OFFICE OF THE GOVERNOR

OFFICE OF MANAGEMENT AND BUDGET
DIVISION OF GOVERNMENTAL COORDINATION

☑ SOUTHCENTRAL REGIONAL OFFICE
3601 "C" STREET, SUITE 370
ANCHORAGE, ALASKA 99503-2798
PH: (907) 561-6131/FAX: (907) 561-6134

☐ CENTRAL OFFICE
P.O. BOX 110030
JUNEAU, ALASKA 99811-0300
PH: (907) 465-3562/FAX: (907) 465-3075

☐ PIPELINE COORDINATOR'S OFFICE
411 WEST 4TH AVENUE, SUITE 2C
ANCHORAGE, ALASKA 99501-2343
PH: (907) 278-8594/FAX: (907) 272-0690

June 3, 1993

George Constantino
U.S. Fish and Wildlife Service
1011 East Tudor Road
Anchorage, AK 99503

Dear Mr. Constantino:

The State of Alaska has reviewed the Draft Moose Management Plan for the Kenai National Wildlife Refuge. Before submitting final comments on this document, we endorse the mutual wishes of the Service's and the Department of Fish and Game's technical staffs on the Kenai Peninsula to meet and resolve as many outstanding issues as possible. Based on our telephone conversations this week, it appears this will be possible.

This plan has elicited a high degree of frustration within DFG based on concerns that this planning process appears to be similar to the problematic approach taken in the 1980's with the Furbearer Management Plan for the Kenai Refuge. The Furbearer Plan was preemptive of state management of furbearers and inappropriately excluded the State from its preparation. Ensuing confrontations between biologists and administrators from DFG and the Service were avoidable, unnecessary, and unproductive. Policy makers in both agencies subsequently agreed to a process whereby future plans which affect each other's management authorities would be cooperatively developed.

The State wishes to clarify and build on these promises of cooperation rather than engaging in counter-productive debates about process. To this end, I am providing the attached technical comments largely prepared by DFG to assist the local Service and DFG staff discussions. It is the State's hope that

most if not all of these issues can and will be resolved at the local level. Following local consultation, the State will be prepared to submit final comments, and will be interested in elevating any unresolved issues to policy-level representatives in the Regional Office, if necessary.

Thank you for your interest in working with our concerns. The local DFG staff in Kenai look forward to an opportunity for productive consultation and stand ready to meet at the Service's convenience. If you need any assistance in setting up the desired work session(s), please call me at 561-6131.

Sincerely,

Sally Gibert
State OCSU Coordinator

cc:
Paul Rusanowski, Division of Governmental Coordination
Tina Cunning, Department of Fish and Game

CSU Distribution List
Kenai Moose Letter
June 7, 1993

Tina Cunning, Department of Fish & Game, Anchorage

Priscilla Wohl, Department of Environmental Conservation, Anchorage

Alice Iliff, Department of Natural Resources, Anchorage

Paul Rusanowski, Division of Governmental Coordination, Juneau

John Katz, Governor's Office, Washington, D.C.

Stan Leaphart, CACFA, Fairbanks

Attachment
State of Alaska Preliminary Technical Comments
Kenai Refuge Moose Management Plan
June 3, 1993

Habitat Enhancement Program

The DFG believes the habitat program outlined in the plan is inadequate. The almost total reliance on prescribed burning to enhance moose habitat will likely fail to meet minimum enhancement acreage objectives due to inherent problems in use of this method on the Kenai Peninsula. The objectives are based on questionable assumptions (e.g. only 50 percent of the land area is enhanceable) and on inappropriate rotation schedules (50 years is the shortest rotation offered). Enhancement opportunities on areas classified as "minimal management" and on designated wilderness lands should also be addressed in the plan.

The ability of the Kenai Refuge to support large numbers of moose after major wild fires and reduced predator populations is well-documented (Spencer and Chatelain 1953, Lutz 1960, Spencer and Hakala 1964). When fires, principally man-caused, removed maturing forests and created areas of early seral habitat with abundant food and cover, moose flourished. After a period of 20-30 years, change in the occurrence and availability of important forage species due to browsing and natural plant succession caused moose populations to decline. With the exception of the 135 square mile area burned in 1969 and relatively stable subalpine habitats, the capability of the Kenai Refuge to maintain current moose population densities has deteriorated due to forest maturation and high predator densities.

Land management policies over most of the Kenai Peninsula currently emphasize active fire suppression. Consequently, managers who desire to maintain current moose densities can no longer rely on the fortuity of wild fire to generate productive quantities of moose habitat. In contrast, public interest in moose on the Kenai Peninsula for hunting and other recreational uses is extremely high and is not expected to decrease.

Maintenance of a vegetation base capable of supporting a large and healthy moose population will depend on the following actions: 1) dedication of suitable, sufficient acres of land for moose habitat enhancement; 2) implementation of an "active" habitat enhancement program based on long-term

vegetation manipulation employing a variety of enhancement methods; and 3) a comprehensive fire management plan. While planned habitat improvement programs cannot be expected to equal the amount of land affected during past wild fires, it will provide a relatively constant amount of early seral vegetation. Habitat improvements in remote areas may, over time, redirect moose movement away from urban areas and highways.

Moose Management Objectives

The DFG urges the Service to rewrite the plan to place more emphasis on moose habitat management and to appropriately recognize the DFG as the population manager; both agencies could then work cooperatively to interface habitat and population management by developing mutually agreeable objectives and methodologies.

If the Kenai Refuge management feels the 1986 objectives, designed cooperatively with DFG, need revision, then Service and DFG staffs should mutually engage in a reevaluation based on current data. The existing selective harvest program has accomplished most of the objectives outlined in 1986. The bull:cow ratio has increased from 16:100 to 22:100, the average age of bulls has increased, and bulls are now commonly available for post-season viewing. The Alaska Board of Game recently extended the season for hunting moose due to the program's success in securing the bull segment of the population.

To accomplish the Kenai Refuge's proposed objectives would require additional restrictions on hunting opportunities to protect large bulls. We are currently monitoring the impact of the selective harvest approach and believe that additional reductions in harvest are not biologically justified.

Achieving the Service's proposed objectives of 30 bulls:100 cows and 8 50+inch bulls:100 cows on Kenai Refuge portions of Game Management Units 15(A) and 15(B) West and 50 bulls:100 cows and 20 50+inch bulls:100 cows on Kenai Refuge portions of Game Management Units 15(B) East and 15(C) is not possible under current hunting seasons and bag limits. The DFG is strongly opposed to these objectives, in part due to their impact on hunting and other recreational opportunities and impact on management of a moose population under declining habitat conditions.

As an alternative, DFG suggests that Service and DFG technical staffs mutually evaluate an objective for the Kenai Refuge portions of Game Management Units 7, 15(A), 15(B) West, and 15(C) of 25 bulls:100 cows. We also suggest considering the objective for 15(B) East and Skilak Loop to maintain the current mutually agreed objective of 40 bulls:100 cows. The DFG strongly opposes the management objectives of 8 and 20 50+inch bulls:100 cows and requests its elimination from the plan.

We also note that in a stable or declining population where habitat is limited and predation high, an objective to increase the ratio of bulls to cows would increase the rate of decline by reducing recruitment. Bulls will out-compete calves and older cows when habitat is limited, therefore, over time bulls will reduce the survival rate of these sex and age classes of the population.

Page-Specific Comments

TITLE The title of the plan is misleading to reviewers--the State manages moose and the Service manages moose habitat. This arrangement is reflected in existing federal law, Service policies, and the Master Memorandum of Understanding between the Service and DFG. The title of the plan fosters a misunderstanding of federal responsibilities and an appearance of preemption of State management authority. It should be renamed the *Moose Habitat Management Plan*.

PAGE 1, Paragraph 1, We request **sentence 3** be rewritten to read: "As the principal ungulate species on the KNWR, moose provide important opportunities for consumptive and nonconsumptive uses by human as well as a primary food base for several predator and scavenger species." Then the **last sentence** may be revised to read "In addition, moose attract a large number of visitors to the KNWR annually."

Paragraph 2, sentence 2 Include "wolverines" in list of scavengers of "predator- or winter-killed moose".

Paragraph 2, sentences 3 and 4 We suggest combining these sentences to read: "Recent increasing trends in Alaska's population and visitation to the state can be expected to affect the Kenai through demands on wildlife

resources, and the potential for negative impacts of human activities on wildlife, such as loss and/or fragmentation of habitat."

PAGE 2, carryover paragraph, last sentence We request the sentence be revised to read: "The Service's mandates for managing wildlife and habitats in their natural diversity while providing opportunities for wildlife-oriented recreation on the KNWR necessitates that moose populations be maintained at near-current densities, subject to natural fluctuations."

Paragraph 1, sentence 1 We object to the Service's statement that the "Plan was developed to guide future Service management of moose". The DFG manages moose. We suggest revisions such as inserting "habitat" so that it reads: ". . . future Service management of habitat for moose".

Paragraph 1, sentence 3 We request a rewrite of this sentence to read: "Based on these analyses, the Service proposes to cooperate with ADF&G in the following actions to maintain moose populations at near-current densities . . .." Such statements of course must be assumed to recognize that maintenance of wild populations is subject to natural and cyclic fluctuations.

Action #1 Delete "the" and replace with "a" to read: " . . . using prescribed burning as a primary tool;"

Action #2 Revise to read: "continued cooperative monitoring with ADF&G of the status of moose . . ."

Action #3 Revise to eliminate appearance that the Service is solely responsible for regulations and establishment of population objectives. We suggest it read: "cooperate with the Alaska Board of Game and ADF&G to continue selective harvest regulations for bull moose and cooperate with ADF&G in their establishment of moose population composition objectives for moose populations . . .."

Action #4 Revise to begin: "Cooperate with ADF&G in the examination of predator-prey relationships and highway accidents involving . . .."

Action #5 We have objections to: "identification [by FWS] of research priorities related to moose management on the KNWR." We request at a minimum the above be revised by inserting "habitat" so it reads ". . . to moose habitat management". As an alternative, we suggest the action item be rewritten to read: "Identify priorities and conduct research related to moose habitat management in the KNWR."

PAGE 3, The Need for Action, sentence 1 We suggest replacing the word "driving" with "affecting".

Sentence 5 Delete the word "recently." In terms of wildfires which return the habitat to a natural mosaic and which are useful as a wildlife management tool, there have been no *recent* fires.

PAGE 4, carry-over paragraph, sentence 2 Delete "northern portion of the".

Sentence 3 We strongly disagree with the Service's choice of 2,000 acres per year as the preferred level for prescribed burning. We urge the Service to reconsider adopting the 4,000 acres per year alternative. This quantity is also consistent with recommendations made in 1989 by Service staff after extensive analysis.

PAGE 5, carryover paragraph 1, sentence 4 We request clarification that the Service's intent to "support research activities at the . . . moose research center" includes financial support and participation by the Service through cooperative agreement. We suggest replacing "agreement, among which are efforts to assess" with "agreement. These activities include efforts to assess moose . . .."

PAGE 6, carryover paragraph We request the Service revise the objectives consistent with our concerns elaborated throughout this review. Specifically, we request joint consideration of the following:

1) On KNWR portions of Unit 7 and GMS 15(A) (except Skilak Loop), 15(B) West and 15(C) - 25 bulls:100 cows; [delete "8 50"+ bulls:100 cows.]

2) Skilak Loop Area and 15(B) East - 40 bulls:100 cows [delete "20 50"+ bulls:100 cows.]

We request the entire last sentence be deleted: "If modifications of current harvest regulations are needed in the future, they are most likely to involve . . .." This assumption does not reflect the cooperative evaluation process established for the Kenai Refuge with the DFG and fails to recognize that the Alaska Board of Game establishes harvest regulations and the DFG is responsible for establishing population objectives.

PAGE 6, Predator-Prey Relationships and Highway Mortalities, paragraph 1, sentence 2 The current sentence reads:

> "The potential for providing sustained numbers of moose to support healthy predator and scavenger populations and high levels of human use on the KNWR using habitat management is greatest while moose densities remain relatively high due to still-favorable habitat conditions created by recent wildfires."

We request the sentence be revised to read:

> "The potential . . . is greatest before moose densities decline due to the current progressive loss of productive habitats, which were created in the past by wildfires.

PAGE 7, carryover paragraph and sentence We request this sentence be revised to read: "Should moose populations decline to low densities as a result of decreasing habitat quality, moose populations may not respond to improved . . .."

PAGE 7, paragraph 1 Please see the discussion for **Page 104.** We request the Service make appropriate corrections (e.g., deletion of this discussion) due to the inapplicability of the study upon which these conclusions have been reached.

PAGE 7, Research Priorities, paragraph 1, sentence 1 The first sentence needs to be revised to eliminate the presumption that the Service has sole responsibility for research and management of moose. We suggest

inserting "habitat", so it reads "moose habitat management". We also suggest that item 4 be deleted or more carefully defined in its relationship to the DFG's management of moose populations.

PAGE 8 to 17, Introduction to Future Moose Management This is a well-written summary of background information regarding the Kenai Refuge.

PAGE 10, carryover paragraph, line 2 We suggest adding acknowledgement that the Service agreed in the Master Memorandum of Understanding to adopt refuge management plans in agreement with DFG's species management plans unless the latter are formally determined incompatible with refuge purposes.

carryover paragraph, last sentence The statement that "As specified in this Memorandum of Understanding, the KNWR Moose Management Plan (Plan) was developed in cooperation with the ADFG to minimize conflicts" is inaccurate. Since an internal draft technical document was reviewed two years ago, there has been no communication with the DFG. Further, the plan was released to the public and announced by the media before local and regional wildlife managers, much less policy staff, were provided copies. Staff were unaware that such a plan was being developed.

Paragraph 1 We request further refinement of the statement: "This Plan details specific management actions for moose to be undertaken by the Service on the KNWR, including . . . monitoring the status of moose populations . . . .." We suggest a revision such as "specific management actions related to moose which will be undertaken . . . and cooperate with the DFG in monitoring . . . .."

PAGE 18, carryover paragraph The top line would be more accurate if it stated: "mature forest types (primarily white spruce, aspen and birch forests on the Kenai Lowlands) to . . . .."

Paragraph 1 This paragraph, describing uncertainties surrounding creation and maintenance of early seral habitats, essentially states that

habitat enhancement objectives will not be accomplished and therefore, "limit the usefulness of establishing numerical objectives for various moose populations." We agree. Consequently, we recommend that bull:cow ratio (25 and 40:100) objectives be linked to population size and habitat enhancement objectives. With the relatively restrictive selective harvest program in place, emphasis of this plan should be directed towards enhancement to increase carrying capacity of existing habitats.

Potential annual habitat management scenarios presented range from 0 (no enhancement) to 0.2 percent (4,000 acres) of the 1.97 million acres managed by the Refuge. If 4,000 acres were enhanced annually in the Refuge portion of Game Management Unit 15(A), only about 0.5 percent (4,000 of 807,000 acres) of the area would be affected annually. Unless this plan is rewritten with a more realistic habitat plan designed to produce measurable benefits for moose, there is liitle point in assessing projected goals.

For example, the Mystery Creek area was scheduled to burn about 3 years ago, but has not been completed. This area was initially identified for burning in 1987. This area will produce significant amounts of quality browse for moose, however, the 1990 winter moose densities of 0.1 moose per square mile suggest this area will not recover to 1.75 moose per square mile found in low density areas in 1982. Progressive habitat maturation and predation has driven the moose population so low that enhancement may essentially be a waste of effort in the Mystery Creek area unless predators are controlled to allow moose to recover. Survey data indicate about half of Game Management Unit 15(A) is already in a "predator pit" situation where enhancement alone will not allow the low density moose population to recover.

PAGE 19, carryover sentence and Paragraph 1 These discussions should be revised to reflect cooperative moose management objectives developed with the DFG OR to reflect that these are "the primary moose habitat management objectives".

PAGES 26-27 The use of prescribed burning in areas designated by ANILCA as wilderness areas should be discussed in this plan. Kenai Refuge management recognizes that prescribed burning and other active management can occur in designated wilderness areas under carefully developed regimes for purposes such as returning artificially suppressed habitat to a natural habitat mosaic. It is inappropriate to simply dismiss such management from consideration in this plan.

PAGE 29, Paragraph 2, sentence 3 The statement that it is only practical to enhance 50 percent of the selected burn areas seems questionable. When the Skilak Loop area was crushed and burned, approximately 70 percent was enhanceable. The remaining acres were left as cover. If the plan assumes only 50 percent of a selected area can be manipulated, we recommend enhancement objectives reflect the actual acres treated.

Productive years for enhanced habitat is dependent on type of habitat enhanced and the density of moose it supports. If the moose density is low, enhanced areas will not be productive for more than 15-20 years because browse species will grow out of reach. In areas where densities are greater, moose will remove sufficient amounts of the current annual growth to maintain plants at a lower height, increase production of the plants, and extend the productive period of the enhanced area. This is evident in the area burned in 1969 in Game Management Unit 15(A). This area burned extremely hot allowing a dense regrowth of birch to establish. The moderately high moose population has maintained this area by utilizing most of the annual plant growth and preventing the birch trees from growing out of their reach. The 1969 burn is still producing quality browse after 24 years and should continue to be productive about 6-10 more years. However, if over browsing occurs, plants can be destroyed and productive life of enhanced areas will be shorter. An example of over browsing occurred in the area burned in 1947, resulting in a productive life of about 15-20 years.

The plan's suggestion of a 50, 75 or 100 year rotation period would result in enhanced areas remaining unproductive 20-70 years after treatment. We suggest selection of a shorter rotation period of 25-40 years. This would allow the Service to more closely imitate a natural fire regime and maintain the moose density near current levels where numbers are acceptable and increase densities in areas where numbers are not acceptable.

PAGES 36-37, Moose Population Projection The graph suggests the Game Management Unit 15(A) moose population will decline for 20 years then stabilize at 2,133 moose if no enhancement is conducted. The following page states the model projections for the no action alternative may be optimistic and the Game Management Unit 15(A) moose population could fall to about 1,000 moose. Based on data jointly collected by the agencies during the 1990 census, the DFG believes 1,000 is a much closer estimate than the 2,133 for Game Management Unit 15(A) in 20 years.

Assuming the super high (10.2 moose/sq. mile) and high (5.0 moose/sq. mile) areas deteriorate to current medium density areas (3.1 moose/sq. mile) and current medium density areas deteriorate to low density areas (0.1 moose/sq. mile) in 20 years, the following calculations are logical. A total of 1,063 sq. mile of low density habitat capable of supporting 106 moose and 216 sq. miles of medium density supporting 670 moose would result from no habitat enhancement for Game Management Unit 15(A). Without considering the increased impact of predation on that low of density of moose, 776 moose is probably closer to a minimum population. Using the 1992 assumption of 3,100 moose in Game Management Unit 15(A) suggests the population could decline by 78 percent in the next 20 years from habitat maturation alone.

PAGES 41 to 43, Five-Year Habitat Manipulation. The plan indicates between 1992-1996, 10,369 acres in the Mystery Creek area will be burned. Oldemeyer and Regelin (1984) and Peek (1976) recommended minimum project sizes of 4,942 to 23,000 acres because moose

are attracted to areas with abundant forage and can easily damage regrowth vegetation on smaller areas by over browsing. Of the 10,369 acres proposed for enhancement during the next 4 years (93-96), 806 acres are in medium and 9,563 acres in low moose density areas, according to the 1990 census. Using the 1990 density estimates, these areas represented 4 moose in the medium and 2 moose in the low areas during the 1990 census. Predators in this area are currently estimated at 10.8 black bear (1 bear/1.5 mi^2), 0.9 brown bear (1 bear/19 mi^2), and the territories of 6 wolves overlap this area.

The assumption that predators in the proposed enhancement area out number moose by 3 to 1 strongly suggests the habitat enhancement efforts in the next planning phase should focus on areas of higher moose density, if enhancement to benefit moose is the objective. We recommend that areas of medium or high moose density be identified to be included in this five year schedule in the plan.

We are also hesitant to encourage enhancement work in Game Management Unit 15(B) with an objective of 200 acres per year. Areas of that size are far too small to justify the funds for implementation. Funds scheduled for Game Management Unit 15(B) could perhaps be added to efforts in Game Management Unit 15(A) to expand work there.

PAGE 46, Habitat Mapping The GIS data base should include snow depths.

PAGE 46, Timber Harvest Considering the infestation of spruce with bark beetles and increased price of lumber, we encourage the Kenai Refuge management to consider logging as a viable alternative to prescribed burning. As stated several times in this plan, prescribed burning has limited application near developments whereas logging and/or firewood cutting could be authorized.

PAGE 60, We suggest the Tables be updated. The majority of data, most graphs, and the tables reference 1991. Information collected during the past 2 years should be considered before the final plan goes to print

(e.g., completed research, Pothole Lake fire results, harvest strategies). The updating is particularly important considering that the earliest implementation of the Plan would be 1994 or 1995.

PAGE 63, carryover paragraph 1, last sentence This sentence again gives the impression that the Kenai Refuge makes determinations of moose population characteristics and manages harvests: "this information will be used to assess and direct area-specific harvest management strategies." We request this be corrected; e.g., ". . . this information will be used by ADF&G to assess and direct harvest management strategies."

PAGE 64, Direct Animal Assessments. We request that the plan specify what assistance the Service intends to provide for the Moose Research Center. This paragraph gives the general reader the impression that the Service substantively assists research. Such assistance has been limited, however, to plowing snow as other obligations permit. The DFG would welcome additional assistance.

PAGE 65, Moose Population Composition Objectives The discussion implies that there is a problem with the current objectives and that there are biological problems which need to be addressed by refuge managers. The theories of "balanced male age structure" and "prime aged bulls" need to be defined and proven, so to speak. Management of a population based solely on theoretical assumptions without biological justification does not justify major changes in current and successful harvest strategies.

DFG recommendations on composition objectives are stated earlier in this letter. Additional comments are provided below pertaining to DFG concerns about future hunting opportunity on the refuge.

Paragraph 1, sentence 1 We request deletion of "and a balanced male age structure."

Sentence 2 The plan recommends a higher bull:cow ratio for Game Management Units 15(B) East and 15(C)

but does not mention objectives for Skilak Loop. Game Management Unit 15(B) East has had a higher bull:cow ratio objective (40:100) since the mid 1970s to provide an opportunity to harvest a large bull, and hunting effort is restricted by a limited permit system to provide for hunting under aesthetically pleasing conditions. This program has accomplished the stated objectives. Changing the bull:cow ratio from 40 to 50 bulls:100 cows is unjustified. Skilak Loop has the same bull:cow ratio (40:100), which also seems appropriate.

The Refuge portion of Game Management Unit 15(C) supports a moderate number of hunters and a post-season bull:cow ratio of 37 to 53 bulls:100 cows due to current Refuge access restrictions and difficult access. The DFG recommends that Game Management Unit 15(C) should have the same bull:cow ratio objective as the Refuge portion of Game Management Units 7, 15(A), and 15(B) West since the access restrictions are similar.

Again, we object to the Service independently establishing population objectives when the DFG is the population manager and a cooperative process is in place for cooperative reevaluation of existing mutual objectives.

PAGE 66 As previously stated, the DFG recommends 25 bulls:100 cows for the Refuge portion of Game Management Units 7, 15(A) (except Skilak Loop), 15(B) West, and 15(C). Skilak Loop and 15(B) East should remain at 40 bulls: 100 cows. We request elimination of all references to a ratio of larger bulls:cows.

PAGE 67, carryover paragraph We request revision of the following sentence: "The current regulation has been successful in helping to meet the Service's moose population composition objectives on KNWR." The sentence should be revised to recognize DFG's role as moose manager and the 1986 cooperatively-developed population objectives.

The statement "objectives outlined above are currently being met in GMS 15(B) East and 15(C) . .

." is not accurate. Game Management Unit 15(B) East has maintained a ratio in excess of 50 bulls:100 cows but 15(C) has not. Count area *15(C)-21* (approximately 60% in the Refuge) has exceeded 50 bulls:100 cows in one count year since 1970; 53 bulls:100 cows was counted there in November 1992. Count area *15(C)-22* (90% in the Refuge) has not been counted recently but revealed 37 bulls:100 cows when last counted. The Refuge portion of Game Management Unit 15(C) has a higher average (40-45 bulls:100 cows) ratio than Game Management Units 15(A) and 15(B) West (22 bulls:100 cows) due to the selective harvest program, difficult access, and Refuge management restrictions. Viewing opportunities are excellent in Game Management Unit 15(C), and it currently exceeds the recommended ratio for similar general hunt areas on the Refuge. If the Refuge adopts an objective of 50 bulls:100 cows, unnecessary restrictions will be required to accomplish the desired ratio.

PAGE 68, Harvest Strategy 1, sentence 1 We request this be revised to reflect the management objective for Skilak Loop (130 countable moose and 40 bulls:100 cows) and be updated to reflect recent Alaska Board of Game action expanding the season 12 days (begins Aug. 20 rather than Sept. 1.)

Justification: Item 1) should be revised to reflect that prime aged bulls (not defined) have increased in Unit 15 - not just 15(A).

Item 3) To be more accurate, change "GMS 15(A)" to "Unit 15".

PAGE 69, Harvest Strategy 2. Two terms are used in this section which are not defined: "balanced age structure" and "minimum number" of prime-aged bulls. There are a couple of interesting but not proven theories pertaining to "balanced age", "average age", and "minimum number of prime-aged bulls" necessary to provide adequate breeding success. Although it is not stated, we assume that these are what the author is alluding to. Research conducted on the Kenai Refuge by Chuck Schwartz and Al Franzmann showed pregnancy rates high in heavily

hunted areas such as Game Management Unit 15(A) with less than 15 bulls:100 cows. Until a biological justification demonstrates the necessity for a "balanced age structure", the DFG opposes implementing biologically arbitrary objectives.

PAGE 70, Justification 2) "Numbers of moose harvested in GMS 15(A) will not decline . . ." is not possible. Under the current harvest strategy the bull:cow ratio has increased from 13:100 to 22:100 in Game Management Unit 15(A). To increase the ratio, harvest levels must be reduced. Spike/fork bulls currently comprise about 65-67 percent of the harvest. Since age classes of bulls two years old and older combined would comprise the largest percentage of bulls available for harvest, an any-bull permit system allowing enough permits to maintain current harvest levels would reduce the number of prime aged bulls. An any-bull program would also remove the protection provided now for superior yearlings. A limited permit system would only be beneficial to reduce harvest levels.

PAGES 70-71, Harvest Strategy 3. A post-rut registration hunt would attract many more participants than the Refuge has realized. A limited-entry permit hunt would only be necessary if harvest reduction was warranted. One primary reason for selective harvest was to prevent the need for permits on the Kenai, except to provide additional hunting opportunities.

Harvest Strategy 4. Archery-only seasons are no longer authorized on the Kenai due to recent Board action. An Aug. 15-19 season could be proposed in the spring of 1995, when the Board considers moose proposals again.

PAGE 74, carryover paragraph In the condition listed after "Antlerless moose harvests . . .", retain the first listed condition, but delete conditions "2)" and "3)".

Last paragraph The DFG welcomes the "cooperative review" proposed by the Service of the moose management agreement for Skilak Loop.

PAGE 75, Predation, paragraph 2. The assumption that moderate densities of moose increased in Game Management Unit 15(A) after burning needs to be clearly defined.

PAGE 76 Earlier comments made pertaining to the unlikely benefits to moose by enhancement of the Mystery Creek area are applicable here. We strongly recommend that the next writing of this plan include areas of high moose density (1969 burn) for enhancement. The DFG also requests to be involved in selection of areas to be enhanced.

Paragraph 2 The DFG supports the statements made here pertaining to impact of wolves on a declining population of moose and would welcome further discussion with the Service on management options.

PAGE 77, Highway Accidents, paragraph 2 The statement "Highway accidents constitute the major mortality for reproductive-age female moose on the Kenai" is not correct. The study that this conclusion came from was conducted in an area where moose were highly susceptible to highway accidents. If a similar study was conducted away from developed areas, DFG believes the results would contradict these conclusions. We request deleting paragraph two in its entirety because it does not contribute accurate information to the analysis. We do support statements in paragraph three.

PAGES 84-85, Research Priority 1 and Research Priority 2 We urge the Service to carefully rewrite these discussions and objectives. Research conducted by the Service should be focused on habitat enhancement techniques to maintain moose population objective levels. Care should be taken not to focus on moose population determinations which are the responsibility of the DFG unless the research is cooperatively designed and analyzed.

PAGE 88, Paragraph 1 We request the following statement be rewritten: "Due to funding shortages, the crushers stood idle until 1983". This statement is not consistent with what the Service advised the DFG during a 1976 Moose Conference in Seward. We were

informed by FWS Regional Director Watson that habitat enhancement was being phased out. From that time, refuge management would be following new direction to eliminate actions which specifically benefitted single species (moose). Funding was not the issue.

We also request correction in the first sentence that two crushers were transferred and one was purchased by the DFG.

PAGES 88-96 We request the Service clarify throughout this section the role of the DFG in the conduct of surveys and other population management actions and establishment of harvests. As written the section implies that only the Service has been active in moose population-related activities.

PAGE 94, Paragraph 1, Sentence 1 We request the first sentence be slightly modified to add one more important factor contributing to the moose population decline. The sentence could be reworded: "Declining range conditions (Oldemeyer et al. 1977), recolonization by wolves, and a series of severe winters . . . ."

PAGE 95, Paragraph 2, Sentence 1 We request the Service insert "potential loss of hunting opportunity" so that the sentence reads: "Biological concerns for the potential impacts of low bull:cow ratios, potential loss of hunting opportunity, and male age structures favoring younger bulls in . . . ."

PAGE 96, carryover paragraph and sentence We request the Service insert "(except Skilak Wildlife Management Area)" after "15(A)" and before "only". We request the next sentence be modified to read: "These regulations remained in effect from 1987-92. In 1993, the Board of Game lengthened the season to Aug. 20-Sept. 20 and dropped the archery-only hunt in 15(A)."

Research, Sentence 1 We note that "1996" should be "1966".

Sentence 2 We request the Plan correct 4 $1mi^2$; it should be four one-mi^2.

PAGE 97, MANAGEMENT IMPLICATIONS . . ., Paragraph 1, Last Sentence After "Kenai Lowlands in 1947 and 1969", we request the Service add "and the absence of wolves."

Throughout the plan, the DFG recommends that the Service add a more complete and accurate assessment of the impact of predators on moose. The impact of predation is noticeably absent in the discussion pertaining to scheduled enhancement and how the moose population has changed over time. For example, there should be mention of the impact of wolves following the severe winters during the early seventies. Although we agree changes in habitat by wildfires was the primary reason for dramatic increases in moose densities, habitat improvements alone will not produce desired moose densities in portions of the Refuge with current predator populations. This is exemplified in the Plan in the example given for predator-prey ratios in the prescribed burn area on Mystery Creek Road.

PAGE 101, Table 9 The department recommends the bull:cow ratios shown for 1984 and 1986 in Game Management Unit 15(A) be deleted. Due to poor counting conditions, only portions of the area were counted resulting in unreliable (not directly comparable) data for Game Management Unit 15(A) during these years.

PAGE 102, carryover sentence We request deletion of "reduced reproductive success".

PAGE 103, carryover paragraph We request revision of the last sentence in this paragraph to make it accurate: delete "Although" and remainder of sentence after "inconclusive." The sentence should read: "Fall population composition data for GMS 15B and GMS 15C are limited and inconclusive."

Paragraph 1 The discussion located here concerning predators reflect comments which should be appropriately included elsewhere in the overall text

of the plan. We urge the Service to review this section. Statements related to predator-prey relationships should be interfaced with changes in habitat and moose densities. No mention was made that additional predation and higher harvests may have benefitted the moose population following the 1947 burn when over browsing occurred or that predators are currently maintaining moose at low levels where habitat is poor.

Paragraph 2 The citation "Del Frate and Spraker in press" should be updated. This paper was published in Alces, Vol. 27 in 1991.

PAGE 104, carryover paragraph, last sentence Bangs *et al.* incorrectly reported in 1989 that highway vehicles were "the principal source of mortality for prime-age female moose on the KNWR". On Page 8 it is also incorrectly reported that vehicle accidents are the primary source of mortality for breeding-age cow moose on the Kenai Peninsula. According to DFG staff who participated during the collaring phase of this study, moose were collared less than 10 miles from Soldotna in the Slikok-Coal Lakes area. The results were biased, in part due to the location of the study area and its proximity to the most developed area on the Kenai. Monitoring of road kills since 1976 by the DFG shows the majority of all moose killed on the Peninsula are killed within 15-20 miles of Soldotna. In that light, it is surprising not more of the collared moose in Bangs' study were victims of vehicle accidents. Bangs' study demonstrated cause of mortality in a unique location on the Kenai and could not be repeated (and considered applicable) for the Kenai Refuge and especially not for the entire Kenai Peninsula. We strongly recommend any reference to this study be made with recognition of these limitations.

Paragraph 1. We agree with these statements and recommend their use early in the plan for clarity.

Paragraph 2, Sentence 1 We request the Service replace "40-50 years" with "10-20 years".

PAGES 107-108 In light of the foregoing problems, we request the discussions in these sections be largely deleted. The Service appears to be inappropriately applying the results of a biased study to the entire Kenai Peninsula to justify opposing improvements of the main highway down the peninsula.

PAGE 115, Appendix 4, assumption 1 We request the Service add "for specific vegetation types" at the end of the sentence.

assumption 5 This should be revised; a more accurate statement is "Moose density in residential/developed areas varies with severity of winter, as shown in 1990 census." The Plan's stated assumption would over estimate the moose density.

assumption 6 The average winter density reflects an extreme winter (6.0 moose/sq. mile), resulting in an inflated number of moose.

assumption 7 The figures in Appendix 5 and 6 are overestimates due to assumptions in 1, 5 and 6.

assumption 8 This assumption over-inflates the current and future population.

assumption 10 We recommend winter kill and road kills be separated from other mortality factors since they vary greatly between years.

Title 16 Permits We request that, in an appropriate location, the Plan include recognition of the need to acquire an Alaska Statute 16.05.870 anadromous fish stream permit when the Service intends to enter a designated anadromous fish stream with equipment, such as conducting moose enhancement projects. We also request the opportunity to review and identify appropriate permit terms and conditions once the Service completes this review process and begins their actual program.

Technical Supplement

We request that the final Technical Supplement to the management plan be made available, with corrections and

additions, since it serves as the basis for the decisions contained within the plan. In light of the problems with base information leading to discrepancies in objectives for refuge management, DFG recommends that the Kenai Refuge consider publishing a second draft plan for public review after further consultation between the Service and DFG. Many of the substantive comments provided above require major revisions which do not lend themselves to a page-by-page review. We certainly hope to avoid agency disagreements during the public input phase of the planning process which further damages our respective credibility and working relationships.