NOTES COMPILED AT WORKSHOP

ON MOOSE RESEARCH AND MANAGEMENT[1/]

Winnipeg, Manitoba
March 21 and 22, 1966

This is the third in a series of such meetings devoted to discussion of moose management and research in North America. The two previous meetings were held in St. Paul, Minnesota in March of 1963 and 1964. The meetings have proven their usefulness as evidenced by the wide representation present at all three meetings.

1. Current moose population status and trends.

Alaska - On a statewide basis moose populations are high, probably exceeding range capacity in many instances; and die-offs during severe winters are common.

Manitoba - A declining trend in the moose population was evident from 1961 - 1965. This trend has recently reversed itself. Overharvest may have contributed to this decline. Censuses are conducted using a four man crew and a Beaver aircraft. Transects are flown at 3 to 12 mile intervals depending upon accessibility and importance of the area for sport hunting. The transects are flown at 650 feet above the ground and moose are counted on a strip one-eighth mile on each side of the aircraft by the two observers in the rear of the aircraft. The flights begin around 10 January and are completed in about two weeks. A crude estimate places the population at 40,000 moose. The licensed harvest in 1964 was 2,000 animals.

Alberta - Moose losses were experienced in 1962 due to the deep snow and heavy tick population. Since this there has been an upswing in the population and this

1/ Material contained herein should not be quoted without approval of the contributing individual or agency.

past winter we experienced the highest moose count since 1957. Last winter was a severe winter. In areas of low or negligible harvest the percentage of calves is 15 percent. In areas of heavy harvest this becomes 30 percent.

Saskatchewan - An aerial survey is conducted in areas of heaviest harvest pressure. The highest populations exist in the east central portion of the province in the Cumberland Marsh area and declines as you proceed westward. The overall population has been increasing over the past four to five years. The burn areas are showing good population increases.

Alberta - The population extended southward to Bow River in 1940. A southward range expansion has taken place. A population increase was noted in the 1950's. From 1952 to 1956 a predator-rabies control campaign was carried out that was effective in reducing the number of predators. Browse-outs date back to the 1950's suggesting that predators may have been a limiting factor to moose populations. Increased use by moose of areas logged and burned shows up 7 to 8 years after the disturbance. Deep snows in 1961-62 and 1962-63 coupled with high tick (Dermacentor albipictus) populations resulted in winter and spring losses.

In censusing moose in Alberta Helio-courier aircraft are utilized. This aircraft is capable of flying at speeds of 60-65 m.p.h. Straight line transects are flown at 300 to 350 feet; one-eighth mile strips on each side of the aircraft are used as the sample area. In comparing the fixed-wing aircraft with the helicopter, very little difference was noted in the number of animals observed. The helicopter flew at 150 - 200 feet altitude. A three man crew using a tape recorder is used on the census flight. Moose populations range from 0.5 to 4.5 moose per square mile in the Grand Portage area and 3.5 moose per square mile in the Peace River area. In the latter area populations in some instances may equal or exceed 10 moose per square mile. Based on eleven years data, there is currently 51,000 square miles of moose range in Northwestern Alberta supporting some 67,000 moose. Moose carrying capacities are

being described by forest type.

Ontario - Straight-line transects were originally used to census moose but were abandoned after two years use. A plot system is now employed. Some troubles were encountered this winter (1965-66) in using a turbo-prop Beaver aircraft in that heat waves passed by the observer's window.

Perhaps the figures discussed here this morning are not statistically significant and the population differences are due more to "countability" of the animals.

The fall of 1965 probably produced the best hunt in recent years.

In the winter of 1965-66 the Port Arthur District began using a 1 x 5 mile plot for censusing. This was accompanied by an increase in the number of plots with a greater distribution. Plots flown in early winter shows a decrease as winter progressed. Current population is 0.7 moose per square mile.

New Brunswick - Six moose seasons have been held to date in recent years. The population is increasing at the rate of 10 percent annually. This is based on data gathered from road transects and hunter observation data. There is one overpopulated area in the province that requires special legislation to alleviate. Starvation deaths have been recorded. Two men found 87 dead moose in 1960, a year of heavy tick (D. albipictus) infestation. The population in this area is now considerably reduced. Antlered moose only are harvested legally. Lack of cows is observed in some areas. The calf portion of the fall population is 25 percent. Hunting has relieved overpopulation in some areas. Further herd control is anticipated to reduce moose competition with deer. A lack of young cows has been noted. The majority of them observed are 5 to 6 yearsof age. Current population estimate is 5,000 moose on 28,000 square miles of area.

Overpopulated ranges yield smaller animals. The yearlings are 100 pounds less in weight from the overpopulated areas.

Flying transects and plots is ineffective for censusing moose under New Brunswick conditions. Current census efforts are in conjunction with other work in flying streams and counting one-eighth mile each side of the stream.

Minnesota - Some 10,000 moose in State on 15,000 square miles of primary range and 8,000 square miles of secondary range. Aerial censusing has been used in the two major moose ranges of northern Minnesota since 1959. The ranges are now stratified into high and low density areas from which 3 x 5 mile plots are randomly selected. The trend for northwestern Minnesota has been a slight increase over the past seven years accompanied by a slight population shift.

The trend for the northeastern herd has probably levelled off and in some areas may actually have declined. The crew variable is an important item in the census and this was certainly evident in the census effort this winter. The crew for the most part flew straight line transects across the plots with no intensive search effort upon sighting moose. This has been a common practice in the past and has yielded 20-60 percent more observed animals during a given census period.

There is no legal moose harvest but about 40 are taken each year.

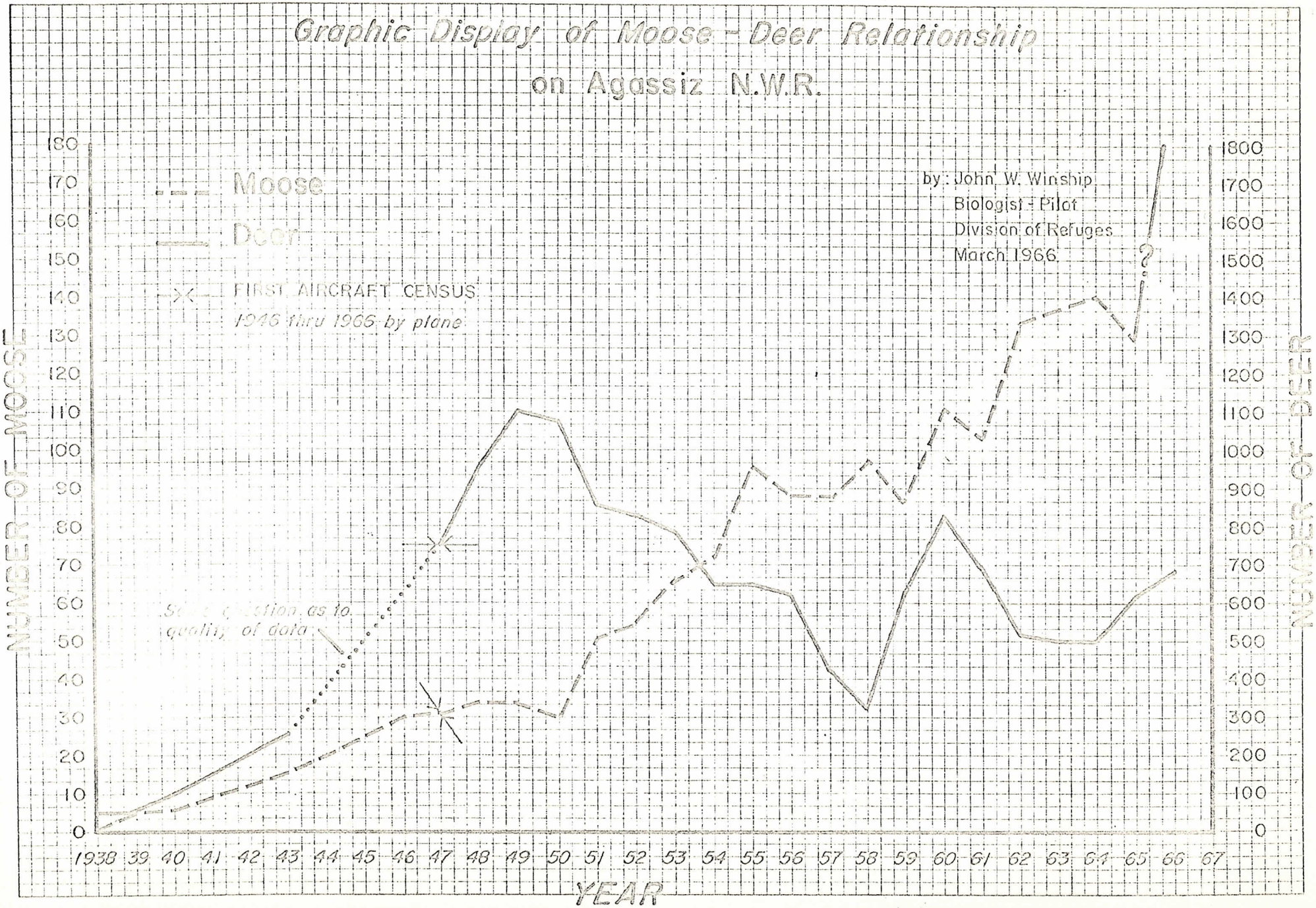
Wisconsin - Wisconsin is on the southern fringe of the moose range. The stocking in 1960 probably was the result of a reinvasion of former moose range by animals from Minnesota. Although no special survey efforts are made there is a system whereby confirmed moose reports are uniformly reported. From 1960-63 the number of moose in the state probably increased. Nineteen sixty-three produced the first sighting of cow with calf. No increase was noted in 1964 or 1965; however, in 1964 three cows were reported to be accompanied by calf and in 1965 five or six cows were observed with calf. Major losses are attributed to poaching. In 1962 and 1965 two moose were known shot and one each from the years 1963 and 1964.

Minnesota - U. S. F. & W. S. - Agassiz National Wildlife Refuge consists of 61,000 acres of which 43,000 are in uplands and marsh types. The remainder of the area is flooded. A winter aerial survey covers 50 percent of the ground area with one-half mile wide transects. The population for this past winter was established at 2.7 moose per square mile. The accompanying graph illustrates the deer-moose population for this area.

2. Harvest data and techniques for obtaining a desired harvest.

Alaska - Ninety-five percent of the harvest tickets issued to hunters are returned annually. The tickets are free and two reminder letters are sent to those individuals who fail to return their tickets on time. No prosecution of non-respondents has been implemented at this time. The failure of the Department to obtain public acceptance of antlerless seasons has been our biggest stumbling block in achieving desired harvests in accessible areas. The lack of access restricts the harvest on perhaps 50 to 60 percent of the moose range. Timing of antlerless seasons with heavy snowfall which generally occurs in late November has proven to be most helpful in achieving large harvests from those herds that exhibit altitudinal shifts. In November, 1964 and again in 1965, unusual weather conditions contributed to large harvests on small areas in south central Alaska. Approximately 800 to 1,000 moose were harvested from a 500 square mile area in one day in 1965. Future hunts will probably limit the number of hunters allowed afield in this particular management unit as the roads and byways were clogged with cars this year. Fortunately there were no accidents. On a statewide basis the harvest of moose remains at about 9,000 animals per year.

Manitoba - Approximately 2,000 moose were harvested by licensed hunters in the 1964 hunt. About three-fourths of these were taken in the late, or winter, any sex season. The hunter success is determined by a mail poll of 10 percent


Graphic Display of Moose - Deer Relationship
on Agassiz N.W.R.
by: John W. Winship
Biologist - Pilot
Division of Refuges
March 1966
Moose
Deer
FIRST AIRCRAFT CENSUS
1946 thru 1966 by plane
Speculation as to quality of data
NUMBER OF MOOSE
NUMBER OF DEER
YEAR
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
1938 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67

of the license holders. The number of moose harvested by Indians is unknown. Seasons are varied to meet the local conditions. Currently the major portion of the sport harvest is in the southwestern portion of the moose range. The early seasons provide better sport and higher meat quality. Power vehicles are presenting a problem. It is possible to track down and kill moose by the use of power toboggans. One of the legal questions that has to be answered in this respect is where does transportation end and hunting begin. Legislation is needed to clarify this situation. Then too, what type of hunt the sportsmen want often governs the use of these machines. The coordination of aircraft with ground parties by two-way radio creates another problem.

Ontario - The snowmobile is an asset to hunt in inaccessible areas. However, with the introduction of the two-way radio on the toy market, the air-ground coordination of hunters has become a problem. One wonders if it is a sport hunt any longer or if all they are after is the meat.

Wisconsin - There is federal regulation in the U. S. on the use of motor vehicles in wilderness areas where their use is prohibited.

Saskatchewan - Early and regular seasons are held on a province-wide basis. There is a higher kill of bulls in the early season and complaints of moose loss due to lack of tracking snow are common. These fears connected with moose loss are probably unfounded with the modern-day hunter who does little tracking if the animal shot at does not show great signs of being mortally wounded.

Alberta - There are 85,000 big game hunters in Alberta, of which approximately 50,000 hunt moose. Older bulls comprise a high percentage of the kill in the early bull-only season. Approximately 25 percent of the animals shot are illegal and left in the woods during this bull-only season. The early seasons have an effect on the cow portion of the any sex seasons.

Percent cows harvested in either sex season	Preceeding hunts
46.5	None
42.1	One month bull-only hunt
38.3	Two bull-only seasons

An increase in moose productivity is noted as hunting pressure increases. Approximately 7,500 to 10,000 moose are harvested annually.

Nova Scotia - A limited harvest is permitted in a four county area of the province. In 1964 there were 7,000 applicants for the 400 licenses. The licenses are restricted to one per household. A ten day September season is held and set to include two Saturdays. The moose population is estimated at 3,000 animals and the 400 hunters harvested 134 bulls and 49 cows in 1964. Licensing is on an individual basis but the individual may be accompanied by as many people as he wishes as long as there is only one gun in the party.

Manitoba - The elk hunt in this province is on a special permit basis and an individual or a party of two may apply on the same form. In the case where two are drawn on the same form two licenses are issued and are counted as such towards the total licenses to be issued. A person may only make one application. This has proven to be popular among the sportsmen.

New Brunswick - A limited number of permits are issued to residents only by public drawing for the moose hunt. There are 18,000 applications for the 1,000 permits on an individual basis. Licensing of the same individual in successive years is not permitted. A waiting list is established to fill licenses from the original drawing that are not claimed by an established date. A successful applicant for a moose permit is required to sign a declaration that he is familiar with the rules and regulations governing the hunt.

Zoning is currently used to concentrate the hunters and control the harvest. Hunter success is 45 percent in the overpopulated portions of the range and is 31 to 33 percent over the rest of the area. A success ratio of 93 percent

was attained on one area in its initial hunt.

It is required that successful moose hunters bring their moose to a station to be registered and tagged. A tag is placed on each quarter of the animal in addition to the tag placed on the moose by the hunter in the field. Eighty-five percent of the moose are submitted for registration field dressed only. The hunter must submit a jaw from his moose at the time of registration.

Antlered animals only are currently harvested in the province. Authority is being sought for any-sex seasons.

The moose season in New Brunswick is concurrent with the deer season.

3. Techniques applicable to moose research and management.

Alaska - In applying the cementum technique of age determination we are now using a commercial bench grinder with vacuum attachment and hand holding I^1 in preparing sections. This technique has allowed us to process from 15 to 20 teeth per hour. Cross checking against known-age specimens through $8\frac{1}{2}$ years of age reveals excellent correlation. The cementum deposits in the teeth from males generally are not as good a quality as is that from female moose. Apparently there is an extra line laid down concurrent to their rut which confuses interpretation of the alternate light and dark layers.

A modification of the "stratified random sampling" technique described by Siniff and Skoog, Jour. Wildl. Mgmt. 28(2) 1964 was used in a census of moose on a 400 square mile area in the Matanuska Valley in February, 1966. The sample units consisted of one square mile areas. The area was stratified as High, Medium, and Low density range based upon moose observed on a reconnaissance flight made just prior to the census. The results indicated 2,953 moose $\pm$ 466 at 90 percent level. The technique appears better adapted to homogeneous ranges. The Matanuska Valley is an agricultural area with many small patches of winter range - stratification was difficult and I apparently did a poor

job as the medium density areas had as many moose as the high density areas. Of course, no moose were found on a few high and medium density areas.

We have continued ear tagging calves on the better calving grounds using direct communication between a Supercub (PA 18) and Hiller three place helicopter. The rest of the grounds have been searched thoroughly with the Supercub before tagging commences. With the aid of the direct communication tieup we have tagged calves at the rate of 20 per hour or until "taggers" gave out. Last spring we averaged about eight calves per hour in tagging 260 calves. This winter we are using the pax arm equipment to tag adults. We have found the gun does not work well if exposed to subzero temperatures. The values apparently allow the gas produced by the explosion of the 22 cartridge to bypass the plastic gaskets and sufficient power is not produced. In moderate temperatures the gun has proven to be very accurate and reliable. This marking project is an attempt to assess dispersal and movement patterns of adults as compared to the same items for calves. We have some evidence that calves (12 months old) wander considerably when the maternal ties are broken rather suddenly by the advent of the female having another calf. We are using neckbands similar to those described for the Yellowstone elk.

In general no techniques were discussed other than aging as done by Ontario using tooth development and wear. Radio tagging of deer has been conducted by Minnesota on a limited basis. The radios had a range of one-fourth to one-half mile and a life of six months.

4. Productivity and calf survival.

Manitoba - Early December surveys can give an accurate picture of productivity but management is not intensive enough at the present time to warrant the data collection.

Alaska - We still use and rely heavily upon in utero examinations, aerial surveys in the spring and fall and age composition of the moose harvested to measure fecundity, fertility, natality, and survival of calves through the first twelve months. Of all the variables that influence productivity, weather seems to be the one item that can be identified. We have been able to show that the survival of calves is adversely affected by prolonged periods of deep snow, unusually cold or late springs accompanied by delayed "greening up".

In an effort to quantify some of the remaining variables associated with interpreting the interactions of range on moose densities, we plan, in cooperation with United States Fish and Wildlife Service, to construct an enclosure where experimentation can be conducted. The present plans call for a two mile square enclosure, subdivided into four square mile pens. The area will provide opportunity to conduct intensive research of a variety of types. Our next step is to survey the area, do a complete soil and vegetation analysis and construct and stock the pens. Stocking will probably take place in 1967. The initial cost is estimated at $50,000 to $75,000.

Alberta - Preferred calving areas are on the islands in the Peace and Smokey Rivers, probably to get away from predators. Observed calf proportions for Alberta are as follows:

Months	Cows	Calves	Percent of calves
June and July, 1965	89	174	195.5
August and October, 1965	45	30	66.7
January, 1965	19	11	58.0

Minnesota - A reversal in the number of twins is noted from summer to early fall observations. This was reported at the last meeting.

5. Moose in a forest management program.

Manitoba - Mr. A. J. Kotowycz, Manitoba Forestry Branch, reviewed forestry programs in the province and commented on the relationship of these programs.

to the welfare of moose.

Province has 122,000 square miles of forest lands. 58,000 square miles are productive or potentially productive. 64,000 square miles or 53% are non-productive. Average of 356 fires per year that burn over 500,000 acres. In 1964 there were 581 fires that burned over 836,000 acres.

In respect to cuttings, now cut 350,000 cords per year of which 65% is pulpwood.

(a) Manitoba Paper - 70 - 80,000 cords per year. 90% clear cut base.

(b) Timber sales and permits 100 - 5,000 cords each.

In respect to planting, $2\frac{1}{2}$ - 3 million trees or 3,000 acres each year. Mostly in northeastern Manitoba on sand ridges. Broadcasting - 1 - 2,000 acres annually. Chemical spraying - only rare and to release white spruce from brush.

The Particle Board plant at Sprague is cutting 30,000 cords of poplar each year. Many new roads required for access. In regard to future developments, some 4-500,000 cords per year for The Pas Forest Products operation. This will require some 50,000 acres annually to be mostly clear-cut.

Ideal plan for reforestation is to burn and reseed immediately to bypass non-productive stages of natural plant succession.

Mr. Kotowycz emphasized the need for foresters and wildlife biologists to work together as a team in the field in order to bring about multiple use of forest lands.

Minnesota - In some areas the forests are coming under intensive management for conifers which is proving to be detrimental to moose range. Currently 60,000 to 100,000 acres are logged annually which makes a very small contribution to moose or deer range.

General - Equating wildlife values in monetary standards as harvestable surplus may have application for wildlife management in areas designated

for intensive forest management. Actual returns on the investment from game management would in all probability exceed those from forest management.

Of benefit to the wildlife resource in many instances associated with logging are the newly created early stages of forest succession and access roads.

Alberta - Stelfox remarked on the studies within the North Western Pulp and Power lease area west of Edson determining the effects of pulp cutting practices on moose, deer and elk populations. Three forest types are being studied, namely; white spruce, lodgepole pine, spruce-pine-poplar. The general situation during the first nine years following logging was little use except for summer use by deer for the first five years. Beginning about five years after logging some winter use was being observed by deer and to a lesser extent by elk and moose. Between six and nine years after logging big game use became quite heavy both during summer and winter. In the white spruce forest nine years after logging year-round use is moderate by deer, light by elk and nil by moose. In the same age regenerating pine forest summer use is quite heavy by deer, while winter use is moderate by deer and elk and light by moose. In the mixed spruce-pine-poplar forest year-round use is moderate by deer and elk and negligible by moose. In the pine-spruce-fir forest of this age use of the nine-year-old strips is heavy by moose and light-moderate by deer and elk. In all areas big game use has been considerably greater in the unscarified areas than the scarified areas.

6. Moose disease.

Drs. McGowan and Van Drummel of the Manitoba government reported on a number of moose autopsies they conducted. Pneumostrongylus tenuis has been obtained from animals displaying the moose disease syndrome.

Dr. Roy Anderson, Guelph, Ontario, discussed the life cycle of P. tenuis in detail and reported on experimentally producing the moose disease syndrome

in wapiti. Mr. Karns of Minnesota reported the recovery of first stage P. tenuis larvae from wapiti feces obtained in northwestern Minnesota. Dr. Anderson stated that P. tenuis is also pathogenic in mule deer. Field studies on transmission of P. tenuis are currently being conducted in Ontario and Nova Scotia.

Moose disease is considered to be a limiting factor to moose in areas of Minnesota and New Brunswick. White-tailed deer displaying the moose disease syndrome have been observed in Minnesota and Nova Scotia. Introduced European molluscs are generally unsatisfactory hosts to the larval stages of P. tenuis.

Taenia krabbei, Echinococcus granulosus, Dictyocaulus, Fascioloides, are considered to be rather common parasites of moose. In instances where the degree of infection by T. krabbei is extreme in a hunter killed animal another permit is issued by some jurisdictions.

Leptospirosis was a rather common finding in a study of moose sera collected by Minnesota from that state, Ontario, and Wyoming.

7. Flooding at Grand Rapids, Manitoba, and moose - Mr. Donald Miller, Manitoba Department of Mines and Natural Resources, The Pas, Manitoba.

The dam on the Saskatchewan River at Grand Rapids was closed in the winter of 1964-65. The flooding will inundate 385,000 acres of moose range. Moose remained on the area throughout the winter as they have in the past. Animals on ice over four feet or more of water were in trouble at time of the spring break-up. The moose in several cases retreated to higher ground as the spring waters rose and in many cases were finally moved from there by rising waters. In some instances cows calved on these islands. A large sum of money was spent in attempts to move the moose to higher ground by driving with aircraft. In general these attempts were not too successful. Thirteen animals were

known to have drowned.

8. Interspecific relationships of the moose to other animals within its environ.

Nova Scotia - Winter populations of deer and moose occur on separate areas. The deer winter in the lowlands along the coast and the moose in the uplands. This reduces the competition between these two browsers during the critical winter period and reduces the chance of transmission of P. tenuis.

Manitoba - Wolves will take moose when they are available but deer and barren-ground caribou served as important buffers. Wolf control in Manitoba has been employed mainly to protect domestic stock and barren-ground caribou. It may be that the wolves take moose only under certain circumstances, i.e., deep or crusted snow, so the moose is at a disadvantage.

Wolves may be an important factor in the spread of hydatid cyst and Taenia krabbei. The possibility of predator control to reduce the incidence of such parasites would be interesting. Newfoundland has an interesting instance where caribou calves are killed by a parasite normally found in lynx.

Minnesota - The Isle Royale studies indicate that the wolf can be a successful predator on moose but that they probably have to work harder at surviving than if they were on a deer economy. Where deer are present, as in Minnesota, the wolf predation on moose is thought to be minor significance.

Alberta - McCutchem reports from Alaska of wolves being killed by moose. This may actually serve as a selection process in wolf survival. Predator control has been carried out in Alberta mainly to reduce the incidence of rabies. On one area with no previous control 44 percent of the animals removed were pups. Another area on which previous control was exerted 54 percent of the animals taken in the second campaign were pups. Less than five percent of the wolves taken were three years or older. Current policy on wolf control is to maintain packs at eight animals or less in the wilderness areas and six animals or less in other areas. Heavy infestations of predator-borne parasites are

noted in moose coming from areas of high predator density. Additional hunt tags are issued in the event a hunter bags a heavily parasitized animal.

Ontario - Wolf kills are being collected from Algonquin park and are classed as to species, age, sex, and condition. The wolves are not controlling the deer within the Park.

Nova Scotia - The question of the role of mountain lion as a predator was raised to which no answers were available. Bobcats are preying upon deer in Nova Scotia.

Nova Scotia - What is the role of black bear as a moose predator?

Manitoba - Reports originate from the Duck Mountain of bear killing moose.

Alberta - The Peace River area bear harvest range from one to two thousand annually and this is an area of high moose populations.

Nova Scotia - Dogs are very important predators on deer. Are they capable of killing moose?

Alberta - Good dogs in a pack are probably capable of killing moose.

Alberta - There is definite competition for browse between elk and moose. The elk is generally more adaptable than the moose as they can exist on a much wider variety of plant species, although the elk will suffer more from deep snows and cold than a moose will. Elk have eliminated moose from one area in the province because they are better competitors for the available food. Where snow does not present a problem to deer movement the deer are successful competitors with moose. In the major moose range the deer and moose are separate on the wintering areas.

Minnesota and Nova Scotia - There is probably direct deer-moose competition of one type or another where winter ranges overlap. The North Shore of Lake Superior in Minnesota and the coastal areas of Nova Scotia are similar in that the deer winter at the lower elevations closer to the water and the moose are in the highlands. Thus, on this portion of the winter range there

is little direct competition.

Minnesota - Deer populations increased from 1900 to 1930's in the presence of new habitat in northern Minnesota. A decrease in moose populations occurred in the 1930's at the peak of the deer populations. From 1930 to 1956 winter die-off's of deer occurred about every four years. A major die-off has not occurred from 1956 to the present. It was during this time, 1940 to the present, that the moose herd increased to its present size. Its fate may depend on the future deer herd densities on the major moose range.

Nova Scotia - An effort must be made to keep deer and moose populations at reasonable levels.

9. Range carrying capacities - what are they and how can they be defined?

Alaska - We have no concrete knowledge on this interesting facet of population dynamics but a recent census of the Matanuska Valley in south central Alaska revealed eight moose per square mile after some 1,000 (approximately two per square mile) had been removed through hunting. We still adhere to the philosophy that a "hedge effect" is essential to obtaining maximum production for the longest period of time especially on birch and aspen ranges.

Manitoba - We are faced, under the ARDA program, with the task of classifying land capabilities to produce various products. Wildlife products are broken down into ungulates and waterfowl. Here we have real need to know what is carrying capacity and at what successional stage we should make our calculations.

Discussion - Hedge effect on browse plants is important in maintaining big-game range production for the longest period of time especially on birch and aspen ranges. Various plants show different tolerances to browsing pressures. In Alberta willow maintains itself well with 50 percent removal of the annual growth yearly; serviceberry kept from growing over one foot high produces good browse. Minnesota has learned that 60 percent removal of the annual growth

of mountain maple on a yearly basis maintains browse production and keeps the plants within reach of deer. Even 100 percent removal of annual growth yearly did not kill the mountain maple shrub over an eight year period.

To define carrying capacity many variables have to be established at some point. Among these are the successional stage and forest association under discussion, the animal's critical period, other land uses, and the wildlife population under discussion. Some attempts are being made, as in Alberta, to determine carrying capacity by forest associations.

Wisconsin has divided the state into deer management units with established deer winter population goals. As harvest by hunting is one of the least controllable aspects of management it is questionable if the goals can be achieved. Hunting as recreation is not growing in direct proportion to the increased leisure time and other recreational pursuits.

10. Next meeting tentatively scheduled for Edmonton, Alberta, in 1967.

April 27, 1966.