Wildlife Service be directed to protect and manage the entire Arctic National Wildlife Refuge consistent with the conservation purposes for which it was originally established by Congress.

We wish to commend the many dedicated resource professionals in the U.S. Fish and Wildlife Service, U.S. Geological Survey and Bureau of Land Management who gathered information for the assessment report, often at great personal risk and sacrifice. Because of their many contributions, the outstanding resource values of the coastal plain have been reconfirmed and understood better than ever before.

As one of the oldest and largest conservation organizations in the United States, the National Audubon Society has a long history of involvement in the Arctic National Wildlife Refuge. We recognize it as a very special national treasure. Dedicated friends in conservation, including Olaus and Margaret Murie, worked long and hard for its establishment in 1960 to preserve a portion of the eastern Brooks Range of arctic Alaska for its outstanding wilderness values. Thus, unlike many other refuges in the system, the Arctic Refuge was established not out of a singular need to conserve wildlife, but to preserve for all time the spectacular wilderness ecosystem of

northeastern Alaska as a whole. Audubon strongly supported this far-sighted action, and so too enlargement of the refuge in the Alaska National Interest Lands Act of 1980 (ANILCA). Over the years we have worked with other conservationists to protect the refuge from a series of threats from development interests.

Conservationists in Alaska and throughout the nation are becoming increasingly concerned about the ulterior motives of these development interests (including the Reagan Administration) who claim that the oil resources of the Arctic Refuge are critical to fulfilling growing national energy needs, particularly since President Reagan recently vetoed the National Appliance Energy Act of 1986. Passed overwhelmingly by both houses of Congress, this act would have saved the nation millions of barrels of oil and billions of dollars on utility bills by the year 2000, thus making exploitation of the Arctic Refuge totally unnecessary. In addition, the Reagan Administration has opposed establishment of fuel efficiency standards for automobiles and continuance of the 55 mile/hour speed limit.

In this debate over the future of the Arctic Refuge and its coastal plain, it is vitally important to realize that major compromises have already been made on Alaska's North Slope between development and conservation interests. These compromises have resulted in current land jurisdictions that essentially make almost 90 percent of the slope potentially available for oil and gas leasing. This is not to mention the additional 24 million acres of nearshore (state) and offshore (federal OCS) lands available in the adjacent Beaufort Sea. A mere 2 million acres of of the entire North Slope has been committed to conservation purposes in the Arctic Refuge. Now most of that is under siege by development interests. The questions must be asked: Where will the compromising stop? Aren't there any public wilderness lands along the Arctic coast

of Alaska that should be considered sacrosanct?

It is also important to note that this 18 million-acre refuge is the second largest unit in the National Wildlife Refuge System, and the largest and most spectacular arctic wilderness sanctuary for wildlife in the world. Wildlife species of particular national and international concern include the 180-thousand-member Porcupine caribou herd (whose calving ground is on the refuge coastal plain), polar bears, grizzly bears, muskox, Dall sheep, wolves, wolverines, snow geese, peregrine falcons and other migratory birds, and Arctic char and grayling.

When considered in conjunction with the North Yukon National Park that adjoins it on the east, the Arctic Refuge constitutes an international commitment to the protection of nature.

We agree with the Department of the Interior (on page 45 of the draft assessment report) that:

"The Arctic Refuge is the only conservation system unit the protects, in an undisturbed condition, a complete spectrum of the various arctic ecosystems in North America."

and (on page 46) that:

"The 1002 area is the most biologically productive part of the Arctic Refuge for wildlife and is the center of wildlife activity on the refuge. Caribou migrating to and from the 1002 area and the post-calving caribou aggregation offer an unparalleled spectacle."

Despite these outstanding natural values, and the fact

that the chance for discovery of an economically recoverable oil field is only 19 percent, the Department of the Interior is recommending that the entire coastal plain be made available for leasing to the oil industry. Meanwhile, officials of the Department are conducting negotiations in secret to trade away refuge lands on the coastal plain to private interests. This subverts the entire assessment report process in my opinion, preempts congressional options, and could lead to privatization of the refuge. Many of the individuals involved in these land trades are the same ones who attempted to trade away wilderness lands on St. Matthew Island to oil interests in 1984. In that case, a federal judge ruled that Interior officials made serious errors in judgement, and that the land trade was not in the public interest. Now they are designing another refuge land trade scheme on an even larger scale. Apparently, little was learned by Interior from their St. Matthew experience.

~~The Department has left us no reasonable alternative but to oppose its recommendations because of the following serious shortcomings~~ in its resource assessment process for the coastal plain of the Arctic National Wildlife Refuge:

- 1) Failure to point out that the compromise to establish the Arctic Refuge in 1960 to preserve its unique wildlife, wilderness and recreation values resulted in the remainder of Alaska's vast North Slope and adjacent offshore waters being made available for oil exploration;
- 2) Failure to release for public review and comment geologic information critical to the 1002 assessment process. This gives those who could profit from exploiting refuge resources advantage over those who actually own those resources--the American people;
- 3) Failure to reveal its proposed land trades with various

Alaska Native corporations and the State of Alaska, and to demonstrate how such trades will serve the public interest;

- 4) Failure to justify full leasing when prospects for discovery of even one major economically recoverable oil field on the coastal plain is only 19 percent (pages 49 and 68), and with the market value of leases depressed because of the world oversupply of oil;
- 5) Failure to conduct a comprehensive economic analysis to show how the benefits to the Alaska and national economies can be optimized from leasing, both in the short and long term;
- 6) Failure to provide evidence that the Department will ensure that air and water quality will be protected from toxic chemicals and other pollutants such as those creating problems in the Prudhoe Bay oilfield;
- 7) Failure to explain how adequate water and gravel supplies will be obtained after finding that "...specific locations and sources of water and gravel for exploration and development activities have not been identified; it is understood that these resources, especially water, are not readily available on the 1002 area," (page 75);
- 8) Failure to explain why it wouldn't be in the national security interests of the United States to purchase more foreign oil at current low prices for addition to our nation's "Strategic Petroleum Reserve" rather than lose income to the federal treasury by further flooding a depressed lease market through opening the Arctic Refuge;
- 9) Failure to evaluate cumulative impacts on the Arctic Refuge from oil and gas lease sales on more than a million

acres of adjacent state lands (Camden Bay, Demarcation Point and Prudhoe Bay uplands) and 21.2 million acres of OCS leases (Sale 97) in the Beaufort Sea scheduled for July 1987. The latter sale, just off the refuge coast, is the largest oil and gas lease sale ever held in the Arctic Ocean;

- 10) Failure to thoroughly discuss alternative energy policies that if implemented could make the nation energy secure without exploiting the Arctic Refuge;
- 11) Failure to assure that scarce refuge staff and funds will not be diverted from refuge conservation programs to monitor and regulate industrial activities on the coastal plain. (Since the coastal plain resource assessment was initiated in 1982, more than 90 percent of the refuge budget has been devoted to the 1002 assessment process, resulting in the almost total neglect of the overall refuge conservation program);
- 12) Failure to recognize that a North Yukon National Park adjoins the Arctic Refuge and that the United States has responsibilities to cooperate with Canada in protecting shared wildlife resources;
- 13) Failure to address the need for cooperative management of the Porcupine caribou herd with Canada through the international management agreement that has been negotiated over the past several years;
- 14) Failure to consult with the appropriate agencies of the Government of Canada as directed in Section 1005 of ANILCA; and
- 15) Failure to hold public hearings in all Alaskan communities

that will be directly affected by the proposed action, and to make an adequate number of copies of the assessment report available in a timely manner.

Unfortunately, a series of citizens' lawsuits proved necessary during the assessment process to assure that the law was followed. Furthermore, citizen monitoring of government activities was required as well to learn of industry activities taking place on the Arctic Refuge. And, despite the magnitude of resources at stake and the seriousness of the consequences of the decision on people both in Alaska and throughout the nation, the Department of the Interior chose not to make this report available to the public. Then, after being placed under court order to do so, the Department abbreviated the comment period to 60 days over the Christmas holiday period. This is not the way a democracy like ours works best.

In addition to Audubon's long history of involvement in wildlife conservation, another major priority goal of the Society is to "promote national strategies for energy development and use, stressing conservation and renewable energy resources." In an effort to achieve this goal, we have developed an "Audubon Energy Plan" with input from energy experts in industry, government and the academic community. This was done in the realization that energy is a major factor in determining the quality of human life. It furthers the production of goods and services, but its production and use can seriously impact the quality of the environment.

The Audubon Energy Plan is a practical, step-by-step alternative to the Administration's energy policy of exploiting the last remaining wilderness lands in the United States. It shows that proper planning and policy development at the federal level will enable the United States to produce more goods and services while actually improving the environment. The

environmental pay-off will be cleaner air, purer water, and less pressure to exploit wilderness lands and wildlife habitat such as that in the Arctic Refuge.

True, Audubon's Energy Plan requires the introduction of regulatory measures that correct imperfections in the marketplace, such as efficiency standards for home appliances and fuel economy standards for automobiles. Such reliance in our Plan on modest measures to promote cost-effective conservation stands in contrast to the approach taken by the Administration, which holds that conservation should be left solely to the marketplace, no matter how far economists tell us individual markets are operating from the cost minimum, no matter how much energy is being wasted as a result. When this blindspot toward energy conservation is combined with the Administration's skepticism towards environmental protection, it is perhaps not surprising that the Administration makes drilling in wilderness areas one of the pillars of its energy policy.

Fortunately, the recent bipartisan show of support in Congress for appliance efficiency standards indicates that the Administration is out of touch with the country when it comes to tolerance of modest conservation regulations. We are confident that a Presidential veto of the appliance bill in the upcoming session will be overridden by Congress. We are also confident that, when the choice is clearly put, Congress will decide to enact additional conservation legislation in order to preserve our national treasures such as the Arctic Refuge (as well as to save consumers money.)

In the meantime, and as long as this Administration refuses to take reasonable administrative and legislative action to promote cost-effective energy conservation, we will have no choice but to oppose attempts to open the Arctic Refuge to oil and gas development. Audubon has worked hard, particularly at

the state level, to get appliance efficiency standards enacted. In New York, we initiated the process that led Governor Cuomo to introduce a tough efficiency standards bill last year. Massachusetts Audubon played a similar role in getting a bill introduced (and passed) in Massachusetts. Audubon members are well aware that preservation of wildlife and protection of the human environment requires wise husbanding of our energy resources.

Audubon continues to be actively involved in efforts to develop a long-range "Comprehensive Conservation Plan" for the Arctic Refuge. However, we have not been party to any actions that would preempt a thorough review of the mandated resource assessment report for the refuge's coastal plain, waiting to judge the report on its merits, waiting to see if there were a few key areas in which exploration could be allowed without risking serious interference with wildlife and wilderness resources. Instead of a complete and objective report with viable management options, we find the assessment report biased, contradictory, and lacking essential information. The only possible excuse for this is that Interior must not really be serious, but is floating a totally unreasonable position in the hopes of maximizing its bargaining power in Congress. If so, the tactic is likely to backfire by completely alienating those organizations willing to keep an open mind regarding multiple resource values on the coastal plain. Certainly, this has been the effect on the National Audubon Society.

The major undiscovered deposits of oil and gas on federal land holdings are thought to lie off the coast of the lower 48 states and Alaska. Thus, in the next two decades, as known onshore reserves are depleted, offshore development will become more important. Relatively little offshore land is currently off-limits to energy development. Most of these deposits will eventually be tapped.

The fact that all federal lands have not yet been leased does not mean that development is proceeding too slowly. These leases will be much more valuable ten to twenty years from now. If the government were to lease all these lands at once, it would derive an unfair economic return for the taxpayers.

Judged in this context, the Reagan Administration is making a serious mistake in rushing to lease virtually the entire U.S. Outer Continental Shelf (OCS)--almost a billion acres--and onshore prospects as well. The practice of offering tens of millions of acres of public lands each year at a time when oil prices are depressed raises very serious questions about whether the entire federal leasing program is amounting to a giveaway to the oil industry.

By flooding the market with lease offerings, it is clear that the Administration is helping to drive the price of leases down, thereby providing the oil industry with an opportunity to lease large acreages at bargain-basement prices. Evidence of this downward pressure on lease prices is overwhelming:

- * The average bid per acre under the Reagan Administration's 5-year program has been less than half that under the Carter program (\$1,092 per acre versus \$2,381 per acre), (Washington Post, November 8, 1983.) Before Interior went to area-wide leasing in 1982, the average price per acre for OCS lease bids in Alaska was \$2,794. After area-wide leasing was initiated, OCS lease sales in Alaska netted an average of only \$1,229/acre, (OCS Report, MMS 86-0067, September 1986.)
- * The General Accounting Office (GAO) found that the number of bids per tract declined from of 2.44 to 1.65 under the area-wide program.

- * GAO estimated that "the federal government received about \$7 billion (or a discounted value of \$5.4 billion in 1984 dollars) less than it would have received if the same acreage were under the tract selection program," (GAO Report, RCED-85-66, 1985, p.i.v.)

- * Even the industry recognizes the lease price depression caused by area-wide leasing--the Oil and Gas Journal reports that "offshore producers agree that acreage costs on area-wide lease sales are lower than under the previous nominated tract concept because more acreage is offered at one time." (Washington Post, November 8, 1983.)

Aside from the economic arguments against leasing so much so fast when oil prices are depressed, there is a compelling conservation argument. Huge lease offerings involving tens of millions of acres make it impossible to do meaningful environmental impact analyses. Additionally, they make it extremely difficult for states like Alaska to conduct rational development planning.

In Alaska, less than 6 percent of oil resources are estimated to lie beneath designated or potential wilderness lands, including those in the Arctic National Wildlife Refuge. Clearly, Congress and the federal government have made sure that lands with the vast majority of highest potential for oil and gas have been excluded from consideration as potential wilderness.

Nationwide, relatively little oil and gas is estimated to lie under wilderness lands. When this country was first settled by Europeans, 100 percent of the land area corresponding to the contiguous 48 states was wilderness and teeming with wildlife. The unrestrained pressure of civilization has steadily eroded wilderness areas to a small percentage of the total--4 percent

in the lower 48 states. To those who assign value to wilderness, it is incomprehensible that anyone would object to protecting the nation's last remaining fragments. Unless the nation maintains the sanctity of designated and potential wilderness areas, even that small percentage will disappear.

There will always be proposals to use wilderness and critical habitats for other purposes, particularly energy and mineral development. But little wilderness will be left if the engineers are allowed to scour the land for the next thirty years and beyond--building new roads and drill sites, returning for a closer look each time the price of energy or minerals jumps, and returning whenever a new technology allowing recovery of formerly inaccessible resources is developed.

The National Audubon Society believes that a nation like ours with a 200-year history should look at the wilderness preservation issue in a time frame that spans hundreds of years rather than decades. Only with such perspective can the nation pass on to succeeding generations the wilderness resources that are still intact.

The fact is that wilderness such as that on the Arctic Refuge coastal plain serves a variety of valuable, noncommercial uses: fish and wildlife habitat, watershed protection, scientific study, fishing, hunting, camping, hiking, and most other forms of dispersed, low density outdoor recreation. Such wilderness lands offer also the spiritual lift of peaceful, truly natural settings.

Although not every oil industry organization takes the limited view on wilderness protection espoused by such organizations as the American Petroleum Institute, there is obviously a clash in values between advocates of exploitation and those whose favor preservation--a dispute that must

continuously be settled through the political process. The Audubon Energy Plan has been developed with this dispute in mind. The Plan demonstrates that there are practical alternatives to exploiting the last of our wilderness areas. The United States can leave wilderness alone and still solve its oil import problem. The total amount of oil and gas under wilderness lands is too small to justify the abandonment of the nation's remaining wilderness heritage.

Under the Audubon Energy Plan, the mean risked estimate of 1.6 billion barrels of oil and the 1.6 billion barrel equivalent of natural gas estimated to lie under land already legally designated as wilderness would remain underground forever. The same would be true for the 2.3 billion barrels of oil and the 2.5 billion barrel equivalent of natural gas estimated to lie under wilderness land that has yet to be formally designated as wilderness, (A. Stege and J. Beyea, "Oil and Gas Resources on Special Federal Lands: Wilderness and Wildlife Refuges," Annual Review of Energy, Vol. 11, 1986, pp. 143-161.) Because wilderness land would never be exploited under the Audubon Plan, there would be no need for exploration.

The estimates for oil in wilderness lands given above assume a mean risked estimate of 600 million recoverable barrels of oil for the Arctic Refuge. In contrast, the Draft Coastal Plain Resource Assessment mentions a figure of 3.2 billion barrels, without clearly specifying whether or not the estimate is "risked." (We suspect it is not.) Clarification on this point is needed from Interior. If the 3.2 billion figure is risked, that is, already incorporates the risk of finding no oil (81%), Interior would be claiming that there are 2.6 billion more barrels of oil likely to be found in wilderness lands than in the estimates we have been using. Nevertheless, even an additional 2.6 billion barrels would not change the fact that a very small percentage of U.S. oil is in potential and designated

wilderness lands. The percentage of U.S. oil resources on these lands would rise from 3.5% to 5.8%.

Certainly, any exploration that may eventually be permitted on these areas should be made by nonintrusive methods, such as satellite survey. Nonintrusive methods are currently inadequate for confirming existing Interior estimates, but the situation will no doubt change in the future. Fifty years from now, technologies for identifying natural resources will have surpassed the crude methods available to energy companies today. With such a small percentage of U.S. land remaining as wilderness, it would seem wise for the nation to be patient in confirming Interior's estimates.

As has been indicated, the National Audubon Society is not blindly opposed to resource extraction on public lands. We expect that more than 95 percent of oil and gas resources on federal lands will eventually be tapped. The Society stands ready to work with oil and gas companies to help them develop environmentally sound methods of exploration and extraction that are suitable for the great percentage of land, both public and private, on which such activities need not be prohibited completely. Audubon will continue to insist, however, that exploitation of resources on public lands be carried out carefully in a manner that protects the environment and wildlife. Audubon will continue to oppose oil and gas exploration in any situation where government agencies or energy companies move hastily, without fully assessing the environmental and economic effects of activities or providing adequate safeguards for their implementation. This appears to be one of those cases.

It is argued by industry that the coastal plain of the Arctic Refuge must be leased now because it will take at least fifteen years to develop any oil fields discovered there. It

must be remembered that following discovery of oil at Prudhoe Bay in 1968, oil was flowing through the 800-mile-long Trans Alaska Pipeline (TAPS) by June of 1977, a period of only 9 years. All that would be needed should oil production be permitted on the Arctic Refuge would be a 100 to 150-mile-long pipeline spur (at maximum) to tie into TAPS. Our guess is that industry could bring an oilfield on line in the refuge within 5 years should it someday prove in the national interest to do so.

It is an illusion to believe that leasing on the coastal plain of the Arctic Refuge will solve the economic problems of the North. After all, its whole purpose is to deliver northern oil to homes and industries in the South--or perhaps the Orient. Indeed, rather than solving the North's economic problems, it may accentuate them. For evidence of this, we need look no further than the situation in Alaska today. With the Trans Alaska Pipeline carrying oil at near full capacity, the state is going through one of the most serious economic recessions in its history.

The situation on the Arctic Refuge obviously calls for bold and courageous political leadership at both the state and national levels. For politicians to be holding out the promise that yet another great oil bonanza lies beneath the Arctic tundra just waiting to be exploited only postpones the day when all Americans must begin to live within their means by implementing cost-effective conservation measures.

On page 6 of its assessment report, Interior states:

"Oil and gas development will result in widespread, long-term changes in wildlife habitats, wilderness environment, and Native community activities. Changes could include displacement and reduction in the Porcupine caribou herd."

We agree, and therefore do not believe the long-term conservation, economic, or national security interests of the United States will be served by recommending that such sacrifices be made on the finest Arctic wildlife and wilderness sanctuary in the world at a time of a world oversupply of oil, and with hundreds of millions of acres of other federal and state lands available for exploration.

It has been said by many that we are now at our Last Frontier in Alaska. This has different meaning to different people. To some it offers opportunity for resource development and the jobs and material benefits delivered. To others, it is wildlife and wildland spectacles which constitute a heritage to be preserved for generations of Americans. The decisions we make on the Arctic Refuge therefore are not simply about oil fields and caribou herds. They are decisions that strike to our very deepest concerns as a nation.

The National Audubon Society feels the Department of the Interior is making a serious mistake in recommending that the coastal plain of the Arctic Refuge be opened to full leasing. The facts convince us that America can achieve energy security without exploiting the last great arctic coastal wilderness in the United States.

We believe that U.S. Senators Howard Metzenbaum and Paul Tsongas were right when in the 1979 debate on the Alaska Lands Act they stated:

"It appears as if the "forbidden fruit" syndrome is operating with regard to the Arctic National Wildlife Range. Regardless of how bitter that fruit may be, there are some oil and gas companies which will want to invade this last stretch of north slope arctic land unimpacted by man. What the Congress does with regard to this fragile

area will be an indication of how wisely we are going to conserve the nation's natural resources in the future. We can afford to make this Range the "last place to go" in the search for energy and we should. We urge the Senate to study the arguments on both sides of this issue, for we believe strongly that aside from high emotions which have surrounded the debate on this issue, the facts support protection for the Range at this time..." (Report of the Committee on Energy and Natural Resources, United States Senate, No. 96-413, November 14, 1979, page 421.)

The National Audubon Society therefore strongly opposes leasing of the coastal plain for oil and gas development at this time, and recommends that the U.S. Fish and Wildlife Service be directed to manage the entire Arctic Refuge consistent with the conservation purposes for which it was established.

Your consideration of our comments and recommendations is greatly appreciated.

OUTLINE OF TESTIMONY

BY

MARK A. FRAKER
STANDARD ALASKA PRODUCTION COMPANY
ANCHORAGE, ALASKA

BEFORE

HOUSE RESOURCES COMMITTEE

FEBRUARY 19, 1987

BASIS OF IMPACT ASSESSMENT

- 2-MILE EXCLUSION AROUND ALL ROADS, FACILITIES, ETC.
- USED TO CALCULATE 'HABITAT LOSS'
- 'HABITAT LOSS' USED TO PREDICT 20-40% POPULATION DECREASE.

WHAT IS BASIS OF 2-MILE EXCLUSION?

- STUDY BY DAU AND CAMERON (ADF&G) IN MILNE POINT AREA
- 4 YEARS BEFORE ROAD (1978-1981)
- 4 YEARS AFTER ROAD (1982-1985)
- FWS MISINTERPRETED POINT AT WHICH LINES CROSSED ($\approx 3\text{KM} \approx 2 \text{ MILE}$) AS EXCLUSION DISTANCE (FIG. 1)

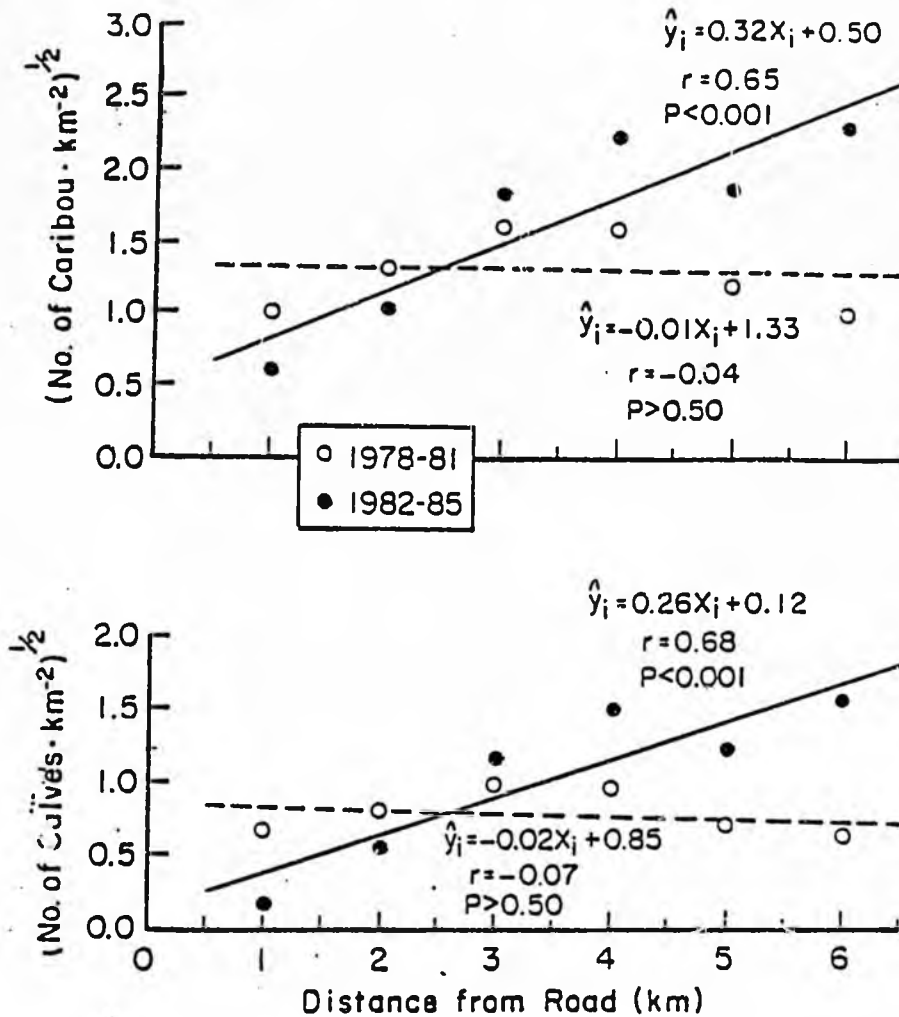


Figure 1. Graphs from Dau and Cameron (1985) showing relationship between the square root of the density of caribou to distance from the road leading to the Milne Point oilfield. Data from 1978-1981 were collected prior to construction of the road; data from 1982-1985 were collected after the road had been built. Note that the data points shown are square roots of the four-year means. Values for individual years have not been made available by the authors and consequently, the annual variability is unknown.

THE MILNE POINT ROAD/CARIBOU STUDY

- PLOTTED DENSITY OF CALVING CARIBOU BEFORE AND AFTER ROAD (FIG. 1)
- USED SQUARE ROOT TRANSFORMED DATA
- APPEARS THAT DENSITY WAS SAME THROUGHOUT AREA EVEN BEFORE ROAD (1978-1981)
- APPEARS THAT AFTER ROAD CONSTRUCTION (1982-1985) DENSITY WAS LOW NEAR ROAD, HIGH AWAY FROM ROAD
- ANNUAL DIFFERENCES IN TOTAL CARIBOU NUMBERS NOT SHOWN
- ANNUAL DIFFERENCES IN SNOW AND WEATHER CONDITIONS NOT REPORTED
- AUTHORS DID NOT CLAIM EXCLUSION NEAR ROAD
- FWS MISAPPLIED STUDY

RE-EXAMINATION OF MILNE POINT STUDY

- PLOTTED DENSITY OF CALVING CARIBOU BEFORE AND AFTER ROAD (FIG. 2)
- DATA NOT TRANSFORMED
- RESULTS:
 1. INCREASING DENSITY OF CARIBOU AWAY FROM ROADWAY BEFORE AND AFTER ROAD CONSTRUCTION TO DISTANCE OF 3KM (2 MI)
 2. HIGHER DENSITY 3-6 KM (2-4 MI) AFTER ROAD THAN BEFORE
 3. ABOUT 2X AS MANY CARIBOU IN STUDY AREA AFTER ROAD THAN BEFORE
- STATISTICALLY EXAMINED (WITH THE AUTHORS) DATA AT EACH DISTANCE INTERVAL BEFORE AND AFTER ROAD CONSTRUCTION
- RESULTS:
 1. STATISTICALLY SIGNIFICANT DIFFERENCES ($P < 0.05$) IDENTIFIED IN THE 0-1 KM AND 5-6 KM INTERVALS
 2. NO STATISTICALLY SIGNIFICANT DIFFERENCES IN THE 1-2 KM, 2-3 KM, 3-4 KM AND 4-5 KM INTERVALS

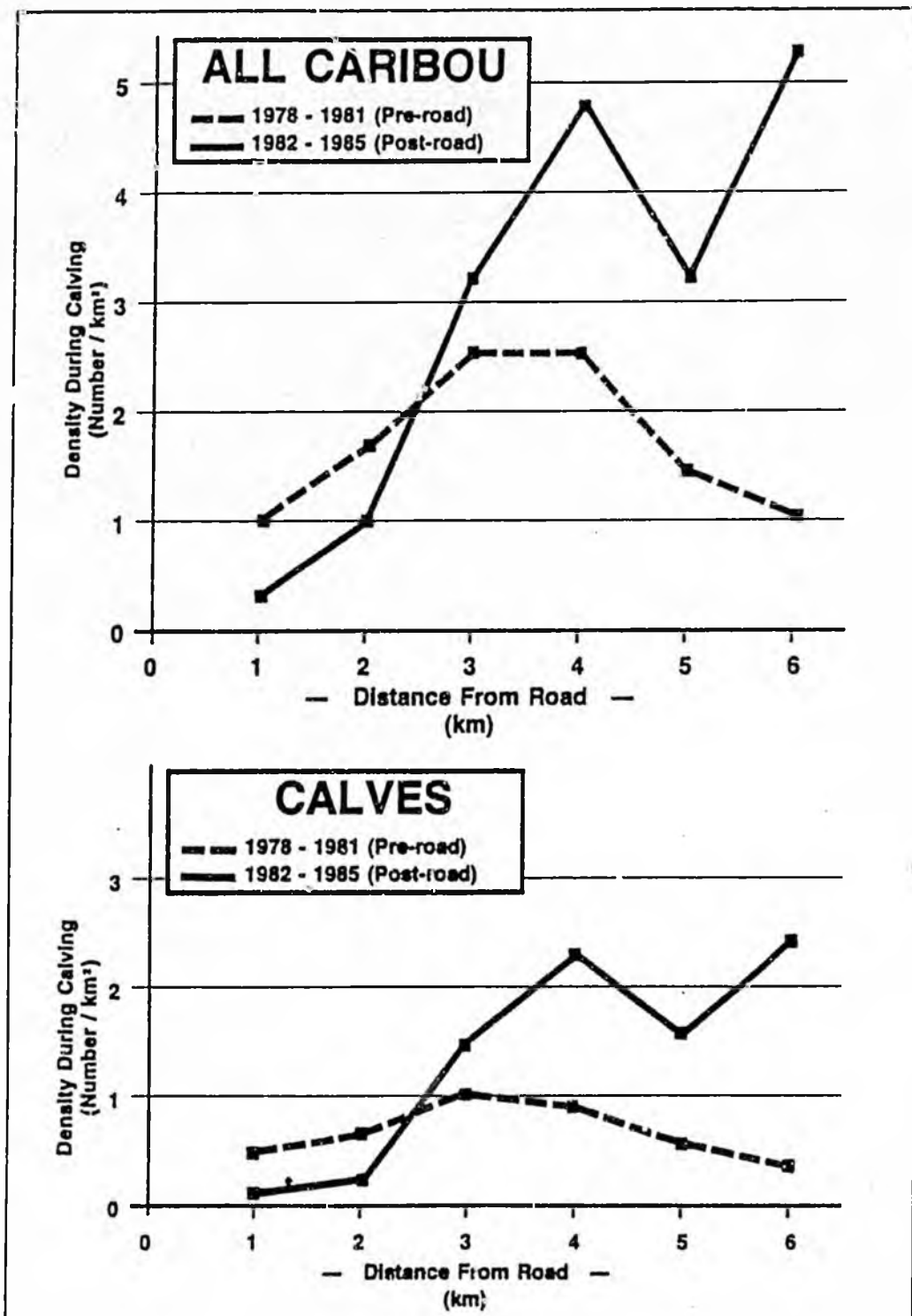


Figure 2. A replotting of the data in Figure 1 to show approximate actual values. Because the authors have not made the original data available, values were obtained by reading the square roots in Figure 1 and squaring them. Shown are the four-year means; variances are not known. [Note added in proof: R. Cameron, Alaska Department of Fish and Game, has provided the actual four-year means. They are not significantly different from those shown in Figure 2.]

CONCLUSIONS

- NO 2-MILE EXCLUSION ZONE
- PARTIAL AVOIDANCE WITHIN 0-1 KM OF ROAD; NOT COMPLETE DISPLACEMENT
- NO EVIDENCE THAT SMALL AMOUNT OF DISPLACEMENT IS HARMFUL TO CARIBOU
- DISTURBANCE CAN BE MINIMIZED BY REGULATING OPERATIONS WHEN CARIBOU ARE PRESENT

The following information is excerpted from "Comments of the Standard Oil Company on the Draft Legislative Environmental Impact Statement for the Arctic National Wildlife Refuge, Alaska, Coastal Plain Resource Assessment" dated 6 February 1987.

G. Response of caribou to oilfield development

The draft report's analysis of potential effects of development on calving caribou are based primarily on conclusions attributed to a study comparing densities of caribou cows and calves before and after construction of an oilfield road on the Arctic Coastal Plain: "Dau and Cameron (1985), in what may be the most systematic study of caribou displacement by oil development, reported that maternal groups showed measurable declines in habitat use within approximately 2 miles on either side of the Milne Point road in the central Alaskan arctic" (p. 107, col. 2, par. 2). However, examination of the cited paper shows that Dau and Cameron (1985) did not refer to decreased habitat use within 2 miles of the Milne Point road, and that their study is so confounded by uncontrolled variables that it is quite impossible to make any conclusive interpretation of their results.

Figure 5 presents graphs from the Dau and Cameron paper showing the relationship between the square root of the density of all caribou and also of calves only, and distance from the road. The data points shown are the means of four years; no information about year-to-year variability is given. The data were collected by helicopter surveys conducted during the four years prior to road construction (1978-1981) and the four years following road construction (1982-1985). The intent, of course, was that the first four years' data would serve as a control against which to compare caribou distribution after the road was in place and development had begun.

Use of the square root transformation and of calculated regression lines (Fig. 5) gives the impression that caribou density was evenly distributed within 6 km of the alignment prior to construction of the road, but afterwards was low near the road and high away from it. If we take the graphs in Fig. 5 at face value, an effect relating to the presence of the road appears to continue out to at least 6 km. However, removing the square root transformation gives quite a different picture (Fig. 6). Examination of the non-transformed data leads to four observations:

1. In both four-year periods, the data from 1-3 km show the same trend, i.e. increasing density away from the road alignment. The fact that this trend existed both before and after the road was constructed suggests that some other factor (e.g., topography) may have influenced the distribution of caribou.
2. The densities shown for the 1-3 km interval are the four-year means; no information on year-to-year variability is given. Assuming that there was a normal amount of variability, it is almost certain that the data from both four-year periods overlap and are not statistically different.
3. The real differences in the data sets appear to be in the 4-6 km interval.

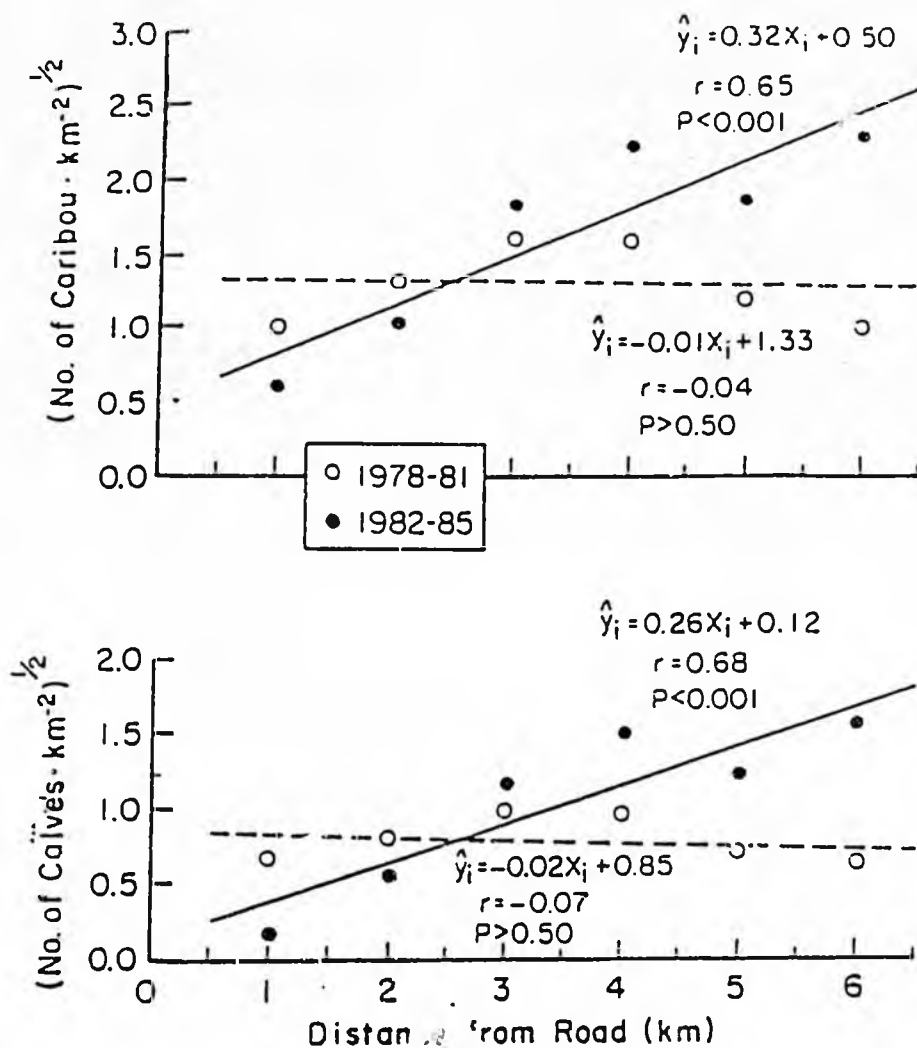


Figure 5. Graphs from Dau and Cameron (1985) showing relationship between the square root of the density of caribou to distance from the road leading to the Milne Point oilfield. Data from 1978-1981 were collected prior to construction of the road; data from 1982-1985 were collected after the road had been built. Note that the data points shown are square roots of the four-year means. Values for individual years have not been made available by the authors and consequently, the annual variability is unknown.

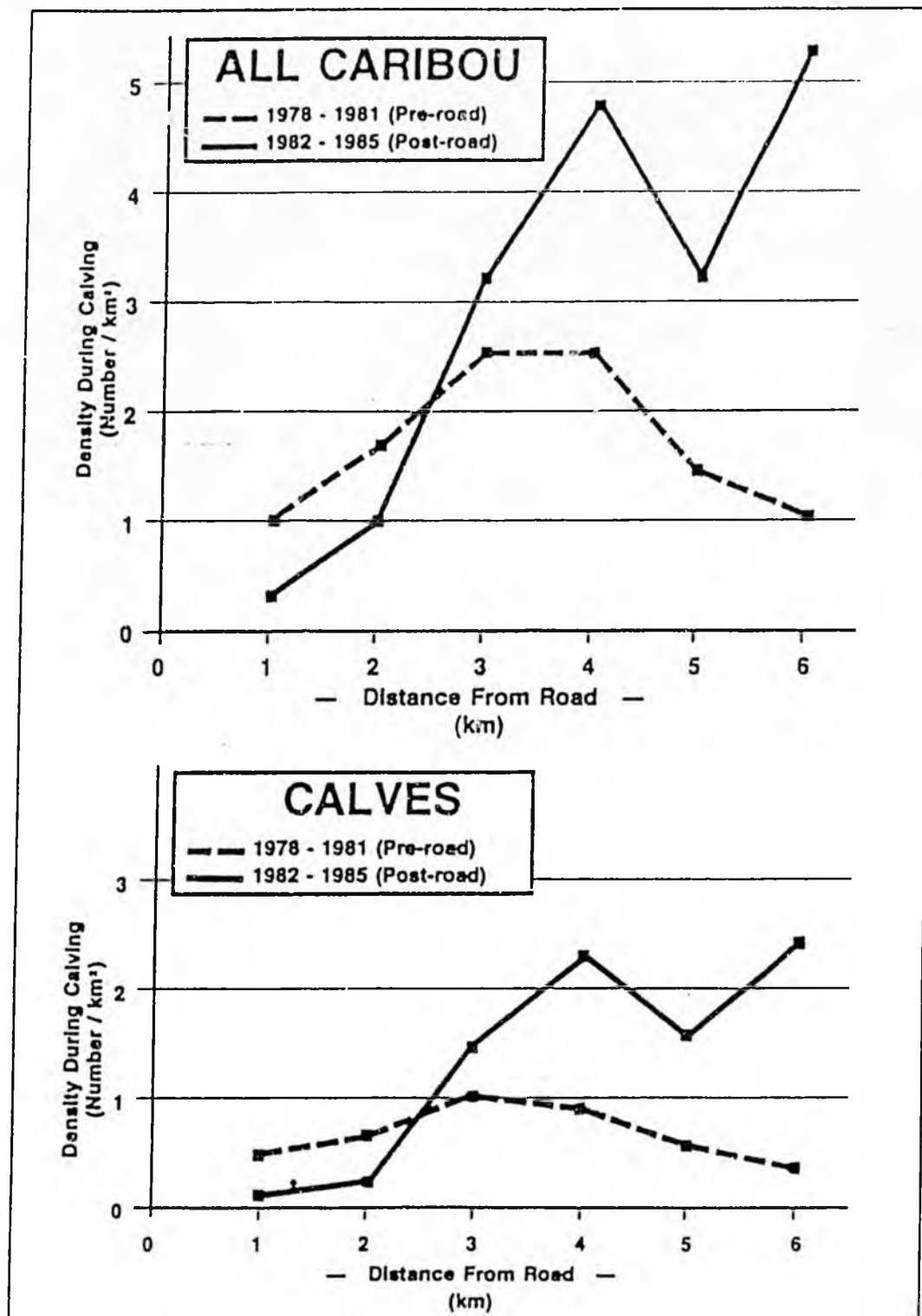


Figure 6. A replotting of the data in Figure 5 to show approximate actual values. Because the authors have not made the original data available, values were obtained by reading the square roots in Figure 5 and squaring them. Shown are the four-year means; variances are not known. [Note added in proof: R. Cameron, Alaska Department of Fish and Game, has provided the actual four-year means. They are not significantly different from those shown in Figure 6.]

4. From inspection of the curves, it is apparent that there were roughly twice as many caribou in the study area (i.e., the 1-6 km zone) following road construction than before.

Finally there are two other factors that confound interpretation of the Dau and Cameron (1985) data. The authors apparently assumed that the density of calving caribou would be the same in both four-year periods. This implies an assumption on their part that 1) the population was constant in size, 2) that the distribution was essentially the same, and 3) that snowmelt and weather conditions were practically identical. In fact, the Central Arctic herd roughly trebled (i.e., from 5,000 to 15,000) in size during the period over which the study took place, and snowmelt and weather conditions differed between years, as did the distribution of calving caribou.

What explains the pattern seen in Figure 6? It is impossible to know. Dau and Cameron's (1985) study is too unclear to permit a conclusion to be drawn, and there is no scientific basis to conclude from their study that any displacement of caribou resulted from the road and associated activity. If the numbers out to 6 km are compared, it is clear that there were about twice as many caribou in the area after the road was constructed than there were before. Clearly, it is inappropriate for the draft report to base predictions of potential caribou displacement from the "core calving area" on the Dau and Cameron study.

During the period 1981-1986 surveys of the calving distribution of the Central Arctic Herd have been conducted (RRCS, 1985; R.M. Jakimchuk 1986, pers. comm.). Figure 7 shows areas of major usage by calving caribou. It is clear that although calving densities may be lower immediately adjacent to areas of active oilfield operations, caribou continue to calve in the region where they have traditionally done so.

The most important point is that whatever the exact response of the Central Arctic Herd to oilfield activities, the herd has grown rapidly. Clearly, and contrary to many earlier predictions, whatever the effect of oilfield activities on individual caribou, there have been no detectable population-level effects. The herd has more than quadrupled in size since development began in the early 1970s. Nor is this situation unique: several other herds are thriving in the presence of considerable human activity (Bergerud et al. 1984). The only effect of human activity that has clearly been capable of seriously lowering caribou numbers is direct mortality from excessive hunting.

[It should be recognized that traffic in the 1002 area will be appropriately controlled during periods when calving animals are present near oilfield developments, and that construction will be timed to avoid periods when calving and post-calving caribou are present.]

[NOTE: On 13 February 1987, a meeting of Petroleum Industry and Alaska Department of Fish and Game biologists was held to analyse further the data collected by Dau and Cameron (1985). A t-test applied to the data at various distance intervals away from the road showed statistically significant ($p < 0.05$) differences in the 0-1 km and 5-6 km intervals; differences in the other intervals were not statistically significant. (Note added February 18, 1987)]

CENTRAL ARCTIC HERD CALVING AREAS MAJOR ACTIVITY AREAS 1981-1986

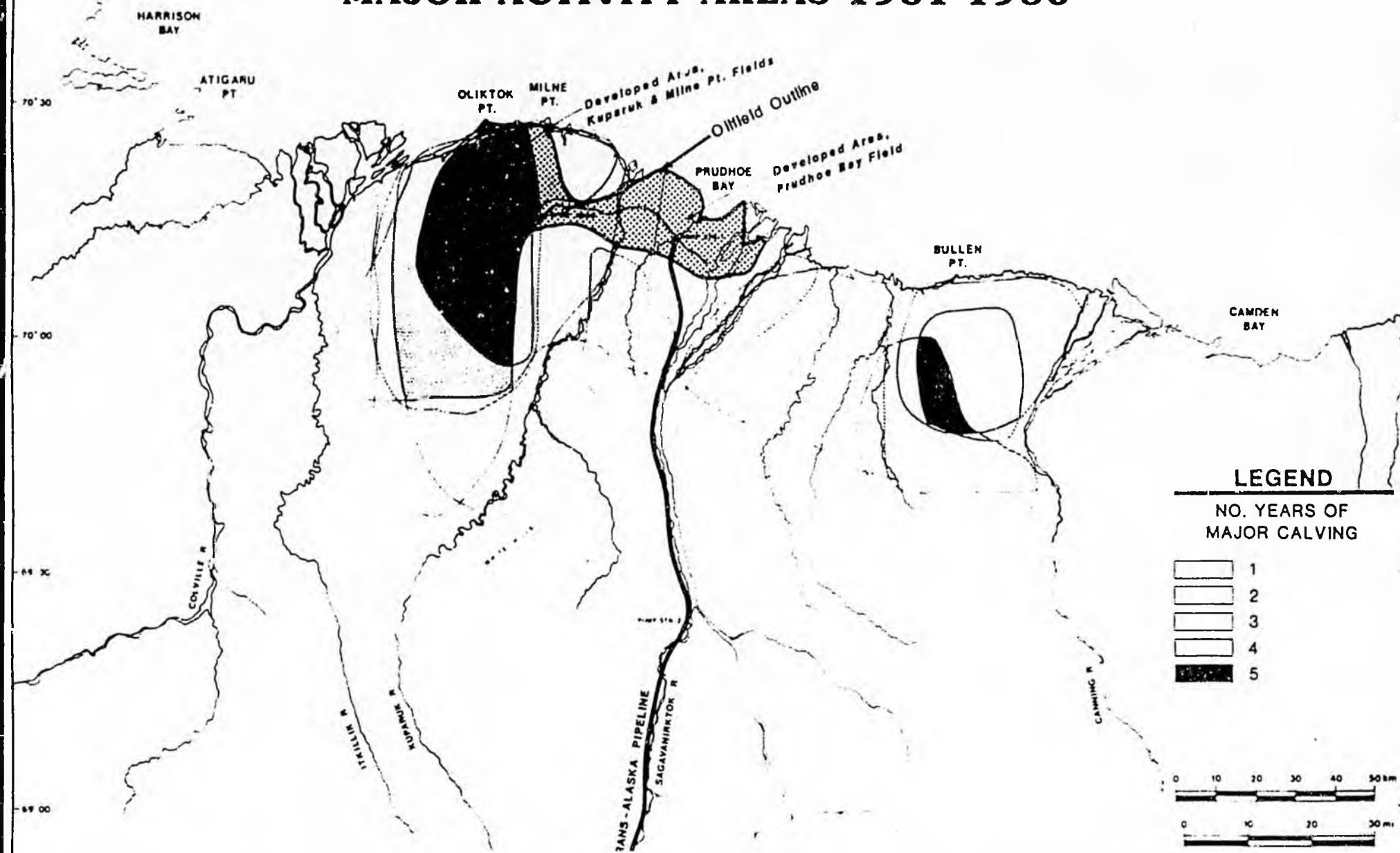


Figure 7. Locations of areas of major calving activity of the Central Arctic Herd, 1981-1986. Note the presence of calving caribou within the general area of the Prudhoe Bay, Kuparuk, and Milne Point oilfields. The Prudhoe Bay Oilfield has never been known to be used often by calving caribou, even prior to development. [Based on data provided by RRCS (1985) and Jakimchuk 1986, pers. comm.].



National Audubon Society

ALASKA REGIONAL OFFICE

308 G STREET, SUITE 217, ANCHORAGE, ALASKA 99501 (907) 276-7034

January 23, 1987

Ned Farquhar
c/o Representative Sam Cotten
Pouch V
Juneau, AK 99811

Dear Ned:

It was nice to talk with you on the phone yesterday. As promised, I have enclosed the following information on the Arctic National Wildlife Refuge for you:

- 1) A copy of Dave Cline's testimony for National Audubon Society on the "1002" Report for the Arctic NWR;
- 2) A copy of the The Audubon Energy Plan; and
- 3) A review of legal issues arising from the Audubon Energy Plan in the Columbia Journal of Environmental Law.

I hope these documents are helpful. Should you have any questions regarding the enclosed information, don't hesitate to contact me.

Sincerely,

Barbara A. Johnson
Regional Representative

ANWR: more than an Alaskan issue (continued from page 1)

America needs jobs—economic activity

Development on the coastal plain of ANWR will generate economic activity and jobs in every State. If a major discovery is made on the coastal plain, billions of dollars will be spent to construct and operate oil field facilities. This spending will involve the manufacturing, construction, transportation and service sectors, and indirect spinoffs in local areas. Some other important facts:

- The U.S. tanker fleet is predominantly employed to transport North Slope oil. Unless new supplies of petroleum are developed, those tankers will be retired and their crews terminated.
- Imported oil accounts for more than one-third of the U.S. trade deficit (\$53 billion in 1984). We can reduce this substantially and enhance our trade opportunities by developing domestic resources within the coastal plain area.
- A recent study by Battelle/DRI determined that oil and gas development on ANWR could increase the U.S. Gross National Product (GNP) by one percent and create more than a million new jobs around the nation.

Environmental integrity—development footprint

Every significant species on the coastal plain has thrived alongside 20 years of oil exploration and production on the North Slope of Alaska and in northern Canada. Caribou and a variety of important bird life co-exist with oil development at nearby Prudhoe Bay. The Central Arctic caribou herd which inhabits the Prudhoe field during part of the year has more than quadrupled in size since oil production began in 1977. Two other major North Slope caribou herds—the Western Arctic herd and the Porcupine Herd, to the east, are also increasing in size, and are expected to soon

Development on the Coastal plain of ANWR will generate economic activity and jobs in every state.

reach historical high levels. Extensive biological studies in northern Alaska and Canada have shown that wolf predation and hunting, not oilfield development, has the greatest impacts on caribou populations.

Through the use of modern technology and development techniques, impact on permafrost, tundra vegetation and water quality can be minimal. The government and oil industry have spent tens of millions of dollars learning how to operate in the arctic without ruining esthetic or habitat values. A little known fact is just how small an area oil-related facilities occupy. For example, during the debate in the late 1980s on whether to allow construction of the trans Alaska pipeline, the newspaper buzz-phrase was "pipeline bisecting Alaska." Maps with the "line" from Prudhoe to Valdez made the pipeline appear unnaturally wide, as if it covered a large area of Alaska. In fact, the 800-mile-long pipeline right-of-way from Prudhoe Bay to Valdez occupies less than 14 square miles!

On the North Slope, the Prudhoe Bay unit involves about 242,000 acres of leased acreage. The Kuparuk River unit, which many geologists

FUELING THE NATIONAL ECONOMY - The map above provides a dramatic visual presentation of the national economic impacts from oil development on Alaska's North Slope from 1980-86. The \$10.5 billion depicted here (\$10,538.2) includes \$6.748 billion in payments by Standard Alaska to U.S. vendors traceable to ZIP

believe to be more typical of what might be found in ANWR, covers about 150,000 acres of leased land. But in both these huge oilfields, and the smaller Milne Point field, to the north, only 8,000 acres are actually occupied by production pads, roads, pipelines or other facilities.

By the time any discoveries in the coastal plain are developed, optimistically by the year 2000, technological progress within the industry will al-

low development to occur using even less space, through new directional drilling techniques and smaller, more compact field production facilities.

Alaska wilderness inventory

Alaska has more than 50 million acres of congressionally designated wilderness lands, which comprise about 15 percent of the state. Alaska also has 70 million acres of other National Wildlife Refuges and National Parks. Eight million acres, or 44 percent of the 19-million-acre Arctic National Wildlife Refuge, has already been designated wilderness.

"Opponents of ANWR development have introduced house Bill 4922 which calls for a wilderness designation of ANWR's coastal plain," comments George M. Nelson, SAPC President. "Such a law would forever prevent oil and gas activity in this vital area."

"We have the new State administration and legislature behind us on the ANWR issue," Nelson adds, "but we must continue to make contact with lower 48 Congressmen and Senators, State governors and administrations, as well as business leaders. We need to make a concerted effort to

show the nation that exploration of ANWR's coastal plain is not simply a State or regional issue or an oil industry issue. We need to convey to the 100th Congress that ANWR is also a national issue which could have far-reaching implications for our country's economy and national security."

During November and early December, SAPC mailed nearly 2,500 ANWR information packets to businessmen and lawmakers in the lower 48. The cover letters for each of the packets described the specific economic benefits Alaska petroleum development has provided that particular state.

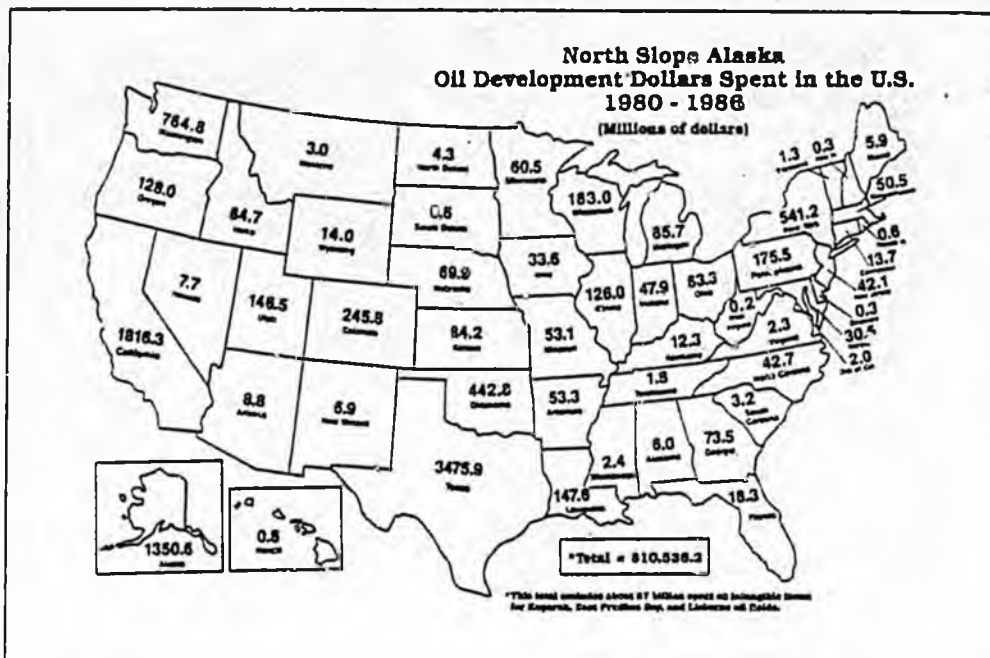
"It's impressive enough that petroleum revenues have been providing about 85 percent of Alaska's income," commented George Nelson. "But the widespread impact of Alaska's oil industry really strikes home when you consider billions of dollars which have gone to State and local economies in the lower 48, not to mention, federal taxes."

SAPC's Roger Herrera, who has recently been making presentations on ANWR to various groups in the lower 48, says that educating the nation on the strategic importance of

ANWR will be a difficult job. "The arctic coastal plain is a long ways from where most people live," says Herrera. "As in the D-2 land battle in the 1970s, Congressmen who haven't been to the arctic can't conceptualize ten thousand acres—let alone the 1.5 million acres they would designate wilderness under House Bill 4922. They have no frame of reference in discussing such huge chunks of land—or in the case of the coastal plain—how relatively little area the oil industry is considering for exploration."

"The upcoming debates on ANWR will often take emotional tactics completely outside the realm of logic and fact," Herrera continues. "If we can keep the dialogues on a steady, logical course, and stick to the facts, I think Congress will agree that it is in the nation's best interest to allow exploration and development in the coastal plain—that the petroleum industry is capable of operating in this area without adversely affecting the environment."

Ed. Note: Intercom will closely follow upcoming ANWR debates and dialogues, and will occasionally feature special interviews on the subject.



coders \$3.668 billion in payments by ARCO, Alaska Inc. for tangible items for the East side of Prudhoe Bay, Kuparuk and Lisburne and \$124 million in payments by Conoco to develop Milne Point (1983-86). It does not include about \$7 billion on intangible items for Kuparuk, East Prudhoe Bay and Lisburne oilfields.

Going back to 1974, it is estimated that the cost of developing the Prudhoe, Kuparuk, Milne Point, Lisburne and Endicott fields has exceeded \$36 billion. Conservatively, Standard Oil's share of that amount has been about \$15 billion.

CENTRAL ARCTIC CARIBOU - Since oil production began on the North Slope almost a decade ago, the population of the Central Arctic caribou herd, which now numbers about 18,000, has more than quadrupled. The other two main North Slope caribou herds, the Western Arctic herd and Porcupine Herd, are also reaching historical high levels.



United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503

IN REPLY REFER TO:

PSS/PL-0673S

JAN 2 1987

Dear Participant:

As you are aware, the Fish and Wildlife Service is preparing a comprehensive conservation plan (CCP) for the Arctic National Wildlife Refuge. We are going to be holding several public workshops on management alternatives for the Arctic Refuge, exclusive of the "1002" coastal plain area. (The question of oil and gas leasing in the 1002 area is being addressed in a separate report, now being prepared for Congress.) We want to invite you to participate in the planning workshops to assist us in identifying the range of alternatives for managing the fish and wildlife resources and uses of the refuge.

Two workshops are scheduled for Fairbanks and Anchorage:

FAIRBANKS: 1-4:30 p.m. and 7:00 p.m.
Tuesday, January 20, 1987
Federal Building & U.S. Courthouse
Room 314
101 12th Avenue

ANCHORAGE: 1:30-4:30 p.m. and 7 p.m.
Thursday, January 22, 1987
U.S. Fish & Wildlife Service
Regional Office, 1st floor
conference room
1110 E. Tudor Road

As a result of these workshops and other deliberations, several alternatives will be presented in the draft comprehensive conservation plan for the Arctic National Wildlife Refuge.

A workbook is enclosed for your use. It is intended to be used in conjunction with presentations on refuge resource values and uses at the workshops. The workbook includes all of the alternatives we so far have considered. Space is also left for you to develop your own alternative(s). If you can attend the workshops, please bring the workbook with you. If you cannot attend, mail your comments on the alternatives in the workbook, or any new alternatives you want to see considered, to us by February 9, 1987.

We hope that you will join us at the workshops so that we may benefit from your knowledge and insights on the Arctic Refuge. Questions regarding the workshops may be directed to Norman Olson, in Anchorage at 786-3393, and Doug Fruge, in Fairbanks at 456-0250.

Sincerely,

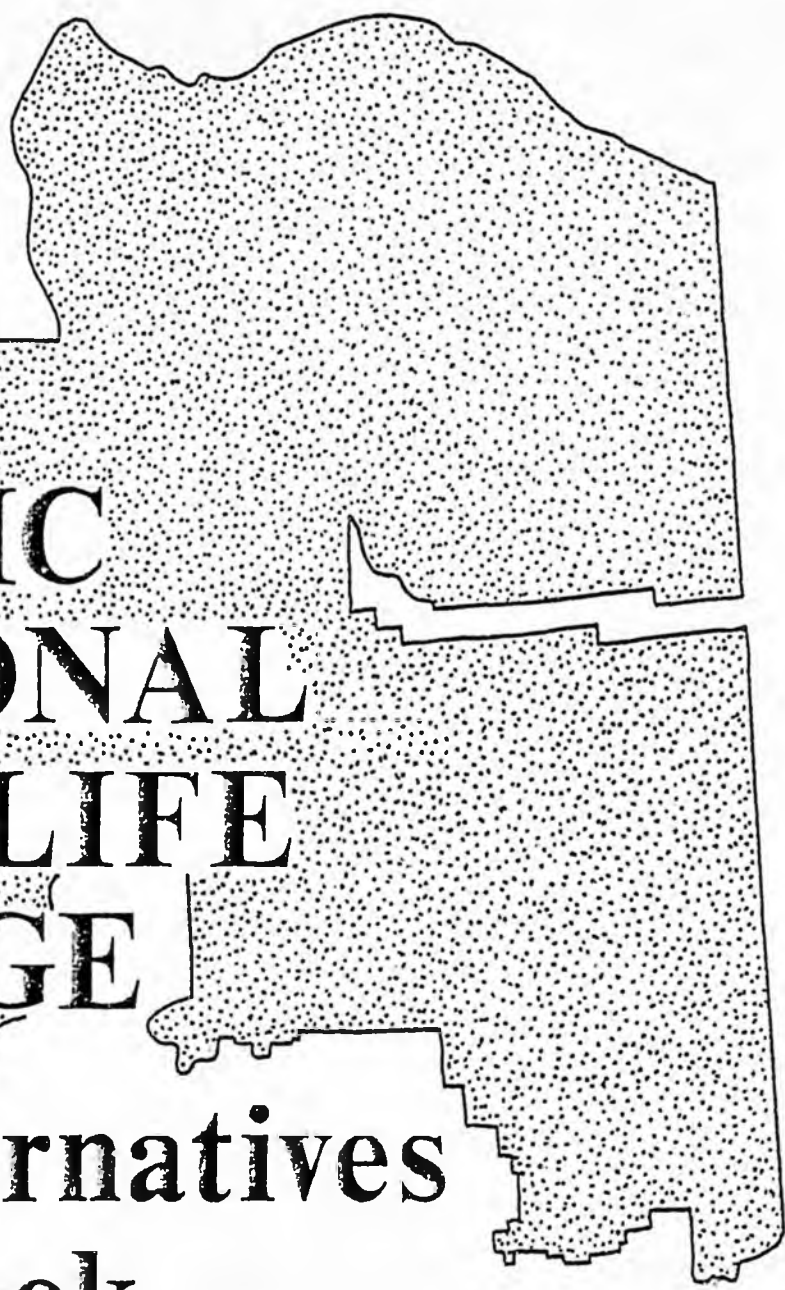
Norman Olson
Norman Olson
Planning Team Leader

Enclosure

**planning
for the future
of the**

**ARCTIC
NATIONAL
WILDLIFE
REFUGE**

**an alternatives
workbook**



Why plan?

The Arctic National Wildlife Range was established by Public Land Order 2214 in 1960, for the purpose of preserving the areas unique wildlife, wilderness, and recreational values. This order culminated extensive efforts begun over a decade earlier to preserve a portion of the Brooks Range and arctic Alaska's great wilderness values. Congress established the Arctic National Wildlife Refuge--enlarging the original Arctic Range and creating the Arctic Wilderness area--with the passage of the Alaska National Interest Lands Conservation Act of 1980 (ANILCA).

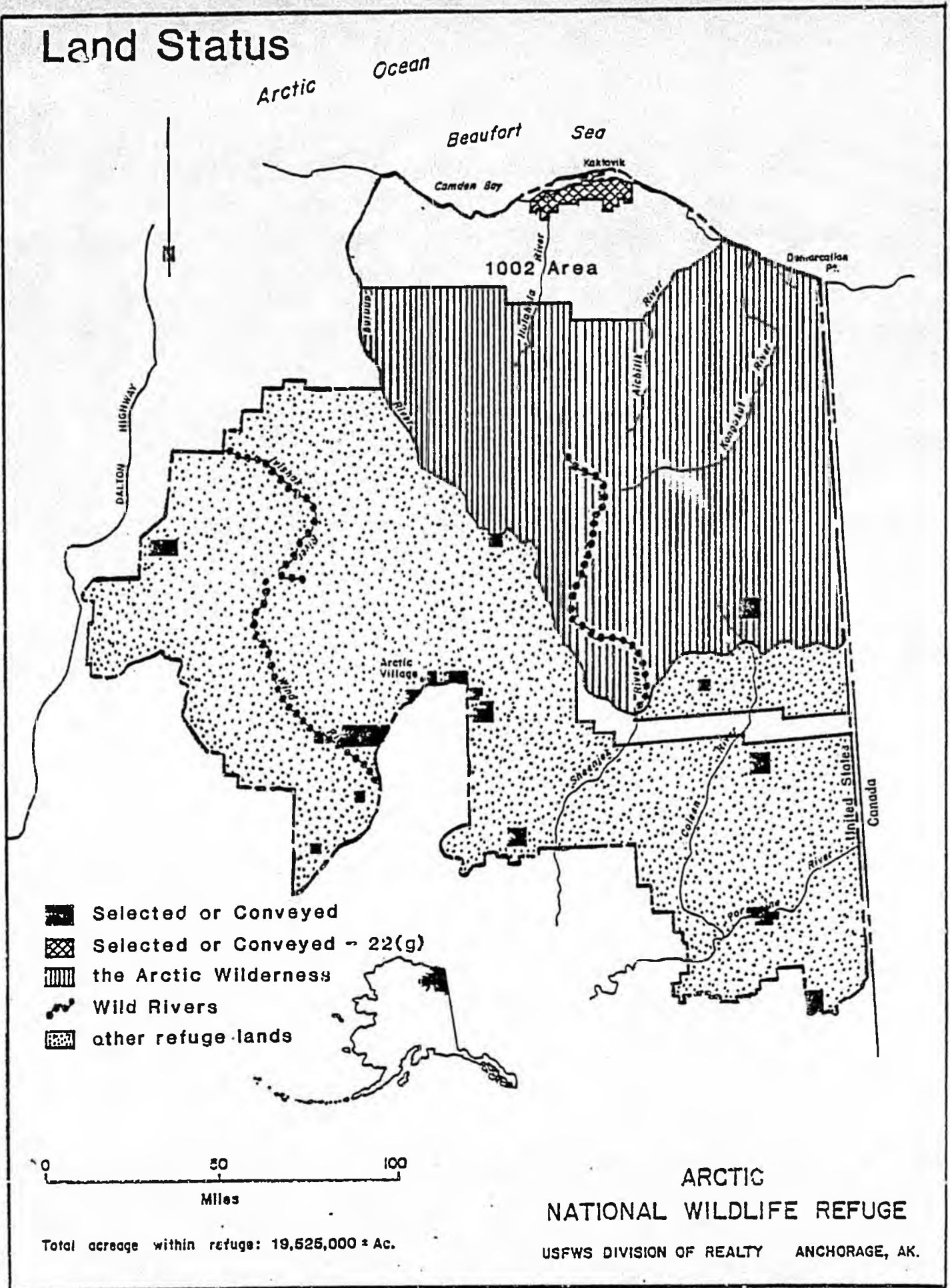
In the Act Congress instructed the U.S. Fish and Wildlife Service to develop a land use plan, called a comprehensive conservation plan, for the new refuge. The plan will tell how the Service intends to achieve the purposes for which the refuge was originally established and subsequently enlarged. In addition to the original purpose of the Arctic Range, the Act identifies the following primary purposes for the new refuge:

1. To conserve fish and wildlife populations and habitats in their natural diversity.
2. To fulfill international treaty obligations of the United States with respect to fish and wildlife and their habitats.
3. To provide opportunities for continued subsistence uses by local residents.
4. To ensure water quality and necessary water quantity within the refuge.

What lands are affected?

The plan will make decisions about management of all public lands that are part of the Arctic National Wildlife Refuge, exclusive of the "1002" coastal plain area. The future management of the "1002" area is currently being addressed in a separate report and recommendation on oil and gas leasing to Congress. This report also addresses oil and gas exploration and development on private lands at Kaktovik, which are subject to Section 22(g) of the Alaska Native Claims Settlement Act. The plan will not apply to any other state or private lands within the refuge, including village and regional corporation lands and individual allotments.

Land Status



- Selected or Conveyed
- Selected or Conveyed - 22(g)
- the Arctic Wilderness
- Wild Rivers
- other refuge lands

0 50 100
Miles

Total acreage within refuge: 19,625,000 ± Ac.

ARCTIC
NATIONAL WILDLIFE REFUGE

USFWS DIVISION OF REALTY ANCHORAGE, AK.

What will the plan do?

The plan is intended to show how the U.S. Fish and Wildlife Service will manage the refuge to protect its resources and the values of the lands. It will:

1. Identify and describe wildlife populations, habitats and other special values of the refuge.
2. Designate areas within the refuge according to their most important resources, values and uses.
3. Specify which uses, activities and developments can be allowed in each area while protecting resources.

The plan will also include a wilderness review, which evaluates the suitability of lands for wilderness designation under each of the management alternatives. Depending upon which alternative is subsequently selected by the Service as its preferred alternative, the plan may recommend additional areas for inclusion in the National Wilderness Preservation System.

Finally, the plan will establish corridor boundaries for the Ivishak and Wind rivers, two of the refuge's three wild rivers in the National Wild and Scenic River System. The third river--the Sheenjek--will not require the establishment of a corridor as it is located within the Arctic Wilderness area.

How will the plan be prepared?

The staff of the Arctic National Wildlife Refuge in Fairbanks and a planning team from the U.S. Fish and Wildlife Service office in Anchorage will be responsible for developing the plan. Throughout the planning effort the Service will be seeking participation from individuals, villages, native organizations, federal, state, and local government agencies and other interest groups concerned with the future of the area.

To complete the plan with the most efficient use of money and manpower available to us, the Service has scheduled some of the most important steps in the planning process. The schedule could change as a result of future limits on funding, the size of the workforce, or other unforeseen circumstances such as new information gathered as we learn more about the area. What follows is our best estimate of the steps that will be taken to develop the plan:

1. Information is collected and analyzed--January 1986 to November 1986. Information about natural resources and land uses was gathered and analyzed. Public meetings were held in February, March, and April 1986 to learn the concerns and issues that citizens want the plan to address.
2. Alternatives are developed--November 1986 to February 1987. Several different management options are developed as possible ways of dealing with the issues. As part of the process, workshops will be held with the public to seek comments and recommendations.
3. A draft plan is written--February 1987 to September 1987. The alternatives are evaluated to see which one does the best job of meeting refuge purposes and resolving issues. A draft plan discussing these alternatives is written.
4. Public review--September 1987 to November 1987. The draft plan is distributed to the public. Public meetings are held to learn what changes may be needed to better resolve issues.
5. A final plan is written--December 1987 to May 1988. The draft plan is revised based on comments received from the public. The final plan is distributed to the public and is adopted to become a guideline for managing the Arctic National Wildlife Refuge.

How can you get involved?

The U.S. Fish and Wildlife Service wants to hear your ideas about the planning needs for the Arctic National Wildlife Refuge, and we hope you will encourage other members of your community to participate in the planning effort. At various stages in the process, planning team members and refuge employees will be holding public meetings and visiting with local residents in villages near the refuge. Public meetings also will be held in Fairbanks and Anchorage. Other meetings will be scheduled to hear comments from leaders of Native organizations, representatives of state, local, and other federal agencies, members of conservation and sportsmens groups, industry officials, and others who may be concerned about the refuge.

To make sure that your ideas are heard, watch for posters, newspaper ads, and other announcements telling when the planning team will be visiting in your area. Plan to attend the public meeting in the nearest community to your home, or visit with the planning team members individually. You may also offer comments in person at the Arctic National Wildlife Refuge office in Fairbanks. If you would like to send written comments or request more information about refuge planning, write to:

Refuge Planning Team,
U.S. Fish and Wildlife Service,
1011 E. Tudor Road,
Anchorage, Alaska 99503.

What are Management Categories?

In developing management alternatives, management categories ranging from intensive management to designated wilderness have been used. A management category is a set of refuge management directions applied to an area--in light of its resource values and existing or potential uses--to facilitate management and accomplishment of refuge purposes. The management categories used to develop the preliminary management alternatives for the Arctic National Wildlife Refuge are:

Intensive Management. This category is designed to accommodate economic development and a wide variety of resource management techniques while protecting refuge resource values. Natural processes may be modified and the influence of human activities may be evident. Permitted management practices may include highly manipulative techniques, such as mechanical manipulation of vegetation, and construction of artificial impoundments and dikes. The construction of administrative sites, public use facilities, and transportation systems also may be permitted.

Moderate Management. This category encompasses undeveloped areas where habitat and public use are managed to provide varied benefits in a natural setting. Existing fish and wildlife populations would be maintained, while providing limited opportunities for economic development. Motorized access for traditional activities would be permitted, subject to reasonable regulation.

Minimal Management. This category is intended to maintain the existing conditions of areas which have high fish and wildlife or other resource values. Subsistence, recreational uses, and traditional motorized access would continue, while economic development would not be permitted. Unlike designated wilderness, lands in this category could be reclassified administratively by the Service if it is determined that such a change is necessary or desirable. Areas proposed for designation as wilderness would be placed in minimal management until actually designated by Congress.

Wild River. The upper Sheenjek, Ivishak and Wind rivers were designated by Congress as wild rivers, within the Wild and Scenic River System, in the ANILCA. The goal of this category is to protect and enhance the values for which the rivers were designated, while providing for public recreation and resource uses that do not adversely impact those values. Management under this category is similar to minimal management. Traditional motorized access, hunting, fishing, trapping are permitted. Economic developments generally are not permitted within the corridors.

Designated Wilderness. Refuge lands can only be included in the wilderness system through congressional designation. Once an area is designated as wilderness by Congress, activities such as mineral and sand and gravel leasing, surface disturbing activities and certain motorized uses would be legislatively prohibited. Other activities and uses permitted in wilderness would be similar to those allowed in minimal management.

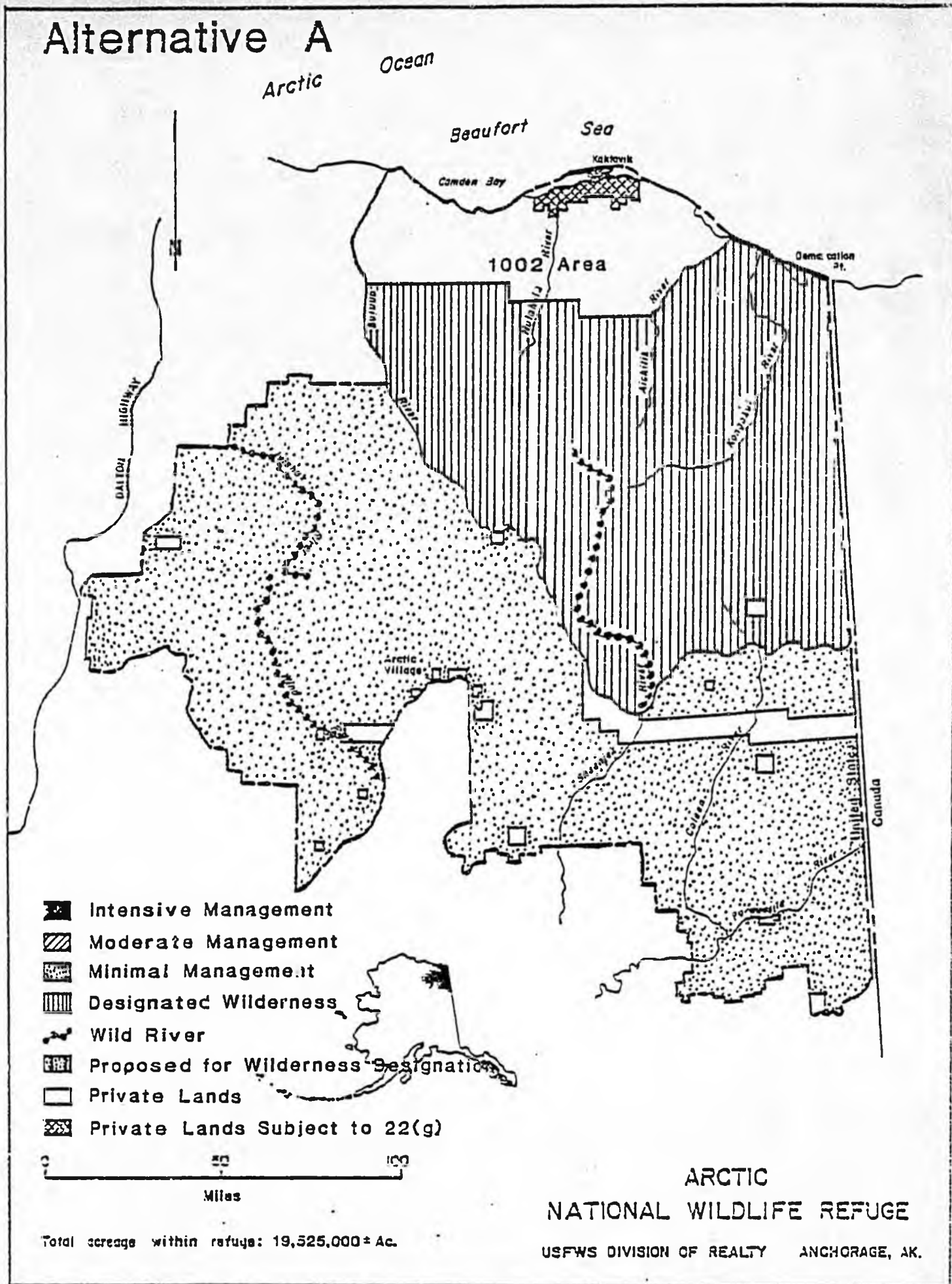
What activities and uses would be permitted?









ACTIVITIES AND USES	MANAGEMENT CATEGORIES				
	Intensive Management	Moderate Management	Minimal Management	Wild River Management	Designated Wilderness
SUBSISTENCE--hunting, fishing, trapping, etc.	YES	YES	YES	YES	YES
CABINS--for use by local residents for subsistence	YES	YES	YES	YES	YES
ACCESS--use of snowmachines, motorboats, and aircraft	YES	YES	YES	YES	YES
RECREATION--hunting, floating, etc.	YES	YES	YES	YES	YES
PUBLIC ROADS	NO	NO	NO	NO	NO
TRANSMISSION LINES/PIPELINES	YES	NO	NO	NO	NO
SAND AND GRAVEL LEASING	YES	NO	NO	NO	NO
COMMERCIAL TIMBER HARVEST	YES	YES	NO	NO	NO
OIL AND GAS STUDIES--					
surficial geology	YES	YES	YES	YES	YES
geophysical testing	YES	YES	YES	YES	YES
core sampling	YES	YES	YES	YES	NO
seismic activities	YES	YES	YES	YES	NO
OIL AND GAS LEASING*	NO	NO	NO	NO	NO
HARDROCK MINING--including placer mining	NO	NO	NO	NO	NO

* Section 1003 of ANILCA prohibits oil and gas leasing unless authorized by an Act of Congress.

Note: Areas proposed for wilderness designation would be placed in minimal management until actually designated by Congress.

Alternative A



-  Intensive Management
-  Moderate Management
-  Minimal Management
-  Designated Wilderness
-  Wild River
-  Proposed for Wilderness Designation
-  Private Lands
-  Private Lands Subject to 22(g)

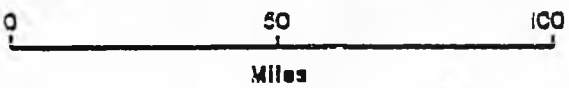
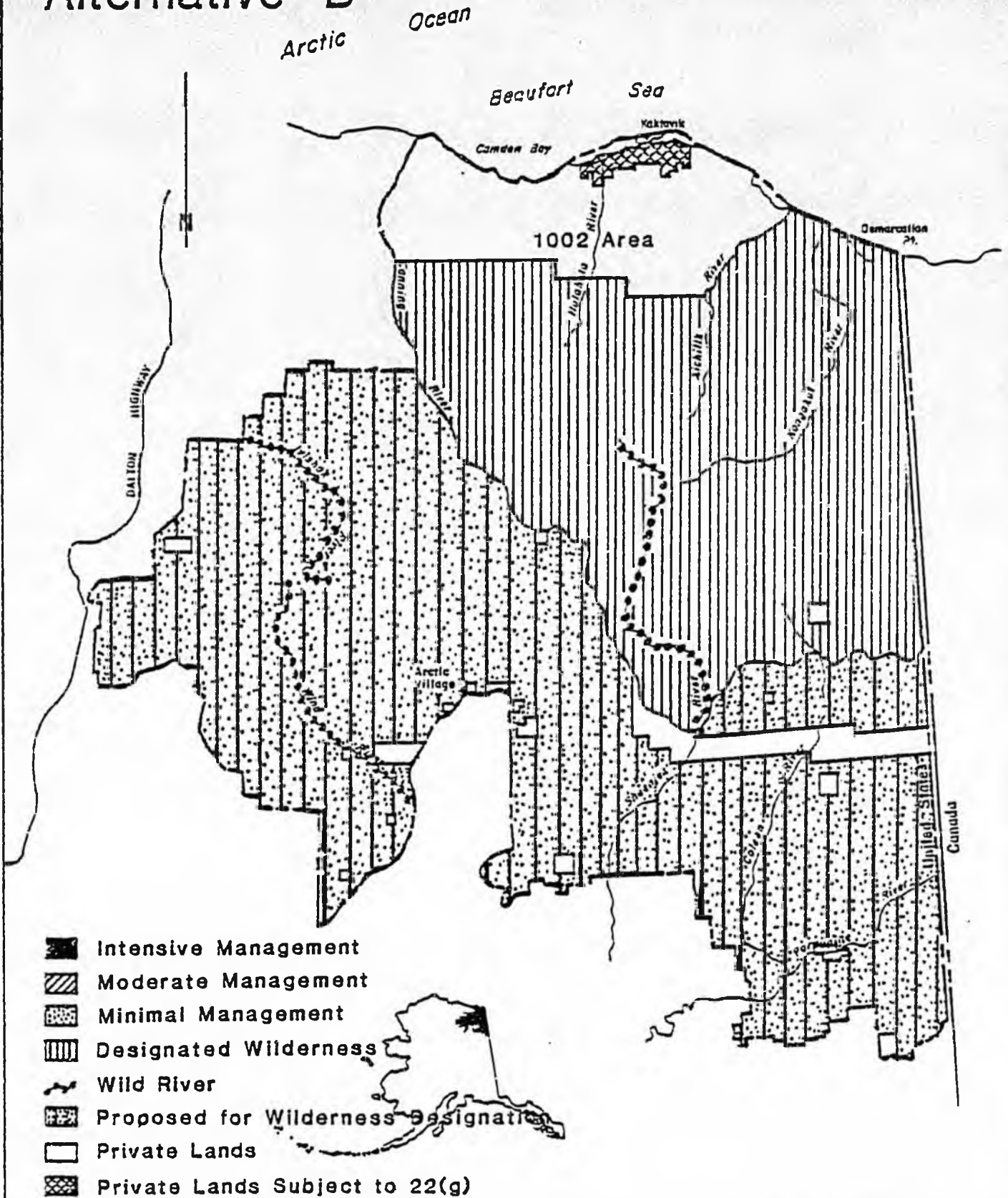
Description:

Alternative A represents the no action alternative. It reflects the way refuge lands are currently being managed.

Intensive Management	0 acres
Moderate Management	0 acres
Minimal Management	9,800,000 acres
Designated Wilderness	8,000,000, acres
Proposed for Wilderness Designation	0 acres

Comments:

Alternative B



Total acreage within refuge: 19,525,000± Ac.

ARCTIC
NATIONAL WILDLIFE REFUGE
USFWS DIVISION OF REALTY ANCHORAGE, AK.

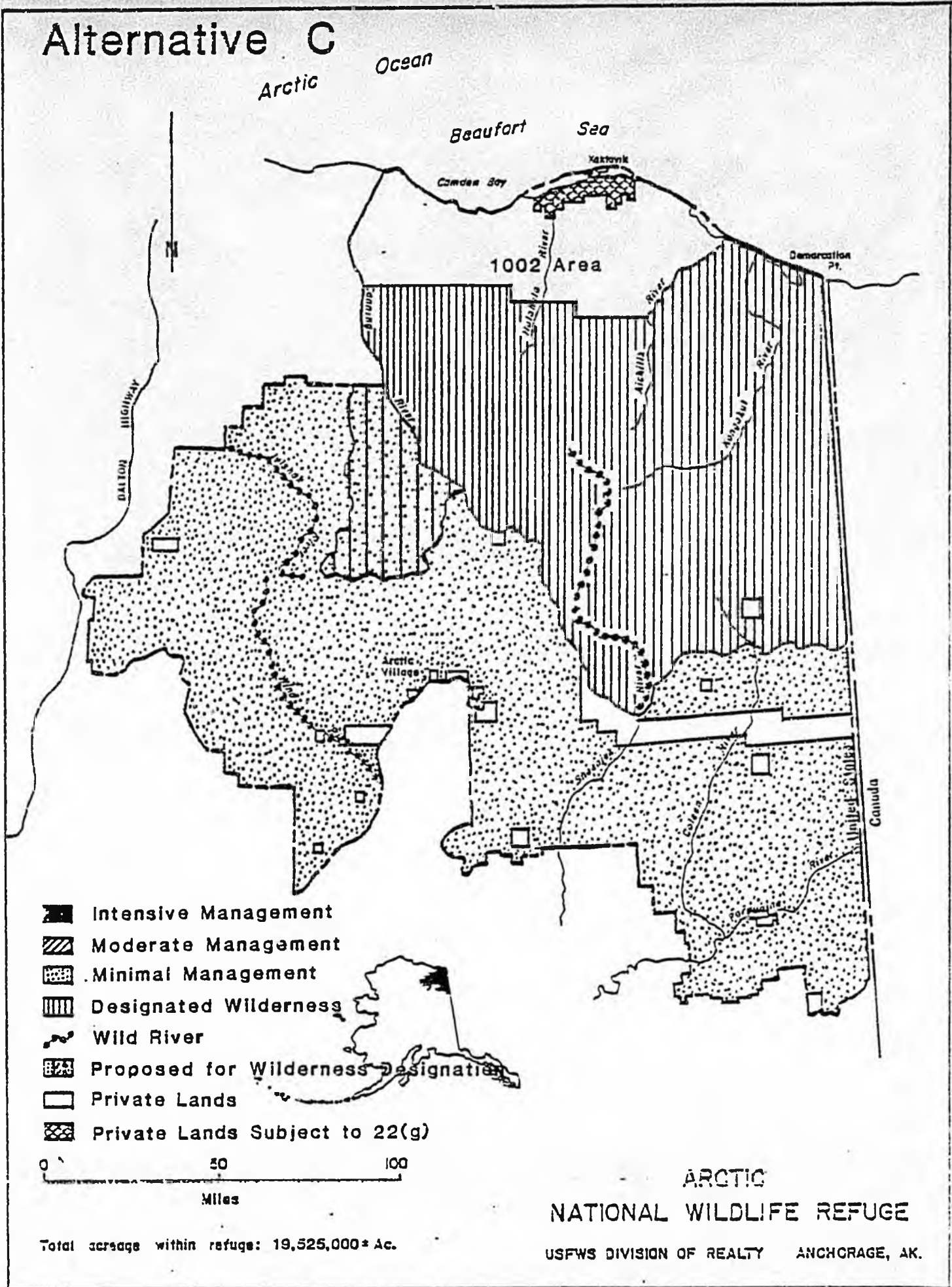
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




Alternative B represents the maximum amount of non-wilderness refuge lands that would be suitable for designation as wilderness.

Intensive Management	0 acres
Moderate Management	0 acres
Minimal Management	0 acres
Designated Wilderness	8,000,000 acres
Proposed for Wilderness Designation	9,800,000 acres

Comments:

Alternative C



-  Intensive Management
-  Moderate Management
-  Minimal Management
-  Designated Wilderness
-  Wild River
-  Proposed for Wilderness Designation
-  Private Lands
-  Private Lands Subject to 22(g)

0 50 100
Miles

Total acreage within refuge: 19,525,000 ± Ac.

ARCTIC
NATIONAL WILDLIFE REFUGE
USFWS DIVISION OF REALTY ANCHORAGE, AK.

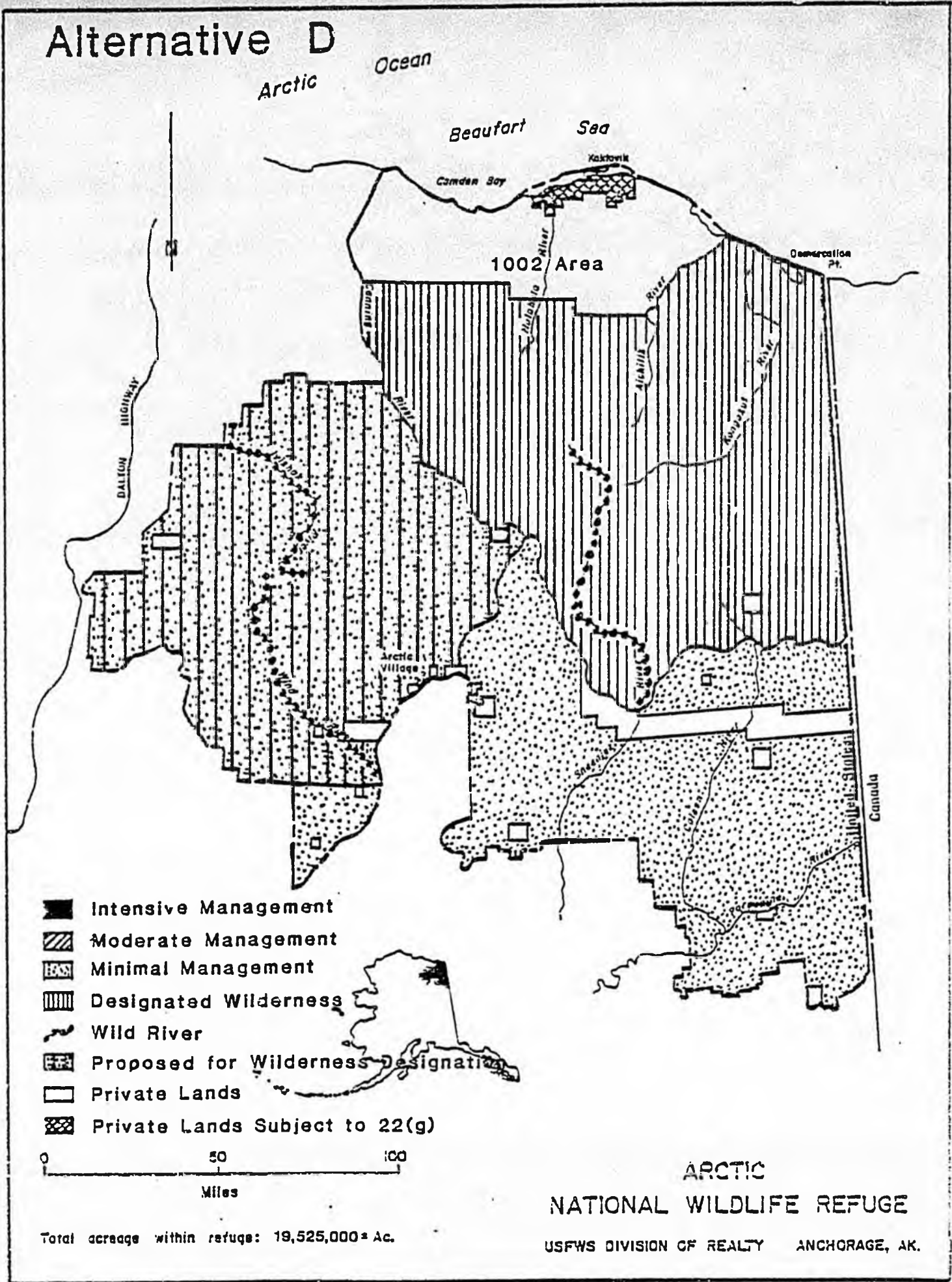
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


Alternative C would expand the existing Arctic Wilderness by adding the Marsch Creek drainage. As a result, the entire Canning River drainage located within the refuge would be included in the Arctic Wilderness.

Intensive Management	0 acres
Moderate Management	0 acres
Minimal Management	9,170,000 acres
Designated Wilderness	8,000,000 acres
Proposed for Wilderness Designation	630,000 acres

Comments:

Alternative D



-  Intensive Management
-  Moderate Management
-  Minimal Management
-  Designated Wilderness
-  Wild River
-  Proposed for Wilderness Designation
-  Private Lands
-  Private Lands Subject to 22(g)

0 50 100
Miles

Total acreage within refuge: 19,525,000 ± Ac.

ARCTIC
NATIONAL WILDLIFE REFUGE

USFWS DIVISION OF REALTY ANCHORAGE, AK.

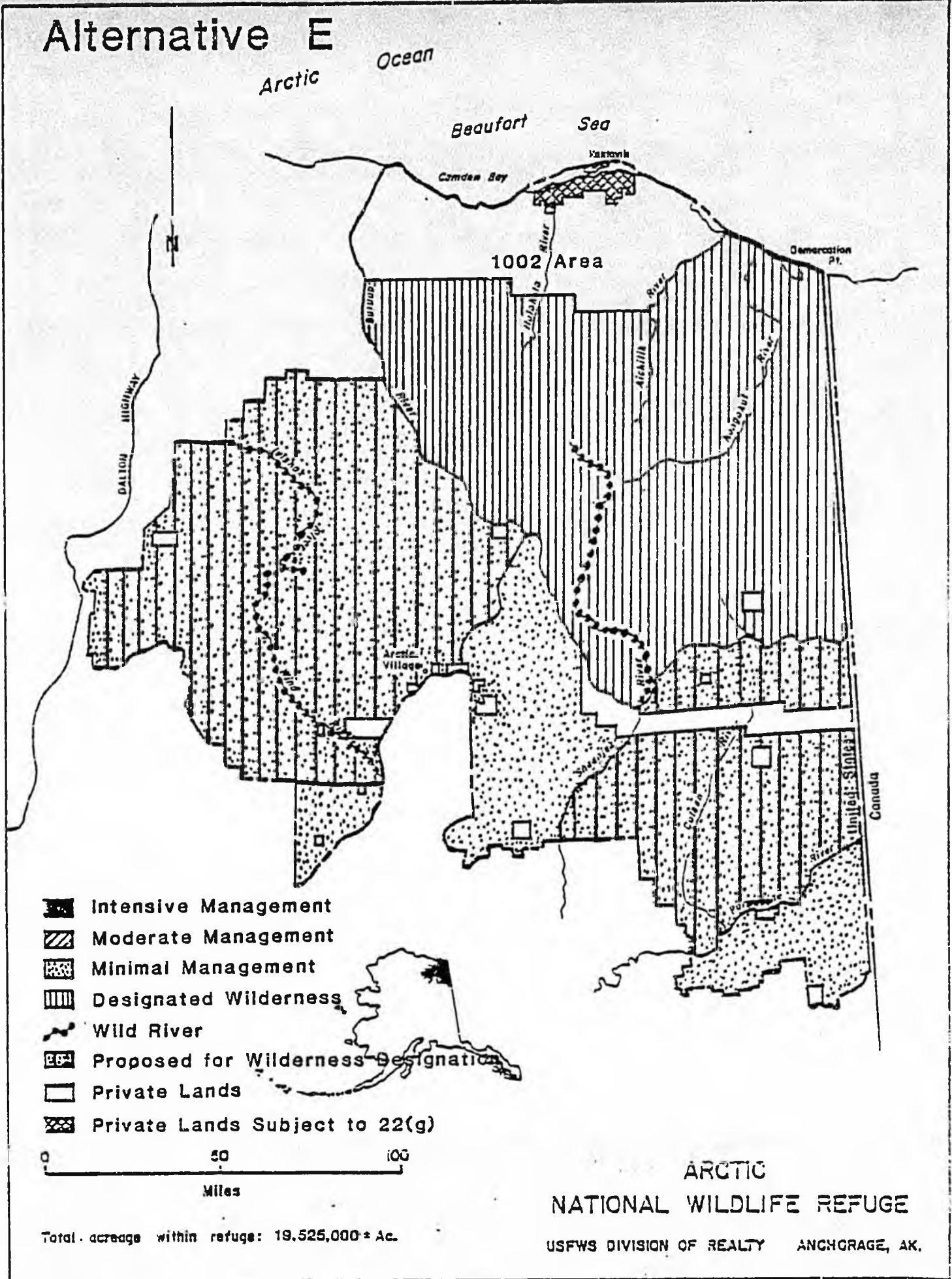
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
Alternative D would expand the existing Arctic Wilderness by adding the entire area within the refuge west of the Canning and Chandalar rivers. As a result, the entire Brooks Range within the refuge would be placed in wilderness.

Intensive Management	0 acres
Moderate Management	0 acres
Minimal Management	4,570,000 acres
Designated Wilderness	8,000,000 acres
Proposed for Wilderness Designation	5,230,000 acres

Comments:

Alternative E



-  Intensive Management
-  Moderate Management
-  Minimal Management
-  Designated Wilderness
-  Wild River
-  Proposed for Wilderness Designation
-  Private Lands
-  Private Lands Subject to 22(g)

0 50 100
Miles

Total acreage within refuge: 19,525,000 ± Ac.

ARCTIC
NATIONAL WILDLIFE REFUGE
USFWS DIVISION OF REALTY ANCHORAGE, AK.

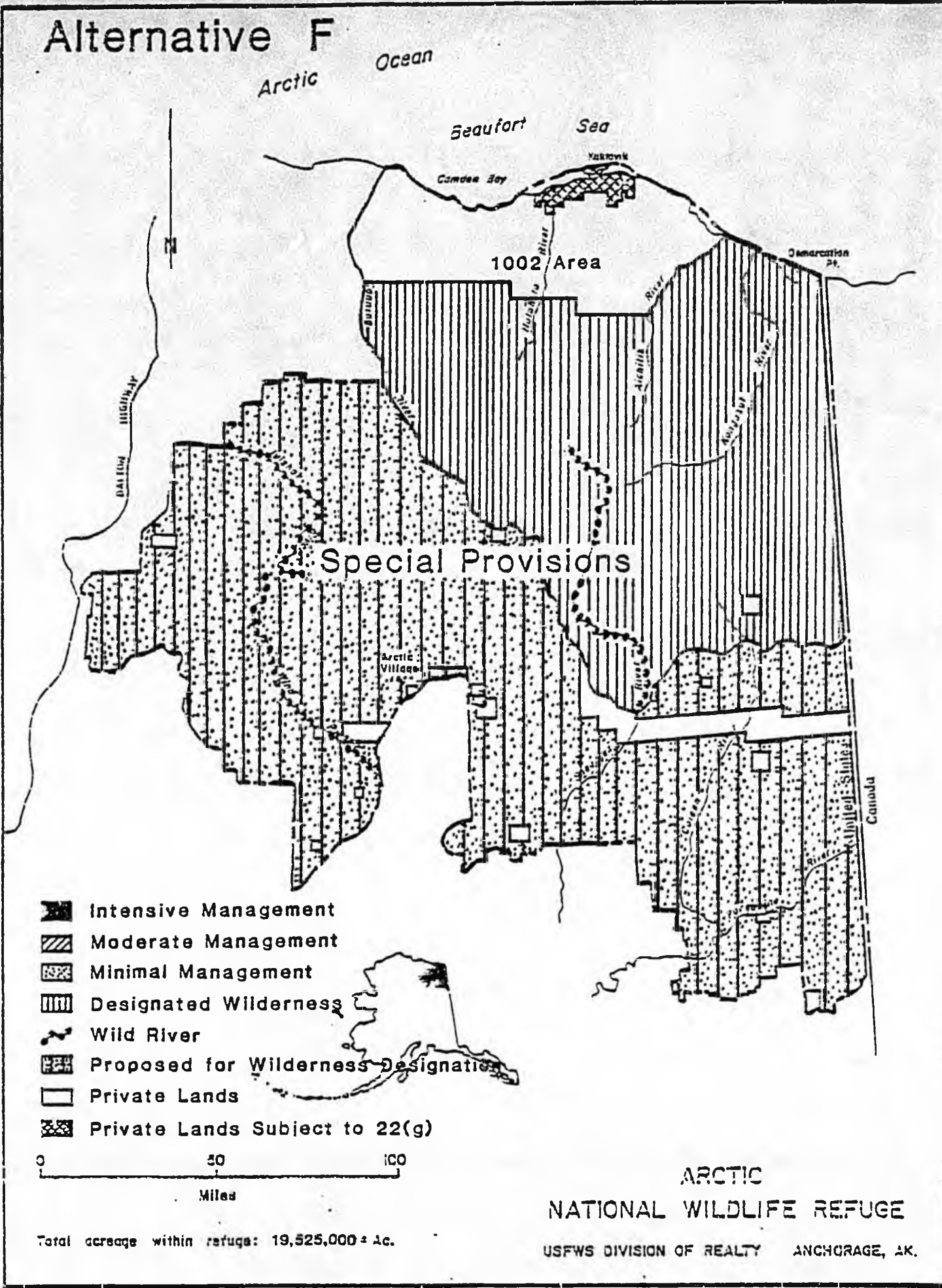
Description:

Alternative E would expand the existing Arctic Wilderness by adding the entire area west of the Canning and Chandalar Rivers as well as the area lying between the Sheenjek and Porcupine Rivers. This would result in both the entire Brooks Range within the refuge and a large part of the boreal forest south of the Brooks Range being placed in wilderness.

Intensive Management	0 acres
Moderate Management	0 acres
Minimal Management	1,800,000 acres
Designated Wilderness	8,000,000 acres
Proposed for Wilderness Designation	8,000 000 acres

Comments:

Alternative F



- Intensive Management
- Moderate Management
- Minimal Management
- Designated Wilderness
- Wild River
- Proposed for Wilderness Designation
- Private Lands
- Private Lands Subject to 22(g)

0 50 100
Miles

Total acreage within refuge: 19,525,000 ± Ac.

ARCTIC
NATIONAL WILDLIFE REFUGE

USFWS DIVISION OF REALTY ANCHORAGE, AK.

Description:

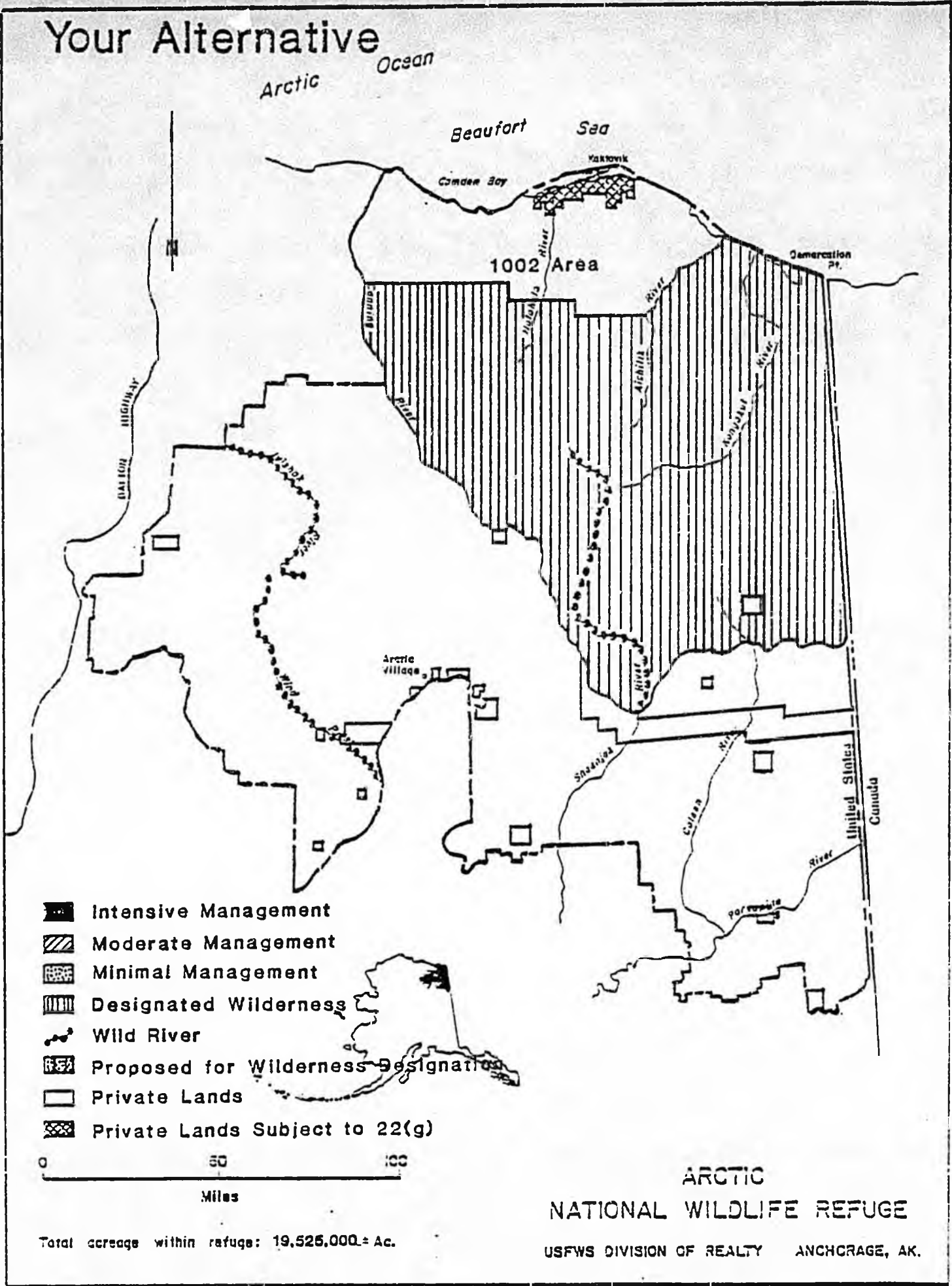
Alternative F, like Alternative B, would place the entire non-wilderness area within the refuge in wilderness. In addition, this alternative would provide an additional layer of protection on refuge lands by adopting the following special provisions:

- no new administrative facilities or recreational development
- limiting the size of recreational groups
- no helicopter access
- no motorboats in high mountain lakes
- no aircraft landings on the tundra
- identifying specific aircraft landing zones
- etc.

Intensive Management	0 acres
Moderate Management	0 acres
Minimal Management	0 acres
Designated Wilderness	8,000,000 acres
Proposed for Wilderness Designation	9,800,000 acres

Comments:

Your Alternative



Description:

My suggested alternative would _____

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Arctic Refuge Planning Team
U.S. Fish & Wildlife Service
1011 E. Tudor Road
Anchorage, AK 99508

Alaska State Legislature
Representative Niilo Koponen

Pouch V
Juneau, Alaska 99811
(907) 465-4992

542 4th Avenue, Suite C
Fairbanks, Alaska 99701
(907) 456-8161

MEMORANDUM

FEBRUARY 23, 1987

TO: all legislators

FROM: Rep. Koponen 

RE: Yukon Position on ANWR

Our actions on the very important topic of oil development in the 1002 area of the Arctic National Wildlife Refuge are of international concern. It is sometimes overlooked that we have treaty obligations with Canada. To help legislators understand the perspective of our neighbors, I have distributed these excerpts from the journal of the Yukon Legislative Assembly.



The Tuvalu Legislative Assembly

Number 67

3rd Session

26th Legislature

HANSARD

Wednesday, January 28, 1987 — 1:30 p.m.

Speaker: The Honourable Sam Johnston

MINISTERIAL STATEMENTS

Meeting with the hon. Joe Clark regarding Alaskan Sale "97" and "1002" Lands

Hon. Mr. Penikett: I wish to report to the Legislature today on our government's recent meeting in Toronto with the hon. Joe Clark, federal Minister for External Affairs.

As you are aware, our Legislature recently expressed its concern on two matters of great concern to Yukoners: the Alaskan Sale 97 lands, offering possible oil leases in an area of the Beaufort Sea under jurisdictional dispute; and the Sale 1002 lands offering possible oil leases within the Arctic National Wildlife Refuge in an area of sensitivity to the Porcupine caribou herd. Our telex to Mr. Clark of December 8, 1986, expressing our concern, was acknowledged in a letter from Mr. Clark on December 30, inviting us to discuss matters further with him. This we did last Friday in Toronto.

Our meeting produced a better understanding between our governments of our respective concerns and of the importance and priority we attach to these issues.

On the Sale 97 lands, we learned from Mr. Clark that the United States government has put the exploration leases it intended to offer in the disputed area of the Beaufort Sea in escrow for an unspecified period of time. In effect, this indefinitely postpones the issuance of leases without abandoning their claim to the area under dispute. Mr. Clark indicated that, for the time being, this was a preferred position, offering the opportunity to carefully weigh future options for pursuing Canada's claims. Clearly, this does not resolve the issue, but the decision by the United States does allow our governments to consider the most opportune time and method for advancing our interest in the area.

Mr. Clark also committed the federal government to discussions between our governments over possible interventions on the Alaskan 1002 lands. Clearly, he recognizes the potential impacts development in the Arctic National Wildlife Refuge would have on the Porcupine caribou herd's calving grounds. We stressed to Mr. Clark our opposition to any development in the area that would negatively affect the herd's population and strongly urged the federal government to consider a similar position. It was our understanding from our meeting that the federal government would take a position on the matter after our officials have the opportunity to meet in Ottawa next week. Subsequently, they will make a representation to the United States government on that development.

In our discussions concerning an international treaty to protect the Porcupine caribou herd, Mr. Clark indicated his belief that a negotiated agreement would be preferable. Such an agreement would hold the same force in law without requiring further lengthy delays prior to congressional approval.

Both the Yukon and federal governments remain committed to the long-term health of the Porcupine caribou herd and the protection of

our mutual interests in the Beaufort Sea. We will continue to meet with one another, and with Alaskan officials, to ensure just that.

Mr. Phelps: The problem with this Ministerial Statement, and some others, makes us, on this side, wonder why news that has already been disseminated throughout the Yukon and the media has to be regurgitated here.

We are in support of the position that has been taken by this government on the issue of Sale 97 Lands and the Alaskan 1002 lands. We are pleased to see that they have had these meetings, and we fully support these actions. With regard to the concept, a negotiated agreement would be preferable to trying to have a treaty ratified in the U.S. That is a position that we find acceptable. In fact, in previous years, we had active discussions with the Alaskan government to see whether even a lower level agreement might be put in place to delay a higher level agreement between the two nations — that is, an agreement between the territories and Alaska, or even Yukon, in order to get something in place to try to protect the calving grounds on the Alaskan side of the border.

Once again, we support the actions taken, and we are pleased to see that the government does see this as a priority.

Speaker: This then brings us to Question Period. Are there any questions?



The Yukon Legislative Assembly

Number 58

3rd Session

26th Legislature

HANSARD

Tuesday, January 6, 1987 — 1:30 p.m.

Speaker: The Honourable Sam Johnston

consulting Canada without considering the transboundary effects on Canada; and without looking at the total cumulative effects of all the developments on the caribou, polar bears, snow geese and musk oxen.

A presentation was also made by the Council for Yukon Indians and additional interventions are being made tonight in the village of Katovik, Alaska by the Porcupine Caribou Management Board and the Band Council of Old Crow. On Friday of this week my Deputy Minister and a representative from the Executive Council Office will make a further intervention in Washington, D.C.

Further to these initiatives, the federal government hopes to present its position on the issues to the United States Department of Interior at a meeting in Ottawa to be held on January 23. The Yukon government will also be represented at that meeting.

It is a little ironic and very disturbing that the US government is proposing to reduce protection for the wildlife of the Arctic Coastal Plain after years of urging Canada to do a better job of protecting resources on our side of the border. Now, we have a national park and a special management mechanism in place and have, in effect, caught up with the U.S. They seem to be headed in the opposite direction.

It is even more disturbing that they would write an impact statement that only makes passing reference to the effects in Canada when, in fact, several important subsistence species are involved and most of the negative socio-economic effects would be experienced in Canada generally and by Old Crow in particular.

The Yukon government is deeply concerned about moves toward oil and gas drilling in Alaska that could have unfortunate and unnecessary long-term effects on the ability of the Old Crow people to harvest the Porcupine caribou herd, as they have traditionally harvested the herd for generations.

In light of these circumstances, we have instructed our officials to make very strong statements on behalf of our government and in the interests of the people of Old Crow and the people of the Yukon in the north. Copies of the statements that were made in Anchorage have been tabled before the Legislature.

Mr. Phelps: I would like to take this opportunity to say that I am, and our side is, very pleased to see these significant steps being taken by our government on behalf of the Old Crow people, the indigenous people of Yukon, all Yukoners and all Canadians.

Several weeks ago, during debate of the motion pertaining to this issue, I said that the protection of our north, our sovereignty, our environment, our people, requires constant vigilance by the Government of Yukon. I am very pleased to see that the government is in constant vigilance in that respect.

I want all groups including this government, to know that this side supports them. In particular, we support the Old Crow Band Council and the people of Old Crow in their efforts to dissuade the powers that be from doing anything precipitous with regard to the environment on the Alaskan North Slope.

We hope that the government will make known to the people in the United States the unanimous feelings of the Members of this Legislature as expressed in debate of Ms. Kassi's motion on the subject.

Mr. McLachlan: I would highly endorse the actions of the Minister and his department. However, I have a concern about the method of presenting our position to the United States Department of the Interior. My concern is that we could greatly improve the impact of our position if we were to be accompanied by a representative of the federal government sooner rather than later when we meet with them this Friday.

It is essential that the U.S. government is made to recognize our opposition to this type of development on the Arctic National Wildlife Refuge coastal plain. In the past, the U.S. government would appear to respond only to powerful lobbying by those groups that oppose such a move. If we hope to persuade the Alaskan government of this most delicate refuge, we must use all of the government clout available. This government must insist that the federal government take a very active role in supporting our position on this matter immediately.

MINISTERIAL STATEMENTS

Yukon Government Presentations to U.S. Department of Interior Hearings on the future of the Arctic National Wildlife Refuge, Coastal Plain

Hon. Mr. Porter: Mr. Speaker, I am pleased to announce today that I have taken steps to ensure that the Yukon government, as well as several major interest groups, are making comprehensive presentations to the United States Government, opposing their proposal to open up the heart of the Porcupine caribou herd calving grounds to oil and gas development in Alaska. These presentations represent the actions we are taking to implement the unanimous motion of this House several weeks ago.

Yesterday in Anchorage, officials of the Department of Renewable Resources spoke to a number of very serious omissions in the draft environmental impact statement. The Department of Interior is proposing to open up a vast area on the Northern side of the Arctic National Wildlife Refuge to oil and gas leases: without first



The Yukon Legislative Assembly

Number 51

3rd Session

29th Legislature

HANSARD

Tuesday, December 9, 1988 — 1:30 p.m.

Speaker: The Honourable Sam Johnston

GOVERNMENT MOTIONS

Motion to Waive Standing Order 27

Hon. Mr. Porter: I would like to request unanimous consent of the House to waive Standing Order 27 with respect to notice in order to deal with Motion 67 standing on the Order Paper.

Speaker: Is there unanimous consent?

Some Members: Agreed.

Unanimous consent granted

Motion No. 67

Speaker: It has been moved by the Government Leader THAT the Speaker forward the following Address to the Prime Minister of Canada:

WHEREAS the Yukon Legislative Assembly has gone on record in support of the 141st Meridian as the offshore boundary between the Yukon and Alaska; and

WHEREAS recent initiatives by the Government of the United States to sell offshore petroleum exploration leases violate this boundary;

THEREFORE BE IT RESOLVED THAT this House urges the Government of Canada to assert Canadian sovereignty in Arctic waters by insisting that the Government of the United States respect the 141st Meridian as the international boundary from the Beaufort Sea coastline to the North Pole.

Hon. Mr. Penikett: Over the past several days, considerable attention has been given to two United States energy development initiatives.

As you are aware, the first concerns a proposal to open the Arctic National Wildlife Refuge to exploitation of oil and gas. This government has expressed its concern over the potential impact on the Porcupine caribou herd habitat by way of a motion standing in the name of the Member for Old Crow and passed by this House following an eloquent intervention by the Leader of the Official Opposition on December 3. As you will recall, this motion called upon the Government of Canada to ensure that an international agreement on caribou be concluded prior to any decision being made with respect to industrial activity within the refuge.

The second initiative concerns the proposed sale of 8.58 million hectares of offshore oil and gas leases in the Beaufort and Chukchi Seas. Our concern with this proposed sale is twofold.

In the first instance, at least two of the proposed lease blocks extend eastward across the 141st Meridian into waters claimed by Canada and forming part of the Yukon offshore. The United States has disputed Canada's claim to this part of the offshore and has stated that its policy is to reserve its rights in all disputed areas. Under this policy, leases can be sold in this territory and development could be approved prior to resolution of the dispute.

Despite repeated requests by the United States to begin negotiations on a number of boundary disputes, and despite the motion passed in this House in May of this year, asking that the Government of Canada assert its sovereign claim to this area, the Minister of External Affairs has, so far, taken no action. In fact, he has expressly stated to his U.S. counterparts that he is not prepared to discuss any of Canada's boundary issues at this time.

"There are, no doubt, many mysterious processes in the world of high diplomacy and there are, no doubt, many subterranean passages to the hearts and minds of the powers that be in Ottawa. I must say that for those of us who are plain folk, ordinary citizens, even legislators in a little corner of the world like this, that we find Mr. Clark's attitude and the attitude of the Canadian government curious, given his repeated commendable statements regarding the assertion of Canadian sovereignty in the Arctic. I am therefore calling on this House to allow me to point out to Canada's Minister

of External Affairs the Yukon's economic and environmental interests in the disputed area and to express our opinion that discussions be held immediately to confirm the 141st meridian as the official northern boundary between the two countries.

I should also like to point out that later this week I will be tabling in this House our response to the Report of the Special Joint Committee on Canada's International Relations. This communication to the Minister of External Affairs reaffirms this government's position regarding our offshore boundary. It will further point out that our interest in the offshore should not be bargained away for any U.S. concessions during negotiations on other, more visible, boundary disputes.

I said that our concern with regard to the proposed offshore lease was twofold.

Notwithstanding our obvious interest in the boundary issue, we are also very concerned with the environmental implications of the proposed offshore development in the Beaufort.

The environmental Impact Statement prepared for the Sale 97 lands indicates that there is an 82 percent chance of an oil spill greater than 1,000 barrels occurring during the expected life of the project. The Yukon, therefore, must obviously be concerned with the effect such a spill would have on the sea mammals, fish and birds that do not respect any boundaries and move freely from U.S. to Canadian waters, and that these animals are a resource upon which northern aboriginal people depend.

This government has therefore decided to intervene at public hearings into the EIS scheduled for Anchorage, Alaska later this month. At that time we will make known our concerns regarding the environmental issues and will use the opportunity to again stress our objection to the sale of leases in what we profoundly believe are Canadian waters.

"It is our view that the United States has no right whatsoever to issue leases in Canada. I would encourage all Members of this House to support this motion in order that a very clear message can be sent to the Right Hon. Joe Clark and to the Government on this issue, which is of great symbolic, material, economic and environmental significance to the Yukon and to Canada.

Mr. Phelps: I once again am pleased to stand in the House and support what I hope will be a unanimously passed motion, because the jurisdictional problems of the Yukon and the north and indeed in the Beaufort Sea are problems that seem continuous. The fight has to be continuous. They are problems that I have long held are critical to the future of Yukoners and to future generations of Yukoners. I honestly believe that many people do not understand just how beautiful that country is up there and how great the potential resources are, including the Porcupine caribou herd.

Over the course of the sittings that I have partaken in over the last year and a half, I have undertaken to put forward motions about that jurisdictional issue. Back on July 18, 1985, I rose on matter of pressing urgency to put forward a motion vis-a-vis the dispute between the NWT and the Yukon, as to which territory has jurisdiction to the north of the Yukon's coastline. I am pleased to say that at that time the motion, as I am sure this one will be, was passed unanimously.

Then again, in May of 1986, I was pleased to put forward a motion regarding the issue at hand. At that time, once again, the motion was passed unanimously. That motion read:

"THAT it is the opinion of this House that the 141st meridian forms the offshore boundary between the Yukon and the State of Alaska and the Beaufort Sea; and THAT the Government of Yukon should urge the Government of Canada to initiate additional measures to assert Canadian sovereignty in Arctic waters including giving consideration to basing its proposed new Polar Class 8 icebreaker at a deep water port at King Point on Yukon's North coast should such a port be constructed."

"In March, 1986 I had the pleasure of appearing before the Special Joint Parliamentary Senate Committee on Canada's International Affairs. At the time of the hearings on March 20, I indicated our concern over this issue and stated that we understand that the United States government has indicated that it is ready to start negotiations with Canada to resolve boundary disputes on the west

coast and that Canada has accepted. It has also been agreed that the boundary between B.C. and Washington State off the Strait of Juan de Fuca and between B.C. and Alaska off the Dickson Entrance will be negotiated first, leaving the Alaska and Yukon boundary on the Beaufort Sea to be negotiated at a future date.

Yukoners are concerned that if this approach is taken the Beaufort boundary could be used as a pawn in order for Canada to achieve a better boundary arrangement off the west coast. Yukoners' fears are not unfounded, as our experience with Canada in negotiating a new Canada-U.S. Salmon Treaty has shown. I went on to state, in no uncertain terms, our position with regard to the issue.

The point is simply that if there is a forgotten place in the world, it is Yukon's north. If there is a place that seems to always play second fiddle, it is our coastline and our resources, at least in the minds of others. So, it is extremely important that we continue to voice our concerns and to unanimously try to ensure that these matters will be resolved in a final way and in a manner that is satisfactory to Yukoners.

I would like to take the opportunity to remind Member of the House of some of the problems that preceded the last 18 months. We had a situation where the COPE claim, which was the claim of Inuit peoples resident in the NWT, which was signed without any participation by the Yukon, despite the fact that the Yukon had been assured that it would be considered in negotiations. The agreement-in-principle was signed in 1978 without any such consultation with the Yukon, and it was a document that gave away not just the Beaufort Sea, but the entire north coast of the Yukon, including Herschel Island. It gave that important land away, back to Canada, to be used as a new kind of park known as a wilderness park.

" This government fought tooth and nail, not only to fight its way into the negotiations that took place after that, but to try to ensure that we would not lose the coastline. Finally, six years after that unfortunate incident, success was attained, but that was one battle and not the war. The fight goes on. We are going to have to continue to exercise diligence to ensure that we do not lose land to overlapping claims, to ensure that the jurisdictional dispute between our territory and the NWT is resolved satisfactorily. It is also critical that we make our position completely clear to the Department of External Affairs and to the Government of Canada.

I have no problem, as Leader of the Conservative Party in Yukon and of the Official Opposition, in unanimously supporting this motion and being critical, publicly, whenever Canada is derelict in its duty to Yukon, no matter what party is in power in Ottawa.

It is for those reasons that I now urge the government to be more diligent in constantly updating and reminding the other jurisdictions of our concerns with respect to our heritage — north Yukon — to continue the fight for preservation of the habitat of the Porcupine caribou herd, and to take whatever steps are necessary to try to fight off this latest intrusion into our Beaufort Sea.

Hon. Mr. Porter: I would like to thank the Leader of the Official Opposition for his remarks on this particular motion today, and would like to join him in some of the comments that he has put forward.

Like the Leader of the Official Opposition, I have had the particular pleasure of spending considerable time in the North Slope region of both the NWT and the Yukon. I have worked in the operations of the rigs out in the Beaufort Sea, as well as participated in some of the traditional whaling camps offshore. I have also spent much time flying over the area and, as recently as this summer, have had the opportunity to visit Herschel Island.

There is no question that that part of the Yukon, which very few Canadians and Yukoners know about, is an extremely important part of our territory. Like the Leader of the Official Opposition has pointed out, it is a very beautiful part of the territory. It is a landscape that is very different from the rest of the Yukon. Unlike many parts of southern Yukon, which contains very rugged mountains with huge icefields and other terrain, the mountains in northern Yukon are very gentle, and there is a lot of open tundra flowing into the ocean.

" I think that if people were able to have the opportunity to see that

part of the world they would agree with me and the previous speaker that this is an area worth protecting and worth preserving.

On the question of the COPE claim and what has resulted from the COPE claim, clearly now we are at the position as governments to begin looking at the implementation of that claim. As a result of the COPE claim, Canada has reserved a portion of the area in question as a national park. We have the second newest national park in Canada created on the North Slope of the Yukon, called the Northern Yukon National Park. As we stated earlier in debates on the supplementary that is before the House, the Department of Renewable Resources is leading the way in the government for the implementation of those aspects of that claim and we are also working with other governments and the Inuvialuit toward establishing a territorial park on Herschel Island.

So, clearly, Canada, as a country, with the participation of the people of the Yukon, has demonstrated its interest and is moving to protect its interest. We have made very clear statements as to how we feel about that particular area and we have made some very concrete moves of a management nature to reflect the degree of feeling that we have with regard to that part of the world.

With respect to the question of the Porcupine caribou herd and negotiations, last week we passed a motion in this House clearly demonstrating the Yukon's opposition to what was intended by the oil and gas interests to explore that area prior to having a solid agreement of an international nature between Canada and the United States with respect to the Porcupine caribou herd. Things seemed to have happened very quickly last week. We debated the motion in the House one day and the next day our negotiators came back from Seattle with an initialled agreement. I would like to point out for the record, that in fact things did not happen simply in a two-day period. Negotiations with respect to the international agreement have been going on for years. Over a year ago we completed an in-Canada agreement between the Canadian jurisdictions on the Porcupine caribou herd and since that point there has been considerable time spent on trying to bring the Americans to the table and to conclude an agreement. There has been an awful lot of leg work done with respect to speaking to people in rural Alaska and speaking to interests in Anchorage and Juneau, as well as participating in meetings between ourselves, the Canadian government, and the U.S. officials concerned with that particular issue.

At the present point, an agreement has been initialled by the negotiators. The process now calls for the principals to the negotiations to review what has been put forward by the negotiators, and I expect that the Cabinet of Yukon will be reviewing that agreement within the next two to three weeks and will be making its views known.

I am happy to hear that the Government Leader has stated on behalf of our government that we intend to pursue the public process that is accorded to all of those who wish to speak on the issue of the environmental statement issued by the U.S. Department of the Interior. It would be my intention that we give full expression to our position with respect to the caribou agreement. If we should find that the caribou agreement does not afford the resource the necessary protection it deserves, then I would suggest that this government should be in a position to exhaust all avenues to articulate the position of the people of the Yukon. If that means going to Juneau and meeting with the Governor's office or going through to Washington to be able to knock on the doors of Congress to make our views known, then I think that the issue before us and the issue of the protection of the Porcupine caribou herd deserves nothing less than that.

" With respect to the long-term view of the initiative that we are concerned with, there is no question that there is legal uncertainty with respect to rights to the offshore Yukon of the Beaufort. We have had cases on the books with respect to initiatives in the eastern part of Canada where legal challenges have been made that question the federal authority on the question of jurisdiction. There have been cases in British Columbia — which are of provincial versus federal interests — in terms of who owns the resources that are contained offshore and who has rights to explore them.

In some cases, there have been negotiated agreements between the federal government and the province concerned. Those agree-

ments have taken the nature of participation in terms of management of the resources and sharing of the revenues that have flown from exploitation of those resources.

There is no question in some people's minds that there are legal arguments on both sides of the issue as to whether or not we, as the Yukon, enjoy legal jurisdiction. Those are questions that are pending in some areas. Those are questions that are being asked and researched and studied by people in the academic field.

I think that we should fight vigorously on this question to keep the door open for the future. Although, at the present time, we do not enjoy provincial status and we do not enjoy jurisdiction over our resources in the Yukon, the day will come when the Yukon will have that opportunity, when we will be able to negotiate our way into Confederation on an equal basis with all of the rest of the provinces in Canada. We should make sure that, when that day arrives, we do enjoy equal opportunity to own the resources and do benefit from the exploitation of those resources.

It would be my position that supporting this motion and supporting Canada's initiative to assert Canadian sovereignty in this area, in the long term, will protect the Yukon's interest to be able to enjoy the day when it does have constitutional, entrenched ownership of those resources, and that those resources are then utilized by the generations yet to come.

This motion is a very important motion, in not only the immediate term, but it is a motion that sets the tone for Yukon's constitutional development for the future as well.

Mr. Nordling: I support the motion of the Government Leader, and I am sure it will receive unanimous support of this House.

This issue is not new to the Legislature. It has been discussed many times before and, most recently, in May of 1986 when, as the Leader of the Official Opposition said, he brought forward a motion in the House, the first part of which was that it is the opinion of this House that the 141st Meridian form the offshore boundary between the Yukon and the State of Alaska in the Beaufort Sea.

The second part of the motion called for Canada to initiate additional measures to assert Canadian sovereignty in Arctic waters. It is important that Canadians do assert sovereignty over Arctic waters, or we stand to lose them.

It appears that the American plan is to assert its sovereignty by selling oil leases over waters east of the 141st meridian in the hope of obtaining ownership or a further claim to that area. The Americans are arguing that the boundary line should be drawn at right angles to the shoreline where the 141st meridian meets the Beaufort Sea.

If we do not take immediate action, this may become the accepted method of determining that boundary. You can bet that if that stretch of coastline, at the intersection of the 141st meridian and the Beaufort Sea, slanted the other way at a right angle from the coast and gave Canada a huge chunk of the waters north of Alaska, the Americans would have none of it. We must speak up now and play a role to make sure that this huge piece of our offshore territory is not traded off as a concession for east coast or west coast offshore settlements.

There is no question that we will be pushed. If we do not show an interest, we will be taken advantage of by both the federal government and the Americans. I do not advocate breaking protocol or doing anything rash at this point. I understand that the squeaky wheel gets the grease, but let us not start a fight with the big boys right now, not until it is obvious that it is our only option.

We should encourage talks to start immediately, and then insist on being present, even as observers if we are not given direct input, so that the federal negotiating team who will be negotiating on our behalf will at least feel our presence and be aware of our concern while the talks are going on. I strongly support the Government Leader's motion, and by having as many as we have had in the House speak on it, I am sure that he will be able to go to the Government of Canada with a clear mandate from this House.

Hon. Mr. Kimmerly: I was not intending to speak, however, the positions put forward by the Member for Porter Creek West were slightly less forceful than the positions put forward by the

Leader of the Official Opposition and the government. I am rising simply to say that if persons reading the debate note an inconsistency, the position of the government is that we should maintain a forceful position throughout.

» The Leader of the Official Opposition was closer to the mark.

Mr. McLachlan: I, too, rise in support of the motion of the Government Leader. I was very surprised last week to hear the Minister of Indian and Northern Affairs say only that the issue was provocative. It is far more than provocative. It is extremely dangerous. Part of the problem is that the Prime Minister and the Minister of External Affairs are engaged in a hand-holding exercise with the President of the United States. They are reluctant to abuse the hand that is feeding them.

It is surprising that the Minister of External Affairs, who is also a former Prime Minister of Canada, has not taken any stronger action with the United States.

As soon as the prospect of finding oil or natural gas becomes a possibility, and a dollar can be made off the leases in the sea, it will not be sufficient then to leave the matter for discussion around a boardroom table in Ottawa. The stakes go up too high and too fast. I would urge all Members to follow the actions of the Government Leader and the Leader of the Official Opposition in taking the strong hand, taking the upper route and making sure that the government in Ottawa knows very well our position and our feelings.

Motion No. 67 agreed to

Mark A. Fisher

The Buffalo of the North: Caribou (*Rangifer tarandus*) and Human Developments

A.T. BERGERUD¹, R.D. JAKIMCHUK², and D.R. CARRUTHERS²

ABSTRACT. The demography, movement, and behaviour patterns of eight caribou populations (Kaminuriak, Nelchina, Central Arctic, Fortymile, Porcupine, British Columbia, Newfoundland, and Snøhetta) exposed to industrial activities or transportation corridors are reviewed. Behaviour patterns of caribou encountering transportation corridors are explainable in terms of adaptive responses to natural environmental features. There is no evidence that disturbance activities or habitat alteration have affected productivity. Transportation corridors have adversely affected caribou numbers by facilitating access by hunters. There are no examples where physical features of corridors or associated disturbances have affected numbers or productivity. Caribou apparently have a high degree of resilience to human disturbance, and seasonal movement patterns and extent of range occupancy appear to be a function of population size rather than of extrinsic disturbance. The carrying capacity of the habitat is based on the space caribou need to interact successfully with their natural predators. Caribou must not be prevented from crossing transportation corridors by the construction of physical barriers, by firing lines created by hunting activity along a corridor, or by intense harassment — a loss in usable space will ultimately result in reduced abundance.

Key words: caribou (*Rangifer tarandus*), disturbance, wolves, predation, overharvest, access

RÉSUMÉ. L'article examine les données ayant trait à la démographie, aux déplacements et au comportement de huit populations de caribous (Kaminuriak, Nelchina, Arctique central, Fortymile, Porcupine, Colombie-Britannique, Terre-Neuve et Snøhetta) exposées aux activités industrielles et aux corridors de transport. Le comportement des caribous ayant contact avec les corridors de transport peut être expliqué comme réaction d'adaptation aux traits naturels du milieu. Les corridors de transport ont affecté de façon défavorable le nombre de caribous en facilitant l'accès aux chasseurs. Il n'existe aucun exemple dans lequel les aspects physiques des corridors ou des problèmes associés ont touché le nombre ou la productivité. Le caribou possède apparemment un niveau élevé de résistance aux interventions humaines, et son déplacement saisonnier et la portée de sa distribution semble varier en fonction des variations en population plutôt que des dérangements extrinsèques. La capacité de soutien de l'habitat est fondée sur l'espace dont a besoin le caribou pour réagir de façon satisfaisante face à ses prédateurs naturels. Le caribou ne doit pas être empêché de traverser les corridors de transport par la construction de barrières physiques, par les lignes de tir créées par la chasse le long du corridor ou par des harcèlements intenses: il en résulterait une perte d'espace qui entraînerait éventuellement une réduction des nombres.

Mots clés: caribou (*Rangifer tarandus*), dérangement, loups, prédation, surchasse, l'accès aux chasseurs

Traduit pour le journal par Maurice Guibord.

INTRODUCTION

During the past decade, considerable research has been carried out on disturbance to northern mammals. In particular, various pipeline projects and proposals became the focal point of environmental concerns, debate, and public hearings. The Trans-Alaska Oil Pipeline (TAPS) is now an operating system, and continued research (Cameron and Whitten, 1976, 1980) is providing information on the response of caribou to that development and its ancillary activities. Klein (1971, 1973) examined issues of potential concern involving caribou populations, including obstruction of movements and various types of direct disturbance to populations and their habitats. Natural gas pipeline proposals in Canada and the U.S.A. stimulated baseline research and disturbance studies sponsored by government, industry, and academic institutions. The implications of aircraft disturbance received considerable attention (Miller and Gunn, 1979), supplementing earlier quantitative evaluations of caribou responses to noise (McCourt and Horstman, 1974) and roads (Surrendi and DeBock, 1976).

With increased interest in disturbance as a facet of impact assessment, considerable debate on its significance to wildlife took place within the profession and in public fora (Jakimchuk, 1978). In the early and mid-1970s, bio-energetic impacts were postulated as a concern related to industrial developments (Geist, 1975).

A panel discussion at the First International Reindeer/Caribou Symposium in 1972 was devoted to the implications to caribou of northern development; several papers on disturbance-related topics were presented there and at the Second International Reindeer/Caribou Symposium in 1979. These symposia brought together an enormous amount of research, much which is relevant to evaluating the significance of disturbance to caribou populations. The literature available on human disturbance to northern large mammals is compiled in Shank's (1979) annotated bibliography and review containing over 551 references. Sopuck *et al.* (1979) have also completed a comprehensive review of general wildlife impacts including disturbance to large and small mammals. Klein (1980) expanded his 1971 assessment of the effects of obstructions on caribou.

In a casual examination of the existing literature, one may find evidence to support virtually any conclusion regarding the significance of disturbance to large ungulates (Shank, 1979). This uncertainty is largely a result of the emphasis being placed on individual and group observations which are then extrapolated to the population level, and of the great variation in information ranging from anecdotal notes to quantitative studies. To date, there have been no studies directed specifically at establishing the effect of specific disturbance(s) on the population dynamics of caribou. The difficulties involved in such a study are obvious. However, in a number of

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cases the status of populations has been analyzed in relation to disturbance forces operating within their environment (Klein, 1971, 1980; Bergerud, 1974a; Calef, 1974).

We agree with Shank's (1979:5) comment, "In actuality, there is a potentially infinite universe of manners in which human activity can influence animal populations and merely demonstrating that one factor is not operative does not negate the influence of the remainder of possible factors. In other words, the only way in which population responses can be shown not to be influenced by disturbance is to study population dynamics."



FIG. 1. The location of caribou herds described in this study. 1) Nelchina; 2) Fortymile; 3) Central Arctic; 4) Porcupine; 5) Kaminuriak; 6) British Columbia; 7) Interior; and 8) Avalon.

In this paper we will assess the impact of human disturbance on the demography of eight caribou herds (Fig. 1): the Porcupine, Nelchina, Central Arctic, Fortymile, and Kaminuriak herds; herds in British Columbia and Newfoundland; and the Snøhetta herd in Norway. We have conducted field studies of five of these herds. We have selected these particular herds because they have been mentioned as possibly being adversely affected by human impacts and some demographic statistics are available to evaluate those assertions. In our assessment of human impacts we go beyond simple correlation reasoning which links a response to a coincident event. Instead, we examine data on reproduction and mortality rates, the underlying causes of the observed rates, changes in population size, herd movements, and range use. Our objective is to show how simple correlation reasoning on the effects of human disturbance on caribou obscures alternative explanations and may lead to untestable generalizations and insupportable conclusions.

We define human disturbance very broadly to include hunting impacts, manipulation of predator populations, development disturbance (transportation corridors and physical structures), and habitat modifications such as logging and flooding.

DEMOGRAPHIC CASE HISTORIES

Porcupine Herd

In 1961 Skoog (1961) estimated 110 000 to 117 000 animals in the Porcupine herd. Lentfer (1965) estimated 140 000 in 1965, and subsequent population estimates fell within the

range of 100 000-110 000. In 1972, LeResche (1975) estimated 93 000-103 000, and in the same year Roseneau and Stern (1974) estimated 90 000-107 000. In 1977 Bente and Roseneau (1978) estimated 105 000. Hinman (1981) reported an estimated 110 000 animals in 1980. Over the past 20 years the Porcupine herd has remained stable at 100 000-110 000 animals (Fig. 2).

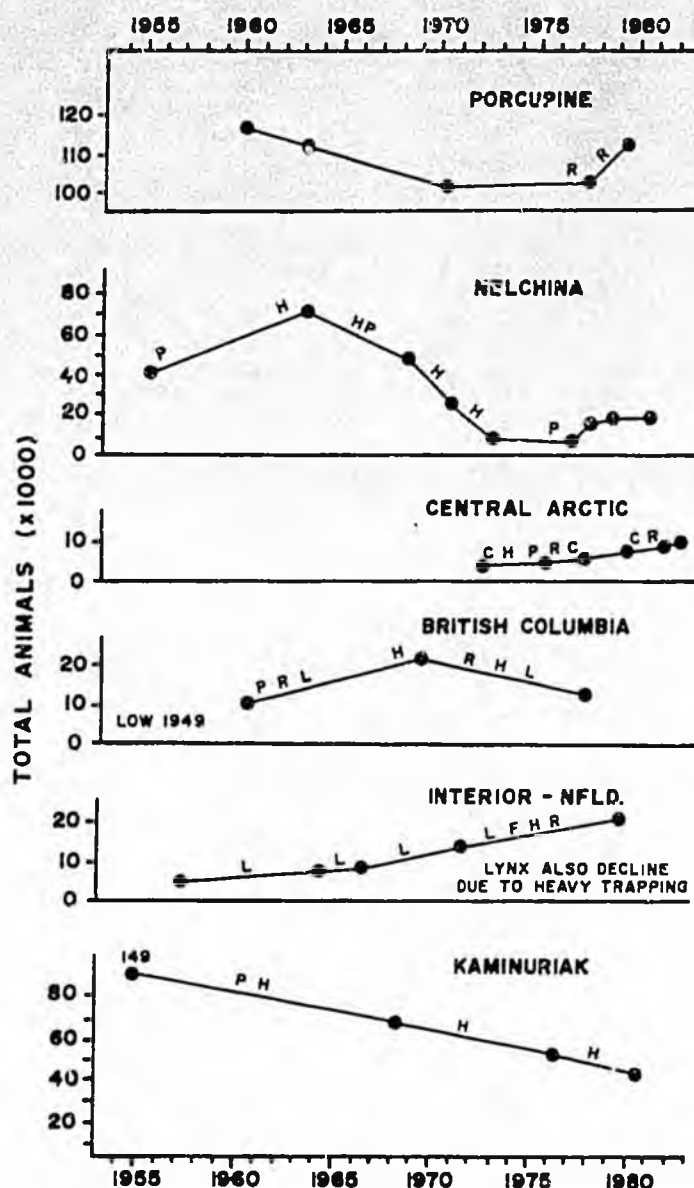


FIG. 2. Trends in population size of (a) Porcupine, (b) Nelchina, (c) Central Arctic, (d) British Columbia, (e) Interior Newfoundland, and (f) Kaminuriak caribou herds, 1949-1981, compared with presence of disturbance features (Skoog, 1968; Bos, 1975; Hawkins and Calef, 1977; Bergerud, 1978; Hinman, 1981; Pitcher, 1982; E. Mercer, pers. comm. 1982; Whitten and Cameron, 1983). Key: P = predator control; H = hunting; C = construction; R = roads; F = flooding; L = logging.

Yearling recruitment has been 10-11% of the total population in July from 1971 to 1980 (Fig. 3) and calves of the year show a similar level of stability at 15-23% of the fall population (Bente and Roseneau, 1978; Hinman, 1981; Jakimchuk *et al.*, 1974; Roseneau and Stern, 1974). In the same period, hunter kill accounted for <3% of the population (Jakimchuk

et al., 1974; Calef, 1974, 1975; Hinman, 1981). Since at least 1971, the Porcupine herd has consistently ranged over a 240 000-km² area.

No estimates of wolf (*Canis lupus*) predation rates are available for the Porcupine herd although Jakimchuk *et al.* (1974) observed 131 caribou kills during late winter surveys in 1971. Wolf numbers are thought to be low to moderate over the range. Martell and Russell (1983) estimated 5% annual adult mortality from all sources other than hunting.

Since the late 1960s construction of the Dempster Highway has bisected portions of the winter range of the herd in northern Yukon. In 1950 new construction transected a major spring migration corridor in the northern Richardson Mountains. The highway was completed in 1978, and at that time a five-mile no-hunting corridor was established along the highway. Crossing of the highway by caribou and use of winter ranges south of the highway have continued to the present time.

Nelchina Herd

The Nelchina herd was first estimated at 10 000 animals in 1945 (Skoog, 1968). Estimates from 1948 to 1954 varied from 5000 to 13 200 animals (Skoog, 1968; Bos, 1975). Calf percentage averaged near 15% (range = 13-17%) in 1951 and

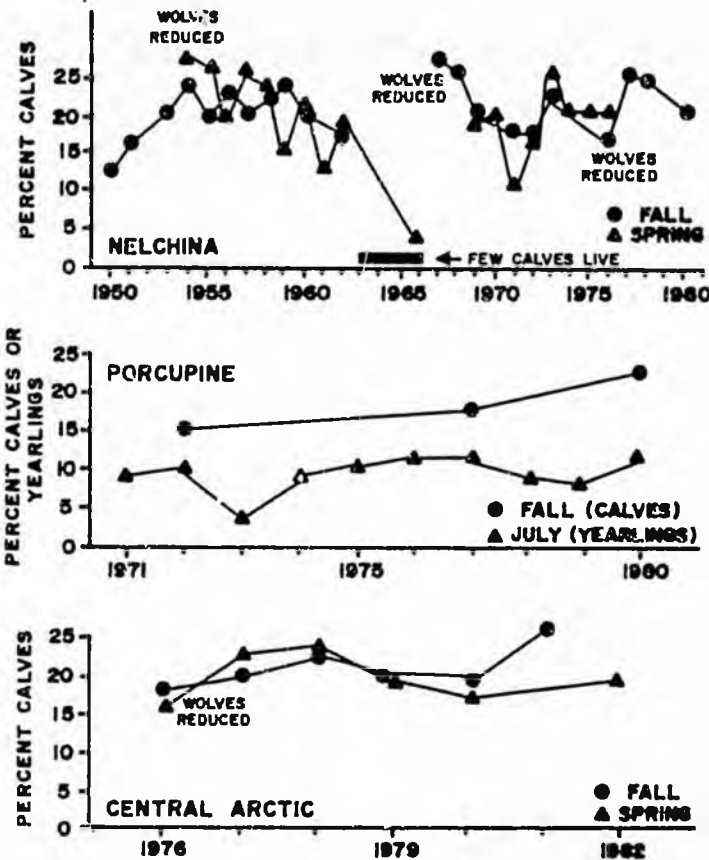


FIG. 3. Trends in calf production and recruitment for the (a) Nelchina, (b) Porcupine, and (c) Central Arctic caribou herds, 1952-1981 (Skoog, 1968; Bos, 1975; Bente and Roseneau, 1978; Doerr, 1980; Hinman, 1981; D. Russell, pers. comm. 1982; Whitten and Cameron, 1983).

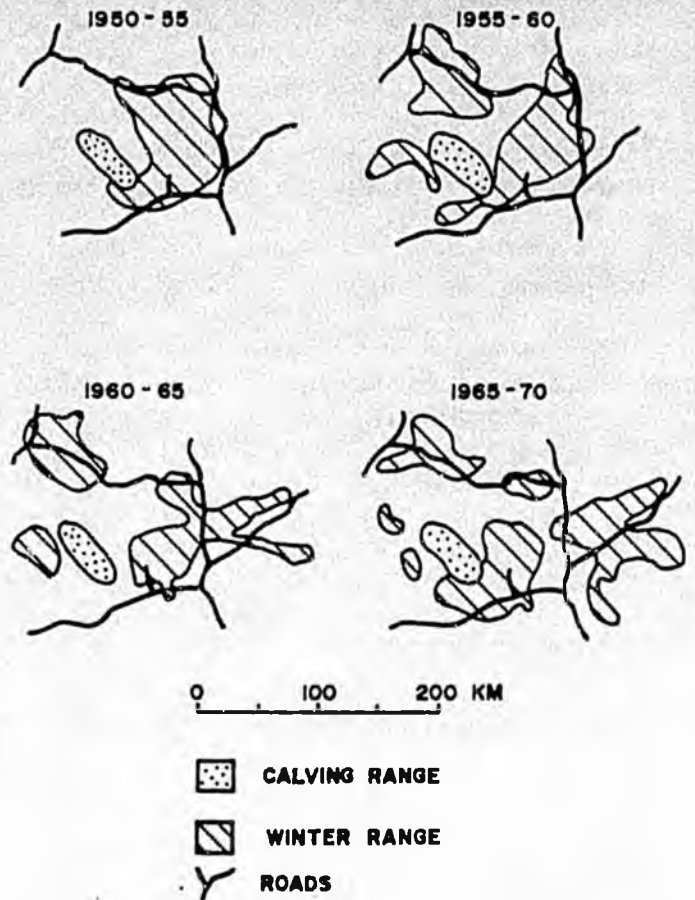


FIG. 4. Increase in extent of winter ranges used by the Nelchina herd, 1950-1970 and in 1973 (adapted from Hemming, 1971 and Bos, 1974).

1952 (Alaska Dept. Fish and Game Files). In the period 1948-1954, 200+ wolves were removed from the Nelchina range and by 1953 only 12 wolves were estimated to be present; these increased to possibly 425 animals by 1965 (Rausch, 1967). Wolves were again reduced and McIlroy (1976) estimated 300 in 1966-67.

The first systematic caribou census was conducted in February 1955 and estimated 40 000 caribou (Fig. 2; Watson and Scott, 1956). Clearly the early counts were too low. Now a unique opportunity was available: the status of both prey (caribou) and predator (wolves) was established and the interactions of the two could be documented. Skoog (1968) began his intensive studies of the herd in the presence of increasing, known, and unmanaged wolf populations.

Following wolf removal, calf survival was high and calves soon exceeded 20% of the herd (Fig. 3). The herd increased, reaching 71 000 in the winter of 1962-63 (Fig. 2; Skoog, 1968). The increase in numbers was followed by increased movement (Skoog, 1968:649) and range expansion (Fig. 4) across the Richardson Highway.

The herd declined rapidly from 48 000 in 1967-68 to 10 000 by 1972-73 (Fig. 2; Bos, 1975), coincident with an increase in wolf numbers (Rausch, 1967), a decrease in calf survival, and heavy incidence of hunting as the herd crossed the Richardson Highway. The survival of the 1964, 1965, and 1966 cohorts

was extremely low (Fig. 3; Bos, 1975). This low survival coincided with high wolf numbers, but when wolves were reduced in 1966-67 calf survival improved (Fig. 3). Coincident with a lack of recruitment, harvests of > 10% of the herd apparently occurred in many years between 1961 and 1971 (calculated from Bos, 1975). This heavy harvest was the major cause of the decline (Doerr, 1980).

The herd continued to migrate across the Richardson Highway as it declined, even in the presence of intense human disturbance from hunting. As the herd increased between 1955 and 1962, it expanded its range to include the same area it had ranged in the 1880s prior to the construction of most of the surrounding transportation corridors (Fig. 5). As the herd increased it crossed the Denali, Taylor, Glenn, and Richardson highways (Fig. 5). Roads were not a barrier to movement but did permit human access which greatly contributed to overharvest and subsequent decline.

The herd continued to decline after 1972 (Hinman, 1981), and in 1976 protective measures (a hunting closure in 1976 and permit-only hunting since 1977, and a wolf control pro-

gram) were implemented by the Alaska Department of Fish and Game. By 1981 the herd had increased to a full population of 20 730 and was considered to be increasing (Pitcher, 1982). Fall calf percentages have varied from 18% in 1976 to > 20% in subsequent years. Construction of the Trans-Alaska oil pipeline, generally parallel to the Richardson Highway, was underway during the mid-1970s. The pipeline, which bisects herd migration routes, was completed in 1977 during the period of the arrested decline of the Nelchina herd (Fig. 2). The increase in numbers and productivity of the herd which has continued to the present commenced during the actual construction period.

TABLE 1. Trends in population size for the Fortymile caribou herd

Year	Population	Source
1920s	500 000	Murie (1935)
1940s	10 000	Skoog (1956)
1950s	50 000	Davis <i>et al.</i> (1978)
1960s	Decreasing	Davis <i>et al.</i> (1978)
1968	30 000 - 40 000	Skoog (1968)
1972	15 000	LeResche (1975)
1975	4000	Davis <i>et al.</i> (1978)
1981	12 000	Hinman (1981)

Fortymile Herd

Davis *et al.* (1978) have provided a comprehensive review of the population dynamics of the Fortymile herd that is not reviewed here. The herd's numbers have fluctuated greatly in the twentieth century (Table 1). Some authors have implied that hunting along the Steese Highway may have resulted in range abandonment for the Fortymile herd in Alaska (Calef, 1974; LeResche, 1975).

As the herd has increased or decreased, its range has also expanded or contracted (Fig. 6). When the herd declined in the

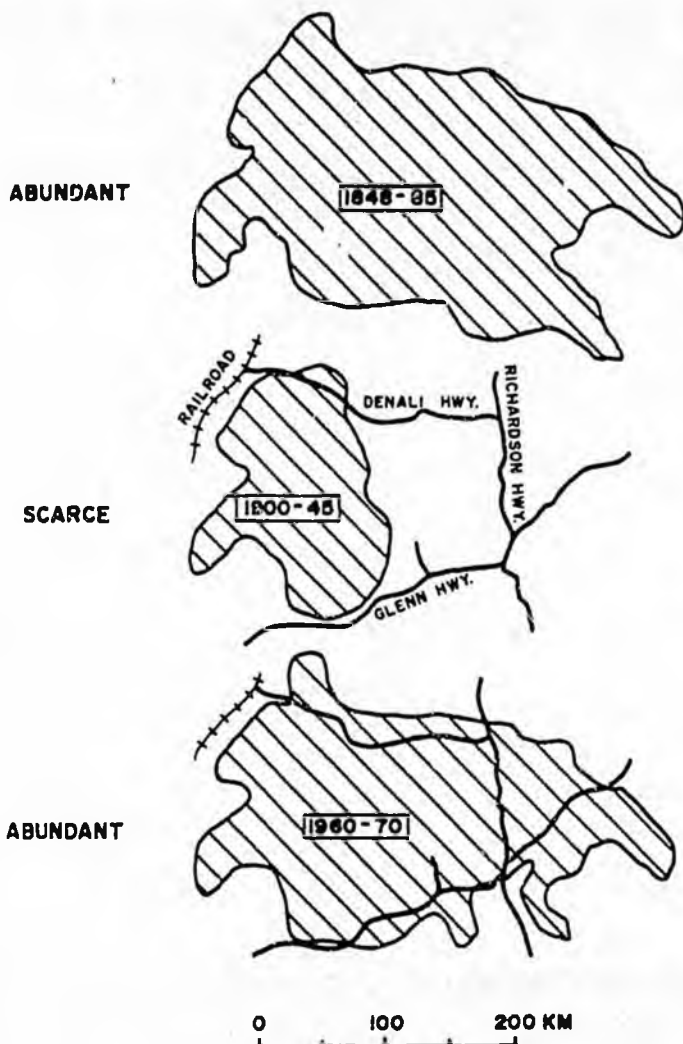


FIG. 5. Comparison of the range used by the Nelchina herd when it was abundant (1848-1885 and 1960-1970) and when it was scarce (1900-1945) (adapted from Hemming, 1975).

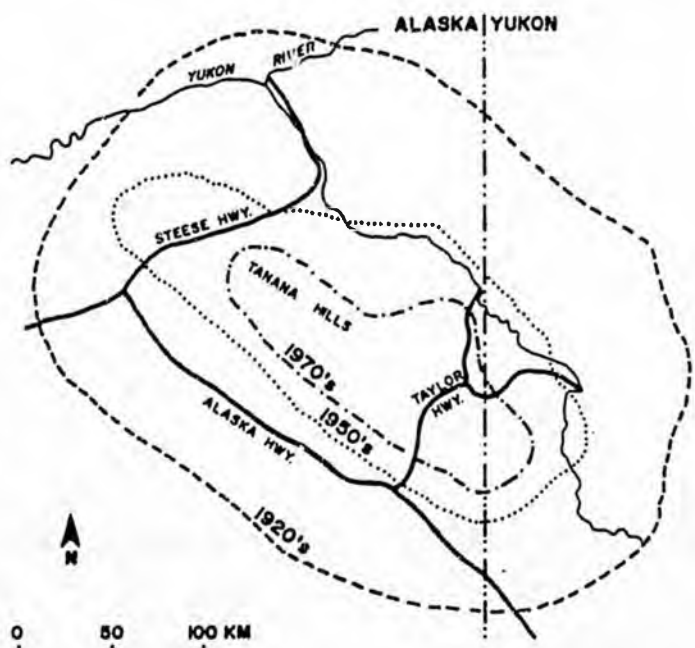


FIG. 6. Distribution of the Fortymile herd between the 1920s and 1970s (adapted from Davis *et al.*, 1978).

1960s and 1970s it stopped crossing the Steese Highway, but continued to cross the Taylor Highway (Davis *et al.*, 1978). The size of overall range of the herd has been positively correlated with abundance (Hemming, 1971; LeResche, 1975; Skoog, 1956; Davis *et al.*, 1978).

Davis *et al.* (1978:ii) concluded their review on limiting factors by stating: "From 1970 through 1972 harvests greatly exceeded the yearling recruitment rate and contributed greatly to the population decline...and...circumstantial evidence... strongly suggest[s] that predation is likely the major factor responsible for the continuous caribou decline since 1960..." We believe that the major impact of the Steese and Taylor highways has been to allow access by hunters, thereby contributing to the overharvest and decline of the herd; no barrier effect or range abandonment has been documented.

Central Arctic Herd

Skoog (1968) described caribou in Alaska's central arctic region prior to 1950 as the "Central Brooks Range herd". Thereafter the herd was thought to have merged with the Western Arctic herd. Child (1973) reviewed available information on caribou in the region and concluded that approximately 3000 caribou summered in the area around Prudhoe Bay in the early 1970s. Roseneau *et al.* (1974) believed that these caribou calved in the region, and referred to them as the Central Arctic herd. Cameron and Whitten (1976) considered these caribou a discrete subpopulation of 4000-6000 animals, characterized by synchronous and uniform north-south movements and fidelity to a calving ground on Alaska's North Slope. Recent calving grounds were subsequently described by Cameron *et al.* (1981). By 1982 the herd had increased to 9000 animals (Whitten and Cameron, 1983) (Fig. 2).

During the early period of development of the Prudhoe Bay oil field and before construction of the Trans-Alaska Pipeline System (TAPS), there were at least 30 000 caribou occupying the current range of the Central Arctic herd (Child, 1973). With the decline of the Western Arctic herd in the early 1970s, the number of caribou in the area declined to 5000 (Cameron and Whitten, 1976). We believe that the Central Arctic herd is a remnant of the Western Arctic herd that roamed the North Slope west of the Canning River in the recent and historic past (Skoog, 1968; Roby, 1978). Continued growth of both herds is likely to result in their integration, and the creation of new patterns of distribution and movement. Since 1976, increased numbers (1200-15 000) of Western Arctic caribou have been observed wintering in the range of the Central Arctic herd (Carruthers, 1983).

Studies of caribou response to the TAPS corridor in this region commenced in 1974 (Cameron and Whitten, 1976; Roby, 1978). The objectives of these studies centered on the postulated barrier and disturbance created by the TAPS and associated haul road and the implications to caribou range use and herd viability and integrity. These studies were initiated along the TAPS corridor (Sagavanirktok River valley) at a time when understanding of overall range use and movements was incomplete and affinities with adjacent herds were not

recognized as important considerations.

Roby (1978), Cameron *et al.* (1979), and Cameron and Whitten (1980) have reported local "abnormalities" in caribou distribution and group composition along the TAPS corridor, which they interpret as avoidance of the corridor. They conclude that this behaviour potentially can reduce the productivity of the herd and may result in "fracturing" of the herd. These effects have not been demonstrated during eight years of research and the consequences appear to be absent based on available demographic data which indicate a healthy, expanding population (Figs. 2, 3; Hinman, 1981; Whitten and Cameron, 1983).

The natural mortality rate is unknown but is considered to be low in view of the low wolf population after 1977 (Cameron and Whitten, 1979). Prior to 1977 wolves were "common" on the range of the Central Arctic herd (Roby, 1978; Cameron and Whitten, 1979). Between 1977 and 1979 "at least three active packs" were reduced to "two to three individuals" by legal and illegal hunting (Cameron and Whitten, 1979:34). Short-yearling recruitment between 1976 and 1978 increased from 16 to 24%, and averaged 22% after 1978 (Fig. 3; Cameron and Whitten, 1983).

Mortality from hunting appears to have been low (<2%) since 1976 (Cameron and Whitten, 1979; Hinman, 1981). Prior to 1976 there were no controls on hunting of the Central Arctic herd and the pre-1976 harvest is unknown (Cameron and Whitten, 1979).

The construction of the Dalton Highway (North Slope Haul Road) began in April 1974 and was completed in September 1974. The 122-cm-diameter Trans-Alaska Pipeline System was constructed parallel to the road and the Sagavanirktok River in 1975 and 1976. A small-diameter natural gas pipeline (buried) was constructed beside the Dalton Highway in 1976 and 1977. During this period hunting was restricted within 8 km of the Dalton Highway.

The Central Arctic herd continued to migrate north and south, parallel to the TAPS and the Dalton Highway, during and after this construction period. Between 1973 and 1982 the herd had increased at an average annual rate of 13%. Productivity in June was high (85 calves/100 cows) (Banfield *et al.*, 1981). Mortality rates probably decreased after 1976 because of legal and illegal wolf hunting, and hunter harvest of caribou is believed to have declined as a result of implementation of controls. The construction and operation of two pipelines and the Dalton Highway through the center of the range of the Central Arctic herd and the proliferation of oil field facilities in the Prudhoe Bay area were not correlated with a negative demographic response by the herd between 1974 and 1982.

At this time the Western Arctic herd, adjacent to the Central Arctic herd, is increasing (Davis and Valkenburg, 1983; Davis *et al.*, 1980). We predict that, as the Western Arctic herd increases, it will expand into the range now occupied by the Central Arctic herd. If that happens it could merge with the Central Arctic herd, with the result that behaviour of the latter herd will no longer be distinct and its current range use may change. We make this prediction now because, if the Central Arctic herd should abandon or alter its range, it would surely

be attributed to human disturbance rather than to the natural spacing shift of a large, mobile population.

British Columbia Herds

Caribou were common in the 1930s in B.C. but declined to low numbers in the 1940s and early 1950s (Bergerud, 1978). This decline coincided with an expansion in numbers and distribution of moose (*Alces alces*) and wolves (Hatter, 1950). Poisoning programs between 1940 and 1963 caused a decline in the wolf population. The caribou population then increased and reached at least 20 000 animals by 1968-1970 (Fig. 2; Bergerud, 1978). The population then declined again; by 1977-78, when many of the herds were censused, the population was down to 10 000 animals. A census of many of these herds in October 1982 indicated a further decline of approximately 50% (Bergerud, unpubl.).

The decline of caribou north of Prince George has been attributed to heavy predation on calves and to overharvest of adults resulting from increased hunter access along new transportation routes (Bergerud, 1978). In 1979 and 1980 young caribou calves were radio-tagged and followed for several months. Predation by wolves and bears was the major cause of mortality (R. Page, pers. comm. 1982).

Several herds were overharvested during the period of declining numbers. For example, the Pink Mountain-Prophet River herd declined from at least 3500 animals in 1969 to possibly only 300-400 animals in 1978. The increased harvest occurred because the Alaska Highway provided hunter access to caribou that came unusually far east, and because hunters travelled seismic lines via snowmobile to reach the animals. Other herds that were obviously overharvested because of increased hunter access included the Telkwa herd, the Tweedsmuir herd, and the Atlin herd (Bergerud, 1978). Helicopters were used to reach the Telkwa herd; the Tweedsmuir herd was accessible from boats travelling up a reservoir created by damming, and access to the Atlin herd was provided primarily by mining roads.

The decline of caribou in central B.C. south of Prince George (Yellowhead herd) was attributed to overhunting and to habitat destruction from logging (Bloomfield, 1980). He included as secondary adverse effects of development: (1) road and habitat barriers to movement; (2) herd displacement; (3) loss of range continuity; (4) increased access; and (5) harassment of caribou. Bloomfield (1980) provided little demographic evidence in support of his view that habitat destruction and harassment *per se* were major factors in the decline. He did not measure reproductive or adult mortality rates, nor did he record animals in poor condition or find starved animals. He found one animal illegally killed.

The Yellowhead Highway and nearby railroad (in the Fraser River valley) are not barriers to caribou movement. The caribou seek both the road and railroad corridors in periods of deep snow. There has been a number of collisions of caribou with trains (K. Child, pers. comm. 1982). The caribou also risk death on the paved highway, which they seek out to escape adjacent deep snow and possibly also to lick salt. The animals

are habituated to the heavy traffic and remain on the paved surface in the presence of traffic (K. Child, pers. comm. 1982). At Kootenay Pass, B.C., animals cross the main highway and use the corridor under the adjacent power line (Johnson and Todd, 1977). Several animals have been killed by vehicles. The animals commonly remain on the side of the road unless approached by people on foot.

Bloomfield (1980:713) also believed harassment was a factor in the decline of the Yellowhead herds: "Harassment can result in diminished growth and reproduction, avoidance or abandonment of critical areas, injury or death." His reference for this generalization was his thesis (Bloomfield, 1979). But during his study he did not measure growth or birth rates, nor did he document avoidance or abandonment of range, or harassment. Such undocumented generalizations, we believe, confound our understanding of caribou behaviour and demography.

The caribou in central and southern B.C. did not decline because of habitat destruction or harassment *per se*. Calf survival is higher for caribou in disturbed central and southern B.C. than in northern B.C. where habitats have not been logged (Figs. 7, 8). In southern and central B.C. the animals commonly make use of arboreal lichens on the branches of freshly cut trees. Ritcey (1980:4), speaking of the decline in central B.C. south of the Yellowhead area, said, "Since productivity has remained high we can only assume that mortality factors not related to nutritional deficiencies are responsible for any possible reduction in numbers."

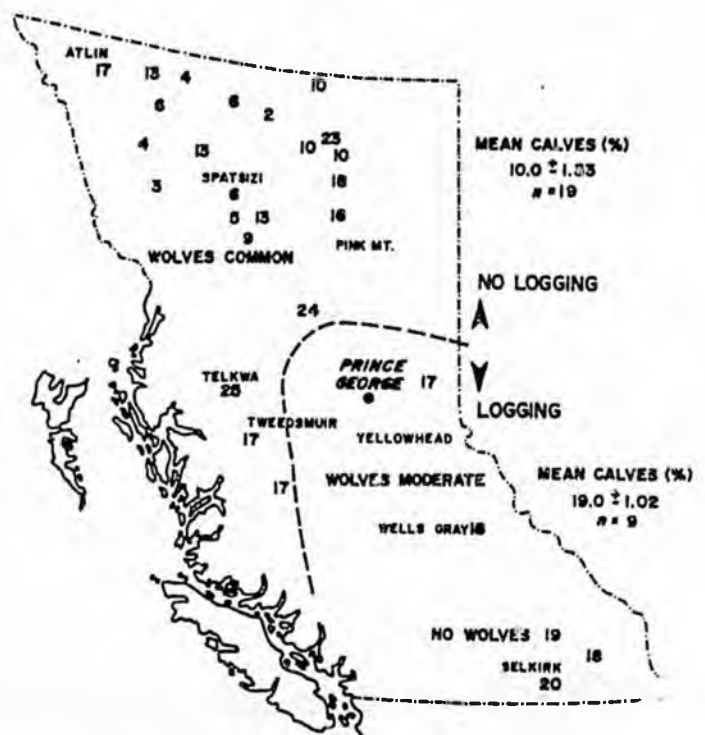


FIG. 7. The location of B.C. caribou herds and the percentage of calves in 1970 and 1977; comparison is between herds in northern British Columbia, where wolves were common and the forest was not logged, vs. those in southern British Columbia, where there were few wolves and much of the forest has been logged (Bergerud, 1978).

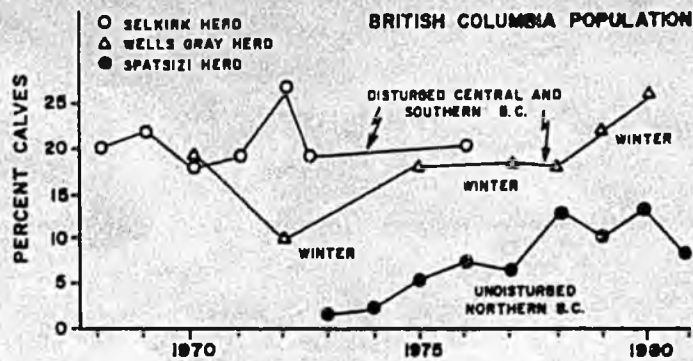


FIG. 8. Percent calves in composition counts: two herds in disturbed central and southern British Columbia vs. one in undisturbed northern British Columbia (Freddy, 1974; Bergerud, 1978).

The mortality factor that precipitated the decline of herds in southern and central B.C. was increased hunting, facilitated by increased access from an expanding network of public and private roads. The decline of the Yellowhead herds was a direct result of hunting and poaching (Fig. 9). Loss of food and cover habitat were not causative factors in the decline.

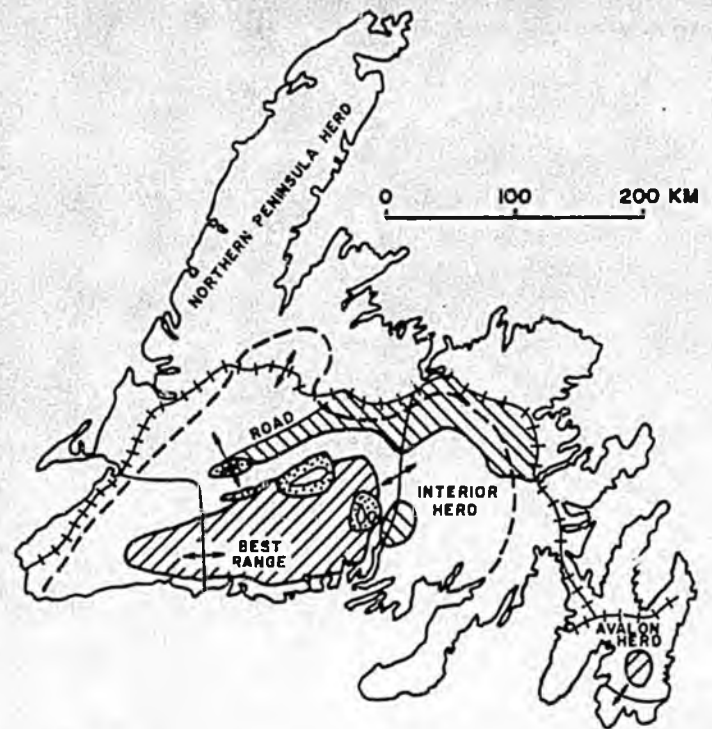


FIG. 10. Distribution and movements of Newfoundland caribou herds (Interior and Avalon) in relation to roads, logging, and flooding.

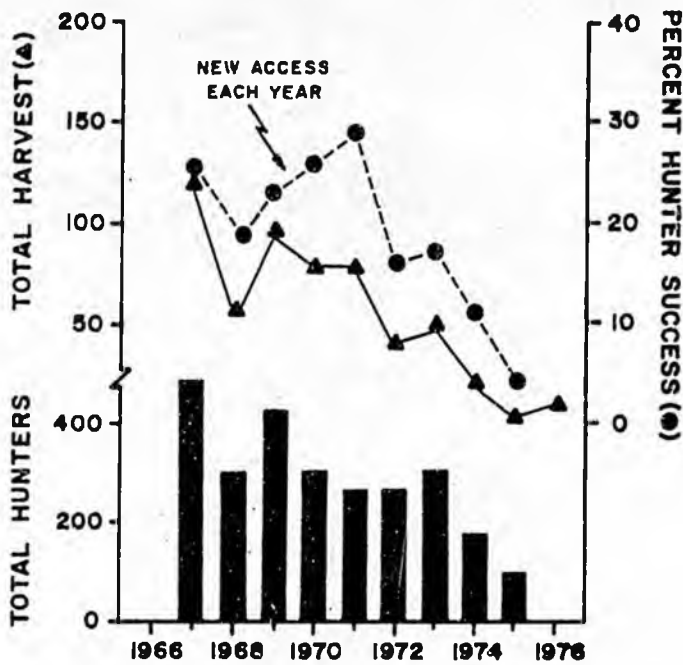


FIG. 9. Decline of the Yellowhead herds based on hunting statistics (Bergerud, 1978).

Newfoundland Herds

The Interior herd of Newfoundland has been exposed to considerable human disturbance. Large areas of former winter range have been flooded since 1970, coincident with the construction of roads and canals. Over 75% of the original forest has been logged (Bergerud, 1971), and the range has been bisected by logging roads and two public highways (Fig. 10). The herd is also the most intensively monitored in North America. Calf percentages are determined in spring, and the herd is counted at intervals. Demographic statistics now span

25 years, from 1956 to 1981, embracing the interval of extensive development.

The caribou in Newfoundland may have numbered 40 000 animals around 1900 (Bergerud, 1971). The Newfoundland railroad was built across the caribou range between 1890 and 1897 (Dugmore, 1913). Caribou from the Northern Peninsula, White Bay Downs, and the White and South Hills historically migrated south to the east of Grand Lake. These herds intersected the railroad near Howley, the Gaff Topsails, and Millertown Junction (Fig. 11). More than 400 hunters (Millais, 1907) massed at these crossings each fall to slaughter the animals. The estimated 15 000 animals in these herds were eliminated by hunting in a period of about 15 years (Bergerud, 1971). Even though these animals met a firing line of hunters (Millais, 1907:102), they continued to cross the railroad until the herd was nearly destroyed.

A Newfoundland herd not discussed in Bergerud (1971), the Topsails herd, now ranges on both sides of the railroad in the area where the Northern Peninsula herd used to migrate south (Fig. 11). This herd numbered less than 300 animals in the

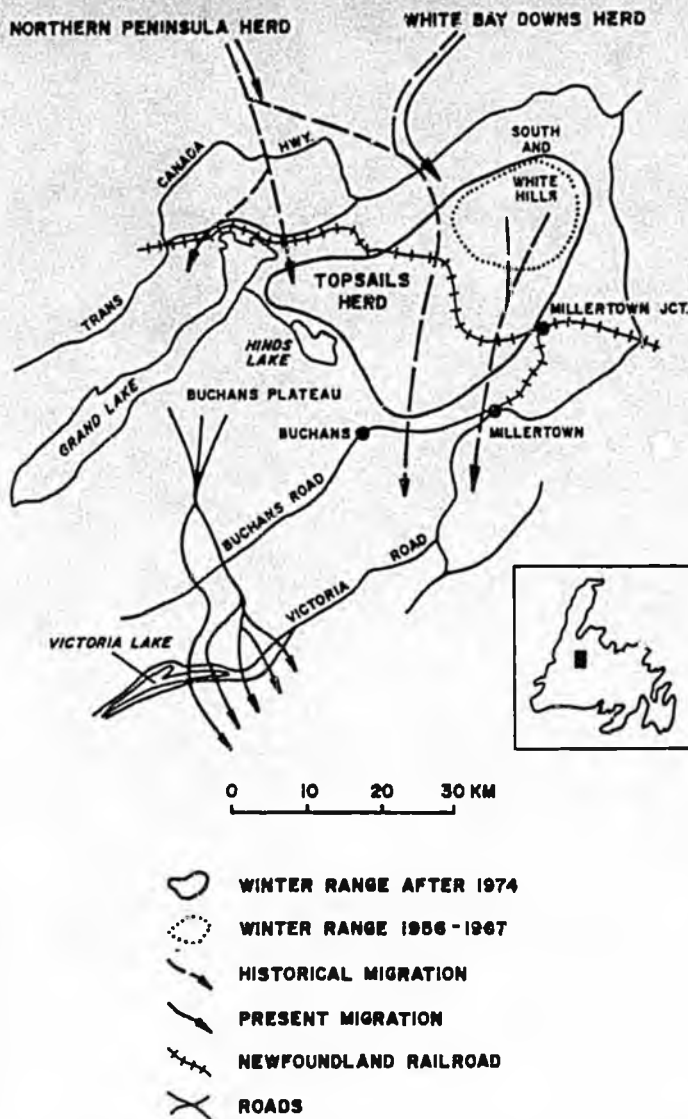


FIG. 11. Migration and distribution of caribou in central Newfoundland in relation to transportation corridors.

1950s and wintered in the White and South Hills. The herd presently consists of 2000 caribou, which freely cross the railroad that bisects their range. The area is open flat tundra and the trains can be seen and heard at great distances.

There are now over 20 000 caribou in the Interior herd (E. Mercer, pers. comm. 1982; Fig. 2), though their numbers are currently limited by illegal hunting (E. Mercer, pers. comm. 1982), which is more prevalent because of the expanded road network and the advent of the snowmachine. Nevertheless, the Interior herd has increased at $r = 0.06$ for the past 15 years (Fig. 2). Calf survival has been high and percent parous females has consistently been $> 80\%$ (Fig. 12). The herd has remained productive, even as its size has tripled and as development has resulted in destruction of lichen ranges, the removal of much of the original timber, and the bridging of the range by public and private roads, hydro lines, and canals.

The Avalon herd of Newfoundland provides a second example of caribou crossing a road as range expansion accompanied a growing population. As the herd increased, from 125 animals in 1956 to 3000 animals in 1979 (Bergerud, 1971; E.

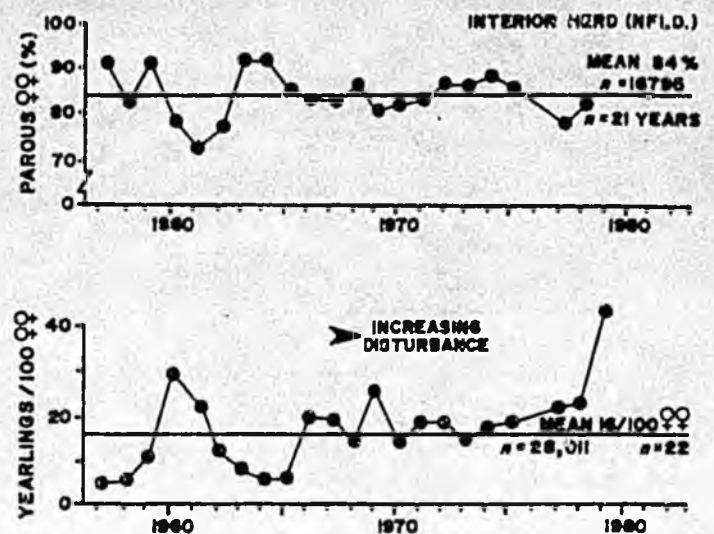


FIG. 12. Counts of yearlings/100 females and percent parous females in June in the Interior herd, Newfoundland (Bergerud, 1971; Fong and Mercer, 1975; Newfoundland Wildlife Files).

Mercer, pers. comm. 1979), it expanded its range south until it encountered a road across the south end of the peninsula (Fig. 10). In July 1978 Bergerud observed hundreds of caribou, mostly females and calves, just north of the road within sight of the fast-moving traffic and accompanying clouds of dust. The animals had habituated to the traffic and could be approached to within 100 m. In the summer of 1980, 500 animals crossed the road and again in 1981 several hundred crossed. The animals in this herd had no tradition of crossing this road and had no experience with other roads.

Kaminuriak Herd

Our intent is to evaluate the impact on the Kaminuriak herd of the Hudson Bay Railroad to Churchill, Manitoba. The railroad was constructed between 1925 and 1931 south of the Churchill River (Fig. 13). Banfield (1980) believed that the Kaminuriak herd increased throughout its range in the early 1940s. Subsequently the herd showed a continuous decline, from 145 000-149 000 animals in the period 1949-1955 to 63 000 animals in 1968 (Fig. 2); Banfield, 1954, 1980; Loughrey, 1955; Parker, 1972). Berger (1977) felt that the barrier effect of the railroad might have contributed to the decline in the herd's population.

The southward movement of the herd has varied through time. Parker (1972), in his review of historical records, concluded that barren-ground caribou were seldom south of the Churchill River before 1900. The distribution observed by Hanbury in 1904 (Parker, 1972) was similar to that documented by Parker in 1966-1968. In both periods the animals were north of the Churchill River.

Two southward penetrations across the Churchill River occurred in the twentieth century, one around 1900 and the other starting about 1935 (Parker, 1972). Lawrie (1948, in Parker, 1972) stated that the first heavy migration along the railroad began in 1935, and that caribou were even more plentiful in 1942. In 1945-46 extended movements brought caribou for the first time in 40 years to God's Lake, Cross Lake, and Oxford

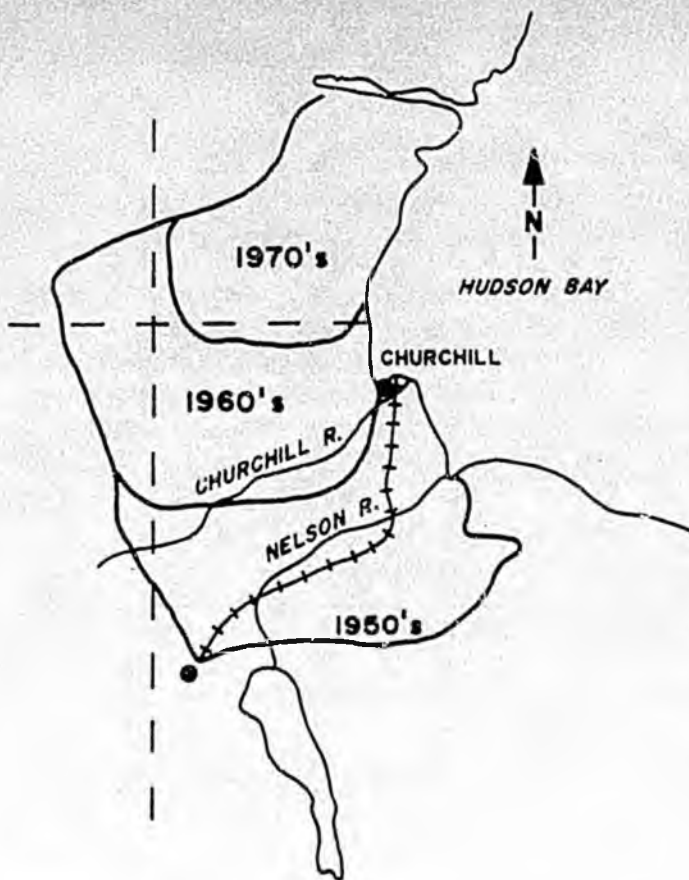


FIG. 13. Distribution of the Kaminuriak caribou herd between the 1950s and 1970s (Simmons *et al.*, 1979).

House. Banfield (1973) documented crossings of the railroad between 1947 and 1953; the migrations ceased after the winter of 1957-58.

Additionally, Parker (1972) concluded that the population increases in the late 1940s resulted in greater penetration southwards. Simmons *et al.* (1979) have provided a distribution map of the herd by decades (Fig. 13). They show that the herd was as far south as the railroad in the 1950s (Fig. 13) and had more northerly range in the 1960s and 1970s. This expansion and contraction of range according to fluctuations in numbers is comparable to that discussed for the Nelchina and Fortymile herds.

In summary, historically the Kaminuriak herd seldom came as far south as the Churchill and Nelson rivers, making only one known crossing prior to 1935. The herd first started crossing the railroad four years after its construction, and the animals continued to cross the corridor as long as the herd was abundant in the 1940s and early 1950s. As the population declined, the herd no longer came as far south as the railroad. The railroad did not act as a barrier; however, it did provide access to the herd in some years, thereby indirectly contributing to a greater kill than would have occurred in its absence. Banfield (1954), who was actually at the crossings in the 1950s, described the crossing as a normal occurrence for many years. The decline of the Kaminuriak herd has resulted from excessive harvests (Banfield, 1954, 1980) coincident with low calf survival due to wolf predation (Parker, 1972; Miller and Broughton, 1974), and possible shifting of part of

the herd (Heard *et al.*, 1981; Donaldson, 1981).

Snøhetta Herd

Klein (1971) reported that construction of a railroad across the wild reindeer range between Knutsho (eastern) and Snøhetta (western) range in Dovrefjell National Park in Norway was a barrier to reindeer migrating between the ranges, and this resulted in extensive deterioration of vegetation on the Snøhetta range. This is the most widely quoted example of a transportation corridor acting as a barrier.

Two of us (RDJ and ATB) visited the Dovrefjell crossing in 1979. We examined the crossing site and discussed it with E. Gaare and T. Skogland who have studied this population over 10 years. They estimated that the herd had contained about 1000 animals in 1900; it had been depleted by overhunting. The herd was subsequently protected, and increased. Most of the animals wintered on the Snøhetta range but a portion of the herd (250) wintered across the valley on the Knutsho range.

The herd subsequently declined. Skogland and Mølmen (1980:134) stated: "During the period 1920-25 it is believed that the reindeer in the area numbered a few hundred. With such small numbers large scale seasonal migrations ceased. During this period (1921) the railroad across Dovrefjell was completed...after this period...migrations ceased entirely."

During the second world war, hunting was limited and the herd increased until it numbered 15 000 by 1960 (4.4 animals $\cdot \text{km}^{-2}$) (Thomson, 1977; Reimers, 1975; Skogland and Mølmen, 1980). In 1956, during a winter with heavy snow, a few hundred animals crossed the railroad and highway and wintered on the Knutsho range. Migration across the railroad has been maintained ever since, with 1/3 of the winter population migrating (Skogland and Mølmen, 1980); these researchers report that most of the crossings take place at night when traffic is lightest. They conclude: "It appears that no type of technical installation poses immediate avoidance reaction as long as it does not physically restrict the animals' presence. The same appears true of access roads. It is the human presence on or nearby the road that induces avoidance reaction" (Skogland and Mølmen, 1980:140).

The obstacles at Dovrefjell include a high board snow-fence with an opening made for the caribou to pass through, a wire fence over which they must jump, the railroad, a major highway used by large trucks, a telephone line, and a river. We have never seen comparable obstacles in North America. Although the migration stopped coincident with railroad construction, now the animals cross not only the railroad but the two fences and the major highway. It is not apparent how the railroad alone could have halted the migration: the supposed cause, the railroad, is still present but the supposed effect of no-migration is absent. The halt in migration was probably a result of a contraction of the range because the herd's numbers were low.

DISTURBANCE THROUGH HARASSMENT

Human harassment of ungulates has been purported to cause death, reduced reproduction, and abandonment of ranges

(Geist, 1978). This hypothesis can be tested for caribou with data from the Interior herd in Newfoundland. In June 1959 and June 1964 ATB severely harassed the females on the Pot Hill calving grounds. Each day females with newly-born calves were hazed by helicopter for prolonged periods to ascertain parous condition and to see if the females would run. All those that did not run had dead calves nearby; those calves that were investigated all had been bitten by lynx (Bergerud, 1971).

TABLE 2. Percent calves (Sept-Oct) and percent parous females at Pot Hill, Newfoundland, compared with percentages for adjacent, undisturbed calving populations. Numbers in parentheses are disturbed populations. (Bergerud, 1971)

Year	Pot Hill		Grey River		Sandy Lake % Calves
	% Calves	% Parous Females	% Calves	% Parous Females	
1958-59	16.0	nd	16.7	92	13.0
1959-60	(20.1)	(77)	nd	80	17.5
1960-61	nd	66	9.9	nd	10.8
1961-62	nd	83	13.0	71	4.4
1962-63	3.3	90	5.7	89	8.5
1963-64	4.3	95	8.9	nd	13.6
1964-65	(6.3)	(96)	9.2	84	12.3
1965-66	nd	93	8.3	79	10.8

This disturbance was severe; the same animals were chased day after day. The calving area of the Pot Hill herd is only 200 km² but the animals did not abandon the area. Calf survival of the 1959 and 1964 cohorts was comparable to survival of cohorts born before 1959 and between 1959 and 1964, and similar to that of calves on two adjacent undisturbed calving grounds (Table 2). Also, the females of the Pot Hill herd were highly productive in 1960 and in 1965, one year after harassment (Table 2). The number of females on the Pot Hill calving ground increased in 1965, the year after the disturbance (Bergerud, 1971). Lynx predation was the major cause of death on all three adjacent calving grounds (Bergerud, 1971).

Another example of extreme disturbance of calving females occurred on Brunette Island, Newfoundland, in 1980. On 29 May seven females were chased by helicopter, and darted and drugged with M-99 (Etorphine). One female had a newborn calf; the other six females gave birth 1 June (n = 2), 2-3 June (n = 1), 7 June (n = 1), 9 June (n = 1), and date unknown (n = 1). None of the darted females abandoned their very localized range, and all were repeatedly seen near where they were drugged (H. Butler, pers. comm. 1980). The physical condition of those seven calves from hazed females was compared to that of four calves from non-hazed mothers in the fall (one calf from a non-hazed dam had died between spring and fall). Comparisons were made of calf antler length, physical size, and general activity level. H. Butler noted no difference between experimental and control groups.

At the other extreme of the gestation period, the Newfoundland Wildlife staff captured several hundred swimming female caribou from the Buchans herd in 1962 and 1963, two to five weeks post-conception. Some animals were pulled into boats and hogtied; others were driven into lakeside traps. Animals were held up to several days in tightly crowded cor-

als. Sixty-two of these females were seen the next spring, and most were accompanied by calves. Pregnancy rates for the herd were higher than in the previous three years (Bergerud, 1971).

In another example, this one in Manitoba in April, Miller *et al.* (1971, 1975) captured migrating gravid females in nets. They reported that 81% (n = 21) of those captured were accompanied by calves in mid-June, compared to 80% (n = 1148) of animals classified on the calving ground at the same time. Similar observations were made in Alaska by Valkenburg *et al.* (1983). They concluded that helicopter chasing, capture, and handling of gravid female caribou in the spring did not affect production or survival. They observed similar calf production between captured (84%, n = 43) and other females (78%, n = 7835) and similar survival rates in the fall (61% for captured vs. 64%, n = 354, for others).

We do not suggest that harassment is either unimportant or acceptable; however, there are data to suggest that caribou and other deer species (Hamlin, 1982) can withstand periodic severe disturbance without adverse effects on productivity and survival. This level of resilience has long been noted in large domestic mammals.

CARIBOU RESPONSES TO LINEAR FEATURES

Numerous authors, in discussing factors governing caribou movement and its orientation, have variously referred to caribou following paths of "least topographic resistance" or "most favourable physiographic features" (Banfield, 1954; Kelsall, 1960, 1968; Skoog, 1968; Miller *et al.*, 1972; Bergerud, 1974b; McCourt *et al.*, 1974). Our observations of migratory movements of caribou herds now suggest a broader concept. During spring migrations, the caribou of the Porcupine herd travel up the axis of the rugged Richardson Mountains; on summer movements they ascend steep slopes in the Brooks, British, and Ogilvie ranges where caribou have been observed at higher elevations than Dall's sheep. Such anomalies may be better explained by the concept that caribou move in response to paths of least *energetic* resistance, consistent with their learned directional orientation. Such a concept explains many discrepancies which are not explained by either topographic or orientation factors alone. This principle also has a direct bearing on understanding reported responses to man-made linear features, obstructions, and barriers, and the associated energetic costs of "deflections" of movements.

Parker (1972) and Kelsall (1968) showed how cows of the Kaminuriak and Beverly herds oriented to calving grounds despite the use of divergent winter ranges. Indeed, they followed a path of least topographic resistance. However, the traditional migration routes of other herds include precipitous mountain terrain and dangerous rivers. Movement traditions and behaviour may be evolutionary adaptations involving factors such as insect harassment, predation, range utilization, and the comparative energetic costs of travelling shorter, more difficult routes vs. longer, easier ones (Jakimchuk, 1980; Reichman and Aitchison, 1981). Movement behaviour probably has both a phylogenetic and an ontogenic origin which

enable caribou to respond to a variable extrinsic environment while maintaining traditions such as those described by Bergerud (1974b) and Skoog (1968).

There are numerous well-documented examples of the "least energetic resistance response". Caribou avoid swimming lakes during summer movements, and they travel single-file in deep snow but fan out where travel is unimpeded. They cross rivers and large lakes at narrow points and follow wind-blown ridgetops, despite steeper topography, when valleys are clogged with snow. This principle is observed in the similar responses of caribou to natural and man-made features encountered in their movements, and may account for much of what has been termed deflection, or paralleling man-made objects in response to disturbance.

As early as 1960 Kelsall (1960) noted that caribou would deflect from their course in order to take advantage of frozen lakes providing easier (less energetic) travel, but would abandon the route if it turned many degrees off their course (traditional orientation). The differential use of seismic lines and winter roads documented by McCourt *et al.* (1974) and Decker (1976) is identical to Kelsall's (1960) description. The associated "deflections" were oriented along the caribou's line of travel, and were not followed if they deviated from the intended travel route (Mccourt *et al.*, 1974; Kelsall, 1960). The energetic benefits derived from behaviour observed in response to natural and man-made linear features may in fact exceed the energetic costs of deflections as calculated by Geist (1975).

Paralleling behaviour appears to be, at least in part, a natural response to find the path of least energetic resistance. In a study of trail systems in northeastern Alaska, LeResche and Linderman (1975:54) found that: "Caribou follow contours in hilly terrain, use gentle slopes and passes, travel in narrow lines in steep areas; *course natural obstacles* [emphasis ours] before crossing them (see also Skoog, 1968); and follow previous caribou trails."

The foregoing examples of "natural deflections" are useful in explaining caribou responses to berms and other linear features in terms of their potential energetic and dislocation impacts. For example, it has always puzzled us that berms are perceived to represent physical barriers when berm-like features (eskers) and steep mountain ranges are commonly encountered in caribou range and are readily traversed by caribou. Thus the paralleling of "apparent obstacle effects" reported by Urquhart (1971, 1972), Surrendi and DeBock (1976), and Hanson (1980) can be explained in a manner which also accounts for apparently different thresholds of response to obstacles.

Hanson (1980) reported a barrier threshold of 1.2 m; Cameron and Whitten (1976) found that caribou crossed the haul road at a mean height of 1.43 m, selecting significantly lower heights over higher sections. Paralleling and selection for lowest crossing points explain the apparent difference in "barrier" thresholds for the same population. During migrations, Kaminuriak caribou unhesitatingly crossed drift fences 1.0–1.5 m high and jumped fences > 2 m high (Miller *et al.*, 1972). The most logical explanation for these observations is

that caribou actively seek the path of "least energetic resistance" rather than respond to physical barriers with a fixed threshold height.

That hypothesis, however, does not explain the "retreat behaviour" reported by Surrendi and DeBock (1976) and Hanson (1980). Retreat from berms or roadways may reflect responses to stimuli other than obstacle height (e.g. hunters, or perception of an earlier route). Control data on normal directional variations in movement are not available from those studies.

DISCUSSION

Human Impacts on Caribou Demography

One can draw conclusions about human impacts on population status by correlation reasoning: numbers changing coincident with disturbance. A more precise method is to measure reproductive or mortality rates and, without knowing their cause, correlate these rates with disturbance. One may attain a higher level of confidence by ascertaining reproductive and mortality rates, their causes, and their impacts on population size. The most sophisticated experimental design is to perturb the system (e.g. by removing wolves) and note *predicted* changes using both experimental and control populations.

Many biologists use correlation reasoning and imply cause-and-effect. Bloomfield (1980) noted that caribou declined coincident with habitat change, and he argued cause-and-effect. The Kaminuriak herd had low calf percentages in the 1970s; some Inuit believe that aerial harassment caused this low productivity. But there were few calves also in 1966–1968 (Parker, 1972), prior to extensive exploration in the north. Therefore, the supposed cause is not necessarily an actual one.

The main fallacy in the correlation argument for cause-and-effect is that other possible causes could have occurred simultaneously with the supposed cause. As the forests were logged in British Columbia, logging roads were built. Declines in caribou could have resulted solely from increased mortality from hunting made possible by improved access, and not from the loss of food and cover resources. Correlation evidence is the springboard to hypothesis testing. If habitat destruction is suspected as the cause, there are verifiable test implications. One might suspect low pregnancy percentages, or poor growth, or one might expect to find starved animals. If these test implications cannot be verified against control populations the hypothesis is not sufficient.

We disagree with Klein's (1980:525) statement: "Historically, fractured *Rangifer* ranges through human development activities have led to range abandonment, herd reduction, or extinction...". He has not documented fractured ranges for North American herds, or the demographic statistics of changes in reproductive or mortality rates that could cause such reductions or extinctions. Alternate explanations for caribou declines — unsatisfactory recruitment resulting from predation, and excessive mortality from hunting — are documented (Banfield, 1954; Kelsall, 1968; Bergerud, 1971, 1974a, 1980; Davis *et al.*, 1978).

Caribou probably can be displaced from ranges by complete

habitat alienation, e.g. by agriculture or by extreme and persistent harassment. However, current industrial development activities in North America are not of this magnitude. Caribou in the Central Arctic herd have increased despite the extensive accumulation of structures and transportation facilities within their range, and the Western Arctic herd is expanding into this same development area.

Again we question Klein's (1980:523) conclusion: "Roads, railroads, pipelines, power lines, artificial or altered water courses or other man-made linear features can, independent of other human activities, block, delay or deflect the movements of caribou and reindeer." Clearly a large-diameter pipeline resting on the ground can be a barrier; however, to date there is no unequivocal example of such effects for a North American caribou herd.

In discussing possible barrier effects, Klein (1980) quoted authorities who lacked firsthand knowledge. For example, he cited Justice Berger (1977) with respect to the possible impacts of the Hudson Bay Railroad on the Kaminuriak herd. Justice Berger had based his opinion on Calef's testimony before the hearing; Calef, in turn, had said he did not know about the barrier effect of the Hudson Bay Railroad but that in Norway a railroad had blocked a migratory crossing. Calef was referring to Klein's (1971) reference to the Dovrefjell crossing.

In this review we have provided a more parsimonious alternative cause for many of the examples of hypothesized effects of barriers presented by Klein (1980). When herds have stopped crossing transportation corridors, it has generally been because numbers have declined and ranges contracted. The evidence shows such contractions to be independent of the presence of transportation corridors. Our explanation depends on the naturally evolved tendency of caribou to alter their movements and range in response to changes in their numbers. It does not require the added assumption and restriction that caribou have evolved behaviour in response to artifacts that were not part of their natural environment. The generalization is that caribou do cross transportation corridors.

We believe that some biologists, in their concern for disturbance at the individual level, may have overlooked the major population regulation factors of hunting and predation. At the First International Reindeer/Caribou Symposium, biologists debated the impacts of pipelines and northern development on caribou, yet the herds in Alaska at the time were declining from predation and overhunting (Davis *et al.*, 1980; Doerr, 1980).

We have reviewed the case histories of eight herds where human impacts on caribou demography have been suspected. One documented impact on caribou was an increase in calf survival following a reduction in wolf populations (also see Davis *et al.*, 1983). Calf survival in the Nelchina, Fortymile (Davis *et al.*, 1978), Central Arctic (Cameron and Whitten, 1979), and British Columbia herds increased following wolf reductions. The second documented impact was increased hunting mortality following improved access from transportation corridors; examples were the Nelchina, Fortymile, and British Columbia herds. The expansion of the Nelchina herd brought it in contact with an already existing road network and

resulted in an overharvest. The Kaminuriak herd was little affected by increased access due to roads but was still overharvested.

The Porcupine herd represents a control population, stable in numbers and productivity and little affected by hunting or by predator management. Completion of the Dempster Highway through its range was accompanied by controls of hunting. This "control" population, exposed to a transportation corridor and to other human activities, has not demonstrated any significant demographic changes in response to these developments. There is no convincing evidence from any of the eight herds investigated that habitat loss or disturbance has adversely altered productivity or adult mortality rates, resulting in declines.

There is ample evidence, however, that hunting (much of which is subsistence hunting by native people), and low calf survival due to predation and other factors, are responsible for caribou declines (Simmons *et al.*, 1979; Bergerud, 1980; Davis *et al.*, 1980; Haber and Walters, 1980; Davis and Valkenburg, 1983).

The unsupported belief that human disturbance may adversely affect caribou has had at least one major repercussion. The Canadian Department of Indian and Northern Affairs has enacted "Caribou Protection Measures" which restrict entry and travel in the vicinity of the calving grounds of the Beverly and Kaminuriak herds between 15 May and 31 July. It is now considerably more difficult for biologists to research questions relative to calving — the key to our understanding of caribou demography. The Northwest Territories government requires that researchers obtain a research permit, and is quite prepared to deny access if native communities near the proposed research area do not give consent. Further, native observers are often required to be hired in major research programs.

These are serious restrictions on free movement in Canada and provide the potential for government interference in research by denying access to large areas of northern Canada. We note that ACUNS (1983) also has concerns in this area and has formed a committee to investigate these restrictions on research. The biological justification of these restrictions relative to the dynamics of caribou populations has not been documented.

Predation as a Factor Influencing Sensitivity to Disturbance

Predation is a "prime mover" in the evolution of behaviour patterns in caribou (*sensu* Wilson, 1975). Natural selection acts against those individuals that respond inappropriately. Predation thus reduces the behaviour repertoire of individuals, i.e., animals are more alike than they would be in the absence of predation. This selection results in animals adapted to avoid predation but does not necessarily improve their adaptation to other components of the environment. The reactions and sensitivity of caribou should be evaluated in the context of survival strategies which caribou have perfected in close association and co-evolution with wolves (Bergerud, 1974b).

Male and female caribou have far different parental in-

vestments because of polygynous breeding. The male's fitness depends on intrasexual competition for females. His role in propagation ceases upon breeding. The female must continue her care until the calf has a reasonable chance of survival or dies. Because of these investment differences females can be expected to be more wary and select more predator-free habitats than males, even at the expense of optimal foraging. Thus, disturbance reactions are greatest on the calving grounds after the birth of the calves; here selection is the harshest culler.

Human activity can upset predator-prey relations. After caribou have habituated to the presence of humans, they may seek human activities because of reduced predator abundance. The caribou from Lake Nipigon, Ontario, winter around the Armstrong airport, probably because of favourable foraging in the absence of predators. Moose may show the same response on Isle Royale (R. Peterson, pers. comm. 1981). When we modify the habitat we may aid wolves in their searching effort — a trail built through caribou escape habitat in Pukaskwa National Park, Ontario, is an example. Small reduced stands of climax forest may attract caribou and act as traps — predators know where to search. Logging-road networks become travel routes for wolves (Bibikov, 1980). Haul roads may be avoided by caribou because of increased predator presence (Roby, 1978). Wolves followed a snowshoe track made by ATB and found caribou that previously had been secure on a mountain refuge surrounded by soft deep snow. Seismic lines provide opportunities for wolf ambush, as do roads in forest valleys. The examples are many and will become more explicit when we know more about the strategies used by both caribou and wolves in their interactions. Human activities can potentially affect caribou indirectly through their alteration of predator-prey systems.

We believe that the major environmental variable that permits caribou to co-exist with predators is space. Caribou need extensive areas so as to space themselves far from denning wolves. Again, space is needed that will provide habitats where caribou have a slight advantage such as mobility. The greater the space the greater the chance for dispersal of caribou, which increases the searching time for wolves. Hufaker's (1958) complex space for fluctuating predator-prey oscillations applies to caribou.

As herds increase they take up more space. The Nelchina, Fortymile, and Newfoundland herds faced hunters in firing lines along transportation corridors but continued to migrate to meet their spatial requirements. However, there must be a point where harassment is so continuous and severe that animals will no longer pass. Such potential barriers must be prevented if caribou are to maintain their populations in natural environments.

Adaptability of Caribou

Caribou are perceived by many as not adaptable to the presence of humans. Yet caribou are one of the few large mammals man has been able to domesticate. One basis for this misconception is their unwary behaviour. Caribou escape strategies, i.e. detecting motion, grouping up, and standing

ground or approaching and verifying, which are successful for natural predators, are ill-adapted to men with firearms.

Caribou are as adapted as other North American ungulates to man's presence. When caribou are captured and placed in holding pens they become calm within hours. Moose captured in Newfoundland remained in a state of panic and many died in captivity (Pimlott and Carberry, 1958). Recently ATB placed wild adult caribou in a game farm and within two weeks they could be approached to within 10 m. Within two months the animals would enter a shed and stand on a scale for weighing. The large herds of caribou feeding along the highway on the Avalon Peninsula, along the TAPS corridor, and along the Dempster Highway are comparable to the herds of habituated pronghorn antelope (*Antilocapra americana*) on the Great Plains, which feed beyond rifle range. Caribou, like pronghorns, also crawl under fences (Miller *et al.*, 1972). Caribou wintering at Armstrong, Ontario, may be avoiding predators as are mule deer (*Odocoileus hemionus hemionus*) that visit downtown Waterton, Alberta (Geist, 1980). Caribou may be found on the highway near McBride, B.C., as are road-wise elk (*Cervus canadensis*) in Banff and Jasper National Parks. Caribou learn that chainsaws signal availability of arboreal lichens, just as black-tailed deer (*Odocoileus hemionus columbianus*) approach felled trees to gain access to browse. The sight of caribou standing on the railroad or stopping the Churchill Express recalls the migration of buffalo (*Bison bison bison*) in the past.

But, adaptable as the caribou is, it still has the same problems as the buffalo — overharvest and the need for space. Our conclusion is that caribou can tolerate and adapt to the presence of man if we will permit them to live by not overharvesting. Caribou will cross major transportation corridors and physical obstructions to maintain their space, but there is probably some upper limit to their tenacity. We must not permit the dissection of caribou populations into small discrete units so that they lose their ultimate adaptation — mobility, to seek space to cope with an ever-changing extrinsic environment.

REFERENCES

- ACUNS Report. 1983. Northern research regulation. Northline 3(2):2. Ottawa: Association of Canadian Universities for Northern Studies.
- BANFIELD, A.W.F. 1954. Preliminary Investigation of the Barren-Ground Caribou. Part I. Former and present distribution and status. Wildlife Management Bulletin Series 1, No. 10A. Canadian Department of Northern Affairs and National Resources. 79 p.
- _____. 1973. Effects of a Railroad to the Arctic on Northern Wildlife. Canadian Wildlife Service, Ottawa. 30 p.
- _____. 1980. Notes on caribou distribution, abundance and use in the Northwest Territories, 1933-1949. In: Banfield, A.W.F. and Jakimchuk, R.D. (eds.). Analyses of the Characteristics and Behaviour of Barren-Ground Caribou in Canada. Polar Gas Project, Toronto. 48 p.
- _____, JAKIMCHUK, R.D. and CAMERON, R.D. 1981. An Assessment of Issues Concerning Caribou and North Slope Petroleum Development. Caribou Advisory Panel Final Report. ARCO Alaska Inc. 36 p.
- BENTE, P.J. and ROSENEAU, D.G. 1978. An Aerial Photo-Estimate of the 1977 Porcupine Caribou Herd Population. Renewable Resources Consulting Services Ltd., Sidney, B.C. 84 p.
- BERGER, T.R. 1977. Northern Frontier, Northern Homeland. The Report of the Mackenzie Valley Pipeline Inquiry, Vol. 1. Ottawa: Ministry of Supply and Services. 213 p.

- BERGERUD, A.T. 1971. The Population Dynamics of Newfoundland Caribou. *Wildlife Monographs* 25: 55 p.
- _____. 1974a. Decline of caribou in North America following settlement. *Journal of Wildlife Management* 38(4):757-770.
- _____. 1974b. The role of the environment in the aggregation, movement, and disturbance behaviour of caribou. In: Geist, V. and Walther, F. (eds.). *The Behaviour of Ungulates and Its Relationship to Management*. Morges, Switzerland: IUCN Publications, New Series No. 24. 552-584.
- _____. 1978. The Status and Management of Caribou in British Columbia. B.C. Fish and Wildlife Branch Report. 150 p.
- _____. 1980. A review of the population dynamics of caribou and wild reindeer in North America. In: Reimers, E., Gaare, E. and Skjenneberg, S. (eds.). *Proceedings, Second Reindeer/Caribou Symposium*. Trondheim, Norway: Direktoratet For Vilt Og Ferskvannsfisk. 556-581.
- BIBIKOV, D.I. 1980. Wolves in the U.S.S.R. *Natural History* 89(6):58-62.
- BLOOMFIELD, M.I. 1979. The Ecology and Status of Mountain Caribou and Caribou Range in Central British Columbia. M.Sc. thesis, University of Alberta, Edmonton. 318 p.
- _____. 1980. The impact of development, settlement and associated activities on mountain caribou in Central British Columbia, Canada. In: Reimers, E., Gaare, E. and Skjenneberg, S. (eds.). *Proceedings, Second International Reindeer/Caribou Symposium*. Trondheim, Norway: Direktoratet For Vilt Og Ferskvannsfisk. 705-715.
- BOS, G.N. 1974. Nelchina and Mentasta Caribou Reports. Alaska Department of Fish and Game, Pittman Robertson Project W-17-5 and W-17-6. 34 p.
- _____. 1975. A partial analysis of the current population status of the Nelchina caribou herd. In: Luick, J.R., Lent, P.C., Klein, D.R. and White, R.G. (eds.). *Proceedings, First International Reindeer and Caribou Symposium*. Biological Papers of the University of Alaska, Special Report No. 1. 170-180.
- CALEF, G.W. 1974. The predicted impact of the Canadian Arctic Gas pipeline project on the Porcupine caribou herd. In: *Environmental Impact Assessment of the Portion of the Mackenzie Gas Pipeline from Alaska to Alberta*. Winnipeg, Manitoba: Research Reports, Vol. 4. Environmental Protection Board. 101-120.
- _____. 1975. Population status of caribou in the Northwest Territories. In: Klein, D.R. and White, R.G. (eds.). *Parameters of Caribou Population Ecology in Alaska*. Biological Papers of the University of Alaska, Special Report No. 3. 9-16.
- CAMERON, R.D. and WHITTEN, K.R. 1976. First Interim Report of the Effects of the Trans-Alaska Pipeline on Caribou Movements. Special Report No. 2, Joint State/Federal Fish & Wildlife Advisory Team, Alaska. 53 p.
- _____. 1979. Effects of the Trans-Alaska Pipeline on Caribou Movements. Alaska Department of Fish and Game. Pittman Robertson Project W-17-10 and W-17-11, Progress Report Vol. IV. 36 p.
- _____. 1980. Influence of the Trans-Alaska Pipeline corridor on the local distribution of caribou. In: Reimers, E., Gaare, E. and Skjenneberg, S. (eds.). *Proceedings, Second International Reindeer/Caribou Symposium*. Trondheim, Norway: Direktoratet For Vilt Og Ferskvannsfisk. 475-484.
- _____. and SMITH, W.T. 1981. Distribution and Movements of Caribou in Relation to the Kuparuk Development Area. Alaska Department of Fish and Game, Third Interim Report. 37 p.
- _____. and ROBY, D.D. 1979. Caribou distribution and group composition associated with construction of the Trans-Alaska Pipeline. *Canadian Field-Naturalist* 93(2):155-162.
- CARRUTHERS, D.R. 1983. Overlap of Central and Western Arctic caribou within the current range of the Central Arctic caribou herd. Prepared for ARCO Alaska Inc. by Renewable Resources Consulting Services Ltd., Sidney, B.C. 20 p.
- CHILD, K.N. 1973. The Reactions of Barren-Ground Caribou (*Rangifer tarandus granti*) to Simulated Pipeline and Pipeline Crossing Structures at Prudhoe Bay, Alaska. Completion Report, Alaska Cooperative Wildlife Research Unit, University of Alaska, Fairbanks. 51 p.
- DAVIS, J.L., SHIDELER, R. and LeRESCHKE, R.E. 1978. Fortymile Caribou Herd Studies. Alaska Department of Fish and Game, Pittman Robertson Projects W-17-6 and W-17-7, Final Report. 153 p.
- DAVIS, J.L. and VALKENBURG, P. 1983. Qualitative and Quantitative Aspects of Natural Mortality of the Western Arctic Caribou Herd. Alaska Department of Fish and Game, Pittman Robertson Project W-22-1, Progress Report. 15 p.
- _____. and BOERTJE, R.D. 1983. Demography and limiting factors of Alaska's Delta caribou herd, 1954-1981. *Proceedings, Third International Reindeer/Caribou Symposium*. Acta Zoologica Fennica 175:135-137.
- DAVIS, J.L., VALKENBURG, P. and REYNOLDS, H.V. 1980. Population dynamics of Alaska's Western Arctic caribou herd. In: Reimers, E., Gaare, E. and Skjenneberg, S. (eds.). *Proceedings, Second International Reindeer/Caribou Symposium*. Trondheim, Norway: Direktoratet For Vilt Og Ferskvannsfisk. 595-604.
- DECKER, R. 1976. Bluenose Caribou Herd: Aerial Surveillance of the Spring Migration, 1976. Northwest Territories Wildlife Service Report. 27 p.
- DOERR, J.G. 1980. Modeling the population decline of two Alaskan caribou herds. In: Reimers, E., Gaare, E. and Skjenneberg, S. (eds.). *Proceedings, Second International Reindeer/Caribou Symposium*. Trondheim, Norway: Direktoratet For Vilt Og Ferskvannsfisk. 611-623.
- DONALDSON, J. 1981. Population and Recruitment Estimates for the Lorillard and Wager Caribou Herds in 1977. Department of Indian and Northern Affairs, Environmental Social Program, ESCOM Report No. A1-43. 50 p.
- DUGMORE, A.A.R. 1913. *The Romance of the Newfoundland Caribou*. Philadelphia, PA: J.P. Lippincott Co. 186 p.
- FONG, D. and MERCER, E. 1975. Newfoundland Caribou Classification Data 1964-74. Wildlife Division Report 75C-1A. 47 p.
- FREDDY, D.J. 1974. Status and Management of the Selkirk Caribou Herd, 1973. M.Sc. thesis, University of Idaho, Moscow, Idaho. 1132 p.
- GEIST, V. 1975. Harassment of large mammals and birds with a critique of the research submitted by Arctic Gas Study Ltd. Report to the Berger Commission, Faculty of Environmental Design, University of Calgary.
- _____. 1978. Behaviour. In: Schmidt, J.L. and Gilbert, D.L. (eds.). *Big Game of North America. Ecology and Management*. Harrisburg, PA: Stackpole Press. 283-296.
- _____. 1980. Downtown deer. *Natural History* 89(3):56-64.
- HABER, G.C. and WALTERS, C.J. 1980. Dynamics of the Alaska-Yukon caribou herds and management implications. In: Reimers, E., Gaare, E. and Skjenneberg, S. (eds.). *Proceedings, Second International Reindeer/Caribou Symposium*. Trondheim, Norway: Direktoratet For Vilt Og Ferskvannsfisk. 645-663.
- HAMLIN, K.L. 1982. Effect of capture and marking on fawn production in deer. *Journal of Wildlife Management* 46(4):1086-1089.
- HANSON, W.C. 1980. Caribou-pipeline encounters in northern Alaska. Draft Report, Ecological Science Department, Battelle Institute, Pacific Northwest Laboratory, Richland, WA, U.S.A.
- HATTER, J. 1950. The Moose of Central British Columbia. Ph.D. thesis, Washington State College, Pullman, WA. 365 p.
- HAWKINS, R. and CALEF, G.W. 1977. A population estimate for the Kaminiariak herd in 1976. Northwest Territories Fish and Wildlife Service. Unpublished report [Available from Wildlife Service, Government of Northwest Territories, Yellowknife, N.W.T., Canada X1A 2L9.]
- HEARD, D.C., CALEF, G.W. and COOPER, S. 1981. Numbers, Distribution and Productivity of Caribou in northeastern Keewatin, N.W.T. in 1976. Department of Indian and Northern Affairs, Environmental Social Program, ESCOM Report No. A1-39. 27 p.
- HEMMING, J.E. 1971. The Distribution and Movement Patterns of Caribou in Alaska. Alaska Department of Fish and Game, Technical Bulletin No. 1. 60 p.
- _____. 1975. Population growth and movement patterns of the Nelchina caribou herd. In: Luick, J.R., Lent, P.C., Klein, D.R. and White, R.G. (eds.). *Proceedings, First International Reindeer and Caribou Symposium*. Biological Papers of the University of Alaska, Special Report No. 1. 162-169.
- HINMAN, R.A. (ed.). 1981. Annual Report of Survey - Inventory Activities. Part II. Caribou, moose and mountain goats. Alaska Department of Fish and Game, Pittman Robertson Projects W-19-1 and W-19-2. Vol XII. 224 p.
- HUFFAKER, C.B. 1958. Experimental studies on predation: dispersion factors and predator-prey oscillations. *Hilgardia* 27:343-383.
- JAKIMCHUK, R.D. 1978. Biology and public forums: the Mackenzie Valley example. Symposium on Biology, Science Policy and the Public. Alberta Society of Professional Biologists, Edmonton, Alberta. 15 p.
- _____. 1980. Disturbance to barren-ground caribou: a review of the effects and implications of human developments and activities. In: Banfield, A.W.F. and Jakimchuk, R.D. (eds.). *Analyses of the Characteristics and*

- Behaviour of Barren-Ground Caribou in Canada. Polar Gas Project, Toronto. 140 p.
- _____, DeBOCK, E.A., RUSSELL, H.J. and SEMENCHUK, G.P. 1974. A Study of the Porcupine Caribou Herd. Renewable Resources Consulting Services Ltd. Canadian Arctic Gas Study Ltd. Biological Report Series, Vol. 4:1-111.
- JOHNSON, D.R. and TODD, M.C. 1977. Summer use of a highway crossing by mountain caribou. *Canadian Field-Naturalist* 91(3):312-314.
- KELSALL, J.P. 1960. Co-operative Studies of Barren-Ground Caribou 1957-1958. *Wildlife Management Bulletin Series* 1, No. 15. 145 p.
- _____. 1968. The Migratory Barren-Ground Caribou in Canada. *Canadian Wildlife Service Monograph No. 3*. Ottawa: Queen's Printer. 340 p.
- KLEIN, D.R. 1971. Reaction of reindeer to obstructions and disturbance. *Science* 173:343-398.
- _____. 1973. Reaction of Wildlife to Aircraft Disturbance. Alaska Cooperative Wildlife Research Unit, University of Alaska, Fairbanks. *Quarterly Report* 25(1):18-23.
- _____. 1980. Reaction of caribou and reindeer to obstructions — a reassessment. In: Reimers, E., Gaare, E. and Skjenneberg, S. (eds.). *Proceedings, Second International Reindeer/Caribou Symposium*. Trondheim, Norway: Direktoratet For Vilt Og Ferskvannsfisk. 519-527.
- LAWRIE, A.H. 1948. Cited in Parker, G.R. 1972. Barren-Ground Caribou Survey, Keewatin. *Canadian Wildlife Service Report C.873*. Unpublished manuscript.
- LENTFER, J. 1965. Caribou Report. Alaska Department of Fish and Game, Pittmann Robertson Projects W-6-R-5 and W-6-R-6, Juneau. 20 p.
- LeRESCHÉ, R.E. 1975. The international herds: present knowledge of the Forty-mile and Porcupine caribou herds. In: Luick, J.R., Lent, P.C., Klein, D.R. and White, R.G. (eds.). *Proceedings, First International Reindeer and Caribou Symposium*. Biological Papers of the University of Alaska, Special Report No. 1. 127-139.
- _____ and LINDERMAN, S.A. 1975. Caribou trail systems in northeast Alaska. *Arctic* 28(1):54-61.
- LOUGHREY, A.G. 1955. Manitoba and Keewatin Barren-Ground Resurvey, 1955. *Canadian Wildlife Service Report C.52*. Unpublished manuscript. 51 p.
- MARTELL, A.M. and RUSSELL, D.E. 1983. Mortality rate in the Porcupine caribou herd. *Proceedings, Third International Reindeer/Caribou Symposium*. *Acta Zoologica Fennica* 175:139-140.
- McCOURT, K.H. and HORSTMAN, L.P. 1974. The reaction of barren-ground caribou to aircraft. In: Jakimchuk, R.D. (ed.). *The Reaction of Some Mammals to Aircraft and Compressor Station Noise Disturbance*. Renewable Resources Consulting Services Ltd. Canadian Arctic Gas Study Ltd. Biological Report Series, Vol. 23:1-36.
- McCOURT, K.H., FEIST, J.D., DOLL, D. and RUSSELL, J.J. 1974. Disturbance Studies of Caribou and Other Mammals in the Yukon and Alaska, 1972. Renewable Resources Consulting Services Ltd. Canadian Arctic Gas Study Ltd. Biological Report Series, Vol. 5:1-245.
- McLROY, C. 1976. Moose survey — inventory progress report — 1974. Game management units 11 and 13. In: McKnight, D.E. (ed.). *Annual Report of Survey — Inventory Activities*. Part II. Moose. Alaska Department of Fish and Game, Pittmann Robertson Project W-17-7. 187 p.
- MILLAIS, J.G. 1907. *Newfoundland and Its Untrodden Ways*. London: Longmans, Green and Co. 340 p.
- MILLER, F.L., ANDERKA, F.W., VITHAYAS, C. and McCLURE, R.L. 1975. Distribution, movements and socialization of barren-ground caribou radio tracked on their calving and post-calving areas. In: Luick, J.R., Lent, P.C., Klein, D.R. and White, R.G. (eds.). *Proceedings, First International Reindeer and Caribou Symposium*. Biological Papers of the University of Alaska, Special Report No. 1. 423-435.
- MILLER, F.L., BEHRAND, D.F. and TESSIER, G.D. 1971. Live capture of barren-ground caribou with tangle nets. *Transactions of the Northeastern Section of the Wildlife Society* 28:83-90.
- MILLER, F.L. and BROUGHTON, E. 1974. Calf Mortality on the Calving Ground of Kaminuriak Caribou. *Canadian Wildlife Service Report Series No. 26*. 25 p.
- MILLER, F.L. and GUNN, A. 1979. Responses of Peary Caribou and Muskoxen to Helicopter Harassment. *Canadian Wildlife Service Occasional Paper No. 40*. 88 p.
- MILLER, F.L., JONKEL, C.J. and TESSIER, G.D. 1972. Group cohesion and leadership responses by barren-ground caribou to man-made barriers. *Arctic* 25:193-202.
- MURIE, O.J. 1935. Alaska-Yukon Caribou. *North American Fauna Series No. 54*. Washington, D.C.: U.S. Department of Agriculture. 93 p.
- PARKER, G.R. 1972. Biology of the Kaminuriak Population of Barren-Ground Caribou. Part I. Total numbers, mortality, recruitment and seasonal distribution. *Canadian Wildlife Service Report Series No. 20*. 95 p.
- PIMLOTT, D.H. and CARBERRY, W.J. 1958. North American moose transplantations and handling techniques. *Journal of Wildlife Management* 22(1):51-62.
- PITCHER, K.W. 1982. Big Game Studies. Volume IV. Caribou. Alaska Department of Fish and Game, Susitna Hydro-Electric Project, Phase I, Final Report. 101 p.
- RAUSCH, R.A. 1967. Some aspects of the population ecology of wolves. *American Zoologist* 7:253-265.
- REICHMAN, O.J. and AITCHISON, S. 1981. Mammal trails on mountain slopes: optimal paths in relation to slope angle and body weight. *American Naturalist* 117:416-420.
- REIMERS, E. 1975. Age and sex structure in a hunted population of reindeer in Norway. In: Luick, J.R., Lent, P.C., Klein, D.R. and White, R.G. (eds.). *Proceedings, First International Reindeer and Caribou Symposium*. Biological Papers of the University of Alaska, Special Report No. 1. 181-188.
- RITCEY, R.W. 1980. Summer caribou census. Fish and Wildlife Branch, Kamloops, B.C. Unpublished report. 7 p. [Available from B.C. Fish and Wildlife Branch.]
- ROBY, D.D. 1978. Behavioral Patterns of Barren-Ground Caribou of the Central Arctic Herd Adjacent to the Trans-Alaska Oil Pipeline. M.Sc. thesis, University of Alaska, Fairbanks. 250 p.
- ROSENEAU, D.G. and STERN, P.M. 1974. Distribution and Movements of the Porcupine Caribou Herd in Northeastern Alaska, 1972. Renewable Resources Consulting Services Ltd. Canadian Arctic Gas Study Ltd. Biological Report Series, Vol. 7:1-209.
- _____ and WARBELOW, C. 1974. Distribution and movements of the Porcupine caribou herd in northeastern Alaska. In: McCourt, K.H. and Horstman, L.P. (eds.). *Studies of Large Mammal Populations in Northern Alaska, Yukon and Northwest Territories, 1973*. Renewable Resources Consulting Services Ltd. Canadian Arctic Gas Study Ltd. Biological Report Series Vol. 22:1-197.
- SHANK, C.C. 1979. Human-Related Disturbance to Northern Large Mammals: A Bibliography and Review. Foothills Pipe Lines (South Yukon) Ltd. 254 p.
- SIMMONS, N.M., HEARD, D.C. and CALEF, G.W. 1979. Inter-jurisdictional management problems: Kaminuriak caribou herd. *Transactions of the North American Wildlife Conference* 44:102-113.
- SKOGLAND, T. and MØLMEN, Ø. 1980. Prehistoric and present habitat distribution of wild mountain reindeer at Dovrefjell. In: Reimers, E., Gaare, E. and Skjenneberg, S. (eds.). *Proceedings, Second International Reindeer/Caribou Symposium*. Trondheim, Norway: Direktoratet For Vilt Og Ferskvannsfisk. 130-141.
- SKOOG, R.O. 1956. Range, Movements, Population and Food Habits of the Steese-Fortymile Caribou Herd. M.Sc. thesis, University of Alaska, Fairbanks. 145 p.
- _____. 1968. Ecology of the Caribou (*Rangifer tarandus granti*) in Alaska. Ph.D. thesis, University of California, Berkeley. 699 p.
- SOPUCK, L.G., TULL, C.E., GREEN, J.E. and SALTER, R.E. 1979. Impacts of Development on Wildlife: A Review from the Perspective of the Cold Lake Project. Prepared by LGL Ltd., Calgary, for Esso Resources Canada Ltd. 40 p.
- SURRENDI, D.C. and DeBOCK, E.A. 1976. Seasonal Distribution, Population Status and Behaviour of the Porcupine Caribou Herd. *Canadian Wildlife Service Report to Mackenzie Valley Pipeline investigation*. 145 p.
- THOMSON, B.R. 1977. The Behaviour of Wild Reindeer in Norway. Ph.D. thesis, University of Edinburgh, Edinburgh, Scotland. 428 p.
- URQUHART, D.R. 1971. Caribou Distribution and Behaviour in Relation to a Seismic Grid. Game Management Division, Northwest Territories Government, Progress Report No. 2. 15 p.
- _____. 1972. Oil Exploration and Banks Island Wildlife. Game Management Division, Northwest Territories Government. 105 p.
- VALKENBURG, P., BOERTJE, R.D. and DAVIS, J.L. 1983. Effects of darting and netting on caribou in Alaska. *Journal of Wildlife Management* 47(4):1233-1237.

- WATSON, G.W. and SCOTT, R.F. 1956. Aerial censusing of the Nelchina caribou herd. Transactions of the North American Wildlife Conference 2:499-510.
- WHITTEN, K.R. and CAMERON, R.D. 1983. Population dynamics of the Central Arctic Herd, 1975-1981. Proceedings, Third International Reindeer/Caribou Symposium. Acta Zoologica Fennica 175:159-161.
- WILSON, E.O. 1975. Sociobiology. Cambridge, MA: Belknap Press of Harvard University. 697 p.

ANWR

THE NORTHERN LINE

"Behind is a forest that goes to the Arctic ...
And here we must draw our line."

Gary Snyder



The journal of the Northern Alaska Environmental Center

Volume VIII, No. 6, December 1986

Action Alert: Oil lease proposal threatens Arctic National Wildlife Refuge

Director's note: This special edition of the Northern Line is designed to encourage public comment on the fate of the Arctic National Wildlife Refuge coastal plain. The issue includes an overview of the refuge, facts about the coastal plain, and detailed information on the contents of the draft 1002 Report. Please take a moment to read through this information and voice your concerns.

YOUR INPUT WILL MAKE A DIFFERENCE.

The Arctic National Wildlife Refuge is our nation's most northern unit of the National Wildlife Refuge System. No other refuge or park encompasses such a continuum of undisturbed, biologically intact, Arctic and Subarctic habitats—from the interior boreal forest and the central Brooks Range, to the coastal plain bordering the Arctic Ocean. No other area protects habitat for so many healthy populations of national interest species, including grizzly and polar bear, caribou, muskox, Dall sheep, wolf, wolverine, peregrine falcon and gyrfalcon. The annual migration of the 180,000 member Porcupine Caribou Herd between the Arctic Refuge and adjacent areas of Canada is considered by many to be the most spectacular wildlife phenomenon on American and Canadian soil.

When the Arctic National Wildlife Range was established in 1960, the action was seen as the culmination of extensive preservation efforts begun more than a decade earlier. In 1980, Congress passed the Alaska National Interest Lands Conservation Act (ANILCA) which increased the size of the range to 19 million acres and renamed it the Arctic National Wildlife Refuge. Eight million acres of the original wildlife range was designated as wilderness. Twice the House of Representatives voted overwhelmingly to designate the coastal plain, the 1.5 million acres wedged between the Brooks Range and the Beaufort Sea, as wilderness. In the Senate version of the Alaska Lands Act, which finally became law, the coastal plain wilderness was deleted.

In its place, ANILCA called for an assessment of the fish and wildlife resources, and the oil and gas potential of the coastal plain. This provision of the law also required the Secretary of the Interior to assess the likely impact of oil and gas development on refuge values and submit a report and recommendation to Congress. This report, required by Section 1002(h) of ANILCA, (hence the name ten-o-two), is now out for public comment before being finalized and submitted to Congress. It is important to keep in mind that

Section 1003 of ANILCA prohibits further oil exploration and development in the coastal plain unless Congress passes specific legislation to open the area for such use.

When the draft 1002 Report was finally released in November 1986, it recommended that the entire coastal plain be opened up for full oil and gas leasing. The nation is being given a clear choice: preserve intact the unique ecosystem that is the Arctic Refuge, or hack off a crucial chunk of it for environmentally destructive resource development.

Full oil and gas leasing of the Arctic Refuge coastal plain will completely subvert the purposes for which the refuge was established, which include: a) to conserve fish and wildlife populations and habitats in their natural diversity, b) to fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats; c) to provide the opportunity for continued subsistence uses by local residents, and; d) to ensure, to the maximum extent practicable, water quality and necessary water quantity within the refuge. This basic mandate for management of the refuge should be kept in mind when reviewing the recommendations of the draft 1002 Report.



The foothills of the Brooks Range at the edge of the Arctic Refuge coastal plain.

ing that GM will include them in some other future car program

Besides, competition for the new car will be fierce. Mazda Motor Corp. has

it they had steadfastly resisted for years. Instead, they had clung to a system of staggered breaks that required 350 extra workers as substitutes to keep the line running. Those 350 now are being laid off.

Local 276's actions don't stop there. Members recently voted three to one to

won't open until September 1987.

Attention From Politicians

Meanwhile, both the Arlington and Jefferson Avenue plants are getting attention from local politicians, something that will happen time and again as similar situations occur. When Texas Gov. Mark White heard that Arlington wouldn't get GM's

Alaskan City Resists Taxes, Police And Zoning Despite Fast Growth

Continued From First Page

suggest a zoning code. "Used to be that at the very mention of the word 'zoning,' a lynch mob would come out of the woodwork," Mr. Mitchell says. "The politicians didn't even have the word in their vocabulary."

"Used to be," in Wasilla parlance, means a couple of years ago. Some old-timers attribute the apparent mellowing of attitudes lately to an influx of Anchorage commuters attracted by the mountain views and modest real-estate prices, rather than by the anti-zoning politics.

After the borough beat its hasty retreat on a valley-wide zoning plan, for instance, Wasilla adopted its own land-use plan. It gives residents the right to formally protest, though not necessarily stop, "incompatible" intrusions, such as junkyards, in their neighborhoods. But most of the town remains essentially unzoned.

"There is considerable resistance here by people to any sort of controls over their lives," says Harold Newcomb, a real-estate investor and a former Wasilla mayor. "They move up here and buy their one acre. They build a house. They put in a septic tank and a water well. Maybe they get a power line, but that's their only connection to the outside world. They become a little kingdom unto themselves. They've got a .44 Magnum and if anybody messes with them, they become a police department, too."

Although the town has a spiraling felony rate and an urban-style drug-trafficking problem, Wasilla seems to have as little use for police as it does for planning. Mr. Newcomb advocated the civilized concept of a police department three years ago, and his plan was promptly derailed by a coalition of Libertarian Party members and "some folks who just didn't want the police snooping around," he says.

Libertarians and Republicans

Mr. Newcomb subsequently lost his bid for re-election to the Libertarians, a considerable force in Alaskan politics. The Libertarians themselves were routed from city hall by the current mayor, Charles Bumpus, a self-described "liberal Republican." Mr. Bumpus's Republicanism might not be recognizable

of authority and tend to be virulently anti-tax, the mayor says. He adds that the town is unlikely to start levying any taxes until residents take the initiative.

"What for?" asks Lester Baker, a mechanic. He and his neighbors, he suggests, are perfectly able to care for themselves and protect their property. "The last guy who drove up past the 'Keep Out' signs" on the gravel road leading to his home outside of town, he says, "my neighbor just got his gun and pulled off two rounds over his head. He peeled out of there pretty quick." Most residents haul their own garbage to the dump, and volunteers man the fire department.

Police protection actually is provided by the state, which can spare only four troopers at any given time to cover Wasilla and the rest of the West Virginia-sized borough. Wasilla also largely depends on state grants to support its 14-person city work force and a bare-bones capital-improvement program.

Are Taxes Inevitable?

With state revenues being battered by slumping oil prices and with growth continuing to overload the town's gravel roads and rudimentary services, however, Mr. Bumpus concedes that taxes may be inevitable. A few small neighborhoods, in a big step for Wasilla, already have agreed to create localized taxing districts to finance sewers and other improvements without putting the tax bite on all residents.

Sheer growth, meantime, keeps eroding the town's frontier spirit. Wasilla (the name came from an Indian term for "breath of air") sprang up in 1917 as a trading post for workers building the Alaska Railroad. In the 1970s, when the energy crisis spurred spectacular growth in Alaska in general, Wasilla attracted the mavericks and developers who disdained taxes and zoning laws.

Even some of these people now lament the effects of the pell-mell growth. Leaky septic tanks have begun to foul the town's two lakes, and unregulated development is jeopardizing the underground aquifer that feeds residents' wells. Rush-hour traffic clogs the town's commercial strip, and on weekends during the

the company didn't consider Leucadia's proposal an offer because it was "vague and full of so many conditions," including that financing be arranged. Leucadia hasn't given details, but a Leucadia attorney said the company would use its borrowing power and GATX assets to finance the acquisition.

"I thought \$38 (a share) is as specific as one can get," said the Leucadia attorney, Stephen Jacobs. He also said the only conditions Leucadia set were typical for any acquisition. Aside from adequate financing, the offer is subject to regulatory and shareholder approval, to a review GATX's finances, and to a definitive merger agreement, Mr. Jacobs said.

GATX said it would provide Leucadia with full financial information if a "specific bona fide proposal" is made. GATX said it would require Leucadia to sign a confidentiality agreement. Leucadia signed a similar agreement last month, when it first expressed an interest in the company, and received information on some of GATX's operations. Leucadia returned the information, as specified in that agreement, which has expired.

Intel to Redeem Warrant Series

SAN FRANCISCO—Intel Corp. said it plans to call for redemption a series of warrants it issued in November 1984 along with 11% senior subordinated notes due Jan. 1, 1994.

The leasing, marine construction, and railroad concern said the transaction would reduce its debt about \$14 million.

Intel said the call date is March 3. It said each of the three million warrants is exercisable into common stock at \$4.75 a share and callable at 50 cents a warrant. The warrants are exercisable through March 24 by payment in cash or the 11% notes.

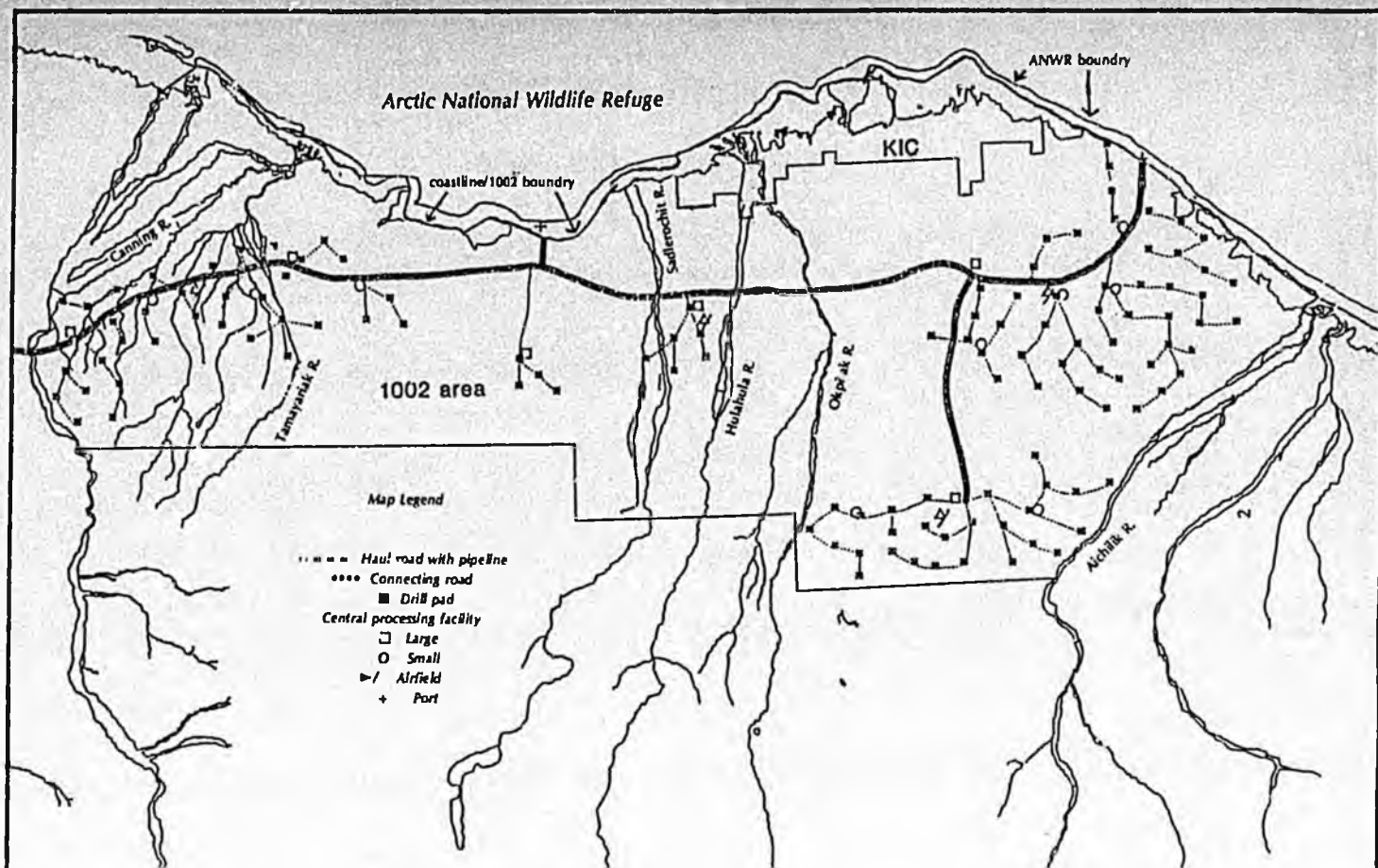
Boeing Says Airline Found Two More Jets With Cracks

By a WALL STREET JOURNAL Staff Reporter

SEATTLE—Boeing Co. said British Airways found structural cracks near the nose of two more 747 jumbo jets during an inspection.

The discovery brings to four the number of older 747s found to have this problem. Earlier this month, the Federal Aviation Administration ordered U.S. airlines to inspect 747s that have made more than 10,000 landings. There are 160 such planes flying domestically. Boeing, an aerospace concern, also alerted international carriers.

The FAA order followed Boeing's discovery of cracks in a Pan American World Airways jet.



U.S. GEOLOGICAL SURVEY

Map of the 1002 area and hypothetical development scenario

The 125 mile stretch of coastline along the Arctic Refuge, most of which is in the 1002 area, is the only section of Alaska's 1100 miles of Arctic Ocean coastline that is currently protected from the environmentally damaging effects of oil development.

Impact of alternatives

The draft 1002 report presents and analyzes five management alternatives for the coastal plain. The five options are: 1) full leasing of the entire 1002 study area; 2) partial leasing within the 1002 area; 3) additional oil and gas exploration including exploratory wells (currently prohibited by ANILCA); 4) no action which would include the 1002 area in the refuge comprehensive planning process currently underway; and, 5) federal wilderness designation for the entire coastal plain. Signed by Assistant Secretary of the Interior Bill Horn, *the draft 1002 Report recommends full leasing of the coastal plain for oil and gas production.*

Resources and the Price of Extraction

On the North Slope of Alaska, there are over 23.6 million acres of federal land in the National Petroleum Reserve-Alaska already committed to oil development. This figure does not include the vast oilfields around Prudhoe Bay or state and federal Outer Continental Shelf (OCS) oil leases.

No one knows conclusively how much, if any, oil actually lies beneath the coastal plain. The draft 1002 Report predicts that *there is only a 19% chance that any economically recoverable oil deposits lie beneath the coastal plain.* This 19% chance is called the marginal probability, and makes recoverable oil estimates

"conditional"; that is, based on the rather important condition that there is any oil there at all. It is against this one in five chance for economically recoverable oil that the American public is being asked to sacrifice internationally significant wildlife and wilderness resources.

The rationale provided in the draft report to justify the full leasing recommendation includes the national need for domestic sources of oil and gas and the need to provide for national security. Information included in the draft 1002 Report does not provide sufficient evidence to demonstrate that development of the Arctic Refuge coastal plain would provide enough oil to significantly alter the nation's dependence on foreign oil.

Two kinds of oil resource estimates are frequently made: estimates for oil "in place" (how much oil is down there), and estimates for "economically recoverable oil." Not all the oil in the ground can be extracted, given current technology.

The report presents a range of conditional probabilities of how much oil might be recoverable. Many of the wildly optimistic figures cited by the Department of the Interior in the press are for estimates of oil in place with low probabilities of occurrence. The mean estimate of oil cited in the draft is 3.2 billion barrels with a 40% probability of occurrence. This figure is used in the report as the basis for economic predictions. Using this mean figure, production from the Arctic Refuge under full leasing would equal only

Alaska State Legislature

Fourteenth Legislature — Second Session

Senate Calendar

FRIDAY
April 25, 1986
10:30 a.m.

Official Business of the Senate

One Hundred third Legislative Day

Chaplain: Right Reverend Archimandrite Innocent (Fryntzko) of
St. Nicholas Russian Orthodox Church

SECOND READING OF SENATE BILLS

SB 475 Designating the woolly mammoth as the state fossil
Resources report pg 2463, fiscal zero

SENATE BILLS IN SECOND READING

CSSSSB 391 Relating to the ethical conduct of governmental
(SA) activities
eff. date
Held from 4/23, amendment No. 1 moved and pending

SECOND READING OF HOUSE BILLS

HB 559 Approving the sale of Kuparuk River Unit royalty
oil by the State of Alaska to Petro Star, Inc.
and Chevron U.S.A., Inc.
eff. date
Resources report pg 2282, Finance report pg 2437

CITATIONS

Honoring - Gold King Midget A Amateur Hockey Team 1986 Western Regional
Champions
by Senators Fahrenkamp, Bennett and Coghill;
Representatives Davis, Frank, Koponen, M.W. Miller, Ringstad
and Shultz

In Memoriam - Bessie Barnabas
by Representatives Binkley and M.W. Miller

4.17% of projected U.S. oil demand by the year 2005, 2.57% by 2010.

The report bases its economic predictions on optimistically high oil prices of \$33 and \$40 per barrel, while recent oil prices have been in the neighborhood of \$14 to \$18 per barrel. These calculations produce correspondingly high figures with which to bolster arguments relating to the national interest.

Environmental Damage

One reason cited by Assistant Secretary Horn for proposing full leasing is "the ability of industry to minimize damage as learned from oil and gas activities elsewhere in the Alaskan Arctic." From the same report: "Accidental spills of crude oil and refined petroleum products are an inevitable consequence of oil field development."

Since 1972, there have been 23,000 oil spills that were reported to the Alaska Department of Environmental Conservation. The largest spill was 658,000 gallons. This does not indicate a good industry track record and represents a serious threat to the fragile life forms of the arctic tundra.

Hazardous waste disposal is another serious problem that remains unsolved: there is currently no permitted hazardous waste disposal site on the North Slope. Studies of reserve pit fluid discharges (which occur at every drill pad) at Prudhoe Bay indicate increases in the levels of heavy metals such as zinc, arsenic, and aluminum. The studies note that "along with deteriorations in water quality, the quality and quantity of organisms used as food by North Slope bird species may be decreasing."

Caribou

The Porcupine Caribou Herd stands as a symbol for this threatened ecosystem. Two extremely critical phases of caribou life history take place in the 1002 area: the calving and post-calving periods. Caribou cows with new-born calves are particularly sensitive to disturbance. During the post-calving period caribou store energy for winter survival; disturbances from human activity can cause stress and energy loss at this crucial time. Also at this time, hordes of insects, mainly mosquitoes, emerge to plague the caribou. To avoid the insects, caribou seek out the windy and cool Beaufort Sea coast. The 1002 area provides the most important calving, post-calving and insect relief habitat for the Porcupine Caribou Herd.

Other Species

The 1002 area also provides essential habitat for a variety of other wildlife species. Muskoxen were exterminated from the North Slope by the late 1800's. Today's healthy population in the 1002 area is a result of a reintroduction in 1959 and 1970. The area provides important habitat as well for wolves, arctic foxes, wolverines, brown bears, and polar bears. One hundred and eight species of birds have been recorded on the Arctic Refuge coastal plain, including the threatened arctic peregrine falcon. Most of these birds nest on the coastal plain, others feed, nest, molt, or prepare for the fall migration on the rich tundra vegetation. As many as 300,000 snow geese, or approximately 50% of the Pacific Flyway population, stage on the coastal plain to prepare for their long migratory flight south. Twelve species of fish frequent the rivers and streams of the 1002 area, while many more species inhabit the waters

It is against this one in five chance for economically recoverable oil that the American public is being asked to sacrifice internationally significant wildlife and wilderness resources.

offshore. In summary, the coastal plain is the most biologically important part of the Arctic Refuge because it provides critical habitat for so many resident and migratory species.

Direct Impacts to Fish and Wildlife

The report projects a "population decline or distribution change for 20-40 percent of the Porcupine Caribou Herd." The report also indicates that caribou may be forced to avoid 72,000 acres of insect relief habitat under full leasing. "Depending upon design, pipelines may create a barrier. Those adjacent to or close to active roadways would probably most impede free movement...This is of particular concern in the 1002 area because the probable pipeline/haul road route would bisect the area," said the report.

"Increased noise and disturbance level displacing wildlife throughout the 1002 area..." is one of the unavoidable impacts listed in the report. Another is direct loss of habitat due to ground being physically covered by structures, roads, and other facilities. Displacement and increased harvest of wolverines, direct loss of moose habitat, direct mortality of birds, a decline or change in distribution of golden eagles, a decline in the wolf population: the list goes on and on. "A major reduction or change in distribution of snow geese using the 1002 area could occur through the cumulative effects of direct habitat loss, indirect habitat loss due to disturbance, and direct mortality," is also indicated by the report.

The coastal plain is vital to the ecological integrity of the Arctic Refuge. It is not a separate entity which can be conveniently sliced off without major adverse effects to the whole system.

Mitigation

Measures proposed for mitigation of impacts associated with oil production represent wishful thinking at best. For example, the report says that "...negative effects to muskoxen could be mitigated by standard stipulations prohibiting disturbance, implementing necessary time and area closures, and requiring on-site monitoring." Yet in the next paragraph, the report admits that "...major negative effects upon the muskoxen population from oil and gas development could occur, considering the present management objectives for continued population growth of the herd under natural regulation and the displacement from habitat likely to occur."

Subsistence Values

Native people in both Alaska and Canada depend on Arctic Refuge resources for both cultural and nutritional sustenance. This includes the Inupiat people of the village of Kaktovik and the Athabaskan people of Arctic Village,



Alaska State Legislature

HOUSE CALENDAR

OFFICIAL BUSINESS OF THE HOUSE

NINETY-THIRD DAY

Tuesday

Chaplain: Pastor Jon Paden
Church of Christ

April 15, 1986
Convenes: 10:00 a.m.

29 Passed

SECOND READING OF HOUSE BILLS

HB 463 "An Act relating to criminal trials and restitution."
 -Judiciary report w/CS(Jud), new title, p. 2438:
 An Act relating to authority to compromise certain misdemeanors and to the payment of restitution.
 Zero Fiscal Note
 Zero Fiscal Note w/analysis, House Supplement No. 100
 -Finance report, p. 2568
 -Returned to Rules from calendar, 4/14
 -Rules reported today

HB 542 "An Act relating to corrective management of threatened stocks of game."
 -Resources report w/CS(Res), same title, p. 2417
 Zero Fiscal Note
 -Finance report w/CS(Res), p. 2550

SECOND READING OF SENATE BILLS

CSSB 109 "An Act relating to provision of chiropractic services under the medicaid program."
 (HESS)
 -HESS report, p. 1407
 -Finance report, p. 2085
 Fiscal Note, House Supplement No. 35

SECOND READING OF SENATE RESOLUTIONS

SJR 47 Requesting additional action by the United States to reduce high seas interception of Alaska-bound salmon.
 -Rules report, p. 2599

CITATIONS

Honoring - Dr. Henry I. Akiyama by Senators Kerttula, Ziegler, Ray, Rodey, Ferguson, Sackett, Zharoff, Halford, V.Fischer, Sturgulewski, Abood, Fahrenkamp, Bennett & all other members of the Senate; Representatives M.M.Miller, Duncan

ANNOUNCEMENTS

Minority Caucus	Court Building	Noon
Blood Pressure	Capitol - 2nd Floor	11:30 a.m. to 1:30 p.m.



U.S. FISH AND WILDLIFE SERVICE

Porcupine Caribou Herd crossing a coastal plain river.

Venetie, Chalkyitsik and Fort Yukon in Alaska and the village of Old Crow in Canada. The most important subsistence resource of all is the Porcupine Caribou Herd. "Caribou is the most important food source for the people of Arctic Village..." according to the 1002 Report. Other refuge species used by the people of Kaktovik include Dall Sheep, Arctic Char, Arctic Cisco, ptarmigan, polar bear, numerous species of waterfowl, bearded seal, spotted seal, ringed seal, wolf, wolverine, brown bear, and Arctic-ground squirrel.

Recreational Values Would be Compromised

"An experience in the Arctic National Wildlife Refuge is one you must search out yourself", states the form letter the U.S. Fish and Wildlife Service sends to potential visitors to the refuge. "You will find no packaged trip plans nor trail maps pointing the way...perhaps more than anywhere in America, the Arctic National Wildlife Refuge is a place where the sense of the unknown, of horizons unexplored, of opportunities for self reliance, independence, challenge, discovery and adventure...finding one's own way in a setting unsurpassed in beauty and vastness...make the Arctic Refuge a unique recreational experience." If the 1002 area is developed, the sights and sounds of oil drilling and transportation will dominate the visitor's sensual experiences anywhere from the coast to the Arctic Divide. Aesthetic impacts will extend beyond the 1002 area itself.

Other Problems the Report Fails to Address

Two major problems immediately meet the eye. One is the lack of sufficient water quantity in the 1002 area. The other is the enormous requirement for gravel necessary for building drilling pads and roads on permafrost. The report says "Specific locations and sources of water and gravel for exploration and development activities have not been

identified; and it is understood that these resources, especially water, are not readily available on the 1002 area." The report states that "...as much as 15 million gallons of water may be needed to drill one exploratory well." As for gravel, "Each mile of road occupies about 5 acres and requires approximately 40,000 cubic yards of gravel." In all, 40 to 50 million cubic yards of gravel would be required for construction, operation, and maintenance. "Gravel might have to be mined from upland sites, river terraces, streambeds, lagoons, or other potential sites." How this is to be accomplished without causing severe adverse impacts to fish and wildlife populations and their habitats is not addressed.

The Managing Agency's Biased Record

Throughout the decision making process on the 1002 area, the Department of the Interior and the U.S. Fish and Wildlife Service have demonstrated tremendous disregard for the intent of Congress and have done everything possible to minimize public involvement.

Contrary to the intent of Congress as expressed in ANILCA and appropriation bills, the Department of the Interior has spent over \$300,000 appraising land values in order to develop land exchange agreements with private Native corporations. These proposed exchanges would remove subsurface mineral rights from the public domain in the 1002 area. These secret negotiations, known within the Department as "Project M or Megatrade", have compromised the objectivity of the 1002 report and created additional vested interest pressures to open up the area.

Originally, the agency had no intention of allowing a public review of the draft 1002 report. A successful lawsuit, undertaken by Trustees for Alaska with the support of many other local and national conservation groups, required the Department of the Interior to hold public hearings and take public testimony before submitting the

ALASKA PROFESSIONAL SPORTFISHING ASSOCIATION

Chris Goll
President
4127 Raspberry
Anchorage, Alaska 99502
(907) 243-7894



Ron McMillan
Secretary/Treasurer
3318 West 30th Avenue
Anchorage, Alaska 99517
(907) 248-1714

April 12, 1986

Re: HB 93 (Finance),
Recreational Rivers bill

Dear Representative:

The Alaska Professional Sportfishing Association is the largest association of professional sportfishing guides, lodges and outfitters in Alaska. It is a statewide organization interested primarily in furthering our industry and maintaining the high quality sportfishing upon which we depend.

In behalf of our Association, I urge passage of HB 93 (Finance). It establishes six recreational rivers in southcentral Alaska. Several of the rivers are important to the guide, air-taxi, and sportfishing industries. Lake Creek, Talachulitna River, Deshka River, the Talkeetna River and Alexander Creek offer high quality salmon and trout fisheries that support air-taxi services, riverboat services, and in the case of the Talalchulitna, several lodges.

HB 93 (Finance) helps assure that the quality sportfishing, fish and wildlife habitat, and public access will be maintained. I am pleased that HB 93 protects existing commercial activities within the six river corridors, and I agree with the provision allowing management of commercial activities, including guiding. My hope is that these provisions will protect existing operations, allow for expansion that is compatible with quality guiding and quality sportfishing, and will prevent these rivers from developing problems so apparant on the Kenai. I used to guide on the Kenai and no longer do because of the changes in the character of the experience I could offer my clients.

HB 93 (Finance) strikes a good balance. I support the bill as it stands and urge consideration of one amendment if it would not jeopardize passage of the bill.

That amendment concerns land disposal. I appreciate that the bill would close to land disposal those lands within the corridors that are within a half mile of the rivers. However, I agree with the position of the Wildlife Federation of Alaska that the full designated river corridors, which average about a half mile on each side, should be closed to land disposal. The present language, "within one-half mile upland of the meander of the

"The Keepers of the Streams"

final report to Congress. The public involvement opportunities currently established are the Department's attempts to minimally comply with the mandate set forth by the courts as a result of litigation.

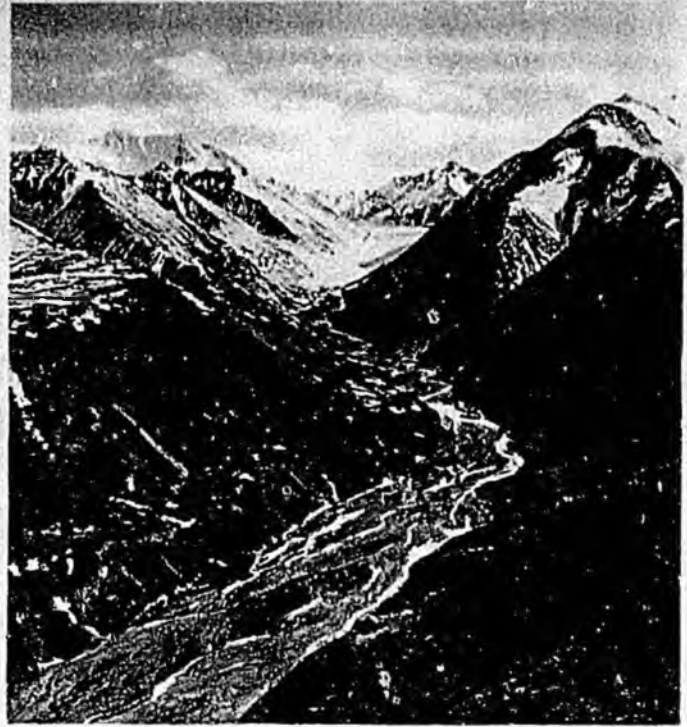
Comments desperately needed

Key points to include in your comments:

- ★ Support Alternative E which recommends wilderness designation for the entire Arctic Refuge coastal plain.
- ★ The report finds that there is only a one in five chance of finding economically recoverable oil beneath the coastal plain. Moreover, these estimates assume that oil would be priced at *more than double* what it is now.
- ★ Despoiling Alaska's premier wilderness refuge and jeopardizing its internationally significant wildlife and wilderness resources is *not in the national interest*.
- ★ Full oil and gas leasing of the coastal plain could be disastrous for the more than 180,000 caribou that use the area for calving and post-calving insect avoidance. This is the nation's only opportunity to protect virtually the entire range of one of the largest and only internationally migratory caribou herd in the world.
- ★ Caribou are vital to the subsistence way of life of Native people in both Canada and Alaska; adverse impacts on the caribou population will result in adverse impacts on subsistence.
- ★ The report looks at the 1002 area in isolation, rather than examining in detail the cumulative effects of oil and gas development on adjacent state and federal leases and offshore on the outer continental shelf.
- ★ The disposal of hazardous wastes associated with oil development presents a serious long term problem that has not yet been adequately addressed.
- ★ Further efforts towards energy conservation and creating viable alternative energy sources can better provide for our future energy needs than sacrificing the Arctic Refuge for a few days supply of oil.

The 60-day comment period for the draft 1002 report ends January 23, 1987.

Three public hearings, where people can voice their concerns, are scheduled for Kaktovik, Anchorage, and Washington, D.C. on January 6, 5, and 9 respectively. The public hearing in Anchorage will be located in spaces 1 and 2 of the Egan Convention Center. The hearing will begin at 9:00 a.m. and continue until all testimony is received. Please arrive early to be sure you can testify!!



The glacial headwaters of a coastal plain river.

For more information contact the Northern Alaska Environmental Center.

Legislation was introduced in the House of Representatives by Morris Udall during the 1986 Congressional session to protect the coastal plain as wilderness. The bill is expected to be reintroduced early in 1987, and we hope a similar bill will be introduced in the Senate. If you can, please send a copy of your letter to Senator Bennett Johnston, Chairman of the Senate Energy and Natural Resources Committee, with a note asking him to sponsor legislation to include the area in the National Wilderness Preservation System. Also, a copy to Governor Cowper will help show him there is support inside the state for preservation of these wildlands.

Mail Your Comments To:

U.S. Fish and Wildlife Service
Attn: Division of Refuge Management Resources
2343 Main Interior Building
18th and C Streets, N.W.
Washington, D.C. 20240

Senator Bennett J. Johnston
Senate Energy and Natural Resources Committee
Senate Office Building
Washington, D.C. 20510

Honorable Steve Cowper
Governor, State of Alaska
Pouch A
Juneau, Alaska 99801

have questions regarding any amendments, please feel free to call me at 344-5235 in Anchorage.

Sincerely,

A handwritten signature in cursive script that reads "Russ Redick".

Russ Redick
Executive Director
Alaska Sportfishing Association



Environmental organizations working for the Arctic Refuge

The following groups are working together to save the Arctic National Wildlife Refuge:

Alaska Center for the Environment
Defenders of Wildlife
National Audubon Society
National Parks and Conservation Association
Northern Alaska Environmental Center
Sierra Club
Southeast Alaska Conservation Council
The Wilderness Society
Trustees for Alaska

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THE NORTHERN LINE

Environmental News
of
Arctic and Interior Alaska

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Letters to the editor should bear the writer's signature, but names may be withheld upon request. We reserve the right to edit letters to fit space requirements.

NAEC is a nonprofit, educational organization dedicated to the preservation of the environment of the Arctic and interior Alaska, and the wise management of our natural resources.

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Anchorage, AK 99501





Alaska Sportfishing Association

3605 Arctic Blvd., Suite 800 • Anchorage, Alaska 99503

April 12, 1986

Re: HB 93 (Finance),
Recreational Rivers

Dear Representative:

The Alaska Sportfishing Association has long supported passage of a strong recreational rivers bill. HB 93 (Finance) accomplishes that.

Alaska sells more than 200,000 sportfishing licenses annually. Our association has more than 2000 members, most of whom are in southcentral Alaska. As the recently retired supervisor of ADF&G, Sportfish Division for southcentral Alaska, I am familiar with the six rivers designated by HB 93 as recreational rivers.

They are important and popular salmon and trout sportfisheries. According to ADF&G sportfish harvest surveys, these six rivers attract approximately 100,000 person days of sportfishing each year. For example, according to ADF&G sportfish harvest surveys, the Little Susitna has about 35,000 person days of fishing each year; the Deshka (Moose and Kroto) has 23,000; Lake Creek has 15,000; Alexander Creek has 10,000; Talchalitna River has 5,000, and the Talkeetna has 8,000.

The rivers provide diverse fishing opportunities, from the crowded king salmon fisheries at the mouths of the Deshka River and Alexander Creek, to the quiet float trips for salmon and rainbow trout in the Talchalitna River and Moose, Kroto and Lake Creeks. The Little Susitna is good for coho and kings and is part of the Nancy Lakes canoe system. The Talkeetna has excellent trout fisheries at the mouths of several clear water tributaries, and even the mainstem offers good trout fishing when the silt clears in September.

The Finance Committee has done a good job, and I appreciate their efforts. We particularly want to compliment Representatives Cotton, Larson, Pourchot, Larson, Rieger, Frank, Uehling and the other members of the Finance Committee. If you