
Western Arctic Caribou Herd Working Group

Goal: To work together to ensure the long-term conservation of the Western Arctic Caribou Herd and the ecosystem on which it depends, to maintain traditional and other uses for the benefit of all people now and in the future.

Chair: Roy Ashenfelter

Vice-Chair: Phil Driver

December 17, 2007

Mr. Bruce Phelps, State Planner
Department of Natural Resources
550 West 7th Ave., Suite 1260
Anchorage, AK 99501

Re: Caribou Working Group Comments on DNR Northwest Arctic Plan

Dear Mr. Phelps:

On behalf of the Western Arctic Caribou Herd Working Group (Working Group), I am submitting scoping comments on the Department of Natural Resources (DNR) Northwest Arctic Draft Land Management Plan (referred to hereafter as NWA Plan) covering an outward extent of 31 million acres in northwestern Alaska and within which DNR has administrative responsibility for approximately 12 million acres, including both state lands and state selected lands combined. On behalf of the Working Group, I want to thank you and your staff for going out of your way to provide us with valuable information on your planning process and seeking comments from the Working Group. We have appreciated your openness and interest in including information in the plan on seasonally important caribou habitats.

The Western Arctic Caribou Herd Working Group was created in 1997 and consists of a broad range of stakeholders interested in using and conserving the Western Arctic Caribou Herd (WAH). The goal of the Working Group is to work cooperatively with each other and state and federal resource management agencies *“to ensure the long-term conservation of the Western Arctic Caribou Herd and the ecosystem on which it depends, to maintain traditional and other uses for the benefit of all people now and in the future.”*

The NWA Plan will address many lands within the Planning Area that affect the caribou herd, seasonal ranges and habitats used by the herd, and the people who use the herd. The Working Group knows the WAH is a vital and irreplaceable wildlife resource in northwestern Alaska and every effort must be made to protect and conserve the herd, and its habitats, in perpetuity. This letter provides DNR with Working Group comments and recommendations for lands within the plan that have high value as caribou habitat and consequently should be given strong consideration for habitat protection. The following major topics are covered in this letter: background biological information, the Cooperative Management Plan and Resolutions adopted by the Working Group, climate change, critical and sensitive habitats, recreation management, fire management, grazing management, and resource development.

1) Background Biological Information.

The Western Arctic Herd is the largest caribou population in Alaska numbering over 490,000 animals in July 2003. It occupies the northwestern quarter of the state, an area of about

140,000 mi² (Figure 1). The heritage and traditions of Native Alaskans residing in about 40 subsistence-based communities have been shaped to a large extent by the availability and abundance of these caribou.

Annually, the caribou use five seasonal ranges located within the Planning Area (see Figure 1) and of these, only peripheral range is considered non-essential for the maintenance and stability of the herd. The other four seasonal ranges are considered essential for the herd to maintain its abundance and distribution in northwestern Alaska:

1. Calving Grounds. The calving grounds are located in the Utukok Uplands near the center of summer range. The western portion of the calving grounds are contained within the Planning Area (Figure 2).
2. Summer Range. This range includes the area north of and including the Brooks Range, an east-west continuum from Umiat to Point Hope, and the area south of the Brooks Range to the Wulik River, De Long Mountains, upper Noatak River and upper Kobuk River (Figure 3). Major portions of summer range are critical insect relief habitat and occurs throughout the entire northern portion of the Planning Area (Figure 4). Important insect relief areas are from Point Lay to Cape Lisburne and eastward in the foothills and mountains of the western Brooks Range.
3. Migratory Area. This area includes the portion of Game Management Unit (Unit) 23 from the base of the Baldwin Peninsula north to the crest of the Brooks Range and from Anaktuvuk Pass westward to Kivalina. This area allows passage of large numbers of caribou as they move from summer range to winter range during the fall migratory period, and from winter range to calving grounds in the spring migratory period. In their annual migrations between summer and winter ranges, WAH caribou travel through the Brooks Range and along the western coastal plain and foothills. Figures 5 and 7 show fall and spring migratory routes, respectively, that are particularly concentrated in portions of Unit 23.
4. Winter Range. Primary wintering areas occur in the Nulato Hills, the eastern half of the Seward Peninsula, and in the upper Kobuk River drainage (Figure 6). Since 2000, the large number of satellite radio collars in the herd shows a preference for winter range on the Seward Peninsula. However, prior to 2000 VHF radio collar data and low numbers of satellite collars demonstrate that the Nulato Hills were the primary wintering range (Jim Dau, ADF&G personal communication). In addition to these primary wintering areas, in some years substantial numbers of WAH caribou have wintered between Atqasuk and Anaktuvuk Pass, and in the Brooks Range between Iniakuk Lake and Wiseman.

Human harvest of caribou has been primarily for subsistence purposes. Caribou, along with fish and marine mammals, have historically been a staple in the diet of many local residents. Presently an estimated 15,000 Western Arctic caribou are harvested each year for subsistence within the range of the herd. The Planning Area includes 26 villages that harvest WAH caribou and at least 75-80% of the annual herd harvest is associated with subsistence hunting within the Planning Area. Additionally, since 1998 non-resident and non-local hunters have taken approximately 500-800 animals from this herd annually, mostly within Unit 23.

Maintaining access to high-quality habitat used seasonally by caribou is essential for the long-term conservation of Alaska's largest caribou herd. We strongly recommend that DNR prioritizes the long term health and maintenance of the Western Arctic Caribou Herd, and the

habitats upon which it depends, within the Planning Area to ensure the health of the herd and subsistence opportunities for the communities of northwestern Alaska. Maintaining productive caribou habitat and working closely with communities in northwestern Alaska and the Working Group should be a high priority for the DNR planning process.

2) Cooperative Management Plan and Working Group Resolutions

The Working Group adopted the Western Arctic Caribou Herd Cooperative Management Plan (Caribou Plan) in March 2003 and subsequently received endorsements and support for the Caribou Plan from the Alaska Board of Game and the Federal Subsistence Board. The Caribou Plan contains 7 Elements describing: cooperation, population management, habitat, regulations, reindeer, knowledge, and education. The relationship of important Caribou Plan 'elements' to the Planning Area are described below:

- A) Habitat. Maintaining adequate high quality habitat is essential for the long-term conservation of Alaska's largest caribou herd. The goal of the Caribou Plan is "*to assess and protect important habitats of the herd*" (emphasis added). Further, the Caribou Plan outlines a strategy stating the Working Group should inform managers of concerns about potential habitat impacts to achieve the goal of protecting the herd by protecting important habitats. The important habitats identified by the Working Group are calving grounds, summer range (including insect relief habitat), migratory area (including identified travel corridors), and winter range. The Habitat Element of the Caribou Plan also considers wildfire management and encourages resource management agencies to fully understand how wildfire affects the range condition and thus future management and conservation of the herd. The Working Group recommends wildfire management strategies that protect lichen habitats found on seasonal ranges, especially winter range.
- B) Reindeer. Minimizing conflict between reindeer herders and the caribou herd is the goal of this portion of the Caribou Plan. The Working Group recommends reduced grazing activities within areas frequented by caribou to help avoid conflicts in the future.

The Working Group has emphasized the importance of habitat relationships to the WAH by adopting several resolutions focused on understanding and protecting important and critical habitats used by the herd.

- A) Resolution 2004-01 was adopted on May 6, 2004 and relates to resource development impacts on seasonal ranges. The resolution stated in part:
 - The Western Arctic Caribou Herd Working Group has identified habitat conservation issues as a major area of focus;
 - The Working Group will encourage more coordinated efforts to locate and assess the condition of habitats for summer range, winter range, calving, insect relief and movement corridors and to assess development impacts on these habitats.
 1. Evidence of slowed herd growth and recent depletion of winter range highlights the importance of protecting winter range habitats within the range of the herd.
- B) Resolution 2005-01 was adopted on October 4, 2005 and relates to conservation and protection of migratory routes and seasonal ranges used by the herd. The resolution states:

NOW THEREFORE BE IT RESOLVED that the Working Group considers conservation and protection of migratory routes and seasonal ranges used by the herd as important tools to be used in managing the future well-being of the Western Arctic Caribou Herd; and

BE IT FURTHER RESOLVED that the Working Group recommends minimizing impacts of human activities on Western Arctic Caribou Herd and the habitats associated with seasonal ranges used by the herd.

Additional information showing the importance of migratory routes in the Planning Area will be presented later in this letter.

- C) Resolution 2005-02 was adopted on October 4, 2005 and shows the importance of the Nulato Hills as critical winter range for the herd. The resolution nominates this habitat as an area of critical habitat and environmental importance and further action by the Working Group elevated the Nulato Hills winter range to the Bureau of Land Management as an 'ACEC' during scoping for the Kobuk-Seward Peninsula Resource Management Plan.
- D) Resolution 2006-01 was adopted on September 14, 2006 and shows the importance of cooperative planning process to alleviate user conflicts in Unit 23 during the fall hunting season. The resolution also recommended specific actions to consider regarding recreation management in Unit 23.

3) Climate Change

There is an overwhelming scientific consensus that climate change is taking place and that it is having impacts on the arctic environment in Alaska. Climate change, and the associated warming of the arctic region in Alaska, is an enormously important issue with implication for nearly every activity that takes place within the Planning Area. The Working Group recommends that the NWA Plan consider climate warming/climate change and its effects on caribou, habitats and ecosystem relationships. Any responsible attempt to create an effective long-term plan spanning the next 10-20 years for the area must address the impacts of climate change on the region. We recommend the plan contain a process which will allow the DNR to respond to the impacts of climate change that may occur during the plan's duration.

While climate change is complex, warming temperatures cause permafrost to melt and broad impacts are expected on ecosystems and activities within the Planning Area. For example, as permafrost occurring under ponds and lakes melts, surface water moves to groundwater and the resultant effect is drying of ponds and lakes. Indeed, many drained tundra lakes are now apparent within the range of the WAH as are numerous thermokarsts on summer range. Drying soil conditions and warmer temperatures allows advancement of shrub habitats and loss of tundra vegetation (Arctic Climate Impact Assessment 2004).

In addition, melting of permafrost affects transportation infrastructure and structures. The NWA Plan should acknowledge the need to re-evaluate current standards in the face of rapid climatic changes.

Forest ecology is modified by climate change and warming climates are having significant impacts on Alaska forest ecosystems (Glenn Juday, UAF, personal communication). Disturbance to normal forest processes reduces forest performance and increases vulnerability to disease and fire. Mature black spruce forests, which are most vulnerable to

fires when mature, provide important habitat for caribou by supporting lichens that caribou rely on during the winter. The effects of climate change on these types of habitats related to caribou should be considered and evaluated for lands within the Planning Area.

4) Caribou Habitats

The Working Group requests that DNR coordinate with BLM, NPS, and F&WS in regard to land cover classification and mapping in the northwestern portion of the State. The Point Hope, De Long Mountains and Point Lay quads in the Planning Area are very important to caribou during post-calving, insect-relief and summer seasons. Also, in some years, a portion of the herd winters in these areas. Inventory and knowledge of vegetative classification will help identify areas that sustain the herd during the varying seasons of the year.

The estimates of abundance and quality of lichen crop on winter range are extremely valuable in assessments of range condition for the WAH. The Working Group recommends that DNR work collaboratively with other resource agencies to establish and monitor permanent sites in calving and summer range areas that will allow trend analysis of the quality and abundance of key habitat parameters.

The Working Group requests that DNR recognize and manage lichen-rich plant communities as unique habitats that are highly important to caribou. Lichen-rich areas in the Planning Area should be protected for the future benefit of the caribou herd. These habitats form essential and critical winter range for the herd.

The Working Group requests that fire suppression techniques be implemented to protect selected areas of old growth lichen on caribou winter range within the Planning Area. Recent information shows that caribou do not select (avoid) burned lichen stands for long periods of time (50-100 years) after lichen areas are burned. Extensive loss of old-growth lichen should be avoided.

The Working Group encourages DNR to recognize and manage multi-aged lichen stands for the benefit of caribou within the Planning Area. This management strategy ensures that, through time, lichen stands will mature to old-growth quality and help perpetuate quality caribou range for the herd. Since lichens mature slowly, the view for range quality and their usefulness to the herd should be measured by centuries and not by decades or shorter periods of time.

5) Caribou Populations

The Working Group requests that DNR work cooperatively with State and other Federal agencies to help inventory and monitor habitats of the WAH. This herd is an important subsistence resource for the people in 40 villages located within the range of herd. The Planning Area includes lands that are used by caribou during every season of the year. Monitoring efforts within the Planning Area will help contribute to comprehensive assessments of WAH caribou and their range.

The Working Group encourages DNR to work cooperatively with State and other Federal Agencies to implement the Western Arctic Caribou Herd Cooperative Management Plan prepared in March 2003. The Plan, on pages 6-8, identifies high level of human use of the herd, potential impacts of resource development, increased

recreational use of the herd, and concern over environmental contamination of caribou and its relationship to human health.

The Working Group strongly recommends that DNR provide permanent protection to WAH migration corridors and all seasonal core habitats on state lands within the Northwest Planning Area. Habitat protection is essential to maintain the WAH and is the driving mission of the Working Group. The protection of critical habitats and migration corridors will ensure that opportunity for human uses of Alaska's largest caribou herd are sustained for the 40 Native villages that depend on the herd and the other people who also use and appreciate this herd.

6) Traditional Ecological Knowledge

At the December 2007 Annual Meeting of the Working Group in Anchorage, village representatives used their traditional ecological knowledge and identified specific areas of importance/concern on maps of the Planning Area provided by DNR. These maps were made available to the DNR planning staff following the meeting.

7) Resource Uses

a) Mining

The Working Group believes caribou habitat protection should be a high priority in the Planning Area. No mining activities should occur in the concentrated seasonal habitats used by caribou. The primary objectives should be high protection of habitats used by caribou and preventing disturbance to caribou as they engage in their annual seasonal movements and range use. If coal or hard rock mining is permitted, it should not be allowed within the primary calving ground (90% kernel analysis, Figure 2), critical insect relief habitat (90% kernel analysis, Figure 4), migratory corridors in central Unit 23 (Figures 5 and 7), and concentrated winter ranges in the Nulato Hills, Seward Peninsula and upper Kobuk River (90% kernel analysis, Figure 6). These seasonal ranges must be protected and should be considered mining exclusion areas.

In areas outside core seasonal habitats, mining stipulations must be developed and implemented to prevent localized and/or broad scale contamination of vegetation, drainages and habitats used by caribou in other portions of their range outside the protected habitats described above. Strict adherence to abatement of fugitive dust in mining activities must be stipulated.

Aircraft flights for exploration and development activities should be conducted at least 2,000 ft AGL (except for take-offs and landings). No harassment of wildlife by low flying aircraft during exploration activities.

Cumulative effects analysis of coal and hard rock mining and other industrial activities within the Planning Area must also address concurrent climate change issues in the Arctic and appropriate risk analyses should be conducted.

b) Coal bed methane or oil and gas

The Working Group believes caribou habitat protection should be a high priority in the Planning Area. The primary objectives should be high protection of habitats used by caribou and preventing disturbance to caribou as they engage in their annual

seasonal movements and range use. No leasing or activities associated with the development of coal bed methane or oil and gas should occur within the primary calving ground (90% kernel analysis, Figure 2), critical insect relief habitat (90% kernel analysis, Figure 4), migratory corridors in central Unit 23 (Figures 5 and 7), and concentrated winter ranges in the Nulato Hills, Seward Peninsula and upper Kobuk River (90% kernel analysis, Figure 6). These seasonal ranges should be considered exclusion areas. Outside of the core habitat protection areas (described above), strong stipulations should be developed (in collaboration with caribou managers and scientists from state and federal agencies and universities) similar to those on the North Slope in order to minimize impacts to caribou.

In areas outside concentrated seasonal habitats, exploration and development stipulations must be developed and implemented to prevent localized and/or broad scale contamination of vegetation, drainages and habitats used by caribou in other portions of their range outside the protected habitats described above.

Aircraft flights for exploration and development activities should be conducted at least 2,000 ft AGL (except for take-offs and landings). No harassment of wildlife by low flying aircraft during exploration activities.

Cumulative effects analysis of coal and hard rock mining and other industrial activities within the Planning Area must also address concurrent climate change issues in the Arctic and appropriate risk analyses should be conducted.

The National Academy of Sciences National Research Council (NRC) March 2003 report on *Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope* also confirmed that oil and gas drilling has had profound impacts on the region's environment, including migrating caribou. The NRC observations included various negative effects of oil and gas extraction on the Central Arctic herd, including "localized changes in habitat use, longer approach distances and altered activity patterns" (pg 109). The study found that caribou would not come within 3,900 ft of a drilling site, and even frequently stayed as far as 1.2 miles. Also, caribou entering a drilling area spent less time foraging and resting.

If similar stress and displacement were to occur on a much larger herd like the WAH, which migrates long distances, the population-level impacts could be much higher. Griffith et al. (2002) predicted significant population-level impacts to the Porcupine Caribou Herd from industrial development of the concentrated calving ground. Considering the similarities in size of the herd and length of migration, the WAH herd could feasibly suffer these same projected impacts.

c) Livestock Grazing

The WACH Cooperative Management Plan (March 2003) seeks to minimize conflicts between reindeer herders and caribou. The Working Group recommends that DNR screen grazing permit applications for potential conflicts with caribou.

Additional Land-Use Allocation Recommendations:

1. In the Draft NWA Plan, DNR should evaluate and describe cumulative effects of proposed development activities on caribou habitat and populations throughout the entire range of the WAH.

2. The Draft NWA Plan should evaluate and describe cumulative effects of those activities on subsistence and other uses throughout the entire range of the WAH.
3. The Draft NWA Plan should identify and describe sensitive caribou habitats and movement corridors within the Planning Area. Maps of the caribou habitats and movement corridors should be included in the Final NWA Plan.
4. If the Draft NWA Plan allows resource development activities within sensitive caribou habitats and movement corridors within the Planning Area, a risk analysis should be conducted for the WAH similar to that prepared for the Porcupine Caribou Herd within the Arctic Refuge Coastal Plain (see Griffith et al. 2002).
5. The Draft NWA Plan should explicitly describe what measures will be taken to protect sensitive caribou habitats and movement corridors and how those measures will be monitored and enforced.
6. Cumulative effects analysis of industrial activities within the Planning Area must also address concurrent climate change issues in the Arctic and appropriate risk analyses should be conducted.
7. An explicit monitoring and assessment plan should be developed for any substantive resource development activities that may affect caribou habitats and populations within the planning areas of the NWA Plan.
8. The Draft NWA Plan should evaluate the tradeoffs between short-term resource exploration and development activities and their resulting benefits versus long-term sustainable uses of caribou in terms of social, cultural, and economic values.
9. The Draft NWA Plan should explicitly describe the dismantling and removal of infrastructure, as well as a specific reclamation plan for the area, including time lines and funding mechanisms.

Recreation Management:

The Working Group recognizes that user conflicts occur in northwestern Alaska (particularly in Unit 23 during the fall hunting season) and recommends that the Draft NWA Plan address these conflicts. We also recommend that DNR participate in the Unit 23 Planning group being formed with other state and federal resource agencies and regulatory boards to minimize user conflicts on state lands within the Planning Area.

Off-Highway-Vehicle considerations are closely related to recreation management in the Planning Area. Damage to vegetation is accelerated with the use of multi-wheel OHVs (e.g. Argo type vehicles). These vehicles should not be permitted in the ice-free season when unfrozen soils are damaged by the opposing rotation of wheels (axles) to allow directional control of the OHV.

8) Concentrated Seasonal Habitats and Migratory Corridors

Calving Grounds (Figure 2). The calving grounds are located in the Utukok Uplands near the center of summer range. The western portion of the calving grounds is contained within the Planning Area. The 90% kernel analysis (excluding years 1990 and 1991) shows a repeatable area that is consistently used by the herd. This area deserves the highest priority for habitat protection because of its importance to the herd on an annual basis. Note that kernel analysis does not include 1990 or 1991 data only because in 1990 poor weather prevented calving survey data collection and

in 1991 early calving by the herd occurred before scheduled surveys so it was not possible to determine the extent of the area used for calving. In all other years, observations of calving show that only occasionally are areas outside the primary calving area used by the herd.

Summer Range (Figure 3). This range includes the area north of and including the Brooks Range and westward from Umiat to Point Hope. The summer period is characterized by extensive east-west movements, high mobility and consistent use of mountain and foothill habitats. Summer habitats are important to the herd for fattening of animals prior to migration and deserve high priority protection in the Planning Area.

Insect Relief (Figure 4). During the summer period when insect harassment of caribou is high, the herd seeks relief from insects in the northern portion of its annual range. Important insect relief areas are from Point Lay to Cape Lisburne and eastward in the foothills and mountains of the western Brooks Range. The portion of the Planning Area west of NPRA includes critical insect relief habitat where kernel analysis at the 50%, 90% and 95% levels nearly converge on the same portion of summer range. This area warrants the highest priority for habitat protection because nearly the whole herd seeks relief in this concentrated area. In other portions of summer range, insect relief is more dispersed due to annual variations in areas selected by the herd. Overall, the 90% kernel analysis reflects an area that is of high importance to the herd and deserves high habitat protection in the Planning Area.

Fall Migration Areas (Figure 5). The herd is more dispersed during fall than at any other time of year. Caribou are found throughout their entire range, although movement patterns based on satellite collar track histories help show areas of concentrated movements. The central portion of the Planning Area is an area with concentrated migratory pathways and these areas should be given high priority habitat protection. Generally, caribou move southwest during fall and roughly follow 4 corridors of heavy use through Unit 23. From east to west these are:

- 1) a broad area between Ambler and Kobuk;
- 2) the mountains between the Salmon and Squirrel River drainages;
- 3) the Aggie and Ely Rivers; and
- 4) the coast near Cape Krusenstern.

These fall movement corridors all converge in the vicinity of Selawik Lake as caribou move southward to winter range. The map (Figure 5) under-represents movements into the Nulato Hills because few satellite collars were deployed during the late 1980s to middle 1990s. High numbers of satellite collars (20-30 functional collars per year) didn't begin until the late 1990s. By this time period, the WAH started using the Seward Peninsula as winter range more often and more heavily than in previous years. The map should show movements splitting into 2 'tails' in the vicinity of the Buckland drainage: one going west onto the Seward and one going south into the Nulato Hills.

The multiple major pathways and convergence area of fall migration should be given special land status and provided protections that preserve and do not alter the habitat in these areas. Also, the areas identified as migration areas should be designated as exclusion areas for resource developments.

Winter Range (Figure 6). This area includes the concentrated areas of use in the Nulato Hills, eastern Seward Peninsula and upper Kobuk River. These areas (50% kernel analysis) should be given the highest priority for habitat protection in the Planning Area. Additionally, high priority protections should be given to winter range depicted by the 90% kernel analysis area. This area has more annual variability but shows the widespread use of the herd range that is used in the winter season. Note that since 2000, the large number of satellite radio collars in the herd shows a preference for winter range on the Seward Peninsula. However, prior to 2000 VHF radio collar data and other observations demonstrate that the Nulato Hills were the primary wintering range of the herd. The Working Group supports designating winter habitat in the Nulato Hills as a special protected habitat designation within the Planning Area. In fact, the region was so critical that several ACECs were established by BLM in this area. McCarthy's Marsh is a winter habitat favored by caribou in years when they migrate to this portion of the Seward Peninsula. The Working Group supports a special habitat designation within this area.

Spring Migration Areas (Figure 7). The map is self explanatory and shows that caribou converge on an area bounded by Selawik, Noorvik and Kobuk as they begin their movement northward to the calving grounds. It is important to note that during spring movements, caribou do not follow the same corridors used during fall movements.

The narrow corridor of spring migration in the vicinity of Selawik-Kobuk should be given special land status and provided protections that preserve and do not alter the habitat in these areas. Also, the areas identified as migration areas should be designated as exclusion areas for resource developments.

Thank you for accepting and acting on these comments from the Working Group. If I can be of further assistance to explain the position of the group, please don't hesitate to contact me.

Sincerely,

<signed>

Roy Ashenfelter, Chairman

cc: Tom Irwin, DNR
Denby Lloyd, ADF&G
Doug Larsen, ADF&G
Tom Lonnie, BLM
Tom Melius, FWS
Marcia Blaszk, NPS

Attachments:

- Figure 1 – ADF&G WAH seasonal range map
- Figure 2 – WAH calving grounds kernel analysis
- Figure 3 – WAH summer movements track history
- Figure 4 – WAH insect relief areas kernel analysis
- Figure 5 – WAH fall migration track history
- Figure 6 – WAH winter range kernel analysis
- Figure 7 – WAH spring migration track history
- Explanation of Kernel Analysis (Figures 2, 4, 6)
- Literature Cited

Western Arctic Caribou Herd Working Group

Goal: To work together to ensure the long-term conservation of the Western Arctic Caribou Herd and the ecosystem on which it depends, to maintain traditional and other uses for the benefit of all people now and in the future.

Chair: Raymond Stoney

Vice-Chair: Roy Ashenfelter

Explanation of Kernel Analysis (Figures 2, 4, 6):

Kernel analyses (Silverman 1986) were used to delineate critical calving area, insect relief, and winter range habitats. This statistical method identifies the smallest possible area containing the specified percentage of data points. In the scientific community, the convention is to show the 95% kernel as a conservative estimate of range use. As with other caribou herds throughout North America, maternal WAH cows show very strong fidelity to the calving grounds compared to other seasonal ranges. Because strong fidelity and limited movements of cows during parturition elevates the importance of calving grounds to caribou, the 90% kernel is used to identify the primary calving area used by the herd (Fig. 2). In contrast, critical insect relief habitat and winter range habitats were evaluated using the 50%/90% kernels (Figs 4 and 6). During these periods more annual variation occurs and concentrated use occurs when the 50% and 90% kernel areas converge on the same portions of the herd range. Caribou respond to insect harassment during July through mid-August by forming large aggregations and rapidly moving long distances. Because of these movements during the 6-week insect period, the 95% kernel included areas that are not essential to the health of this herd. Therefore, the 50%/ 90% kernel (combined) was used to delineate critical to insect relief habitat needed by the herd. Winter range has annual variation, yet core areas are identified by 50% kernels and favored areas are depicted by 90% kernels.

Literature Cited

- Arctic Climate Impact Assessment. 2004. Impacts of a warming Arctic. Cambridge University Press.
- Griffith, B., D. Douglas, N. Walsh, D. Young, T. McCabe, D. Russell, R. White, R. Cameron, and K. Whitten. 2002. The Porcupine caribou herd. *In* D. Douglas, P. Reynolds, and E. Rhode, editors. Arctic Refuge coastal plain terrestrial wildlife research summaries. U.S. Geological Survey, Biological Resources Division, Biological Science Report BSR-2002-0001.
- National Academy of Sciences National Research Council (NRC) March 2003 report on *Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope*
- Silverman, B.W. 1986. Density estimation for statistics and data analysis. Chapman and Hall, London, England.