1969

Transactions of the

THIRTY-THIRD
FEDERAL-PROVINCIAL WILDLIFE CONFERENCE

held in Edmonton, Alberta

July 8-10, 1969

CANADIAN WILDLIFE SERVICE

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT

1969

Transactions of the Thirty-third Federal-Provincial Wildlife Conference held in Edmonton, Alberta July 8-10, 1969

Canadian Wildlife Service
Department of Indian Affairs and Northern Development

Issued under the authority of the
HONOURABLE JEAN CHRETIEN, P.C., M.P.
Minister of Indian Affairs and Northern Development

Contents

Summary of the 33rd conference

Tuesday, July 8

1. Opening of the conference

Dr. J.S. Tener, chairman, opened the conference and called on the Honourable J.D. Ross, minister of the Department of Lands and Forests for the province of Alberta, to address the meeting.

Dr. Ross welcomed the delegates to Alberta – "the princess province of Canada." He supported the trend in our society towards an increased concern with the quality of environment, and felt that governments should be more active in this area. Resources belonging to the people as a whole should be carefully husbanded so that the people as a whole would benefit.

2. Recommendations of the 32nd conference

F.H. Schultz reported on action taken on recommendations of last year's conference (page15). There was no discussion.

3. Recommendations committee

The chairman appointed C.B. Forbes (chairman), M. Prime, J.P. Fitzgerald, and D.A. Benson (secretary) to the Recommendations Committee.

4. Activities of the Canadian Wildlife Service

Dr. Tener gave this report (page17).

5. Canadian Wildlife Federation

R.C. Passmore reported on the federation's activities (page18). Since the printed report was available to the delegates Mr. Passmore did not read it, but he did ask for discussion on two items: improving National Wildlife Week; and training of young hunters now made possible by the recent revisions of the Criminal Code.

Mr. Passmore indicated a number of problems associated with National Wildlife Week which he wanted the conference to discuss. He asked that provincial directors order materials more promptly. Two provinces mentioned difficulties arising from poor timing of wildlife week. This year, for the second time in six years, wildlife week coincided with Easter school holidays. In addition wildlife week now takes place close to the time when estimates are being debated and when schools are winding up the year's work. June, July or September were suggested as alternative times. One province liked the present time since it coincided with the beginning of spring on the prairies. Two directors suggested that information on posters and other materials be issued earlier. Mr. Passmore agreed that a longer planning period was needed and drew attention to the four recommendations in his report.

Mr. Passmore reviewed recommendations of the Canadian Wildlife Federation with respect to licences for young hunters.

a. Unlicensed hunters below the minimum age for first hunting licences in each province should be allowed to hunt under close supervision of a licensed adult who would share his limit with the youngster(s) under his supervision. Although the Criminal Code permits supervision to be given by a 16-year-old, or even a 14-year-old if he had a permit to possess, we would suggest that the supervisor should be no younger than 21 years.

b. A learner's licence permitting hunting under the supervision of a licensed adult should be issued to persons between the age of 14 years and the age at which a person can be licensed to hunt on his own. Such a licence should provide for a separate bag limit and might be issued only to persons who have graduated from a hunter safety training program.

c. With the two previous recommendations providing for a relatively long period of supervised training, 16 might be a suitable age at which to issue a first licence permitting a young person to hunt on his own. Combined with the hunter safety training programs now compulsory or available in almost all provinces, supervised field experience and more formal training and testing should provide ample opportunity for young hunters to develop a sense of responsibility not now found in some segments of the hunting fraternity.

Dr. J. Hatter said that B.C. had changed the requirements for persons under 18. Those under 18 must be in the company of a person 21 years of age or older. Although no studies have been made, he thought that there had been fewer accidents since the regulations had been changed.

B.C. Carter said that New Brunswick permitted 14-year-olds to hunt if they were supervised by a licensed hunter at least 18 years old. The 14-year-old must have passed a hunter's course and must have a minor's licence. There has been only one accident in the last 8 or 10 years, and the plan is considered to be quite successful. Changes in the course are planned for 1970. The only difficulty has been arranging courses throughout the province.

6. Polar Bear Committee

Dr. N. Novakowski reported on the first administrative meeting of the committee. There was no discussion.

7. Resource co-ordination problem

C. de Laet, secretary general of the Canadian Council of Resource Ministers, first reviewed the work of the council. The council consists of 11 ministers of the crown, one from each province and one from the federal government. It is not a decision-making body but does provide a consultative forum where problems may be discussed before decisions are made. This has been done in a variety of ways. Two national conferences (*Resources for Tomorrow* in 1961, and *Pollution and Our Environment* in 1966) have been held; another, *Multiple Use of Resources and Outdoor Recreation,* is scheduled for 1973. Suggestions for the next conference were invited. Two water seminars have been held and a forestry seminar is proposed for next year.

Mr. de Laet mentioned growing worldwide concern over the benefits and drawbacks of man's action on his environment, the need for co-ordination in dealing with these matters, and the importance of the multiple-use concept in managing resources.

8. Canada Land Inventory

Dr. V.E.F. Solman reported on progress of the Canada Land Inventory (page 23). The first five wildlife capability maps have been published, and another 50 are in process. Eventually there will be about 400 maps altogether. The first five will be available from the Queen's Printer within a month; another six, in two months; and 20, by the end of the year. Work is going on in all the provinces and this will reduce the possibility of one resource being developed at the expense of the others. These "real, working tools" will shortly be in the hands of anyone who wants them.

9. Migratory birds regulations — open session

Dr. F.G. Cooch introduced this discussion. Three topics were discussed: the use of raptors for hunting, the regulations with respect to power boats, and the regulations with respect to bag limits.

The use of raptors for hunting

B.C. has more experience with raptor regulations and operators than other provinces. This year provincial officers captured 10 Peal's falcons on the Charlotte Islands and sold them at $200 each to 10 applicants. There were only 11 applicants. This was done to minimize the disturbance to the birds. Although there is a good deal of interest in falcons, there is no evidence of illegal operations or sale of falcons for export at high prices. Interest in falcons is by those interested in using the birds themselves. One man has been giving lectures and demonstrations throughout the United States, and has done a good deal to promote conservation and to extend appreciation of birds of prey.

B.C. considers that the use of falcons to take waterfowl should be legalized. The charge of cruelty is not well-founded, and the falcons are less efficient than guns. It is very difficult to train falcons so extensive use is not likely. There has been an upsurge of interest in breeding falcons in captivity and this may be very important if they decline rapidly as a result of pesticide use.

Ontario has done some experimental licensing for scientific study. The provinces would not object to legalizing the use of raptors for hunting but they are reluctant to endorse such a program. There was concern about the effect on the bird population for the birds decline rapidly when they come into contact with man. This, however, is more a matter of the general effect of settlement than the capture and use of the birds. A number of speakers stressed that falconry is not an amateur sport, but one for the dedicated enthusiast, and that the by-products in knowledge of wildlife and the aesthetics of hunting were important values.

No formal decision was reached.

Use of power boats

At the request of British Columbia and New Brunswick, the Canadian Wildlife Service has been attempting to provide some rationale for the use of power boats in tidal waters for two years now. There are 10 points of view on this subject so no change has been made in the regulations.

The following points were agreed on:

a. Federal regulations should be sufficiently flexible to allow provinces to impose restrictions as they see fit.

b. Since the problems of harrassment and the problems of retrieval are distinct issues they should be dealt with separately.

c. The provinces should submit suggestions on retrieval, and the Canadian Wildlife Service should consult the Royal Canadian Mounted Police on harrassment and retrieval and circulate suggestions to the provinces.

Regulations concerning limits

Contrary opinions were vigorously expressed:

a. The regulations limiting bags should refer to the field and take no account of what was in the freezer at home. Possession limits were regarded as a nuisance and unenforceable with no impact on the resource.

b. The regulation has a management rationale and should be retained to prevent stock-piling. Under certain circumstances it is enforceable and in any case, regulations should not be judged by the degree of difficulty in enforcing them.

The chairman suggested that further suggestions on this matter be made in writing.

10. The federal wildlife land acquisition and easement program

N.G. Perret presented the report (page24) on this program.

Discussion

a. The federal and provincial governments must work closely together on the program.

b. A variety of uses of the land are contemplated – hunting, sanctuary, etc. – depending on joint decisions of provincial and federal authorities.

c. Few farmers have broken leases.

d. More flexible arrangements or a more general authority is needed so that the program may move quickly when necessary.

e. How the program affects drainage should be evaluated. In Alberta, the main criticism is that the easement program has little effect on restraining drainage.

f. Since 1966, emphasis on this program has greatly decreased. This has been the result of two things: federal funds have been drastically cut; and assumptions on which the program was based are in question. The Canadian Wildlife Service considers that there may be a more efficient way to manage waterfowl populations than the way envisaged by the program.

g. A permanent easement from some farmers might be secured with a single initial payment representing a fair percentage of the total proposed over a 10-year period. This would save on administrative costs.

11. Pesticides research

J.A. Keith presented his paper (page 27), "Results and Implications of Pesticides Research by the Canadian Wildlife Service".

Discussion

The chairman said that environmental biologists should make their views known publicly. Dr. Stuart Smith considered the final three paragraphs of the paper the most important. Several delegates agreed with Mr. Keith's views.

Mr. Keith said that the Canadian Wildlife Service had effectively pressured two government departments. It was suggested that work through inter-departmental co-ordinating committees might be useful. There has been no experience of "muzzling effects" from the politicians, but many professional people preempt the political decision by assuming that the politicians do not want them to speak.

12. Barren-ground caribou

The paper, "Additional Information and Comments on Disease Conditions and Parasites of Barren-Ground Caribou" (page30), by Dr. E. Broughton and Dr. L.P.E. Choquette was enlivened by a slide presentation.

13. Canada Fur Council

C.R. Merkely, Department of Industry, Trade and Commerce, reported on the work of the council. For a variety of reasons the Canada Fur Council has not been very active during the past year but it is hoped that it will be more active in the coming year. The purposes of the council are to promote the use of wild fur, to initiate and promote research on fur and problems associated with production and marketing of fur.

There are two active projects at present:

a. Participation in the Frankfurt Fur Fair – this year's exhibit was successful.

b. A seven-man fur mission to Hong Kong and Japan last spring – the mission was well-received, especially in Japan, and it is hoped that sales will follow.

14. Waterfowl status

Reports were given on the status of waterfowl across Canada.

H.J. Boyd reported for eastern Canada. Since duck breeding surveys were considered an unprofitable approach to waterfowl

management it was decided to discontinue them in 1969. Emphasis will be placed on developing a management system, based on quantitative information on the abundance and distribution of ducks and hunters in the autumn, within three years.

Data on geese indicated that production will be normal, i.e., near the average for the past 12 years.

There is some indication of a slight increase in the breeding populations of black ducks in some areas. Little change in the pre-season populations of black ducks is expected.

W.G. Leitch, Ducks Unlimited (Canada), reported for Manitoba. June brood counts and glowing reports from field men have confirmed the optimism expressed in earlier "Duckologicals". This has been the most successful breeding season since 1952. The performance of the early nesters has been nothing less than spectacular, and with secure water there is no reason why the later-nesting species and re-nesters will not do as well. The high waterfowl populations of the mid-1950's will not be reached in one season because the breeding population is smaller, but 1969 cannot help but be a long step in that direction.

This optimistic report was endorsed by other reports from the prairie provinces.

British Columbia – conditions there are much the same as the long-term average.

Northwest Territories – there has been no opportunity to gather information.

Yukon Territory – conditions are much the same as usual although some bad fires will wipe out the birds in those areas. No change is expected except in the areas of the fires.

Thursday, July 10

15. Waterfowl management in Canada

Five presentations were made during this panel. The papers were by Dr. F.G. Cooch, Dr. S. Smith, R. Webb, W.G. Leitch, and R.D. Jakimchuk (page 39 to 82).

Discussion was grouped around the following points of interest: a) questions of fact and interpretation based on Mr. Jakimchuk's paper; b) the information failure and scientific management; c) Dr. S. Smith's paper; and d) involvement of the "public" in management.

Mr. Jakimchuk's paper

It was pointed out that Mr. Jakimchuk was on contract to the government of Alberta and had therefore made no recommendations at this time. However, recommendations would be included in confidential copies of the final report to be forwarded to the ministers in each province.

Although farmers are most happy with shooting as a control measure, it appears to be ineffective in limiting damage. Most damage occurs after the season opens and farmers with shooting permits suffer the same amount of damage as those without permits. In effect, shooting distributes the damage. Since trampling when the birds land causes most damage, it would be better to leave them where they first come down. There is reason to think that shooting permits provide an excuse for an early shoot or Sunday shooting. It was suggested that it would be desirable to eliminate shooting permits altogether and save the funds for more effective control.

The time of the crop harvest seems to be the most important factor in determining crop damage.

The information failure and scientific management

In their papers Dr. Cooch and Dr. Smith raised the point that failure to publish research data on wildlife seriously hinders the

scientific management of wildlife resources. There must be more and better communication between the technical people involved. Several speakers underlined these points.

Dr. S. Smith's paper

Critical examination of Dr. Smith's paper was led by H.J. Boyd (page39). Dr. A.R. Sen (page 39) also questioned the statistical manipulation in the tables. Dr. Smith conceded that there are weaknesses, but pointed out that the tables had been available for some time and that no one had adequately refuted the conclusions or proposed a more feasible or workable approach.

Involvement of the "public" in management

This discussion was sparked by W.G. Leitch's departure from his paper to become "just a disgruntled duck hunter." In expressing his irritation with some of the regulations (e.g., opening times, harrassment, and bag limits) he put the case for greater involvement of the hunter in the formulation of regulations. This would avoid the imposition of regulations reflecting personal opinions of administrators rather than the needs of the situation and would be good for the hunter's education in wildlife management. Several speakers endorsed this position and argued for greater consultation with sportsmen and sportsmen's organizations.

Other speakers took the view that sportsmen were as likely to argue from personal bias as administrators. It was also pointed out that sportsmen represent only three to six per cent of the clientele. The argument was not against involving the public but against identifying the public with hunters. The non-consuming public should also be considered.

It was agreed that more interpretation and greater involvement of the "public" in the problems and issues of wildlife management was needed. At the same time it was stressed that it was necessary to identify clearly who this "public" was.

Who should pay for management of wildlife resources? One view held that the user — hunters, bird watchers, hikers, etc. — should pay. Another view was that the cost of wildlife management should come out of consolidated revenue since proper management of the resource also benefits those who are not active users.

Report of the rapporteur

F.A. Walden, rapporteur of the panel on waterfowl management, commented briefly on each of the papers.

"Current State of the Art" (page39) by Dr. F.G. Cooch: The great need for research data, the need for co-operation among the agencies, the need for more positive and vigorous scientific work in waterfowl management — these are all apparent. Mr. Walden disagreed with the statement that results of previous work are available to all who wish to use them. Some agencies lack the staff resources to use the data even if they wish to do so.

Mr. Walden thought that the emphasis on the details of mallard management, and especially on population estimates, revealed a strong prairie bias and did not reflect the only or the main problem. Moreover, the methods are crude, the observation system faulty, and the actual performance of birds surprising. As has been pointed out, the regulations are not always effective. Mr. Walden did not agree that this type of continental model was needed for every species but he did agree with Dr. Cooch's premise that difficulties in using the mallard model for other species arise because details on the genetics and ecology of each species differ. It may be that a number of models are needed.

It is natural that we are influenced by what the U.S. bureau does and it is unfortunate that our lack of knowledge prevents us from gaining a strong bargaining position. We do have Canadian data on species composition, size, and distribution of the harvest but it is not in a readily usable form. The banding data are unavailable because of shortage of staff. In any event we are still working too much as if the flyway concept were pure.

"Critique of Waterfowl Management" (page 51) by Dr. S.B. Smith: In commenting on Dr. Smith's paper Mr. Walden conceded that it may be true that the federal government makes agreements with the United States with which the provinces do not agree, but he felt that it was unfair to blame the provinces. They do not have the staff and resources that would enable them to take an effective part in the process of reaching agreement. The difficulty is based on disparity in their natural resources.

Mr. Walden considered that Dr. Smith's outline of an alternate way of looking at the mallard problem was done with too wide a brush. We must begin to put the mallard and probably other species under the glass of rigorous scientific study. There is much to be said for Dr. Smith's conclusions, namely, more contact between the provinces and the universities, greater co-ordination between the Canadian Wildlife Service and the provinces, and the need for a Waterfowl Research Review Committee.

"Roles of Various Agencies" (page 60) by R. Webb and W.G. Leitch: Mr. Walden considered that Mr. Webb's paper supported the need for more co-ordinated effort between the provinces and the federal government, e.g., he pointed out that there is not as yet agreement on a working language.

Mr. Walden did not agree with Mr. Webb's suggestion that the "user" pay for waterfowl management. He pointed out that almost everyone benefits. There is another problem related to the proposal to assign fiscal responsibilities on the basis of benefits received. This would lead into the morass of equalization among provinces with widely varying capacities. A bright spot in all this is that we are now reaching the stage where recreation is recognized as worthy of public expenditure, sometimes at quite substantial levels.

Mr. Walden thought that a number of Mr. Webb's statements on relations between Canada and the U.S., and between the provinces and the Canadian Wildlife Service, were not completely in line with accepted concepts. He did agree, however, on the need for more effective guidelines. Mr. Walden was less enthusiastic about Mr. Webb's "grass-roots, Jeffersonian democratic approach" to participation in management. Involvement of the local municipalities would more likely lead to confusion than to effective participation. However, we should pay attention to the ideas expressed by Mr. Leitch.

Hunters should be more deeply involved in management. The concept of a complete ecological experience is healthy, if a bit idealistic. Mr. Webb has provided a conceptual approach meriting further study.

"An Analysis of Agricultural Damage by Waterfowl in Alberta" (page 68) by R.D. Jakimchuk: It is more difficult to bring this paper into the general concept of the panel. However, it is a particularly useful study and illustrates very well the kind of discrete problem that lends itself to the use of a consultant rather than an agency biologist.

Mr. Walden also commented on the work of the technical committees. He was disappointed that the Eastern Technical Committee

had spent $4\frac{1}{4}$ hours out of 14 hours of meeting time on non-technical discussion and activities. The technical committee should not review, for example, the land acquisition or enforcement programs. It should deal with the kind of problem analysed by Dr. Smith.

In concluding his review Mr. Walden made these points: a) the real problem is the biology and the basic ecology of each species; b) too much time is spent on the "prairie duck factory" and not enough on the distinct problems of B.C. and eastern Canada; c) clear definition of provincial and Canadian Wildlife Service roles is needed and should be based on appropriate negotiations with each province in order to resolve individual provincial needs; d) "in summary, it is about time we got together and damn well got down to work! "

16. Royal Canadian Mounted Police and the Migratory Birds Convention Act.

Superintendent W.G. Pritchett reported that special enforcement officers work closely with provincial authorities in enforcing the Migratory Birds Convention Act. Over the period from 1966 to 1969 the man-hours have doubled from 33,246 to 65,262 and prosecutions have more than tripled from 362 to 1,111.

The increase in prosecutions was not caused by failure to possess the federal licence — only 321 such charges were laid in 1968-69. It would be better, however, if the federal and provincial licences were issued at the same location since many people do not know that they need a federal licence. In general, enforcement has improved and should continue to do so.

17. Recommendations committee

C.B. Forbes presented the committee's report. Discussion followed. Mr. Passmore renewed his plea for greater provincial support of wildlife week. Two members stated that the national theme was not always appropriate in the local context — e.g., preservation of wetland habitat in the Northwest Territories. The theme should be broad enough to include local issues. It should also be one of interest to the general public so that the situation of "the converted talking to the converted" would not arise.

The method of preparing and discussing the recommendations is less than satisfactory. Copies of the recommendations should be distributed at least one day before they are to be considered if the discussion is to be thoughtful and approval meaningful.

18. U.S. Bureau of Sport Fisheries and Wildlife

N.E. Buell spoke on developments and general trends in the United States. There were three matters of special interest. The secretary of transportation has replaced the secretary of commerce on the Migratory Bird Conservation Commission. Since the former is more in touch with the problems of the bureau, the commission has been strengthened. An act of the 90th Congress prevents the disposal of acquisition lands without review by the Migratory Bird Commission and provides for funds from lands that are disposed of to be paid into the Migratory Bird Fund. A wilderness area within a few miles of New York has been declared. It is made up of 3,750 acres of the Great Swamp in New Jersey.

A considerable number of other wilderness areas are either being established or being considered and the passing of the Wild and Scenic River Act provides for a 10-year study of the methods of preserving access to them. A National Trail Act has established two national trails, and 14 other trails are being considered.

The word "environment" has acquired special status in the United States, as elsewhere, and a great deal of activity is directed to protecting or enhancing the environment. An important step is the U.S. president's establishment of the Environmental Quality Council made up of cabinet officers. A large number of bills coming before congress and being proposed in state legislatures cover environmental problems. Many proposals deal with endangered species, wilderness legislation, pesticide bills, and other lines of action to protect or improve the environment. Although the budget for land acquisition has been cut by $2,500,000, the program is strongly supported by the Department of the Interior and is continuing steadily.

The experimental teal season has worked well. Mr. Buell estimated that the season produced about one quarter of a million man-days of enjoyment. The program emphasized enforcement and hunter education. There has been some difficulty with field possession limits but these problems should be resolved by next spring. In spite of restrictive hunting regulations in 1968, the Duck Stamp sales had declined only five per cent from 1967 (from 1,875,000 to 1,795,000). This suggests that there is a new kind of hunter, more interested in the sport than in the amount of the bag.

The Department of the Interior is very much concerned about how the oil strike in Alaska will affect the development of the northern slope of Alaska. Therefore, the Bureau of Sport Fisheries and Wildlife has assigned eight more men to the department's task force. A symposium on migratory bird depredation will be held in Washington during the week of July 13 and will include concerned citizens who might have new points of view. The Japanese and United States governments are making a joint study with a view to reaching an agreement to protect migratory birds found in both jurisdictions. Of 156 species in this class, 17 are not hunted in the United States and have no protection under U.S. federal laws.

19. Science Council

Dr. W.J.D. Stephen presented the council's study (page 85) of fisheries and wildlife resources research in Canada. Discussion indicated that the overall goals set by the act are subject to revision and that individuals are encouraged to submit recommendations.

20. National Waterfowl Advisory Council

B.C. Carter was appointed representative to this council.

21. Conference objectives and format

F.H. Schultz introduced this discussion and pointed out that the nature of the conference was changing. The main emphasis of regulations governing bag limits, etc., has changed to study and discussion of issues and problems facing wildlife managers. He pointed out that panel discussions in 1968 and 1969 which dealt in some depth with two major topics, and the free day were introduced by staff of the Canadian Wildlife Service responsible for planning the conference. Members were asked to make suggestions during the discussion, as well as to use the feedback form distributed at the conference.

Discussion

a. The conference has been too much oriented to prairie problems. Problems of other parts of Canada should also be dealt with.

b. Provision should be made for provincial directors to talk about specific problems since the conference is the only opportunity they have for such discussion.

c. The conference is too hurried, and the discussion opportunities too limited. The free day should be continued, and the conference should be extended by one more day.

d. Mr. Schultz pointed out that in January the Canadian Wildlife Service asked provincial directors to make suggestions for the conference agenda but only one replied. The conference is therefore slanted to federal problems and does not deal with provincial problems as seen by the provinces. It was suggested that this might be remedied by greater emphasis on this aspect of planning when the first announcement of the conference is made.

e. It was agreed that the development of the technical committees had changed the nature of the conference more than was realized, and that thought and good planning could produce a very valuable meeting.

Report on the recommendations presented by the 32nd Federal-Provincial Wildlife Conference

Recommendation 1

That the conference commend the Canadian Wildlife Federation for its continuing efforts to encourage teacher training in conservation subjects and its valuable work in co-ordinating publicity on the annual theme for National Wildlife Week. It is also recommended that provincial and territorial resource departments distribute National Wildlife Week posters and classroom lessons widely, and use their good offices to encourage provincial and territorial departments of education to introduce conservation education into teacher training and into curricula. It is further recommended that the conference introduce the suggested theme of Ecology and Land Use Planning for National Wildlife Week, 1969.

Action

The recommendations and appropriate appreciation were conveyed.

Recommendation 2

That the conference express its appreciation to the United States Fish and Wildlife Service for making it possible to have its representatives, Messrs. Noble Buell and Walter Crissey, at the 32nd Federal-Provincial Conference; to the Yukon Territorial Game Branch for its handling of the conference arrangements; and to the Royal Canadian Mounted Police for its growing support and co-operation at both provincial and federal levels.

Action

Appreciation in each case was directed as required.

Recommendation 3

That the conference, through the minister of Indian Affairs and Northern Development, request the Government of Canada to establish further contact with the provincial resource agencies with respect to Bill C195 dealing with firearms legislation, before Bill C195 is discussed in committee in the Parliament of Canada.

Action

The Canadian Wildlife Service brought the matter to the attention of the departmental legal adviser and the Indian Affairs and Northern Administration branches. We understand also that the Canadian Wildlife Federation carried on discussions with the minister of justice.

Recommendation 4

That the conference recognize the need for evaluation of the effects of river basin development projects on all resources, before such projects are begun, and that the conference delegates draw to the attention of their respective governments possible undesirable effects of the Peace River storage on the water levels in Lake Athabasca, Lake Clair, Richardson Lake and the Athabasca Delta, and the possibility of serious damage to habitat for waterfowl, fur bearers and fish resulting therefrom.

Action

This recommendation was directed to all governments. We assume that all delegates took the necessary action to inform their respective governments of the view of the conference.

Recommendation 5

As the import of wildlife from other lands is presently under the aegis of numerous agencies, federal and provincial, and since introduced species may represent an environmental pollutant either in themselves, by direct destruction or degradation of their environment, by degradation of compatible indigenous species through hybridization, or by introduction of diseases or parasites, it is recommended:

a. that responsible federal and provincial authorities prohibit the import of non-indigenous species into any province or territory of Canada, except in those cases and for those species shown by the importer to the satisfaction of the responsible authorities not to constitute an environmental pollutant now

or in the future, either in themselves or through their progeny.

b. that responsibility for inspection of non-indigenous species at their port of entry into Canada rest with inspection personnel under authority of a duly designated federal or provincial agency and that responsible personnel should be supplied with sound basic information on the parasites and diseases likely to be harboured by the non-indigenous species.

c. that non-indigenous species of wildlife, imported for any purpose, be subject to the decontamination procedure used for domestic species and that such procedures be carried out in a manner similar to that used for domestic species and by the same agency.

d. that the Canadian Wildlife Service be responsible for maintaining a current list of rare and endangered species of other lands likely to be imported into Canada and that the Service conduct, in co-operation with other federal and provincial agencies, studies in diagnostic methods for determining the health of relevant non-indigenous species.

e. that export of wildlife in danger of extinction, rare, or peripheral, be prohibited or authorized with cause by the responsible provincial agency and by the responsible federal agency when and where applicable, and that liaison be maintained by the Canadian Wildlife Service with the appropriate authorities in Canada and in other lands to assist those authorities to control export of rare and endangered species or parts thereof within their jurisdictions without their knowledge and approval.

f. that Canada sign the convention for the export and import of certain species as requested by the International Union for the Conservation of Nature and Natural Resources.

Action

5a, b, and c. These provisions are included in the convention for specifically named species of animals. The number of importers of non-indigenous wildlife has increased in Canada. The Canadian Wildlife Service is maintaining close contact on their activities through the Health of Animals Branch of the federal Department of Agriculture.

d. A current list of rare and endangered species of other lands and likely to be imported into Canada is being maintained.

e. The Canadian Wildlife Service has made informal representations to our minister on this matter. He has acknowledged that a federal import-export act is desirable. It is expected that such an act will be written in consultation with the provinces and territories for presentation to the legislative committee of cabinet.

f. The Canadian Wildlife Service has recommended that the Department of External Affairs sign the convention for Canada.

Recommendation 6

That the meeting express its appreciation to Mr. James Smith, commissioner of the Yukon Territory, for the splendid hospitality extended to the delegates to the 32nd Federal-Provincial Wildlife Conference, Whitehorse, Yukon Territory.

Action

Appreciation was expressed in an appropriate manner.

Recommendation 7

That the conference express its appreciation to the Yukon Fish and Game Association and many others associated with the conference for the splendid hospitality extended to the delegates to the 32nd Federal-Provincial Wildlife Conference.

Action

Appropriate appreciation was conveyed.

Report of the director of the Canadian Wildlife Service

Dr. J.S. Tener

Again this year there are a number of changes in federal wildlife administration that should be placed on the record of this conference. Dr. David A. Munro, director of the Canadian Wildlife Service for nearly five years, became director of the Community Affairs Branch in the social affairs program of my department last September. We have all missed him very much. His contribution to the development of the Canadian Wildlife Service was immense, and his influence on the growth of wildlife management in Canada was substantial.

In the reorganization of my department last September, John Gordon, my immediate superior, was appointed senior assistant deputy minister for conservation. Alan Loughrey, whom you all know, is now deputy director of the Service.

Since we met last year, the Canadian Wildlife Service has continued to make progress, although current financial and manpower restrictions have curtailed activities significantly. Little change is forecast for at least another year.

Nolan Perret will be reporting to you later today on our wetlands acquisition and easement program so I won't dwell on it. I do want to mention two points, however. First, we are currently examining the basic assumptions and objectives of our entire waterfowl program to determine what is realistic and to devise the most efficient methods for achieving our objectives. Included in that examination is the wetlands program. Second, the Service recently purchased nearly 29 square miles of land at Cap Tourmente, east of Quebec City. That land includes the marshes along the north shore of the St. Lawrence River which are essential to the welfare of the greater snow goose population.

Responsibility for various activities associated with migratory birds has been given to Alan Loughrey. I expect that you and your waterfowl biologists will be seeing a great deal more of Alan as we collectively sort out the many problems facing waterfowl management across the country.

Last year Dr. Munro spoke to you about the government's intention of clarifying the position of Indians and Eskimos in relation to the Migratory Birds Convention Act. The subject is still under discussion but my minister's recent policy statement on Indians does clarify the matter somewhat. He has indicated that the government is prepared to allow transitional freer hunting of migratory birds under the Migratory Birds Convention Act to Indians living in the traditional manner of their forefathers. No further details are available.

This week the first of several wildlife interpretation centres was opened to the public at Wye Marsh, near Midland, Ontario. The official opening will take place next year but the centre is sufficiently completed for us to take advantage of summer tourist traffic. The centre was built at a cost of about $400,000. Its purpose is to interpret to the public the ecology of a southern Ontario marsh and the eastern hardwoods forest. Very close liaison and co-operation with the Ontario Government has characterized all phases of the centre's establishment.

We hope eventually to have an interpretation centre in each major biome of Canada to interpret to the public the characteristics of those biomes and to describe the impact of man's activities on his environment.

A major problem facing Canadians today is environmental quality. Our standard of living is tied not only to surroundings. It seems to me that the wildlife profession is deeply involved in how our environment is used or abused. Our breadth of activities involving

land, habitat, wildlife, and people gives us the opportunity to exert a significant influence on attaining the kind of environment we want in Canada. The Canadian Wildlife Service will increase its emphasis on the need for controlling the development of natural resources to ensure the highest possible standards of environmental quality.

A panel discussion on Waterfowl Management in Canada has been scheduled for Thursday morning. It is time for all of us to examine objectively and searchingly where we have been, where we are, and where we want to go in utilizing that resource.

Report of the Canadian Wildlife Federation

R.C. Passmore
Executive director

National Wildlife Week programs

Last year, at the 32nd Federal-Provincial Wildlife Conference at Whitehorse, you recommended that the 1969 National Wildlife Week deal with "Ecology and Land Use Planning". At the time we expressed some misgivings about the choice of a subject involving that degree of complexity and sophistication. Perhaps we should have objected more strongly before you made your selection.

With the aid of a grant from the Department of Indian Affairs and Northern Development, we were able to produce a wider variety of materials for the 1969 National Wildlife Week program. We added two new items — the 16-page booklet, *Land Use Planning: An Ecological Approach* and a 60-second colour T.V. film for use in public service time. Copies of the film were supplied in appropriate language to all television stations in Canada. Production of these materials and those normally used in National Wildlife Week programs meant that the Canadian Wildlife Federation expended much more staff time on the 1969 program than on those produced previously.

We did put a great deal of effort and consultation into designing a poster which would express the message of the 1969 program, but the result was less than satisfactory to some of the participating agencies and organizations. As difficult as the theme was, there must have been some better way to represent it in poster form and we do regret our failure in this regard.

The 1969 National Wildlife Week program encountered other snags. Three of these involved budgetary problems in provincial resource departments but two, or perhaps three, were related to the subject matter of the program which, it was felt, went beyond the jurisdiction of the departments in

question. Discussion of the theme revealed that one province had had some misgivings about participating in the 1968 program on pesticides. It was pointed out that agricultural use of pesticides, mentioned prominently in the 1968 program, was not within the jurisdiction of the co-operating department. In addition, National Wildlife Week coincided with Easter and schools in most provinces had to be encouraged to use material for National Wildlife Week during some other week.

The distribution of materials produced for the 1969 National Wildlife Week program is shown in Table 1. The total numbers of posters and classroom lessons used in 1969 shows a substantial reduction from the totals of recent previous years.

The 1969 program was not all bad news, of course. The majority of provinces did participate fully and in one case when, for financial reasons, the provincial resource agency was unable to do so, a large conservation club undertook to finance the complete program. The program was generally well received by the public and the school systems. Geography classes in particular made good use of the booklet, parts of which are being incorporated into a new geography textbook in one province. The demand for extra copies of the poster was much greater than usual. Because the T.V. clips are still in use, we have not received detailed reports from many television stations. However, those which have reported indicate a gratifying level of use. We are indebted to the many provincial resource departments, departments of education, provincial wildlife federations, local clubs, and individuals whose co-operation helped to bring another meaningful message to the attention of the public during National Wildlife Week in 1969.

The fact that some programs did develop in connection with the 1969 National Wildlife Week program suggests that a thorough review of these annual undertakings is in order.

The Canadian Wildlife Federation was first invited to be represented at the Federal-Provincial Wildlife Conference held in Ottawa in 1963. It was at that conference that you passed a recommendation which read:

> "That the Canadian Wildlife Service, in co-operation with the provincial wildlife agencies, adopt a common theme each year for National Wildlife Week. It is further recommended that the Canadian Wildlife Federation assume the responsibility for distributing literature throughout Canada and thereby assume the lead in promoting National Wildlife Week, and that federal and provincial wildlife agencies give support to this."

We participate in these programs at your request and we are anxious to make our contribution in the manner which you feel will be most appropriate. In this connection, we would welcome suggestions as to how we might contribute more effectively.

On our part, we feel these programs make a valuable contribution to public understanding of conservation problems in Canada. We are anxious to see them continued and to participate in them in whatever capacity we can be most helpful. If that role is to be in any way similar to that which we now perform, we would like to make the following recommendations:

1. Subjects chosen for presentation in National Wildlife Week programs should carry a simple, direct message capable of clear, forceful representation in posters and other materials.

2. Subjects chosen should fall completely within the jurisdiction of the provincial re-

Table 1

National Wildlife Week, 1969, summary of orders for posters, booklets and lessons

Province & organization	Posters		Booklets		Lessons	
	English	French	English	French	English	French
British Columbia						
Fish & Wildlife Branch			1,500		10,000	
Alberta						
Fish & Wildlife Branch	1,000		1,000		1,000	
Fish & Game Assoc.	750					
Saskatchewan						
Wildlife Federation	1,500					
Manitoba						
Wildlife Federation	6,000		1,100		6,000	
Ontario						
Lands & Forests	9,000		5,500		9,000	
O.F.A.H.	500					
Quebec						
Widlife Federation	4,500	32,000	1,350	8,000	4,500	32,000
New Brunswick						
Wildlife Federation	4,800	1,200	1,250	350	4,800	1,200
Nova Scotia						
Lands & Forests	1,500		1,300		1,500	
Prince Edward Island						
Fish and Wildlife Div.	1,145	35	400	50	1,145	35
Newfoundland						
Wildlife Div.	6,000		2,150		6,000	
Yukon						
Game Branch	200		50		200	
Northwest Territories						
Indian Affairs	375		300		375	
Ducks Unlimited			1,000			
C.W.F. (Kits)	1,400	600	1,400	600	1,400	600
(Extra)			1,700	1,000	600	400
Totals	38,670	33,835	20,000	10,000	46,520	34,235
Grand totals						
1969	72,505		30,000		80,755	
1968	102,475				99,975	
1967	100,275				97,500	
1966	131,050				120,000	

source departments co-operating in the program.

3. Subjects should be chosen two years in advance to permit time for preparation of materials, particularly of booklets and television clips.

4. The Canadian Wildlife Federation has given consideration to subjects which meet these criteria and recommends that *Endangered Wildlife in Canada* be the subject for 1970 and *The Role of Predators* be dealt with in 1971.

We will welcome your comments and recommendations regarding any aspect of these National Wildlife Week programs.

Revision of firearms legislation (Criminal Code)

Bill C-150, given third reading in the House of Commons on May 14, 1969, made substantial changes to the firearms sections of the Criminal Code. The new firearms legislation will not be proclaimed as law immediately but, when it is, it will provide new opportunities for young people (no lower age limit is specified) to obtain supervised training in the field and actual hunting experience under supervision. In most provinces, provincial hunting laws will prevent young people from obtaining the training, experience and enjoyment which the amended Criminal Code will now make possible.

The Canadian Wildlife Federation believes that some very worthy objectives would be served if provincial hunting regulations permitted early training and experience now allowed by the amended Criminal Code. Training would make young hunters safer, more responsible, and more considerate of the rights of others. Provinces now issue first hunting licences at ages ranging from 14 to 18 years. Only two issue any type of licence requiring a young person to hunt under the supervision of a licensed adult. To our knowledge, no province permits an unlicensed young person to hunt under supervision, sharing the legal bag limit of the supervisor.

We recommend that provinces consider amending provincial hunting regulations in the following ways.

1. Unlicensed hunters below the provincial minimum age for first hunting licences should be allowed to hunt under the close supervision of a licensed adult who would share his limit with the youngster(s) under his supervision. Although the Criminal Code permits supervision to be given by a 16-year-old, or even a 14-year-old if he has a permit to possess, we suggest that the supervisor should be no younger than 21 years.

2. A learner's licence permitting hunting under the supervision of a licensed adult should be issued to persons between the ages of 14 years and the age at which a person can be licenced to hunt on his own. Such a licence should provide for a separate bag limit and might be issued only to persons who have graduated from a hunter safety training program.

3. With the two previous recommendations providing for a relatively long period for training under supervision, 16 might be a suitable age at which to issue a first licence permitting a young person to hunt on his own. Combined with the hunter safety training programs now compulsory or available in almost all provinces, supervised field experience and more formal training and testing should provide ample opportunity for young hunters to develop a sense of responsibility not now found in some segments of the hunting fraternity.

REPORT ON THE ADMINISTRATIVE COMMITTEE FOR POLAR BEAR RESEARCH AND MANAGEMENT IN CANADA

Dr. N. Novakowski

A meeting of senior wildlife officials representing the provinces, territories, and the federal government was held on July 7. The meeting was called at the invitation of the director of the Canadian Wildlife Service, in order that research work on the polar bear within Canada be co-ordinated and some uniformity in management strategies for the species established. In general, the Eastern Region of the Canadian Wildlife Service, with Dr. Charles Jonkel as senior scientist, has done most of the research. Individual provincial or territorial game agencies have been responsible for management; and the regulations pertaining to it have varied.

With this background the group first appointed a chairman, Dr. N.S. Novakowski, and a secretary, Dr. A.H. MacPherson, both of the Canadian Wildlife Service. The committee is to be named the Administrative Committee for Polar Bear Research and Management in Canada and will do the following:

1. Review, unify and co-ordinate research and management programs on polar bears within Canada with the aid of recommendations from a technical group of advisers;
2. By general consensus, advise the government of Canada on the character of its representations at international polar bear meetings to discuss research and management;
3. Advise senior officials of each government on measures required to protect the species and its habitat in critical areas.

The committee authorized the formation of a technical committee which is to meet before meetings of the administrative committee in order to prepare recommendations on current and future research and management programs. The technical group will consist of scientists studying polar bears, or having direct management responsibility for them.

In preparation for the first meeting of the administrative committee, the members of the technical committee met informally to draw up the following items for discussion:

1. Co-ordination of research activities: The administrative committee was informed that representatives of Manitoba and Ontario had already agreed to co-ordinate their activities with those of the Canadian Wildlife Service.
2. Standardization of regulations: This was discussed and further proposals will be brought forward at the next administrative committee meeting.
3. Polar bears and garbage dumps in Churchill, Manitoba: Such remedial action as removal of garbage dumps has been promised, but the situation could become quite serious if it is not rectified quickly.
4. Sport hunting of polar bears: The Northwest Territories is the only management organization which operates on a polar bear quota system, which is somewhat less than the previous unrestricted kill.

Other important agenda items were held over for future meetings so that members of the administrative committee could discuss them with their management advisers. In addition, these items have been referred to the technical committee. They include the fur export act in relation to interprovincial traffic in polar bear skins; scientific requirements for licences for polar bear research; assessment of responsibilities for hunting regulations and enforcement in territorial waters; and determination of Indian rights in the hunting of polar bears.

Establishment of the administrative and technical committees will do a great deal toward unifying Canadian research and management efforts. It will also help to simplify and define Canada's responsibility in international study and management of polar bears.

Progress of the Canada Land Inventory

Dr. V.E.F. Solman

You all know that the Canada Land Inventory has been mapping soil capability for agriculture, forestry, recreation, and wildlife for a number of years. Some capability maps have been published in each sector. I have here, for your examination, copies of the first four waterfowl capability maps in the scale of 1:250,000 and the first ungulate capability map in the same scale. Purely by coincidence, the first published ungulate capability map is for Edmonton, map sheet 83H. It is appropriate to present it to you during the course of this Federal-Provincial Conference in Edmonton.

The total Canada Land Inventory area includes a few more than 400 map sheets. There are now in the map production system more than 120 completed waterfowl capability maps and more than 60 completed ungulate capability maps. The production of maps is not uniform across the country because of the difference in complexity of the environment being mapped, differences in staff availability, and other conditions.

For the information of the senior provincial wildlife administrators of the provinces I have prepared tables by province of map sheets for waterfowl, ungulates, and sport fish which have been completed and delivered to the cartography unit in Ottawa. I present these tables to you now because I know you want up-to-date information on the progress of Canada Land Inventory in your province and how it compares with progress in adjacent provinces. If you are not satisfied with Canada Land Inventory mapping progress in your province, I hope you will take steps to improve the situation.

As we hoped, Canada Land Inventory data are being used increasingly by planners at all levels. The type and amount of use varies according to the province. Planners are pleased to have the published maps, some of which we can now make available to them, but they also use the unpublished material which is in the system. The amount of use being made of unpublished map data in some provinces is heartening although it causes some difficulty.

As planners make more use of the factual information provided by the Canada Land Inventory there is more hope that planning will become more closely related to the facts of land capability. The difficulty caused by this increasing use of maps occurs because some provinces are not yet well equipped to provide map information to planners without somewhat delaying the map production program.

We believe that maximum use of Canada Land Inventory data by planners and its widest distribution to the public will be the best result that can come from the Canada Land Inventory program.

I will not take more time to discuss Canada Land Inventory activities. I will be available throughout the conference for discussion with individuals or groups on any aspect of the work.

Thank you very much for your interest.

THE FEDERAL WILDLIFE LAND EASEMENT AND ACQUISITION PROGRAM

N.G. Perret

A meeting of the Canadian Council of Resource Ministers in Victoria, British Columbia, in May 1965 marked the turning point in the migratory bird program of the Canadian Wildlife Service. At that meeting a proposed national wildlife program was discussed and received approval in principle. It was agreed that the program should go forward and that a part of it would be aimed at securing important wetland areas for future waterfowl use.

The proposed national wildlife program was also discussed at the Federal-Provincial Wildlife Conference in June and at a meeting of the prime minister and provincial premiers in July. At those meetings, as at the Victoria meeting, provincial representatives approved the objectives of the national program. Finally, a statement of Canada's National Wildlife Policy and Program was made by the minister in the House of Commons on April 6, 1966.

Prior to the tabling of the policy and program, meetings were held in each of the provinces to discuss the proposed program and means of implementing that portion dealing with the maintenance of migratory bird habitat. The discussions were essentially the same in each province, but details varied according to provincial policy with respect to waterfowl. Several important points emerged from those meetings. The most important was that the Service would not attempt to acquire or manage wetlands in any province without the concurrence of provincial officials. It was agreed that priority lists for acquisition would be prepared jointly by provincial and Service personnel and that the Service would keep the provinces informed of progress in acquiring wetlands. Another important point was that the Service would be prepared to conclude agreements with provinces desiring to participate in acquisition or management of wildlife habitat.

The National Wildlife Policy and Program established two distinct programs for maintaining wetland habitat, leasing of small wetlands and purchase in fee simple of large areas. I would like to review briefly the progress we have made in those activities during the past three years.

Basin easement program

As outlined in the National Wildlife Policy and Program, the objective of the easement program is to maintain about two-thirds of the more than six million ponds on the prairies in order to provide habitat for waterfowl populations at the 1950-56 levels. It was estimated that the program would take 10 years to complete, at a continuing annual cost of five million dollars. It was an ambitious program based on the best available information at the time. However, after two years experience, it appears that it may have been over-ambitous. The manpower and funds required to achieve that degree of control may far exceed the original estimates.

The program area consists of 209 rural municipalities situated in the prairie parklands of Alberta, Saskatchewan, and Manitoba. Priority ratings for offering agreements were assigned to municipalities in each province on the basis of probable agricultural intensification. During a program year all landowners in the scheduled municipalities are contacted and easement agreements solicited.

With the new information available from the Canada Land Inventory we believe that we can more precisely delineate those areas in the greatest danger of being drained or filled. That would involve studies to determine drainage rates by capability class and the establishment of new program areas and new priorities based on waterfowl and agricultural capabilities. It would also require a constant evaluation of

the effectiveness of the program so that priorities and methods can be rapidly adjusted to meet changing conditions. We are now taking the necessary steps to alter our program along the lines outlined. We should have the new priority areas delineated, and new procedures introduced by next year.

Table 1 shows the progress of the basin easement program to date and includes the program for the current year. The cost of new easements to be negotiated each year will increase gradually to $200,000 a year by 1974-75. The special easements shown in the table are for the lease of large wetland areas not included in the easement program. They are areas which require management, or on which certain agricultural practices are permitted.

Acquisition program

Following tabling of the policy statement, the Canadian Wildlife Service embarked on a program of acquiring waterfowl habitat. Lists of important marshes in the eastern provinces have been prepared and priorities for acquisition assigned. Similar priority lists for western Canada are being prepared. Priorities are based primarily on the value of the marshes during migration periods, but weight is given to their value or potential as production areas. Generally these are areas which will require management to increase waterfowl use.

As each area is acquired, development and management plans are prepared. These plans include provision for public use, interpretation programs, and certain land-use practices. The areas will also be used for wildlife

Table 1

Progress of the basin easement program

Year	Acres	Ponds	Annual cost	Accumulated annual cost
1967-68	29,088	31,986	$171,408	$171,408
1968-69	32,272	40,049	124,692	296,100
1969-70	31,220*	39,025*	118,900	415,000
Sub-total	92,580	111,060	$415,000	
Special easements				
1967-68	3,500	N/A	$ 52,619	$ 52,619
1968-69	336	N/A	2,021	54,640
Sub-total	3,836		$ 54,640	
Total 1969-70	96,416		$469,640	

*Estimates

research and for demonstrating land management programs beneficial to wildlife.

To date we have acquired 36,668 acres at a cost of approximately 2.6 million dollars. Most of the areas were acquired by purchase in fee simple from private landowners. In a few cases additional lands were obtained from the provinces through their ceding provincial lands to the federal government for inclusion in the areas.

Table 2 summarizes the acquisition program to data. It includes all areas purchased or in the process of being purchased. During the current year we will continue to buy land in the incompleted national wildlife areas (Table 2) and will initiate negotiations on eight new areas (Table 3). In the five-year period beginning 1970-71 we plan to acquire an additional 80,000 acres at an estimated cost of eight million dollars.

I would like to take a few more minutes to review briefly the procedures followed in purchasing land for a national wildlife area. Perhaps it will answer some questions raised in the past year concerning quick purchases of endangered areas and the effect of our program on wildlife land values.

The Real Estate Branch of the Department of Transport acts as our agent through the entire process from assessment to payment. When a proposal is received from a field officer it is submitted to the minister, then to Treasury Board for approval. That can be a very short or a very lengthy process depending on the size of the area to be purchased, the total cost, political implications, etc.

Once approval is received a copy of the proposal is sent to the Department of Transport for action. Eventually, depending on other priorities of the Real Estate Branch, land ownership is determined and properties are delineated and evaluated. Without further delay, negotiations with individual landowners are started, and options to purchase are obtained.

It is important to note at this point that only accredited appraisers are employed and that the methods they use to establish property values are approved by the Appraisal

Table 2

Summary of national wildlife areas acquired, or under negotiation

Name	Estimated area (acres)	Area acquired
John Lusby	1,435	905
Sand Ponds	1,289	1,289
Jolicure Lakes	3,800	478
Iles de la Paix	299	299
Cap Tourmente	18,425	18,425
Last Mountain Lake	13,800	14,057
S.E. Water Supply	320	320
Wetlands Research	892	892
Vaseaux Lake	3	3
Totals	40,263	36,668

Table 3

New national wildlife areas approved for purchase beginning in 1969

Location	Number of areas	Estimated area (acres)	Estimated cost (dollars)
Nova Scotia	2	2,565	96,000
New Brunswick	1	1,500	52,000
Quebec	2	9,296	456,200
Ontario	2	2,280	451,750
Saskatchewan	1	2,520	101,000
Totals	8	18,161	1,156,950

Institute of Canada. The appraised value of a particular parcel of land and buildings is the basis for negotiation, but we may exceed that value by 10 per cent. In addition, if part of a property is purchased we are required to pay a severance cost which can go as high as 30 per cent of the appraised value.

When options to purchase are obtained the often long and detailed process of obtaining clear titles is started. In general, the process is not too difficult or too time consuming in western Canada but it can be almost impossible in eastern Canada, particularly in the Maritime Provinces. In order to clear titles and exercise options quickly the Department of Transport has employed expropriation. In some areas even that procedure is not sufficient to make payments and we have to survey and redescribe property boundaries.

Expropriation prior to negotiation has not been employed yet, but if it becomes necessary in order to stop land speculation in important areas, a fair price for the land will be negotiated. It is very unlikely that we will force the sale of land. If a fair value for a particular parcel of land cannot be negotiated, the expropriation would be abandoned.

To date, we have had excellent co-operation from the Department of Transport and I see no reason why that should not continue in the future. However, the purchase of land by the federal government for national wildlife areas is a long-drawn-out process which we must live with. In spite of difficulties I am sure that we will be able to preserve and maintain many of the important wetland areas of Canada.

Some results and implications of pesticide research by the Canadian Wildlife Service

J.A. Keith

What sort of things has the Wildlife Service been finding out in the last few years in terms of environmental contamination by persistent pesticides?

The persistent pesticides we know most about are the organochlorine insecticides, especially DDT and dieldrin, and since Canadian uses are usually not radically different from uses in the United States or northern Europe, it is not surprising to learn that there are important similarities between Canada and these countries in the environmental movements and concentration points of this group of insecticides. When we started a few years ago to probe into Canadian wildlife populations we expected, on the basis of European and American work, to find that top carnivores would be concentration points, and that lower trophic levels would have proportionately lower levels of contamination, and this does prove to be the case.

For example, in a series of 15 bird species taken at the end of a winter on the Fraser River delta, or near its shores, the organochlorine contamination of the two hawk species was at least six times higher than that of the others, followed in descending order by owls, herons, shorebirds, passerines, gulls and waterfowl. In Alberta and Saskatchewan, a survey of eggs of 13 species of falcons, hawks, eagles, and owls shows that those that eat birds are more contaminated than those that eat mammals, and collections of their bird and mammal prey show correspondingly lower levels of contamination. In another prairie egg survey, in aquatic systems, waterfowl eggs did not exceed two parts per million (ppm) organochlorine residues, while eggs of gulls and exclusively fish-eating birds ranged between 2 and 26 ppm. In New Brunswick forests where DDT has long been used, the herbivorous snowshoe hares and white-tailed

deer contain really low DDT residues, but bobcats contain many times higher levels, and mice and voles are less contaminated than shrews. In a look at resident northern animals, caribou fat averaged around 0.1 ppm organochlorine compounds whereas polar bear fat averaged twenty-five times higher.

Many of the organochlorine residue levels are sufficiently low that it does not seem worth doing more than keeping them under routine observation. This is the case for western waterfowl as a group and for herbivores generally. But, in the cases where residue levels are high, further research is seriously required to assess hazard or damage to species populations.

For this reason, we are actively studying bird-eating and fish-eating birds in the west. Early results show truly astonishing regional within-species variations in residue loads, and these require explanation, presumably in terms of local pesticide-use patterns and local food preferences. For bird-eating birds, where we now have some data on reproduction and on yearly changes in breeding-pair numbers, we can come to some conclusions on effects. As a model for this group, we are concentrating on the prairie falcon in southern Alberta and southwestern Saskatchewan, and here for this bird there has been a substantial decline in occupied territories during the past decade. In our sample the drop has been one-third. The decline does not include all areas, but it looks as though it is continuing. There are inverse relationships between DDE levels and both eggshell thickness and nestling production.

It is widely known that peregrine falcon populations have collapsed in the settled portions of North America in recent decades, but only in the last few years has a connection with pesticides been more than speculation. We are documenting contamination in this bird and its prey in the northern parts of its former breeding range, and we are also following production at a series of eyries in the Thelon and Bathurst areas. In an obviously limited set of samples, egg contamination by organochlorine insecticides in this bird is as high in arctic breeders as it is farther south. This may simply reflect a floating situation in which a predator moves north and south with an avian prey in which contamination may be highest during winter and during spring migration, and certainly for effects on eggs, it is the peregrine's body load in early spring that counts, not the latitude of the nest.

Atlantic gannets in Canadian waters, feeding on the mackerel and herring populations that are exploited by human fishermen, are grossly contaminated with organochlorine insecticides, whole-egg levels ranging now between 8 and 100 and averaging about 30 ppm on Bonaventure Island off the Gaspé. This is not as high as the egg levels I found in a Lake Michigan herring gull population with abnormally low hatching success, but it is higher than egg levels in the declining populations of peregrines and prairie falcons. Poulin's recent study of the Bonaventure gannets shows breeding success to be only a half that of a Scottish colony which almost certainly has much lower contamination levels, and that hatching success in particular is low on Bonaventure. While insecticides probably are contributing to this situation, the degree of contribution remains to be worked out. The colony on Funk Island, east of Newfoundland, and its summer food are half as contaminated as at Bonaventure, and a very rough census suggests no abnormal drop in productivity.

While organoclorine insecticides are, then, obviously important wildlife contaminants in

Canada, there are other toxic chemicals that deserve much more attention than they have had. Since the disastrous Swedish experience with organomercurial fungicides used on grain seeds and on pulp during paper making, we have been trying to start a project to assess the mercury hazard here, where uses are similar. We have finally got such a project underway and initial results from the prairies suggest that some seed-eating birds do contain much higher mercury levels than could be expected from background and that some raptorial birds are, in turn, concentrating mercury at hazardous levels.

Another group of materials worth immediate attention is the group labelled PCB, the industrially used polychlorinated biphenyls. These have come to attention because some of them have identical retention times with the DDT group on gas chromatographs, which has confounded many analytical results, and they have also recently been shown to be in the same league as DDT and DDE as steroid degraders. The chemist who does our analytical work has devised a technique for separating most PCBs from pesticide residues, and so we are beginning to get some idea of the distribution and abundance of PCBs in wildlife samples. The PCBs are most apparent in our marine and Great Lakes samples, in polar bears around Hudson's Bay, in breeding seabirds from both the Atlantic (puffin, Leach's petrel, common murre, and gannet) and from the Pacific (ancient murrelet) coasts and in ring-billed gulls from the Great Lakes. When present, PCBs can account for all of the apparent DDD and much of the p,p'-DDT, but the DDE values are hardly changed at all by PCB separation.

What are the implications of these and similar results of research into toxic chemicals in wildlife? Should we be content with the conventionally safe and proper wildlife management role of doing research and providing information? Or should we be serious about wildlife "management" in this field and consider toxic chemicals as population-limiting factors and aim to reduce those uses that limit wildlife numbers?

Pursuit of this innocuous-sounding aim, reducing toxic chemical uses that affect wildlife, involves to a surprising degree an open attack on what is now called progress in agriculture, forestry, outdoor recreation and human population growth, and an open attack on motherhood *is* at first glance a surprising involvement for the wildlife profession. But trying to change agricultural or forestry practice, or to alter trends in human population growth, only differs from controlling wetlands in degree, not in principle. Environmental biologists do not just study their subject and passively react to changes in environmental stress. Rather, they actively apply their research results to moderate those stress factors that prove critical.

This leads us, then, into rather fundamental considerations. The increasing man-made environmental stresses, such as chemical pollution, are caused by the continuing growth in both human numbers and per-capita environmental demands. To moderate those stresses, we obviously must tackle their causes. But is it really our business to take to the hustings as social critics? Would we know what we were talking about? In the 1940's and 1950's the atomic scientists found that their special knowledge had the most catastrophic social implications, and this led them to a vigorous effort to inform society of these implications. We have this sort of special knowledge now. More than any other group in Canada, our knowledge of ecology and population dynamics gives us special insights into the catas-

trophic environmental consequences of present trends in the expansion of human populations. Because of this, we environmental biologists have a deadly serious obligation to be articulate, persistent, and *public* critics of those trends in society which we know to have disastrous implications.

Additional information and comments on disease conditions and parasites of barren-ground caribou

Dr. E. Broughton and Dr. L.P.E. Choquette

Federal government concern for the migratory barren-ground caribou, *Rangifer tarandus groenlandicus* (L.), in Canada's northern areas goes back to nearly the beginning of the present century. However, the alarming decline in total numbers prompted systematic investigation much later – initially in 1948 by the Canadian Wildlife Service, and subsequently until 1958 and between 1966 and 1968 under the aegis of an Administrative Committee for Barren-Ground Caribou Preservation formed by federal, territorial, and provincial agencies.

One objective of these investigations was to secure information on diseases and parasites affecting barren-ground caribou and to assess their significance. Banfield (1) and Gibbs (4) reported on observations made during studies conducted between 1948 and 1958. The present report deals with additional information obtained during the Kaminuriak Barren-Ground Caribou Population Study conducted in 1966-68 by the Canadian Wildlife Service (Eastern Region) in collaboration with the Northwest Territories and Manitoba governments. The Service's Pathology Section assisted in that study.

Field investigations were begun in April 1966 and continued until July 1968. Nine hundred and ninety-nine caribou – 436 males and 563 females of various ages, including 97 calves with 50 of them a few days old – were taken during that period. The animals were examined as thoroughly as possible under field conditions prevailing in northern Manitoba and the District of Keewatin at various times of the year. Taking into account the number of persons involved and the probable variation in thoroughness in the conduct of post-mortem examinations, we are satisfied that the information secured under these conditions represents fairly well the

health status of the barren-ground caribou population under study.

Two hundred and fifty-three animals were examined by E. Broughton, a veterinary pathologist; the others by biologists[1] and technicians[2] who recorded the presence of, or collected for laboratory examinations, abnormal parasites or tissues. Partly because limited information was already available, and mostly because of the relative lack of field facilities and the logistic problems of collecting and shipping to the laboratory bulky viscera and portions of animals from a significant number of caribou, the digestive tract, lungs, brain, and cranial cavity were not examined for parasitic worms. However, the lungs of each animal were examined for hydatid cysts. Samples of blood were collected for serological studies.

Infectious diseases

Brucellosis

Brucellosis is the disease condition in animals and man resulting from exposure to bacteria of the *Brucella* group. It occurs in many parts of the world.

The clinical disease or evidence of exposure to its aetiological agent has been reported from many species of wildlife and semi-domesticated species, mostly ruminants, in several parts of the world. In Canada, brucellosis has been reported in bison, elk, moose, and reindeer.

Gibbs reported that 64 barren-ground caribou, 20 males and 44 females, taken between July 1957 and August 1958 and serologically examined for evidence of brucellosis were negative to the test, except in one case in which the reaction was questionable. In 1967 and 1968, blood samples from 321 barren-ground caribou, 200 females and 121 males, were tested for brucellosis. The sera were tested at serum dilutions of 1:25, 1:50, 1:100, and 1:200. A reaction was secured in eleven cases (3.5 per cent).

As shown in Table 1, three of the sera reacted at a serum dilution of 1:50; one, at 1:100; and seven, at 1:200. All reacted at 1:25. On the basis of the criteria used in interpreting results in reindeer and caribou testing in Russia and Alaska, the result of the test was interpreted as "positive" in the eleven cases. As also shown in Table 1, two of the reactors were female calves a few days old. The others were eight females varying in age from slightly less than two to twelve years of age, and one male slightly less than five years old. Most of the reactor serum samples had been collected on the herd's calving grounds. Four of these were cow-calf sera with the calf serum closely reflecting that of its dam.

Results of the brucellosis test conducted in Alaska on more than 1,200 caribou, 1962-65, indicate seasonal variations in reactor rates for males and females, with male reactors being more common than female reactors in the fall, and vice versa in the spring. In the present study, the number of animals (45 females and 52 males) and of reactors (one female only) sampled in the fall and winter months is too small to draw any conclusion in this respect.

Abortion, placental retention, metritis, sterility, orchitis and epididymitis, arthritis, and bursitis (hygromas), associated with brucellosis, have been reported in reindeer in Russia and caribou in Alaska. In Canada, observation of relatively large numbers of barren-ground caribou over a two-year period, except during the months of January, February, and March, and the post-mortem examination of 500 "mature" animals, failed to reveal any significant evidence of the above-mentioned conditions. Orchitisepididymitis has not been reported by Banfield or by Gibbs, who also

[1]T.C. Dauphiné, D. Miller, F.L. Miller, G. Parker and A.H. Macpherson.

[2]J.P. Couillard and G. Tessier.

Table 1

Barren-ground caribou brucellosis test reactors

	Animal Number	Sex	Age	Weight	Locality	Date	Titre 1 25	1 50	1 100	1 200
1.	(403)	F	22 mo.	104 lbs.	N.W.T.	17/4/67	++++	+++	+++	++
2.	(553)	F	99 mo.	196 lbs.	N.W.T.	18/9/67	++	++++	++++	+++
3.	(794)	M	58 mo.	185 lbs.	Man.	14/4/68	+++	++		
4.	(830)	F	108 mo.	188 lbs.	N.W.T.	13/6/68	++++	++++	++++	++++
5.	(837) (dam of next)	F	108 mo.	159 lbs.	N.W.T.	13/6/68	+++	++		
6.	(838)	F	calf	14 lbs.	N.W.T.	13/6/68	+++	++	+	
7.	(869)	F	108 mo.	180 lbs.	N.W.T.	15/6/68	+++	+++	+++	++
8.	(890) (dam of next)	F	120 mo.	155 lbs.	N.W.T.	16/6/68	+++	++++	++++	++++
9.	(891)	F	calf	10 lbs.	N.W.T.	16/6/68	+++	++++	++++	++++
10.	(901)	F	120 mo.	179 lbs.	N.W.T.	16/6/68	++	+		
11.	(933)	F	61 mo.	175 lbs.	N.W.T.	17/7/68	++++	++++	++++	++

observed and examined a number of male caribou between 1948 and 1958.

The only records possibly related to the occurrence of bursitis as a result of brucellosis in barren-ground caribou are those of Banfield and Gibbs, who each reported one observation of adult animals with articular involvement; and that of E. Kuyt, Canadian Wildlife Service, who photographed tumefactions of both carpal joints in a barren-ground caribou taken in the Thelon River in 1966. In none of these three instances were the tumefactions examined to determine their nature nor the animals examined serologically. While bursitis is said to be common in infected reindeer in Russia, this does not seem to be the case in caribou in Alaska or in Canada, where it is also uncommon in reindeer.

As for metritis-abortion, in 1958 Gibbs reported that one of the 44 females he examined showed evidence of chronic endometritis which could not be related to brucellosis. In the test conducted in 1968, one of the positive females (869) had a partially involuted uterus but no calf. It is possible that this animal had aborted as a result of brucellosis. However, preservation of the uterus in formalin precluded its bacteriological examination. The rate of pregnancy recorded in the females taken during that study would indicate that infertility does not appear to be a problem in the Kaminuriak population.

Humans are susceptible to infection by the *Brucella* organisms, and such infection may result from butchering and handling *Brucella*-infected animals, from contact with afterbirths and placental fluids from an abortion, or from eating raw meat or the marrow, or drinking the blood of an infected animal.

Between 1953 and 1966, clinical cases of brucellosis were recorded in Eskimos in Canada and in Alaska. Of the seven cases recorded in Canada during that period, five were from the Bathurst Inlet area, one from Cambridge Bay, and one from Coppermine. Five of the seven individuals had not been out of the Arctic. It was speculated that caribou and/or reindeer were likely reservoirs of infection. The isolation of a strain of *Brucella* from caribou and epidemiological studies in Alaska showed the caribou to be an important reservoir of infection. The present report is the first confirming the existence of brucellosis in caribou in Canada. It is of interest to note that the clinical cases recorded in Canadian Eskimos in the western Arctic occurred in areas where the basic diet is caribou.

Thus, caribou are considered and are likely to be an important reservoir of infection. However, epidemiological studies in Alaska suggest that species such as moose, Dall sheep, and rodents (muskrat and beaver) may also be involved. It has also been suggested that dogs could possibly be another source of infection in some northern areas.

While the information obtained in 1967-68 indicates the existence of brucellosis in the Kaminuriak population, it is not, however, extensive enough to assess the prevalence of the disease as well as its significance in that particular caribou population and indirectly its possible significance from a public health standpoint. At present, there is no information with regard to brucellosis in that segment of the Canadian population utilizing the Kaminuriak barren-ground caribou population. Seemingly, brucellosis does not represent a serious threat to the welfare of that particular caribou population. However, its detection certainly warrants efforts to secure further information on its prevalence to determine its true significance with regard to the animal and public health.

Leptospirosis

This is an acute, chronic or latent infection caused by certain species of microbes of the genus *Leptospira.* Many mammals, domestic and wild, are susceptible to leptospirosis. Some species, particularly rodents, act as carriers of the germs.

Following infection, the microbes localize in the kidney and persist there for an indefinite period. The organisms are present in the urine as long as kidney infection persists, and susceptible animals may acquire the disease through exposure to the urine of infected animals. Man may become infected from such urine or from butchering animals with acute infection. In some species (e.g. cattle) abortion may occur as a result of the infection. This does not seem to be the case in Cervidae.

Forty-three sera from caribou taken in the Lac Brochet, Manitoba, area were tested by Dr. J.G. Cousineau, Faculty of Medicine, Laval University, Quebec, for leptospiral antibodies. None of the sera tested gave a positive reaction. This is similar to the result reported by Gibbs following the testing of 64 barren-ground caribou sera he collected in 1957-58. From these limited results, it seems that leptospirosis is not a problem in the Kaminuriak caribou population at present.

Actinomycosis and actinobacillosis

Actinomycosis occurs in cattle the world over and has been reported in wild ruminants in Canada. It is caused by *Actinomyces bovis.*

In cattle and wild ruminants, it almost always involves the bones of the head, particularly the lower jaw, and is characterized by a bony swelling. *A. bovis* grows in minute purulent centres surrounded by dense tissue displacing the nearby normal tissue. When the microbe penetrates the bone, it destroys the tissue; this, in turn, stimulates the production of new bone which proliferates to form "lumpy jaw." The affected part of the jaw may be enlarged considerably and distorted. Usually the swelling breaks through the skin and discharges through one or more openings; sometimes, the fistulas from bone abscesses extend inward and discharge into the mouth.

Banfield reported that the examination of 380 skulls found on the caribou range, as well as of animals that had been killed, indicated that a condition resembling actinomycosis was widespread, though his finding of lesions in eight of the 380 skulls examined cannot be construed as indicating a widespread infection. However, his photographs of three caribou mandibles showing "lesions of actinomycosis" do not show such lesions, though they indubitably show some anomalies. Similar anomalies were noted in caribou mandibles during the 1966-68 study.

Gibbs reported that he did not see any lesions suggesting actinomycosis in the 150 or more caribou he examined in 1957-58. F.L. Miller examined the jaw bones of all the 999 animals taken in 1966-68. In no case did lesions indicate actinomycosis.

Actinobacillosis is mainly an infectious disease of cattle and is world-wide in distribution. It also occurs in sheep, and we have records of it in bison and moose in Canada. It is due to *Actinobacillosis ligneseri*. Its gross lesions resemble those of actinomycosis. However, it does not affect the bones and shows a marked tendency to involve the tongue (hence the name "wooden tongue" given to the disease in cattle) and lymph nodes. Lesions may occur in any part of the skin and in the internal organs. Gibbs reported his finding of pulmonary actinobacillosis in one of the caribou he examined in 1957-58, and we identified the aetiologic agent of the disease by special histological stains of a

thick-walled subcutaneous abscess in one caribou. It does not seem to be a common infection in caribou. If it were, it is probable that the purulent lesions it produces would have been noted, as they can occur in so many sites in the animal body.

Parasitic infections

Warble and head maggot infestations

Banfield, Gibbs and Kelsall (6) have dealt with the occurrence in and importance to barren-ground caribou of the caribou warble fly (*Oedemagena tarandi*) and the caribou nostril fly (*Cephenomyia trompe*). The bee-like, non-biting flies are serious pests of caribou during the fly season. Their larvae or maggots invade the skin (warbles) or the nasal passages (head maggots).

Warble infestation is by far the commoner of the two. Kelsall reported that 93 per cent of 132 barren-ground caribou examined between 1948 and 1960 had warbles, while only 19 per cent of 63 animals had head maggots. Field biologists who examined 578 caribou during the 1966-68 study recorded warble infestation in 510 or 87.5 per cent of the animals; very few harboured head maggots. The degree of infestation varied from a few to several hundred warbles in one individual. There was no significant difference between the percentage of males and females infested, though male caribou were usually more heavily infested than females. These data confirm earlier reports on the prevalence of warble infestation.

Larvae of tapeworms

The wolf and other canids harbour several species of tapeworms whose larval stages develop in mammalian and other hosts. Because of the relationship (predator-prey) of the wolf and barren-ground caribou, the caribou is an important intermediate host of species of tapeworms occurring in the wolf in northern areas.

Both Banfield and Gibbs commented upon the common occurrence of the large bladderworm (*Cysticercus tenuicollis*) stage of *Taenia hydatigena*, but gave no figure as to incidence. In the 1966-68 study, biologists noted the presence of *C. tenuicollis*, mostly in the liver and, in a few instances, in the mesentery and in the heart, in 202 of 809 caribou – nearly 25 per cent of the animals examined. In the liver, the number of cysts present varied between one and six. The parasite is not transmissible to humans, and it is unlikely that in most instances it has any significant effect on the health of the host.

The barren-ground caribou also harbour *Cysticercus tarandi*, the larval stage of another tapeworm of the wolf, *Taenia krabbei*. The small cyst develops in the muscles, including the heart. Banfield recorded *C. tarandi* in 28 per cent of 54 caribou he examined. Gibbs also reported that it was common in barren-ground caribou. Because of the small size of the cyst, it is likely that it is undetected in light infection of the muscular masses. In the 1966-68 study, it was noted in a few instances, mostly in the heart. However, no attempt was made to assess its incidence, as this would have required a thorough, time-consuming examination of the meat which was being salvaged for human use. At any rate, the parasite is not transmissible to man, and does not seem to affect the animal appreciably, although heavily contaminated meat is unattractive for human consumption. The latter might be of some importance in connection with the sport hunting or commercial exploitation of caribou.

The most important parasite of this category in the barren-ground caribou is the

hydatid cyst, the larval stage of *Echinococcus granulosus.* Banfield recorded it in the lungs of a few barren-ground caribou in 1948, and Gibbs reported that it was fairly common but gave no indication of its approximate incidence. During the 1966-68 study, it was recorded in 52 of 828 barren-ground caribou. In all cases except one, the cysts were found in the lungs; in that one, the infection was localized in the liver.

The hydatid cyst is a vesicle varying in size from that of a large marble to that of a grapefruit or bigger. It contains many tapeworm heads which develop to adult tapeworms when the cyst is eaten by a suitable host, such as a wolf or dog. The eggs of the adult tapeworms are evacuated in the faeces of the canine host (e.g. wolf) and, if eaten by an ungulate (e.g. caribou) — for instance on contaminated vegetation — they slowly transform into hydatid cysts.

While several large cysts in the lungs of a caribou may be debilitating, the primary importance of this parasite is that it can also occur in man and cause a very serious condition. There are several records of hydatid disease in man in northwest Canada and in the Northwest Territories, where it has been shown that the main source of infection is dogs which have been fed or have eaten the contaminated viscera of game animals, including barren-ground caribou in some areas.

Intestinal and pulmonary

As stated previously, neither the digestive nor the respiratory tract was examined for the presence of adult parasitic worms.

On the basis of information obtained from the examination of reindeer by Choquette *et al*. (2) and of barren-ground caribou by Gibbs, together with the absence of clinical evidence, it is likely that intestinal parasites are not prevalent and do not play any significant role in barren-ground caribou. In livestock, particularly herbivores, intestinal parasitism is usually the result of "built-up" infections in animals confined to relatively small areas thus increasing the chances of infection. In animals free to roam over large expanses of land, the chances of infection by the eggs or larvae produced by the parasites are reduced considerably.

Both Banfield and Gibbs reported that the lungworm *Dictyocaulus viviparus* was common in barren-ground caribou, though never present in great numbers. In Canada, this parasite also occurs in other members of the deer family, in bison, and commonly in cattle. In many parts of the country, verminous pneumonia causes severe losses in cattle, particularly young animals.

In young cattle, the disease is primarily due to the invasion of the lung tissue following ingestion of the parasite's larvae infecting pastures. The response of the lung tissue varies and depends on the number of larvae ingested and whether the animal has been sensitized by previous exposures. Thus, the clinical picture reflects the lung's response to invasion by lungworm larvae, which results in the development of an acute or subacute condition often complicated by secondary bacterial infection, or in an asymptomatic form of the disease. In young cattle, in addition to signs indicating respiratory involvement in various degrees of severity, loss of weight and stunted growth are also observed in the clinical forms of the disease.

The significance of *D. viviparus* in caribou is not known. Gibbs reported finding lesions of verminous pneumonia in caribou he examined in 1957-58, but considered that none of these could be classified as dangerous to life. Similarly, during the 1966-68 study, the histolo-

gical examination of the lungs of a small number of caribou showed the presence of lungworm larvae associated with lesions of pneumonia. In either case, whether these lesions were due to *D. viviparus,* or to other species of lungworms, was not determined. So far, we have no clinical evidence that verminous pneumonia is a problem in barren-ground caribou. Nevertheless, we propose to investigate this question of lungworm infection to learn what species might be involved and how significant they are.

Sarcosporidiosis

Sarcosporidiosis is a condition characterized by the presence of spore-containing cysts of parasites of the genus *Sarcocystis* (considered as being protozoa) in the striated muscles of many mammals and some aquatic birds. It also occurs in moose and bison in Canada.

Infection shows up as minute, whitish streaks, usually one millimetre or less in length. Minute sarcosporidian cysts were found in the heart muscle of 14 caribou during the 1966-68 study. It is likely that the systematic and meticulous examination of the heart and other muscles would reveal a high incidence of infection.

It is believed that the infective forms of the parasite (sporozoites) are conveyed by the blood stream to the muscles. Gibbs reported that while no sarcosporidian cysts were seen on post-mortem examination, spores of a species of *Sarcocystis* were found in blood smears.

The significance of *Sarcocystis* is unknown, and unless the infection is an extremely heavy one, it is not likely to cause trouble. The status of sarcosporidiosis from a public health standpoint is not well understood.

Besnoitiosis

Besnoitiosis is caused by spore-forming species of the protozoan genus *Besnoitia.* The spores are formed within pseudocysts which have an affinity for the connective tissues, including the cardio-vascular system in some species.

In 1922, Hadwen (5) reported the occurrence in Alaskan reindeer and caribou of *Fibrocystis tarandi* (= *Besnoitia tarandi*) cysts in the periosteum and on the surface of the tendons. Gibbs recorded similar cysts in the subcutaneous fascia of the legs, belly, and flank from a number of barren-ground caribou taken in 1957 and 1958 in the District of Keewatin. The diagnosis of besnoitiosis in skin lesions in caribou in the District of Mackenzie in 1963 and in the District of Keewatin in 1966 was reported by Choquette *et al.* (3) in 1967. The disease was not diagnosed in nearly 200 reindeer slaughtered in January 1967 (3); nor was it found in 163 reindeer killed in August 1968. The parasite has been reported as common in reindeer in the U.S.S.R.

However, it was not until the barren-ground caribou project of 1966-68 permitted field autopsies of large numbers of caribou that the relatively widespread nature of the disease became apparent. Thus, it was found in 26 of 100 caribou autopsied in the Lac Brochet, Manitoba, area in April 1968 and in 14 of 66 adult caribou taken west of Rankin Inlet, N.W.T. in June 1968. At that time, *Besnoitia* cysts were found in the periosteum and on the tendons as well as in the skin and in the subcutaneous fascia, but not in the cardio-vascular system, though in the latter case they may simply have been overlooked.

In addition to *B. tarandi* in reindeer and caribou, species of *Besnoitia* have been reported in other wildlife in various parts of the world (in rodents in the U.S.A., South America, and the U.S.S.R.; lizards in Panama; and antelopes in South Africa).

Besnoitiosis is a well-known clinical entity of cattle in some parts of the world (Europe,

the Middle East, and Africa). In cattle, it is a chronic, debilitating, and occasionally fatal disease with cutaneous and systemic manifestations. Cutaneous lesions are usually seen as rugose, thickened, hairless areas of skin, particularly on legs, thighs, and scrotum. Invasion of the epididymis and testis resulting in sterility has been reported in both cattle in South Africa and reindeer in Russia. In caribou, the cutaneous lesions were not extensive and consisted in a slight thickening of the affected portion of skin. The male genitalia were not affected, and none of the caribou found infected with *B. tarandi* showed any evidence of debilitation or loss of condition.

The level of infection indicates that the disease is common in the Kaminuriak barren-ground caribou population. Comparatively little is known about its significance in caribou. Hadwen expressed the opinion that reindeer and caribou were affected adversely, either mechanically or by toxins produced by the parasite, and suggested that in some cases it could be a serious condition. Toxins are considered to be an important factor in the pathogenesis of the disease in cattle in South Africa.

Considering the seriousness of the condition in cattle and occasionally in reindeer, its diagnosis in barren-ground caribou is, therefore, of more than academic interest and certainly warrants further study to determine its significance in the latter species.

Summary and conclusion

Brucellosis, which has been detected for the first time in barren-ground caribou, does not seem to be a problem, at present, from a caribou population standpoint, though it may be a source of infection to humans. The serological examination of a small number of caribou sera failed to reveal any evidence of leptospirosis or exposure to it. Actinomycosis, if it exists at all in that caribou population, is certainly not as widespread as has been suggested, and actinobacillosis appears to be uncommon.

Warble fly infestation is by far the commoner of the two Diptera, the other one being the caribou nostril fly, whose larvae or maggots invade the skin and the nasal passages respectively. The non-biting adult flies are serious caribou pests during the fly season, while the larvae of the warble fly depreciate the value of the hide.

Because of the predator-prey relationship of the wolf and barren-ground caribou, the latter is an important intermediate host of species of tapeworms occurring in the wolf in northern areas. Both the bladder-worm, *Cysticercus tenuicollis* (mostly in the liver), and *Cysticercus tarandi* (muscles) are common. None of these are transmissible to man. However, extensive contamination of the meat with *C. tarandi* makes it unattractive for human consumption. The latter might be of some importance in connection with the sport hunting or commercial exploitation of caribou. Hydatid cyst, the larval stage of *Echinococcus granulosus*, was also recorded in a number of caribou. It can also occur in man and cause a very serious condition. In northern areas, the main source of infection for man is the dog fed or allowed to eat the contaminated viscera of game animals. Under these circumstances, it is conceivable that the barren-ground caribou can be an important reservoir of infection for man.

There is no evidence, clinical or otherwise, that parasitic infections of the digestive tract and verminous pneumonia are a problem in barren-ground caribou.

Two protozoan infections were recorded: sarcosporidiosis and besnoitiosis. The signifi-

cance of sarcosporidiosis in caribou, or in other species, is unknown, and its status from a public health standpoint is not well understood. Besnoitiosis is a well-known clinical entity of cattle and reindeer in some parts of the world, and sterility has been reported as a result of the invasion of the epididymis and testis. None of the caribou found infected showed any evidence of debilitation or loss of condition or testicular involvement.

In conclusion, field observations and results of post-mortem and laboratory examinations suggest that the health status of the Kaminuriak barren-ground caribou population is generally good at this time. However, further investigations are certainly warranted to assess the significance of conditions such as brucellosis, verminous pneumonia, and besnoitiosis in caribou.

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The current state of the art

Dr. F.G. Cooch

A more appropriate title for this brief paper might be "The Current State of the Art of Waterfowl Management in Canada". This is a review of where we are as of July 1969, not where we will be in 1970, although limited reference will be made to pious hopes for the future. The first goal of this paper is thus to define where we are.

There is a tremendous need for research data in order to manage effectively migratory game birds. No one agency – provincial, state, or federal – has the resources to go it alone. In North America, several hundred biologists have been working at many locations over the past 25 years. The results of their labour are pooled and are available to all.

One problem to date has been that most of the raw data and analyses have been done at one location. To distribute this information, a plethora of conferences and technical committees, involving personnel from many agencies with a variety of interests, has arisen. To keep up with the flow of pertinent unpublished information one could spend as much as half one's time attending meetings.

Because the problem is vast and intricate, because decisions made in one area may have a direct bearing on persons living thousands of miles away, a co-operative program involving the entire continent is required. Such programs can, of course, succeed only if the need for each job is clearly understood by those co-operating.

The second goal of this paper, therefore, is to explain what we do, why we do it, and what limitations we place on decisions based on our data collection and analysis. Perhaps it's best to clarify the objectives of our management program. To my knowledge, although the federal governments of the United States and Canada have agreed on these objectives, the Canadian Wildlife Service and provincial agencies have not.

Briefly, our objectives as stated by the International Migratory Bird Committee are as follows:

1. To maintain a total population of waterfowl at levels not less than those which existed during the period 1956-62.

2. To manage migratory waterfowl for the benefit and enjoyment of people — meeting recreational, aesthetic, and scientific needs for this resource as equitably as location of habitat and requirements for preservation of this resource permit.

These terms are extremely broad, but they do provide some recognizable guidelines.

Let us first examine that part of our objectives dealing with population levels. In this instance I propose to use a hypothetical model based on the mallard. I know that many of you would prefer use of another species, but I have chosen the mallard because it is the most common species in the bag, more data are available for discussion, and its life equation is relatively simple.

There are three ways of managing populations of migratory game birds in order to meet our stated objectives: regulations; habitat control and development; and replenishment by means of releases from hatcheries.

The key to managing waterfowl populations does not rest solely with regulations and population analysis. It is obvious that if we lose the habitat, we can never hope to attain our specified population levels, in spite of regulations. I do not propose to discuss the Canadian Wildlife Service easement program nor our program of land acquisition. These and provincial and private schemes are, however, vital to any long-range management program. The development of refuges and managed areas usually leads to increases in hunting pressure, especially in those areas where marshes have been created or restored near areas of high human occupancy.

The kinds of lands which we preserve will largely dictate the kinds of ducks that we will shoot because presumably the unprotected habitat will continue to be "civilized." If we save teal habitat, we will end up with teal; if mallard habitat, then mallards; and so on.

Broadly speaking, regulations, and all that goes into them, have an immediate effect on the harvest and its distribution; whereas habitat in the long term determines the distribution of birds, the species which can be harvested, and the upper limits of production.

The concept of "put and take" hunting may not be too palatable to Canadians, yet we must consider this procedure in the long haul. We know how to raise birds, but we do not really know how to release them successfully.

This paper is restricted to a consideration of the basis for regulations. On the Canadian prairies, we are basically interested in maintaining a population in harmony with the ability of the breeding habitat to support it. In periods when the amount of habitat is increasing we attempt to return more birds to the breeding areas each year until the quantity and quality of the habitat starts to decrease, or until some magical time when we simply have too many birds.

One indication that a species is becoming too abundant is when there is an average of more than two birds of that species per water area. Above that point a density-dependent effect becomes evident and reproductive success drops. Once that occurs, the rate of increase is checked or birds in excess of the carrying capability are harvested. In theory, this procedure of reducing kill as habitat expands and increasing kill as habitat dwindles will produce the maximum sustained harvest. No one, to my knowledge, has ever tested this hypothesis mathematically. However, it is what we try or, at least, would like to do.

The most logical alternative is the "take'em while you've got'em" school. Or rephrased – take them now because we may not have habitat next year. Under normal circumstances, conditions of habitat tend to change relatively slowly from year to year. There are exceptions, of course, and 1968 was one of them, but more about that later.

Our first task is to decide what the size of the fall flight is likely to be; second, to determine the desired level of harvest that can be safely taken; and third, to guess the probable carrying capacity for the next year, in order that population levels can be set for the next May.

The product of our labours looks like this:

Hypothetical population forecast based on the mallard

May 1969 breeding population	8,000,000
Less five % summer mortality	400,000
Number of potential breeders	7,600,000
Production ratio (IMM/AD)	1:1
Fall population (as of Sept. 1)	15,200,000
Predicted Canadian harvest	1,500,000
Predicted U.S. harvest	3,000,000
Total hunting continental kill including crippling loss	6,000,000
Other losses (natural mortality)	1,200,000
Predicted population level May 1970	8,000,000

This is one of the models which we use, and it is the simplest. The input into this model is based on many types of activities and these are briefly discussed in order of their appearance in the model.

The May population levels are based on co-operative breeding ground surveys which cover the area indicated in the attached map. I will not completely describe the survey method except to state that it is essentially based on the distribution of mallards as of the mid-1950's. The basic design has been to divide the breeding grounds into large geographical areas, called strata, which have been established on the following bases:

1. Similarity in species composition of the birds found there and their numbers.
2. The number and types of wetland depressions per square mile.
3. Ecological associations, including soil, plant cover and visibility factors.

Each stratum is sampled by means of transects, flown at a speed of 90–110 miles per hour on an east-west or west-east basis and at an elevation of 100 to 150 feet above ground level. The width of the transect is one-eighth of a mile on each side of the aircraft. Thus for every four linear miles flown, one square mile of habitat is observed. The transects are divided into 18-mile segments and completion of a segment means that 4.5 square miles of a stratum is surveyed. Depending on such factors as weather, phenology, population size, number of water areas per square mile, size of stratum, and homogeneity of habitat a maximum of a five per cent sample is flown. The results obtained are reduced to a common denominator, i.e., ducks and ponds per square mile, which is then multiplied by the total area of the stratum to give a stratum index figure.

The key to the breeding ground survey program is the 31 air-ground comparison transects made from the results of the aerial survey. This portion of the survey and some of its limitations are outlined in Anon (1969) and Martinson (1967). The aerial portion of the survey gives by large areas, total birds seen (by species) and the number of water bodies. The air-ground portion provides ad-

justment factors which permit data obtained by the aerial crew to be re-evaluated on the basis of what has been seen on the ground. This is the so-called "visibility factor" and is a measure of the efficiency of the aerial crew, and differing visibilities of the various species.

Basic assumptions are made:

1. The ground crew is running a complete census.
2. The selected air-ground transects represent all habitat in the stratum.
3. The performance of the aerial crew is identical with its performance elsewhere, while over the comparison route and at varying times during the entire flight.

Probably none of these assumptions are correct, but despite these and other criticisms of the scheme, no workable alternative has been available and the scheme seems to work reasonably well.

A habitat survey (number of water areas) is being carried out in late June and early July. A third survey of prairie waterfowl habitat is being made in early July. This is known as the production survey (brood). Data on water areas, broods seen by age class, estimates of numbers of broods seen, and the late nesting index (based on lone males and pairs of mallards, pintails, and canvasbacks) are collected.

Because of difficulties associated with analysis and interpretation of the results of the brood surveys, and difficulties associated with the ground portion of the air-ground comparison study, the air-ground portion of the brood survey has been temporarily discontinued.

Those three surveys (the breeding pair, production, and habitat) give data on number of water areas in May and late June; number of ducks by species; unadjusted and unidentified brood averages; and a late-nesting index.

Their value is three-fold. They permit a check on the population model developed the previous year when, for example, the forecast May population level is checked against the actual May survey population level. They permit development of a production forecast. They give trend data from which educated guesses can be made on events, such as habitat conditions likely to occur in the following year.

The next element in the model is the production ratio of young birds to adults. This is essential when deciding how many birds may be harvested in the year of record. Crissey (1969), Anderson (1968), and Cooch (1969) have developed means of forecasting the probable production ratio in one year. The U.S. approach has been developed on a continental basis; the Canadian has been related to the production strata. Essential elements in these forecast systems have been adjusted May duck counts, unadjusted May and July water counts, and the late-nesting index.

Based on experience and an examination of the historical record of production ratios, a range from 0.5:1 to 1.6:1 immatures to adults can be anticipated. Experience has shown that when regulations and other conditions are not changed markedly, if the production ratio is 1.1:1, the population will tend to remain constant; if it falls below 1.1:1, population will decrease; if it rises above 1.1:1, population will increase. The development of the production ratio forecast is probably the major contribution to waterfowl population manipulation of this decade (1960–69).

On the basis of data from the previous surveys, it is now possible to estimate the size of the fall flight. If a breeding population of 8,000,000 is assumed after natural summer

mortality, then a ratio of 1.1:1 will mean that there will be a total fall flight of 8,000,000 + (8,000,000 x 1.1) or 16,800,000. In the case of the mallard and other dabbling ducks we do not need to consider problems such as minimum breeding age.

Once we have estimated the size of the fall flight, we must quickly decide on the size of the population that we want to return to the breeding grounds in the next year. Here the system falls down because when we set regulations (mid-July in Canada, mid-August in the United States) we do not know how much habitat there will be in the next breeding season. Therefore, we do not really know how many birds we should permit to survive for return to the breeding grounds. We do, however, have a minimum population size for each species which we try to maintain.

However, I stated earlier that trends in habitat develop rather slowly. As a rule of thumb, if the trend has been swinging downward for a year or two, we will estimate a further deterioration of 10 per cent; if upward, an increase of 10 per cent. At the same time, we allow for minimum population targets agreed to by the International Migratory Bird Committee.

The regulations then are initially set on the basis of the estimated size of the Canadian and continental fall flight, and our minimum population target. At this point we subtract "natural" or non-hunting mortalities, and estimate the number of birds that can be killed by hunters.

Estimates of non-hunting mortality are based on the so-called Hickey Triangle — developed by Hickey (1952) further refined by Geis, Martinson, and Anderson (1969) — which shows that non-hunting mortality is partially replaced by hunting mortality; or conversely, that non-hunting mortality increases as hunting mortality decreases (Figure 1). This analysis was based primarily on adult mallards banded in mid-winter in the southern United States. There has been much debate about the validity of the Hickey Triangle. Here is an example of how it is used:

If 1969 hunting regulations were set with the objective of sending back 15 per cent more birds to the breeding grounds in 1970 than were there in 1969, the calculations would be 8,000,000 x 1.15 = 9,200,000 (1970 breeding population). In mid-July, the forecast fall flight is estimated to be 7,600,000 + 7,600,000 x 1.25=17,100,000.

Therefore, 54 per cent of the 1969 fall population must survive until spring 1970 (9,200,000 ÷ 17,100,000); and 51 per cent must survive for the entire fall-to-fall year (9,200,000 — 5 per cent mortality ÷ 17,100,000). Thus the total, annual, allowable mortality would be 49 per cent.

Using the Hickey Triangle we can determine the rate of hunting kill that would result in a total rate of annual mortality of 49 per cent. From this approach, the allowable kill rate is 32 per cent.

Kill rate x fall population = permissible kill. That is, .32 x 17,100,000 = 5,472,000 (continental kill and crippling loss).

Before proceeding, I should state that non-hunting mortality is a poor choice of words. It could be more aptly called "mortality not otherwise accounted for" (poor syntax perhaps, but more meaningful). Included in this category are birds that die from natural causes, birds shot during crop depredation operations, birds killed illegally, birds killed by Indians and Eskimos, and self-compensating errors in survey techniques.

To digress for a moment, the kill on the breeding grounds by persons requiring birds for food is not likely to vary too greatly from

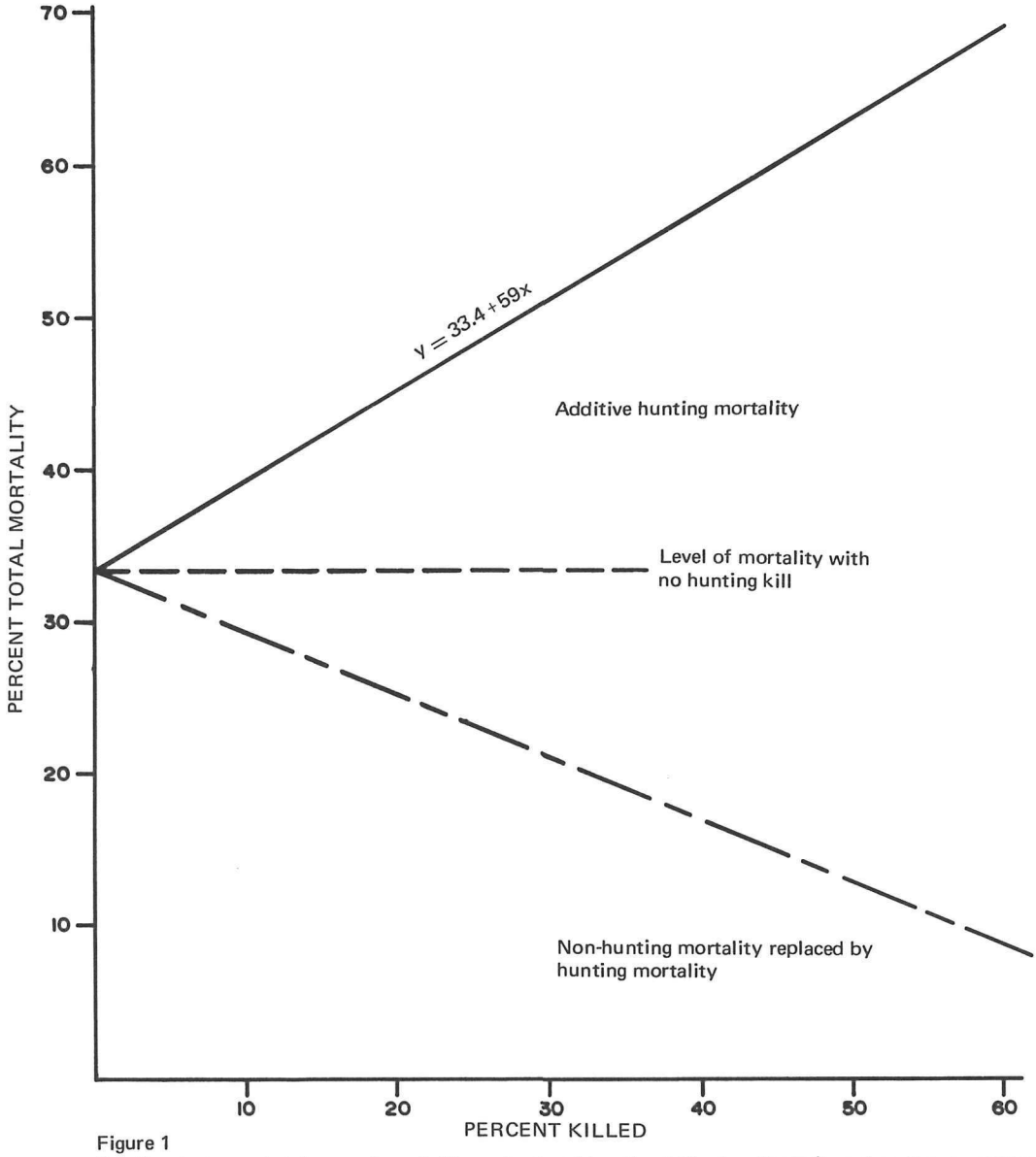

Figure 1
Relation between total annual mortality and rate of hunting kill of mallards (based on the regression of mortality rate on band recovery rate of winter-banded mallards).

year to year; crop depredation is more a problem of weather than population size (for example the autumn of 1968); the error in breeding ground surveys is greater in years when birds concentrate on available water than when they are dispersed. In short, we need to test the validity or shortcomings, or both, of the Hickey Triangle and, should it prove valid, to be able to apply it to species other than mallards.

Once the Hickey Triangle analysis has been applied to the fall flight we arrive at a figure which can be called the permissible continental (Canada and the U.S.) kill.

The procedures discussed are summarized in the following model. The fall flight is developed as follows:

May breeding population (less five per cent) times estimated production ratio equals size of fall flight population as of August 30 (fall flight)	17,100,000
Less "non-hunting mortality" (Hickey Triangle) which varies from 12–29 per cent depending on population size and proportion of populations to be removed by hunting. In this example use 15 per cent.	2,500,000
Net fall flight available for hunting	14,600,000
Less desired population for next year (based on International Migratory Bird Committee targets and estimates, or guesses, of the amount of habitat which will be available)	9,200,000
Number of birds that may be removed from the population by hunting in Canada and the United States. This total includes birds hit but unretrieved.	5,400,000

It is normal practice to consider at this time the consequence of several types of regulations, i.e., those regulations which may be expected to produce kills of 4,000,000, 4,500,000 and 5,000,000, etc., and relate these to our population objective.

We know little at present about the effect of regulations on Canadian kill. Because many of our hunters hunt on the breeding grounds, or on the first pre-migration staging areas, it is not entirely safe to extrapolate from experience gained in the United States (part of the data pool referred to earlier).

There are a number of techniques available which should result in desired regulation of the size and distribution of the kill. The two obvious courses of action are to reduce the daily bag limit or the number of days available for hunting, or both. In some species, closing or opening key areas is the most effective way to regulate kill. Species restrictions, half-day hunting, season bag limits, area- or species-specific quota systems, tagging, etc., are all techniques of varying effectiveness.

A major difficulty in setting regulations is unpredictable weather during the hunting season. An attempt to liberalize the regulations may fail because of "blue bird" weather. Conversely, delayed openings and restrictive daily bag limits may not be effective because the ratio of success per hunter will markedly increase during favourable hunting conditions. In 1968 for example, the combination of wheat and rainy, but not frigid, weather shortstopped mallards and white-fronted geese for weeks in Alberta and Saskatchewan.

We know that as much as 40 per cent of a season's kill and hunter-day activity occur on the opening weekend. If weather conditions are favourable for hunting, the per hunter success average can increase from 1.5 birds to 2.5 or higher. In a single weekend the effec-

tiveness of many restrictive regulations can be lost. On the other hand, liberalized regulations may not deliver the birds to the hunter if the weather is poor.

If we want to reduce the kill in Canada, the season is delayed, or opened on Monday, or both. Bag limits are manipulated, but in all honesty, most daily bag limits in Canada are now too high to be effective. A decrease from five to four ducks a day may have a psychological effect and cause some hunters to hang up their guns, but the number of hunters that would normally be expected to get that fifth duck is very small. Consequently the kill cannot be markedly reduced until bag limits approach the daily average kill, but more about this later. At present, regulations are set to permit a kill of a certain specified size. This will permit a return of a projected number of birds in the next season to the continental breeding grounds. We cannot now ensure reaching a target for an area smaller than a continent, or for a discrete population.

This is then, the basic model for most regulations in North America. We have checks on the validity of this model, but unfortunately they are made a year after the fact. And there are some things which we cannot check, e.g., our basic assumption that a five per cent mortality of adults occurs between the May surveys and the start of the hunting season. We do, however, check on the production ratio forecast by analysing wings received during the species composition survey. Once the wings have been broken down into species, the ratio of immatures to adults is derived for each sample in excess of 20 birds. This unadjusted data is further treated to arrive at a production ratio. To use Alberta as an example, the first step is to analyse the results of the same-season banding program where the ratio of immatures to banded adults, and the ratio of banded immatures to adults reported are known. The relative vulnerability of immatures and adults is then applied to the wing receipts for that province. The results are then weighted by species for each province and state, summed, and a continental production ratio produced.

The formula used to correct for the known higher vulnerability of immatures is (immatures per adult in the harvest) ÷ (immature adult relative recovery rate) = production ratio.

For an example of how the formula functions, let us take a case where the pre-hunting season population age ratio is two immatures per adult, and immatures are twice as vulnerable to hunting as adults. Since immatures in the example are twice as vulnerable to hunting, the band recovery rate for immatures would be twice that of adults, resulting in an immature-adult relative recovery rate of two. Since there are twice as many immatures as adults, and immatures are doubly vulnerable, we would then expect four immatures harvested per adult, resulting in a 4:1 ratio in the species composition survey. Dividing the 4:1 harvest ratio by the 2:1 relative recovery rate would give us the actual pre-hunting season age ratio of 2:1. Since immatures are more vulnerable to hunting than adults, the population age ratio would decrease as the hunting season progressed. However, this would be compensated for, automatically, by a corresponding decrease in the relative recovery rate, since there would also be relatively fewer banded immatures than banded adults as the season progressed.

Table 1 gives relative recovery rates, harvest age ratios, and resulting pre-hunting season age ratio estimates for 1967 mallards in Quebec, Ontario, Manitoba, Saskatchewan, and Alberta. We do not have sufficient band-

ing data to make estimates for British Columbia.

Table 1

Relative recovery rate, harvest age ratio, and adjusted population age ratio for mallards in 1967

Province	Relative recovery rate (banding)	Harvest age ratio (wing survey)	Adjusted population age ratio
Alberta	2.22	3.60	1.62
Saskatchewan	2.38	1.79	.75
Manitoba	2.45	2.29	.93
Ontario	1.60	5.71	3.57
Quebec	2.62	12.88	4.92

Weighting each province's population age ratio by the 1967 breeding population index for that province gives a weighted age ratio of 1.08 for the prairie provinces combined.

The accuracy of the population age ratio estimates, by province, depends on several conditions:

1. The banded sample represents the provincial mallard population, as a whole, with respect to differential vulnerability.

2. Foreign mallards differing in age composition or relative vulnerability from the banded population do not migrate in large numbers into the province.

3. Large numbers of adults do not move out of the resident province into other provinces while immatures remain behind, or vice-versa.

4. If large numbers of mallards move from their home province into other provinces, immature-adult relative vulnerability remains unchanged.

This use of banding has, perhaps, not been clearly understood. It is important that usable samples be obtained from widely dispersed areas in a province and not from a single geographic location. It is equally important that overbanding does not occur. This would result in a marked depression in the rate of reporting (Martinson 1968). It would also make comparison and interpretation of mortality rates even more difficult.

The harvest survey yields data on the size of the total retrieved kill, it is not a species composition survey. Likewise, the species composition survey cannot be used as a kill survey. However, the harvest and the species composition surveys, combined, do give reasonable estimates of the size of the kill by province; and the species composition, age, and sex – at least for numerically important species. To this kill figure we add a 25 per cent unretrieved component – summed for Canada and the United States. This represents our best estimate as to the number of birds legally killed. By returning to our original model and plugging in data from the harvest and species composition surveys, pre-season banding and a new production ratio, plus the current May breeding ground survey, we can, in effect, compare the predicted and actual production ratios, the predicted and estimated hunting kill, the non-hunting mortality, and finally, the size of the breeding ground population with our own previously set target. We are also able to check our forecast of the number of water areas on which we based our derived population level for a given species.

At this point I should say if only we could do this for all of North America. In theory we should build this type of model for each species, and thus develop a provincial, national, and continental model for all species combined. We are taking hesitant steps in that direction, but at present we are restricted to one or two species. Futhermore, these are

continental models, and we must make decisions on small geographical units, such as parts of provinces, and on population segments. There is little cause for self-congratulation if we reach a 6,000,000 continental mallard population objective, then discover that they are all in Alberta. Yet this is basically what we are doing.

I would like to list a few obvious deficiencies in what we do. This is not offered as an apology but there is no sense in deluding ourselves.

1. The present model is not applicable to all of North America, nor to all species for a variety of reasons, e.g., lack of roads for establishing air-ground comparison routes, and behavioural problems.

2. No air-ground adjustment factors have yet been devised for such species as canvasbacks, redheads, and scaup.

3. An arbitrary five per cent breeding ground mortality is applied to all species.

4. An arbitrary 25 per cent crippling loss factor is applied to all species in all parts of the country, although crippling losses in excess of 50 per cent have been observed for some species and in some localities.

5. The adequacy of the pre-season banding program is suspect.

6. The Hickey Triangle has not been proved valid.

7. We know that there are biases in the harvest and species composition surveys, etc.

8. Bonus seasons have been set on species, i.e., scaup and goldeneye, that cannot be counted.

9. Arbitrary air-ground visibility adjustments for forested areas are used.

The second generalized type of approach is used for those species that cannot be counted by "normal" breeding ground survey techniques. Classic examples are wood ducks and black ducks. Here the procedure is to back into the solution; i.e., to use those things that we know such as sex ratio, age ratio, size of the retrieved kill, differential vulnerability, banding analysis, and production ratio to derive an estimate of the population which must have existed in order to produce a kill of a certain magnitude. Unfortunately this means that population data are available a year after regulations are set.

It has been claimed that regulations for all of North America are based on a relatively few species, i.e., the prairie mallard, and the prairie mallard, and of course the prairie mallard, with some attention given to canvasback and redheads. By and large this is true on a continental basis because we can see and count the mallard, and in terms of numbers in the bag it is most important to hunters. Over 50 per cent of the birds harvested in the three prairie provinces, 40 per cent in British Columbia, and 25 per cent in Ontario are mallards.

Harvest of the redhead and canvasback can be controlled by restricting hunting at certain key areas.

The first population model and production ratio forecast were developed exclusively for the mallard. Although we have tried other species such as pintail, gadwall, and blue-winged teal, they do not fit our model. I personally wonder if it is because the survey system and regulations are based on mallards. Yet the survey system apparently samples habitat per stratum in almost precisely the same ratio as waterfowl capability maps prepared by the Canada Land Inventory would show in that stratum, and the production ratios are meaningful when we band enough of those minor species.

While we are able to manage in a gross way we have difficulty in restricted areas, e.g., a

province. Waterfowl are mobile. They do not always return to their place of origin. Their vulnerability to hunting varies from year to year and from place to place. Hunting conditions and success vary according to the weather. For these reasons regulations that succeed often do so by chance.

The setting of regulations in Canada is probably more difficult than in the United States. In the case of mallards and black ducks, any regulations designed to protect them and increase population levels inevitably mean that Canadians are deprived of hunting other early-migrating species. A late-season opening results in an infinitesimal kill of early-migrating pintail and blue-wings.

Attempts to open the season early and still apply species management have failed. Frankly, we do not know how to harvest each species as a crop without damaging another species. In fact, we do not know the permissible harvest for most species nor do we have adequate population targets.

While I am in the process of answering unstated criticisms, perhaps we should deal with another *canard* (with apologies to all *Canadiens* present). Canadian regulations are not dictated by the Bureau of Sport Fisheries and Wildlife, although they are influenced by what the United States might do. We should all keep in mind that there are 2,000,000 U.S. duck-stamp holders and only 390,000 Canadian permit holders, that 1,200,000 of those duck-stamp holders are enjoying two or three ducks and 30- or 35-day seasons with some other restriction added. If the Bureau of Sport Fisheries and Wildlife is forced to increase bag limits by one duck, and the season in states like Minnesota, Illinois or Arkansas by five days (as happened in 1963 vs 1962) a 100 per cent increase in kill of mallards can occur in the Mississippi and central flyways.

We know that a 1968 reduction of one mallard and three ducks per bag on the prairies, plus a delay in opening the season, resulted in a 19 per cent decrease in the kill of mallards here. The 1968 U.S. regulations in the Mississippi flyway reduced the kill there by over 50 per cent. The credit for the U.S. success is due partly to the states and the bureau, and partly to Canada. If we had not reduced our bag limits and delayed our seasons, the bureau and certain states might not have been able to institute restrictions more severe than existed in 1967.

If they had merely held the line in 1968, we would have had fewer than 5,000,000 mallards on the breeding grounds today. Mallard-rich provinces like Saskatchewan and Alberta might not have noticed the difference immediately, because of their wealth and the lesser vulnerability of *their* mallards while in the United States. However, Manitoba's, southeastern Saskatchewan's, and Ontario's number one species would quickly have been in dire straits. Southern Manitoba and adjacent Saskatchewan already have as their number one breeding bird, the early-migrating blue-winged teal. To the extent described, and for the reasons listed, Canadian regulations are influenced by Washington. U.S. hunters can hurt the resource more than we can.

In the next few years our ability to make more complex analyses of population data, and to understand how to use regulations to manipulate those populations will be increased. For the first time we have Canadian data on species composition, size, and distribution of the annual harvest. We are actively investigating the present survey designs and developing means of assessing the significance of the results which we have been obtaining. Within a year, edited, up-dated tapes containing all banding records will be available at the computer in Ottawa.

What has been presented earlier in this paper relates to our present day-to-day ability to understand and manage populations of waterfowl. Where we will be in two or three years depends on the number of trained biologists which all of us can hire, the amount of additional data that will accrue, and above all, on our ability to obtain raw data and work on it. We now have data from two years of harvest and species composition surveys — work for at least 10 biologists. We have four. We annually commit 25 man-years of effort in the collection of waterfowl population data, not to mention our commitment in the Canada Land Inventory, and in habitat and enforcement programs.

At the outset it was stated that the problem was so complex that no one agency could go it alone. The recently initiated technical committees are an important vehicle by which information and views can be exchanged. However, until the provinces are able to provide well-trained waterfowl biologists, progress will be excruciatingly slow. There is so much to do that priorities will be with us for years to come.

Perhaps the statement by Churchill made after El Alamein sums up the present state of the art — I misquote "We have won a great victory (because we still have ducks) but I must advise you that we are not at the beginning of the end, (because although we are now getting the data, we have not yet begun to do the necessary analyses) but rather at the end of the beginning" (because we are only now getting the data required to manage effectively).

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Critique of waterfowl management in Canada

Dr. S.B. Smith

Before discussing Canadian waterfowl management in critical terms, I would like to introduce a few qualifications in order to provide a reasonably clear perspective.

I should state that I am not a waterfowl biologist, nor am I particularly familiar with waterfowl ecology. Thus I do not propose to relate my remarks to published work on basic waterfowl ecology, except to say that I am shocked at how little published information exists which is of real value to management agencies. Nevertheless, it would appear that any statements on management should be related to basic ecological concepts, and I will return to this point later.

A second point which should be emphasized is that a considerable portion of my discussion relates directly to the paper presented by Dr. Cooch. In his paper, Dr. Cooch has made a most valuable contribution by clearly setting forth for the first time the methodology involved in data gathering, together with assumptions used in relating these data to management efforts and particularly to regulation of kill. Where I agree with the present position I will say so; where I disagree, I will attempt to provide a rational argument to support my opposing point of view.

A third part of my discussion will be involved with an examination of data on which the Canadian Wildlife Service and the Bureau of Sport Fisheries and Wildlife have apparently based their mutual decisions regarding regulatory control of huntable populations of waterfowl. This aspect of the discussion uses only those data made available by the U.S. Bureau of Sport Fisheries and Wildlife. No attempt will be made to criticize the data on which the analyses are based. It is assumed they are the same data used each year by the Canadian and U.S. federal agencies responsible for management and regulation of waterfowl under the Migratory Birds Convention Act. As such, these data provide the only means on which a critique can be established.

Finally, it was agreed by the Canadian Wildlife Service that these discussions be published, in order that wider examination be provided of the multitude and complexity of problems faced by waterfowl management agencies both in Canada and the U.S. I hope that there will be no delay in making available these discussions in printed form; some aspects of waterfowl management are at a critical stage, and require immediate attention.

Dr. Cooch opened his discussion by stating the need for research data, while at the same time mentioning the difficulty of keeping abreast with a large amount of pertinent unpublished information. While agreeing that the need for research data is critical, I cannot agree that *any* information pertinent to management question should be discussed, and then used in making management decisions unless both the body of data and the manner in which it is used are available to all persons concerned with waterfowl management. One of the most important areas of conflict between federal and provincial agencies in Canada (and, presumably, between federal and state agencies in the U.S.) is found in the fact that federal agencies reach agreements (as stated by Dr. Cooch) with which provincial and state agencies might not agree, or to which they are not privy until subsequent federal actions are *fait accompli.*

In Canada, provincial agencies are largely to blame because they have consistently failed to employ significant numbers of people specifically oriented to waterfowl biology and waterfowl management. It is only recently

(1968) that a trend has begun to develop in Canada toward examination of management and research effort more attuned to regional and local problems which must be solved within the political boundaries of the provinces, while being completely and openly discussed by officials of the provinces and the Canadian Wildlife Service. Obviously, this is not a biological problem, but biological problems will never be solved until the provinces provide their fair share of the research and management effort, and the Government of Canada, represented by the Canadian Wildlife Service, recognizes the value of that effort.

I would now like to proceed to an examination of the basic concept set out by Dr. Cooch, in which he states, "In theory, this procedure of reducing kill in periods of expanding habitat and increasing kill as habitat dwindles will produce the maximum sustained harvest. No one, to my knowledge, has ever tested this hypothesis mathematically." I find myself startled to see such a statement, which indicates how key decisions are made as a result of habitat surveys, but coupled with an untested hypothesis concerning harvest effects. At the same time, two objectives are stated: to manage waterfowl for " . . .recreational, aesthetic and scientific needs . . ." (with which I agree), and "to maintain populations at levels . . . not less than that which existed during the period 1956-62" (with which I disagree). I would venture to guess that drought conditions of extreme severity will occur on the prairies sometime in the future as they have done in the past. In some years it will be physically impossible to come anywhere near the 10 million plus continental mallard breeders of 1956-58, even with closed seasons in Canada, or to depress the populations level below the 6.2 million mallard breeders of 1962, even with very generous seasons in Canada. These latter two statements assume of course, that the U.S. kill is not more than 50 per cent of the total allowable harvest, but I will return to that later.

In summary, I cannot agree with attempts at population manipulation based on an untested hypothesis or on projections of population trends which cannot be tied, even loosely, to effects of harvest levels on population.

I would now like to run quickly through the kind of relationships which can be demonstrated from available data concerning continental mallard populations. These plots are all based on the data summarized in Table 1.

Briefly, the data concerning total estimated continental breeding population, production of young, hunting mortality and non-hunting mortality for continental mallards (from Table 1) are plotted in a variety of ways, to show the kinds of interactions which might be expected from such data. It should be emphasized that the data on which these plots are based are the same data on which Dr. Cooch bases his hypothetical population forecast, and on which the Canadian and U.S. (presumably) federal agencies also base their suggested regulatory controls. Figure 1 uses the data from column 9 to show the estimated annual instantaneous mortality for mallards, as a percentage of the total fall flight. The significant aspect of this presentation of annual total mortality lies in the fact that fluctuations in mortality are relatively small, and that on the average, about 53 per cent of the total fall population can be expected to die before the following spring.

Figure 2 shows the relationship between non-hunting mortality and hunting mortality, and Table 2 summarizes these two mortality estimates for 10 years, grouped into the five years of highest and lowest hunting mortality.

Table 1

Mallard population dynamics, 1955-66* (population figures in millions)

					Mortality From Sept. 1 to Following May				
	Breeding population	Production Ratio (Imm/Ad)	No. young	Fall flight	U.S. & Can. bag + crippling loss		Loss to causes other than shooting		Total
					Number	Percent	Number	Percent	Percent
Year	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1955	9.6	1.5	14.4	24.0	8.9	37	4.1	17	54
1956	11.0	1.2	13.2	24.2	10.9	45	2.7	11	56
1957	10.6	1.7	18.0	28.6	11.4	40	3.9	14	54
1958	13.3	.8	10.6	23.9	11.3	47	1.6	7	54
1959	11.0	.6	6.6	17.6	5.7	32	3.1	18	50
1960	8.8	1.2	10.6	19.4	6.1	31	5.2	27	58
1961	8.1	.7	5.7	13.8	4.6	33	3.0	22	55
1962	6.2	1.0	6.2	12.4	3.2	26	1.7	14	40
1963	7.5	1.0	7.5	15.0	4.8	32	2.8	19	51
1964	7.4	.8	5.9	13.3	5.6	42	1.9	14	56
1965	5.8	1.6	9.3	15.1	4.3	28	3.2	21	49
1966	7.6								
Average	9.0	1.1	9.8	18.8	7.0	37	3.0	16	53

Figure 1
Total hunting and natural mortality (Sept. to following May) for mallard ducks, 1955-65.

Both of these presentations indicate the strong compensatory relationship between hunting mortality and non-hunting mortality. Table 2 indicates that a slight tendency exists for total mortality to increase as hunting mortality increases, although the regression value for the plot of total mortality on hunting mortality does not differ significantly from zero.

Figure 3 shows the relation between total spring breeding population and total hunting mortality in the preceding year (autumn hunting season). The only rational conclusion to be drawn from Figure 3 is that autumn hunting mortality does not affect the size of the following spring's breeding population. If such an effect occurred, the slope of the plot of breeding population numbers on kill numbers would have to be negative. Actually the size of breeding population in the spring appears to be a reflection of the size of the fall flight in the preceding year. This conclusion is not so startling, in view of the total mortality shown earlier in Figure 1. It is not suggested that hunting cannot affect size of mallard populations. However, within the limits of the data considered here, and on the basis of continental populations, the available evidence leads to conclusions which are diametrically opposite to those which suggest that regulatory controls are effective. My contention therefore must be that the relationships outlined here adequately demonstrate the mistake of believing (1) that the continental approach can be used in regulation of hunting harvests; or (2) that hunting mortality affects size of breeding populations in following years; or (3) that hunting has caused a decline in mallard populations; or (4) that the data used in regulation of hunting are adequate or reliable. I should mention that the plots I have presented here, plus my written conclusions, have been widely circulated for more than a year. I am not aware that these arguments have yet been negated.

Table 2

Comparison of "high" and "low" hunting mortality and natural mortality of mallard ducks from 1955 to 1964

	Years	% Hunting mortality	% Natural mortality	Mean hunting mortality	Mean natural mortality
High hunting mortality	1955	37	17		
	1956	45	11		
	1957	40	14	42.2%	12.6%
	1958	47	7		
	1964	42	14		
Low hunting mortality	1959	32	18		
	1960	31	27		
	1961	33	22	30.8%	20.0%
	1962	26	14		
	1963	32	19		

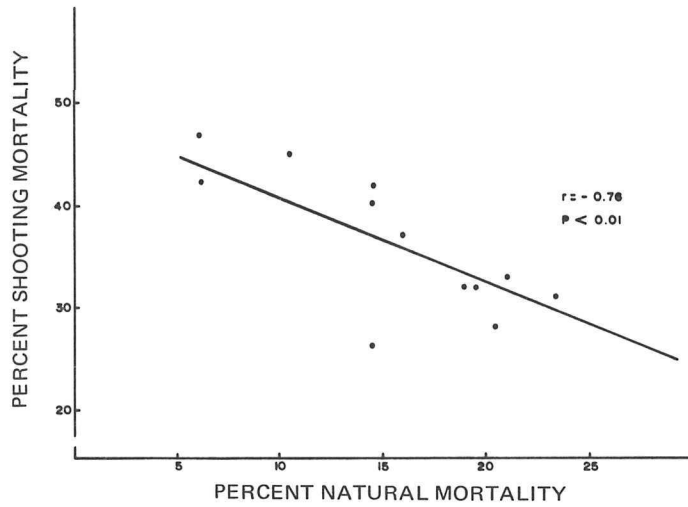

Figure 2
Relation between shooting mortality and mortality from other causes for mallard ducks, 1955-65.

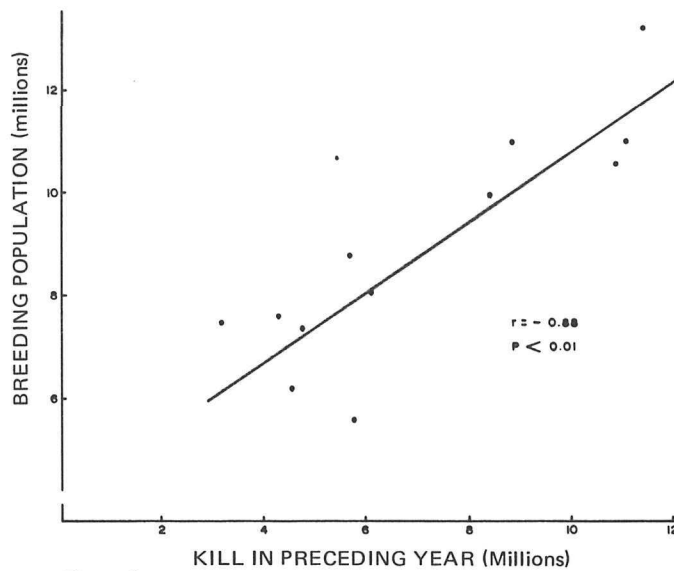

Figure 3
Relation between size of breeding population and total kill in the preceding year for mallard ducks, 1955-65.

Now let us proceed to estimates of waterfowl kill in Canada, as obtained by the Canadian Wildlife Service. As far as I can determine, these estimates are derived from a carefully designed and well thought out program. Estimates obtained in Alberta in 1967 by the Alberta Fish and Wildlife Division agree so closely with those obtained by the Canadian Wildlife Service that there is little room to doubt their validity, particularly in view of the fact that two entirely different methods were used. Most of you are familiar with the reports on the kill survey in Canada, which therefore needs no further elaboration. We see no futher need for duplication of the kill survey in Alberta, and have discontinued our efforts in this regard.

When dealing with exploitation of any populations of animals, reasonably accurate harvest levels can be achieved, if the following factors are known: (1) capacity of habitat to support breeding populations; (2) expected recruitment, as determined by breeding success; and (3) expected harvest and natural mortalities. I would suggest that, with the exception of (2), these parameters are known reasonably well for mallards. Banding data have been used to estimate kill and to indicate the relative proportion of various populations harvested in different areas. A great deal of confusion has resulted from the use of band recoveries to provide estimates of relative harvest rates. Hunters kill birds in numbers related to (a) number of hunters and (b) availability of birds, but particularly the latter. I would suggest that to estimate the fall population, for mallards at least, we only need to know the size of the breeding population, the number of successful breeders, and the average brood size. At present, we estimate the fall flight *after* harvest has taken place. This seems to me to be a procedure that cannot be easily used to set proper harvest levels. These levels need to be determined each year *before* the hunting season begins.

From the available data, I would suggest that we have the means available to predict spring breeding population levels. I would also suggest that we can predict the kill for each province. With a well-designed program, I believe we can accurately estimate the production of young and the total harvest which could be allowed. If we could simply attain the objectives outlined immediately above, I do not think there could be much criticism of waterfowl management in Canada. In most areas of Canada, we should at present not be too restrictive when considering waterfowl harvests, and I agree entirely with Dr. Cooch when he states " . . . in all honesty, most daily bag limits in Canada at present are above the effective range."

At the present time in Canada, we are taking about 20 per cent of the ducks harvested, as compared to 80 per cent in the U.S. We are therefore raising birds for U.S. hunters, while denying our own citizens hunting opportunities in Canada. The amazing fact here, pretty well agreed on by most Canadian biologists, is that we couldn't harvest 50 per cent of the available ducks if we removed the limits entirely in the four western provinces. At the same time, we have almost no opportunity to shoot pintail and blue-wing teal which migrate before we open the hunting season.

With respect to harvest levels, I would suggest that not only are we needlessly restrictive in daily bag limits, but are also penalized by geographical location, with generally early freeze-outs. A 40-day season in Alberta has not the same effect as a 40-day season in Washington or Oregon. In order to take a reasonable proportion of available birds, we should not generally open our seasons later

than September 10 in southern Alberta, or later than September 1 in northern Alberta. The same could be said for almost any of the western provinces, where climate effectively closes the season as soon as the temperature drops sufficiently to ice over ponds.

As I mentioned earlier, I am shocked at the lack of good research material which can be used by management agencies. In the past 30 years, many millions of dollars have been spent on gathering data on waterfowl populations. These data in turn have apparently gathered dust in someone's files, because they have not been published. Data are of no conceivable use to anyone unless they are published documents and are therefore open to criticism.

My final criticism is involved with the influence exerted on the setting of regulations in Canada by the Bureau of Sport Fisheries and Wildlife in the U.S. Canada should forget completely that waterfowl are being harvested in the U.S., as long as Canadians are taking less than 50 per cent of the allowable harvest of any species. In this regard, I would like to use the example of the Fraser River sockeye run on the west coast. Canada provides the spawning and rearing areas for these fish, which reach maturity in the Pacific Ocean. Because these sockeye migrate partly through U.S., and partly through Canadian waters as they approach the Fraser River, it has been agreed that each nation will harvest equal numbers of fish from the available surplus. Similarly, Canada provides breeding and rearing areas for waterfowl, while the U.S. provides most of the wintering areas. In my view, Canada must declare its position on waterfowl harvests, and that position should be to make available to Canadians an equal share of the annual kill. I simply cannot believe that the U.S. federal or state governments would allow overkilling of waterfowl, because Canadians were operating on a more generous daily bag. In any event, there is no evidence that hunters in the most important duck production areas, at least in western Canada, can affect the yearly harvest at the present time.

Although the preceding statements have largely dealt with criticisms of specific management policies or practices, it would be unfortunate if at least a few considerations for research were not raised. First, I would suggest that the provinces must become involved in applied research in close co-operation with the Canadian Wildlife Service, and must devote greater effort to gathering management information, such as the breeding ground surveys. Dr. Cooch mentioned this in the conclusion of his paper, and I agree. Second, the Canadian Wildlife Service and the provinces should provide greater direction in suggesting areas of investigation to university departments, without actually becoming involved with academic direction of graduate students, although I can see nothing wrong with academically qualified civil servants sitting on graduate student directing committees. Third, I believe that one of the functions of the Federal-Provincial Wildlife Conference could be to establish a waterfowl research review committee, which could report to the conference each year. I know of no wildlife management agency which operates successfully without research facts. Those agencies which proceed on an *ad hoc* basis do not manage, they exist. In Canada we have highly qualified people who can produce excellent work, but without a coordinated approach and recognition of objectives we will not succeed. I do not believe we need greatly expanded staffs or huge budget increases – I believe we need direction, plus federal-provincial involvement more than once a year.

Comments on Dr. Smith's paper

H. Boyd

Dr. Smith has many stimulating comments to make on the needs of waterfowl management in Canada and on how the deficiencies of existing data-gathering and analysis might be rectified. But the core of his paper, an analysis of some statistical data on the continental mallard population in the years 1955-66, published by the U.S. Bureau of Sport Fisheries and Wildlife, does not itself form an acceptable contribution to the scientific approach Dr. Smith calls for. Dr. Smith uses correlations between the size of the breeding populations and the kill, and between estimates of mortality due to hunting and losses from other causes to justify the bold claims that it is a mistake to believe "(1) that the continental approach can be used in regulation of hunting harvests; or, (2) that hunting mortality affects size of breeding populations in following years; or, (3) that hunting has caused a decline in mallard populations; or, (4) that the data used in regulation of hunting are adequate or reliable."

The last of those claims may be conceded, but Dr. Smith's correlations are either spurious or irrelevant, or both, and do not provide satisfactory support for the first three assertions.

In particular, to plot the size of the breeding populations against the size of the kill in the preceding year, find a positive correlation, and claim that this destroys the hypothesis that hunting mortality affects the size of the breeding population in following years is a grotesque example of bad science.

Comments on Dr. Smith's paper

Dr. A.R. Sen

I would like to confine my remarks to Figures 2 and 3 of Dr. Smith's paper on which he seems to base his main conclusions.

Figure 1 shows that total mortality remained practically unchanged during the period. Hence, any increase in shooting mortality was accompanied by a commensurate decrease in non-shooting mortality. It would thus be seen that Figure 2 is not necessary.

Dr. Smith's inference of a cause and effect relationship from Figure 3 is an error, most common among users of statistics. A careful look into the data would show that both hunting mortality and breeding population are highly correlated with a third variable (which may be regulatory controls) which changes with time. Eliminating this effect by taking first differences, the Spearman's rank correlation coefficient on the resulting data turns out to be 0.21, which is too low to be significant.

The proper effect of regulatory controls can be assessed only by analysing the data on seasons and limits along with those presented in Table 1.

Roles of various agencies

R. Webb and W.G. Leitch

A clear understanding and acceptance of "roles" is necessary to avoid duplication of effort while providing for the programs necessary to identify and achieve goals in Canadian waterfowl management.

The Oxford dictionary defines "role" as "one's function, what one is appointed, expected or has undertaken to do." Our task is to examine the "roles" or function of individuals, organizations and agencies in a Canadian waterfowl management context. Our strategy will be to "tell it like it should be," secure in the knowledge that others will reflect on the past, and still others will "tell it like it is." Our objective is to stimulate discussion. Perhaps if we succeed, others with power and authority will see and follow improved courses of action. We will endeavour to provoke thought and discussion by frankly pointing out responsibility areas as we see them. There will be no attempt at definitive analysis of legal responsibilities, and yet some documentation of the existing jurisdictional framework is necessary and will be attempted. Some comments may offend but so be it. We can assure that it is not our intention to insult anyone. The spirit of our approach is constructive if at times our tone seems not to be.

Leitch has prepared the material on non-government roles and Webb the sections on role identification, government agencies and relationships between private and government sectors. Neither author has deliberately sought to represent the policies and approaches of his employing agency but, nevertheless, may have inadvertently done so in the course of drawing on his own experiences.

Roles in waterfowl management

It is necessary for many reasons to begin by defining terms, not the least of which is the failure of wildlife resource workers across Canada to yet agree upon a common working language. The pattern of usage currently employed by the Provincial Wildlife Branch in Manitoba is followed. The categorization of wildlife management program areas and processes is also that used by the Manitoba Wildlife Branch.

"Role" has been defined. "Canada" is a recognizable entity, at least at the time this is written. "Agencies" I will construe for the purposes of this paper as any governmental organization with waterfowl management orientation. This excludes government agencies whose activities may in fact have an effect upon waterfowl populations and distribution but do not have waterfowl management as one of their objectives. "Waterfowl management" requires closer scrutiny. It means to me all those activities, except inventories and basic or applied research studies, designed to produce waterfowl or permit or encourage their wise use. As above, activities that accidentally or incidentally do the same thing, without premeditation, are of necessity omitted even though they may sometimes be important. "Management" implies a conscious motivation, then, for the purposes of this paper. The "waterfowl" of which I write are all those defined in the Migratory Birds Act, but with special emphasis upon ducks and geese. "Inventories," in turn, are "one time" quantitative evaluations of the extent and type of the wildfowl resource and/or its habitat base. "Research" studies can be loosely defined as the *how* and *why* investigations usually concerned with relationships between people, waterfowl, and the supporting environment.

Management activities in Manitoba and for the purposes of this paper are grouped into five main classes – those concerned with uti-

lization, development, depredations control, enforcement, education. Three primary processes are undergone in the full development of those five management program classes: 1. fact-finding 2. planning 3. implementation. "Roles" are available and must be assumed for each process within each program area. What these roles are and which government agencies should undertake them are the questions for which answers are proposed in this presentation.

Waterfowl utilization

This program area has as its objective the sustained consumptive and non-consumptive use of waterfowl populations. By definition all activities associated with harvests and interpretive programs are involved except inventory, research, enforcement and education.

Consumptive utilization involves goal setting, seasons, bag limits, hours and hunting methods, refuges, access to land for hunting, resource and program response surveys, and public attitude surveys. The determination of goals and targets, acceptable harvesting methods and equitable bird and harvest distribution; the identification of referent groups; and the provision of access to huntable lands are all part of the consumptive utilization sub-program. Basic to the sub-program are methods of monitoring the responses of people and birds to management activities and to a lesser extent environmental changes. In this category are population, hunter, and kill surveys, banding studies, etc. Important to equitable bird distribution are the locations, size, and management of refuges. Public shooting grounds, shooting preserves, and incentives to private land-owners can provide access to huntable lands.

Non-consumptive utilization involves interpretive centres, zoological gardens, and game farms. Refuges or, at least, lands which provide opportunities to see wild waterfowl are required close to urban centres. Waterfowl should be concentrated. Development for easy viewing is assumed. Zoological gardens and game farms provide viewing opportunity under controlled conditions.

Waterfowl development

Activities within this general program area are those designed to increase stocks of waterfowl for either harvesting, viewing, or preservation of endangered species. Included are predator control, game farm rearing for release, restocking and transplanting, introduction of new species, wetland acquisition, and habitat management.

Wetland acquisition includes purchase, crown reservation, various leasing arrangements, and easements. Habitat management means the control or modification of conflicting land uses, water level manipulation, and the provision of various habitat components such as nesting areas, food, etc.

Depredations control

The objective of this program is to prevent, ameliorate, or compensate for damages to crops by waterfowl. Activities include lure crops, scare or kill permits, scare devices, and compensation.

Enforcement

Acts and regulations are derived to give legislative or executive direction to activities within the aforementioned programs. A guarantee of minimal public adherence to those laws is provided by adequate enforcement.

Education

Public commitment to programs is required. Without it, funds may not be made available and the best planned and executed programs

fail. It comes only through awareness, understanding and acceptance. The prime objective of the educational program area in waterfowl management is to achieve that necessary level of public commitment. A secondary objective is to provide special utilization skills (species identification, etc.) to resource "users" through training programs.

Roles of government agencies

Canadians, Americans, Mexicans, and, to a lesser extent, residents of Central and South America benefit from waterfowl that spend part of their life cycle in Canada. In Canada, benefits are shared by Canadians resident in production, staging and, in a few cases, wintering areas; Canadians resident in non-waterfowl regions; and visiting non-Canadians, mostly Americans. Negative benefits in the form of crop losses, etc., are borne by a few Canadians resident in certain production and staging areas.

Ideally, fiscal responsibility for waterfowl management in Canada should be assumed by agencies representing those groups receiving benefits. Expenditures should be in direct proportion to those benefits. It follows that the system should be reflected in a clearly understood agreement.

Bound as we are by our distinctive jurisdictional framework, decision-making responsibility cannot and should not follow the same pattern of apportionment in Canada. Roles must be assumed in accordance with legal responsibility established by the B.N.A. Act, subsequent acts establishing provinces, duly ratified resources transfer agreement, the Migratory Birds Treaty and Act, and various provincial wildlife acts. Where legal responsibility apparently conflicts, resolution must be by legislative amendment or, temporarily, by agreement.

In Canada, the ideal situation recounted above has not occurred. Instead, roles have been primarily determined by "capacity to perform" with capacity measured in terms of financial and personnel resources. The capacity of agencies to do management work has varied in direct proportion to the ability of senior administrators to have funds committed; and to acquire, organize, and lead a dynamic group of conservationists. The concept of "user pays" has not been fully implemented and jurisdictional perspective has not been clearly maintained.

Specific role assignation to various agencies must await high-level financial agreements and an interpretative review of existing enabling legislation and agreements. However, some general comments based on existing knowledge can be made for the purposes of this paper.

U.S. Bureau of Sport Fisheries and Wildlife

The bureau has for some years assumed part of the burden associated with Canadian resource response surveys – the data from which is of joint interest. There would seem to be no real objection to continued or even expanded performance of this role by Americans providing that their effort is fully co-ordinated with that of the Canadian Wildlife Service and provincial agencies. Maximum participation in research activities is to be encouraged but should be co-ordinated to avoid duplication and ensure best results.

Bureau-administered funds should be welcomed in any management program area providing that they are deployed through existing Canadian agencies and used to extend the activities of those agencies. American tax dollars should be sought and channeled through provincial development and depredations control programs in particular. At no

time, however, should alienation of provincial or territorial lands be allowed or encouraged. Funds from private American sources are presently well spent through Ducks Unlimited.

U.S. federal agency action in Canada should occur only in a manner completely acceptable to the recipient nation. The Canadian Wildlife Service should act as Canadian negotiator, but only after joint provincial-federal guidelines have been developed.

States and flyway councils

State and Flyway Council activity in Canada should be encouraged at the fact-finding level but subject to Canadian co-ordination. Contact should be with the responsible provincial agency or provincial co-ordinating committee if such exists. Joint funding arrangements should be entertained providing that dollars spent are subject to Canadian administration.

Canadian Wildlife Service

The Canadian Wildlife Service receives its authority from the Migratory Birds Convention Act, a federal statute enacted to allow implementation of the Migratory Birds Treaty and duly concurred in at the time by provincial ministers. The Canadian Wildlife Service has, in fact, exceeded that authority in utilization, depredation and development program areas. Both the treaty and the act convey an almost specific and limiting "preservation" role and only in the areas of harvest regulations, permits, santuaries, enforcement officers, and export. The primary purpose of both the treaty and act is to protect migratory birds, including waterfowl, from over-use and extinction. Nowhere is authority given to manage waterfowl for sustained public use nor is that goal implied. Similarly, legislative authority does not exist which charges the Canadian Wildlife Service with direct involvement in wetlands acquisition or in crop depredation control procedures. If a role exists for the Canadian Wildlife Service in the latter areas of activity it is more reasonably a fiscal one rather than one of direct involvement. Dollars should be made available for expenditure by provincial agencies. The federal role in the consumptive utilization program area would seem to be one of ensuring against the extirpation of distinct elements of duck populations. In fact direct federal intervention in all the necessary program areas would be in order to preserve an endangered species.

The obviously federal role of providing Canadian representation at the international conference table must be assumed by the Canadian Wildlife Service. However, such representation can only be realistically provided after agreement between provincial and federal governments has been reached on all points. In other words the Canadian Wildlife Service must represent the views of all sovereign Canadian governments in international deliberations, not just those of its employer.

Another important management role exists for the Canadian Wildlife Service – one that must be exercised persuasively rather than by use of force – the role of Canadian co-ordinator of technical matters. Communication of planned activities and activity results will be the key to successful performance.

Joint federal-provincial waterfowl management goal-setting would seem to represent the most sensible approach to long-range planning. Since goals must relate to resident people as well as to the resource and, furthermore, to the lands necessary to sustain optimum resource levels, they should be stated first for the lowest governmental

denominator — municipality if feasible, province if not.

The federal enforcement role, although legally constituted, should be kept to a minimum, and performed as an adjunct to provincial enforcement capacities wherever and whenever possible. Upgrading of provincial enforcement standards through co-operative training ventures, etc., is a valid and potentially fruitful approach now being explored.

The Canadian Wildlife Service must continue to control waterfowl export and introductions and should exercise more control over restocking and transplanting activities. They need not regulate for the control of waterfowl in captivity, scientific permits, scare or kill permits, or many other items not necessarily of national or inter-provincial concern.

An active educational role has been pursued by the Canadian Wildlife Service in recent years and should be continued.

Provincial wildlife agencies

Provincial agencies must relate in a direct manner to resident Canadians involved with the waterfowl resource. They are charged with providing equitable harvest opportunity and providing protection from wildlife damage. Provincial acts and natural resource agreements clearly spell out provincial jurisdiction over resources as provided for constitutionally. Rational crown land disposition and proper land-use are two important areas of responsibility emphasized in enabling jurisdictional frameworks.

Fulfilment of those roles within the waterfowl management context demands the maximum amount of authority and independence of action that federal legal responsibilities will allow. Provincial agencies should determine seasons, bag limits, hours and hunting methods, the location and extent of refuges, and access to land by hunters, providing that total kills do not significantly exceed those identified in the joint federal-provincial goal-setting process. Federal and other funds obtained on behalf of out-of-province benefactors should be made available to provincial agencies for implementation of those and other ear-marked activities.

Provinces should determine the extent of non-consumptive utilization activities within the confines of their borders. They should contribute money and personnel to joint fact-finding ventures such as resource and people response surveys.

Wetland acquisition, habitat management, and predator control are three development activities that should be under the direction, co-ordination, and supervision of provincial agencies.

Depredations control activities should also be controlled by provincial agencies but jointly planned and funded.

Provincial roles in the enforcement and education program areas are and must be participative. And yet resident needs and jurisdictional responsibility decree that enforcement criteria and standards should be of provincial origin and essentially implemented by provincial agencies.

Municipal governments

Increased involvement in resource management is occurring at the municipal level and should be encouraged in at least the development and depredations control program areas. To succeed, activities in those programs must involve local governments, or landowners, or both.

Some provincial-municipal acts provide for the enactment of by-laws preventing the

discharge of firearms. Waterfowl harvest programs in densely settled municipal districts will prove abortive unless a prior consenus of local government officials is achieved.

Conclusion

It is concluded that prime needs in Canada today are to identify benefactors from Canadian waterfowl management input; measure the benefits received; and, accordingly, assign fiscal responsibility. The task, of course, presupposes a clear-cut understanding of goals, objectives, programs and their effects, as well as agreement at a very high level.

Also required is a concise interpretation of legal responsibility for waterfowl management in Canada – a review admittedly beyond the scope of the author – followed by either joint federal-provincial-municipal acceptance of the *status quo* or a move towards change mutually agreed upon.

Roles of the private sector

More sophisticated management of the waterfowl resource requires increased ecological awareness and greater competence from those utilizing it.

This, in my belief, can only be achieved by more closely involving the hunter in waterfowl management. This is difficult to do on an individual basis and here the private sportsmen's organizations provide a valuable avenue for such participation. Biologists tend to resist the intrusion of laymen into the professional sphere, but I submit that this is wrong.

Successful species management and other ramifications of more sophisticated waterfowl management will depend on the co-operation of waterfowl hunters. This co-operation can only be attained when hunters have some understanding of basic waterfowl ecology, feel personally involved in waterfowl management, and are thus willing to accept the personal discipline required. Professionals must create not only an atmosphere in which the individual hunter can participate, but must be prepared to assist in his training.

We still have a pioneer attitude toward waterfowl hunting and it is regrettable that the many satisfactions of that freedom must inevitably be sacrificed to the complexities of our expanding population. The hunter of the future must be more sophisticated and proficient. However, in the attainment and execution of that proficiency lie satisfactions of which most present-day duck hunters are, as yet, unaware.

Suggestions are circulating in the United States that two classes of hunters might be recognized, the novice and the expert. Those achieving expert status would be accorded increased bag limits of species considered to be in good supply. This idea is attractive, particularly because it rewards an attainable competence which should make it acceptable to our democratic society.

I am aware of the problems revealed by the special blue-winged teal hunting season in the United States and the delayed mallard opening in Manitoba in 1967, but I am still convinced that more intensive species management is unavoidable. Waterfowl hunting may thus in the future seem to be discriminatory – the province of the skilled. However, this is not really true since competence, and the attendant special privileges, lie within the reach of everyone who is willing to make an effort to achieve it.

How can waterfowl hunters become personally involved in waterfowl management, develop competence, and an ecological conscience? Our belief is that this can only be done through education and involvement, and that private organizations can be one of the

vehicles through which this goal can be achieved.

Interest in waterfowl beyond the actual shooting is the beginning. If the objective of hunting is to develop shooting skill, better and cheaper opportunities are available at any trap or skeet club. In hunting, if the significance of the kill is to score, then this satisfaction can also be obtained at a gun club. But hunting can be a great deal more. To the truly initiated, the actual killing of a duck is only the essential climax to a ritual of anticipation and preparation begun perhaps months before. The highest development and greatest gratification comes when the hunter is aware of the whole ecological complex and of the part he plays. Such a complete ecological experience is not possible for all, but the deeper satisfactions of a day afield are directly related to the extent to which it is achieved. In some instances the individual may not be aware of the true source of his enjoyment.

The popularity of wildlife programs, zoos and game farms is evidence of a basic human interest in all wildlife which needs only to be nurtured. While we may not agree with his biological concepts nor those of his successor, we must admit that Jack Miner's contribution to waterfowl appreciation was outstanding. The near-reverence with which the Canada goose is regarded in many parts of Canada is largely the result of his early lectures and publicity. As one biologist has said, most people seem to equate Canada geese with motherhood, dogs and kids! There is no doubt but that the Miner operation did much to establish a conservation conscience in Canada.

Similar private organizations, while they may lack the nation-wide impact of the early Miner operation, can have a significant long-range local effect. An example is the British Columbia Waterfowl Society which has developed the Reifel Refuge adjacent to a large tract of foreshore at the mouth of the Fraser River, near Vancouver. Here, waterfowl of many species are available for public enjoyment and study, both in confinement and in the wild. The Niska Station at Guelph, established by the Ontario Waterfowl Research Foundation, supplies a similar service. Such centres adjacent to all large cities are desirable. The interpretation centres proposed by the Canadian Wildlife Service will also be important in this regard. The Wildlife Foundation of Manitoba operates on a broader sphere, concerning itself with the preservation for public good of endangered wildlife habitat where government or other private agencies are unable to act. This organization is also carrying out a worth-while ecologically oriented educational program directed toward children of high school age.

The education of waterfowl hunters will have to be organized on a wide scale, and will thus require government sponsorship, either provincial or federal. The role of private organizations, such as those described above, in creating interest in waterfowl and opportunity for observation and study is fundamental. A substantial number of waterfowl hunters are already organized in provincial affiliates of the Canadian Wildlife Federation and provide the basic structure for the organization of the remainder. There is thus already a vehicle through which government educational programs to upgrade waterfowl hunters can operate. The educational activities of the Canadian Wildlife Federation itself are well known—particularly the promotion of Wildlife Week. Less well known, are the efforts made to increase the ecological content of high school curricula.

Private organizations which are adequately funded are able, through the co-operation of provincial and federal governments, to make direct and significant contributions to waterfowl research and management.

The Delta Waterfowl Research Station, in Manitoba, has made substantial contributions to our knowledge of waterfowl ecology. Many of our present waterfowl management techniques, notably in the field of inventory, are based on principles first described in publications from the station.

Ducks Unlimited (Canada) has spent 17½ million dollars on habitat preservation and development in Canada since its inception in 1938. While the direct benefits of this program, in terms of marsh development and wetland preservation, are obvious, the indirect benefits may be more important particularly in teaching prairie Canadians to realize the value of waterfowl from both economic and cultural standpoints, and thereby helping to prepare the way for government-sponsored programs of waterfowl management, research, and habitat preservation.

The successful and productive co-operation which now exists between Ducks Unlimited and both federal and provincial governments illustrates how government and private organizations can work toward common goals once mutual trust is established.

The private sector, both on an organization basis and as *ad hoc* groups of interested citizens, has also an important role to play as a political force. A significant demonstration of interest can be extremely valuable in many situations. It might be used to force objectivity on government organizations whose policies may reflect too closely the personal philosophy of a senior administrator.

Finally, organizations in the private sector have the added advantage of mobility which, when combined with freedom from political considerations, enables them to move quickly into emergency situations. As such, they can be important tools of both provincial and federal governments and, at the same time, retain their identity.

Government and private sector inter-relationships

How waterfowl-oriented groups relate is perhaps more important in terms of overall efficiency than the roles they respectively undertake. For many years the federal-provincial wildlife conference served as a forum at which senior provincial wildlife administrators discussed common problems, heard of potential solutions, compared notes, and bargained with the Canadian Wildlife Service over sometimes real and often imaginary harvest opportunities. Visitors were present and politely heard. Waterfowl biologists had limited opportunities to discuss the technical aspects of waterfowl resource management.

Two years ago, action was started to initiate two technical waterfowl committees designed to provide the opportunity for full discussion at the technical level in eastern and western settings. Provinces. territories, the Canadian Wildlife Service, and Ducks Unlimited were accorded delegate status.

Successful as both meetings might be some additional co-ordination and liaison are required. One or more committees or groups is needed to co-ordinate utilization, enforcement, education and development programs in each province. Membership must represent all agencies and organizations, both government or private, plus dominant individuals that perform significant waterfowl management roles within each province. The committees could be advisory in nature or carry authority depending on the views of those members with legally vested responsibility. At any rate, their objectives would be common, i.e., co-ordinated effort to achieve waterfowl management goals.

An analysis of agricultural damage by waterfowl in Alberta

R.D. Jakimchuk

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Introduction

This paper discusses results obtained to date on several aspects of waterfowl damage to commercial grain crops in Alberta based on a study carried out by Renewable Resources Consulting Services Ltd. for the Alberta Fish and Wildlife Division.

By agreement with the Fish and Wildlife Division, the study was conducted on a provincial basis. By this approach it was hoped to put the problem in perspective and to indicate requirements for more detailed studies.

While the study has yielded much information on the scope and magnitude of waterfowl damage in Alberta, it has also revealed the need for further breakdowns on a regional basis, since waterfowl populations, climatic conditions and vulnerability of crops to damage show considerable variation throughout the province. The local effects of these variations and their significance are masked when viewed on a provincial basis.

Since 1964 Alberta has been engaged in a program of monetary compensation to farmers for crop damage caused by waterfowl. Funds for this program are derived from hunting licence fees. Eligibility for compensation does not require the payment of insurance premiums by farmers. Dr. S.B. Smith outlined the legislative and administrative structure of the program in his paper to the 1968 wildlife conference.

Disbursements from the Crop Damage Fund, since its inception in 1964, have been steadily increasing and reached $400,000 (Table 1) in 1968. The cumulative total of disbursements has passed the one million dollar mark. The issuance of shooting permits to farmers sustaining waterfowl damage constitutes the major effort to reduce damage in Alberta.

The effectiveness of both the foregoing programs in reducing damage and farmer unhappiness with damage has never been tested due to the lack of quantitative data on the nature and extent of the problem in the province. Increasing costs of compensation and the need for a quantitative assessment of the effectiveness of shooting permits and compensation, and identification of trends and alternatives available to dealing with waterfowl damage on a provincial basis resulted in the initiation of the present study.

The analyses presented here constitute those data available from the study to date.

Table 1

Number of damage claims and cost of payments (1961-68)

Year	Number of claims	Amount paid ($)
1961	2	140.
1962	10	1,485.
1963	22	5,448.
1964	743	321,841.
1965	531	207,752.
1966	477	158,130.
1967	99	28,222.
1968	821	400,000.*
Total	2,705	1,123,018.

*Approximate total

Methods

A considerable volume of data pertaining to individual damage sites (identifiable to exact location by quarter sections)[1] by year since 1964 are available from claims records of the Alberta Hail Insurance Board, the agency responsible for administering the waterfowl damage compensation program. In addition to those data provided by claims records, auditing of adjusters field reports provided information on yields at each location prior to damage.

All claims locations for each year were plotted on a large scale (1:250,000 – 4 miles = 1 inch) composite map of Alberta. These plotted locations formed the basis for tabulation of additional data with ecological implications to the distribution and occurrence of damage sites.

These tabulations were as follows:

Precipitation data

One hundred and fifty stations within the 100,000-square-mile study area were plotted and annual and weekly precipitation totals recorded. Weekly totals were recorded for week of claim and for each of four weeks prior to the claim.

Water body data

In order to relate possible relationships between water bodies and damage, the following data were tabulated from 1:50,000 (1 mile = 1¼ miles) maps.

1. Number of potholes on each damaged quarter section (all potholes 1/3 acre and larger are mapped at the scale used).

2. Distance of each damage location to the nearest water-body in each of the following size categories:

a. 30–50 acres
b. 51–160 acres
c. 161–320 acres
d. 320+ acres.

[1]Quarter section 160 acres.

Other tabulations

Other data recorded included distance to nearest town and Canada Land Inventory Waterfowl Capability ratings at each damage site. All the above data were coded and key punched on computer cards. Appendix A summarizes the data categories, sources and measurement parameters which were recorded for each damage site and punched on cards.

Shooting permits

A separate deck of computer cards listing the exact location of quarter sections covered by shooting permits and date of issuance of permits was prepared. In addition, the locations of quarter sections covered by shooting permits was plotted on overlays on a 12 miles = 1 inch base map for each year for the years 1964-68. Analysis of shooting permits and claims data by location was carried out by merging the decks of cards during the computer run.

Questionnaire survey

A mail questionnaire survey was designed in order to obtain information on questions unavailable from existing data and also to elicit opinions on the damage problems from farmers themselves. Figure 1 is a sample of the questionnaire sent to 7,500 Alberta farmers. The primary objectives of the questionnaire may be summarized as follows:

1. To determine the number of farmers sustaining damage vs. the number claiming, in order to establish:

a. the potential number of claimants in Alberta.

b. the threshold of tolerance (in dollars) to damage by farmers who have not claimed compensation.

1. Location of farm: buildings. Sec. ☐ Twp. ☐ Rge. ☐ Mer. ☐
2. Number of acres farmed: ☐
3. Have you ever had damage to crops caused by ducks, geese or cranes? ☐ Yes ☐ No
4. If yes, which years did damage occur? 1968 ☐ 1967 ☐ 1966 ☐ Other Yrs. (specify) ☐
5. Have you ever claimed compensation for damage? ☐ Yes ☐ No
6. If you have claimed compensation, which years were claims made? 1968 ☐ 1967 ☐ 1966 ☐ Other Yrs. ☐
7. If you did not claim compensation what do you estimate the value of damage caused? 1968 $ ☐ 1967 $ ☐ 1966 $ ☐ Other Yrs. $ ☐

8. What method did you use to control or prevent damage during . . . .

	1968	1967	1966	Other Yrs.
Shooting	☐	☐	☐	☐
Machinery left standing in field	☐	☐	☐	☐
Scaring with acetylene exploders	☐	☐	☐	☐
Scarecrows	☐	☐	☐	☐
Chasing with truck	☐	☐	☐	☐
None	☐	☐	☐	☐
Other (write in)	☐			

9. If no control method was used, what reason?

	1968	1967	1966	Other Yrs.
Illness	☐	☐	☐	☐
Too wet	☐	☐	☐	☐
None effective	☐	☐	☐	☐
Not worth it	☐	☐	☐	☐
Damage already done	☐	☐	☐	☐
Other (write in)	☐			

10. What do you think should be done about duck, goose and crane damage? (check one)
    - No opinion ☐
    - Government to acquire special feeding areas (lure crops) ☐
    - Increase compensation for damage ☐
    - Nothing ☐
    - Reduce duck populations ☐
    - Other (write in) ☐
11. Would you be willing to pay insurance premiums for improved coverage against crop damage by ducks, geese and cranes? Yes ☐ No ☐
12. Do you allow the general public to hunt on your land? Yes ☐ No ☐
13. Do you personally hunt ducks and geese? Yes ☐ No ☐

Figure 1
Crop damage questionnaire

2. Methods of damage prevention and control considered to be most effective by farmers.

3. The attitude of farmers to damage prevention and whether or not they actively try to prevent or control waterfowl damage.

4. Farmers' opinions on the best manner of dealing with crop damage.

5. Whether or not farmers would consider paying premiums for additional coverage (i.e. compensation).

Statistical basis of the questionnaire

The sampling universe for the questionnaire was all farmers in Alberta. A random sample of 7,500 of the total of 69,000[2] farmers in Alberta was selected from a 1968 voters list for Alberta.

The sample was of farmers chosen from a table of random numbers. A measure of the representativeness of the survey was determined by a Chi^2 comparison of the average farm size of respondents to the average farm size of all Alberta farmers[3].

The frequency of respondent's farm size classes was not significantly different ($Chi^3 = 3.66$ with 11 d.f.) from those reported in the Alberta Department of Agriculture Statistics, and suggests that the survey sample was representative of Alberta farmers.

Discussion and results

The following results do not represent a complete analysis of the data inasmuch as several aspects of the study analyses have not been completed at this writing.

The provincial perspective

Table 1 shows the amount of compensation paid to farmers in Alberta annually since 1964. These sums, however, do not represent the actual loss incurred since compensation is limited to one half of the crop value or a maximum of $15 per acre, whichever is the lesser amount. Moreover, this sum is based upon fixed values per bushel while commercial values fluctuate annually.

An analysis incorporating pre-damage yield and commercial crop values has been carried out and shows that the average loss sustained by claimants is approximately three times greater than actual compensation paid (Table 2). Conversely, the farmer is reimbursed for only 33 per cent of the value of his actual dollar loss.

During 1968, while compensation payments totalled some $400,000, actual losses to claimants totalled some 1.2 million dollars. However, this sum does not include losses sustained by farmers who did not claim compensation. Farmers may not claim compensation for two primary reasons a) they are unaware that a compensation program exists or b) they are willing to sustain some damage loss because they consider it a national hazard which they accept as part of their occupation.

From the questionnaire we have determined that during 1968 those who did not claim compensation reported damage totalling $94,483. This sum may be extrapolated by means of expanding this sum by a factor of 53 to represent all Aberta farmers. The total value of damage not claimed derived by this method is $5,007,599 which, added to actual claimed losses, represents some $6,200,000.

An alternative method used to extrapolate total provincial damage based on questionnaire ratios of claimants to non-claimants sustaining damage resulted in a provincial total loss of $3,060,000. While the possibility exists that the estimated losses reported by respondents to the questionnaire are inaccurate, the mean value of loss reported for that

[2]Dominion Bureau of Statistics.

[3]Data from Alberta Department of Agriculture Statistics.

year (Table 3) is below the mean compensation paid to claimants. Therefore, it is considered that the three-to six-million-dollar range is a reasonable estimate of total provincial losses during 1968. Actual value of all crops for this year was approximately $425 million, therefore waterfowl damage losses represent from 1 to 1.5 per cent of this total. Nevertheless, in total dollars, waterfowl damage assumes the proportions of a problem of considerable magnitude and importance to the farm economy.

In 1968, some 87 per cent of farmers reporting damage stated that they have never claimed damage compensation. Thus the potential demand on the existing crop damage fund, if realized, could quickly eliminate available reserves. Therefore, it is apparent that either funds available for compensation would have to be increased or measures to prevent or control damage in the province be instituted.

Table 2

Commercial value and compensation paid for all crops on damaged quarter sections

Year	No. of ¼ section damage sites	Damaged acres	Commercial value	Average commercial value	Compensation paid	Average compensation paid	Average commercial loss/ compensation paid
1965	24	412	14,251	594	5,571	232	2.6
1966	1,107	16,160	500,830	452	149,539	135	3.4
1967	208	3,275	75,663	364	27,672	133	2.7
1968	2,267	37,118	1,011,939	446	363,935	161	2.8
Total	3,606*	56,965	1,589,857	441	546,717	152	2.9

*This represents approximately half of all quarter sections on which damage was claimed, since the computer rejected unit records with missing data, necessary to calculate the commercial value of the crop.

Table 3

Average dollar loss and compensation paid per farmer (1966-68)

	1968,$	1967,$	1966,$	1966-68,$
Average loss by claims	1,232.57	764.27	1,049.96	1,137.03
Average gov't payment	443.28	278.51	313.50	387.36
Average loss reported by questionnaire	346.09	308.36	356.86	339.43

Factors influencing crop damages

The following discussion and analysis of data were undertaken in an effort to identify those characteristics of waterfowl damage which may provide meaningful information for evaluating the compensation program and alternatives to monetary compensation such as prevention or control as a means of reducing "farmer unhappiness" with waterfowl damage.

From the plotting of actual damage locations and the analyses conducted to date, we have obtained considerable information on the characteristics of damage locations and factors influencing the distribution and intensity of damage.

Table 4 shows the number of acres and bushels lost of each crop type damaged by year. In any given year, total bushels lost of wheat and barley are approximately equal, whereas the oats total is considerably smaller. Significantly, while barley losses are approximately equivalent to wheat in acres and bushels, approximately one half the acreage of barley has been sown annually over the past five years in the province, suggesting that ducks damage barley in a ratio of 2:1 over wheat. Pending further investigation, this may be interpreted as either that ducks prefer barley, or that barley crops are more vulnerable to damage in comparison with wheat, due to differences in harvest chronology.

Time of damage

The time of damage occurrence is directly related to that period of the harvest when the crops are vulnerable. In general, standing grain is not susceptible to damage and the critical or vulnerable period occurs between the time interval when the crop is swathed (in order to hasten ripening and drying and to ensure even ripening) and the time the swaths are combined. Feeding on swaths constitutes the only significant damage interval since once harvest

Table 4

Number of acres and bushels claimed lost, by crop type (1965-68)

Year	No. of ¼ sections*	Wheat		Barley		Oats	
		Acres lost	Bushels lost	Acres lost	Bushels lost	Acres lost	Bushels lost
1965	24	73	2,561	267	10,584	44	2,184
		(18)	(640)	(24)	(962)	(5)	(243)
1966	1,107	5,995	198,170	4,269	159,418	381	15,805
		(10)	(338)	(9)	(338)	(9)	(376)
1967	208	1,256	28,238	888	22,446	118	3,939
		(10)	(230)	(13)	(316)	(11)	(358)
1968	2,267	14,636	377,841	11,458	462,625	896	43,498
		(12)	(313)	(12)	(470)	(12)	(572)
Total	3,606	21,960	608,810	16,882	655,073	1,439	65,426

*This represents approximately half of all quarter sections on which damage was claimed, since the computer rejected unit records with missing data, necessary to calculate the number of bushels lost.
() Averages for each category

is completed ducks feeding on waste grain on stubble field do not create an economic loss to the farmer.

Therefore, time of damage occurrence is a function of the length of harvest, (duration of the swathed condition) rather than start of harvest. It is, of course, also related to waterfowl populations and chronology of the north-south migration in Alberta.

Table 5 shows time of damage for the various years studied. There is a noticeable difference in amount of damage, number of claims, and time of damage occurrence between 1967 – a dry year with favourable harvest conditions, and 1968 – a wet year when swaths remained on the ground for an extended period of time.

The importance of time of harvest, local waterfowl population, and chronology of migration is revealed in a comparison of harvest chronology for two areas of Alberta and inferred information regarding duck populations. Figure 2 shows harvest chronology in 1968 in a low damage area in the extreme southeastern part of Alberta contrasted to a high damage frequency area in the Peace River area of northern Alberta. Both areas have extensive areas sown to grain crops. Damage frequency and intensity is sporadic and low in the southern area. Figure 2 shows, however, that a comparable state of harvest was completed from five to seven weeks earlier in the southern area than in the northern. The northern area is located geographically where migrating populations reach their peak at the time the crops are in the vulnerable swathed condition. A knowledge of these factors provides a basis for predicting damage for distinct geographic areas. Moreover, measures to mitigate depredation, whether by compensation or control measures, must be tailored to variations in harvest data and other variables for specific geographic locations within the 100,000-square-mile damage susceptibility area of the province.

In an effort to facilitate consideration of such factors as location, frequency, intensity, and economic value of damage for specific areas some thirteen zones are delineated.

In general, northern Alberta is characterized by the highest damage frequency per unit area, followed by the parklands of central Alberta with medium frequency, and southern Alberta with sporadic damage occurrence. Actual dollar loss values vary, however, due to the number of square miles encompassed by these three areas.

Table 5

Number of quarter sections damaged related to week of occurrence

Year	No. of ¼ sections	August	Sept. (weeks) 1	2	3	4	Oct. (weeks) 1	2	3	4	November
1965	1,393	12	38	55	128	314	516	187	84	47	12
1966	1,205	19	49	146	172	164	125	173	223	118	16
1967	214	41	36	71	29	17	2	14	3	0	1
1968	2,349	90	30	158	89	281	281	61	275	724	360
Total	5,161	162	153	430	418	776	924	435	585	889	389

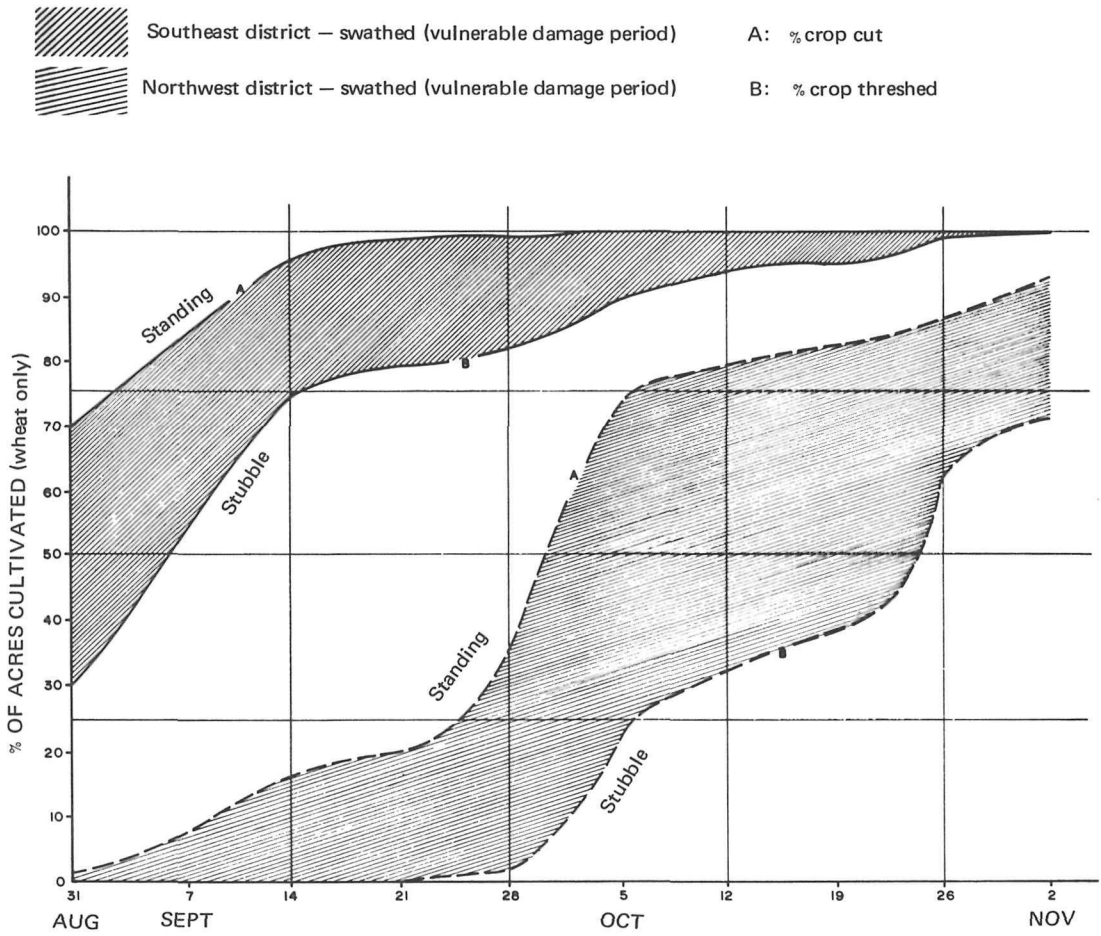

Figure 2
A comparison between the harvest chronology of the southeast (No. 1) and northwest (No. 15) districts of Alberta, 1968.

Damage in relation to measured variables

Information on ecological relationships influencing damage is prerequisite to the formulation of a management approach to prevention or control. While behavioural characteristics of waterfowl provide insight into some aspects of their depredations, data on populations for specific locations are unfortunately not available in sufficient detail to enable analyses on this basis.

Therefore, our analyses were designed to obtain such information on a provincial basis of those factors influencing damage occurrence and frequency/intensity in relation to several measured variables.

A regression analysis was conducted on 12 independent variables for all crops and for all years for which data were available. This step-wise regression analysis determined a best least squares fit of damage intensity against a linear combination of the other parameters and gives an indication of their relative order of significance. It was hoped that such a study would indicate the more important factors operative in waterfowl damage to crops. These computations were performed separately for wheat, barley, oats and other crops, as well as for all crops combined.

A second regression analysis was done to rank the variables relative to the number of damaged acres per quarter section. The results of both these analyses, as well as the correlation coefficients of each variable are listed in Table 6.

As may be seen from Table 6, the correlation coefficients between all variables tested and each of our two dependent variables are relatively small and of the same order of magnitude. From this we conclude that all the independent parameters measured, either singly or in combination with each and all other parameters, have only a weak controlling influence on either damage intensity or number of damaged acres.

It should be emphasized that in the analyses conducted, low statistical significance of the correlation coefficients is attributable, in large part, to the fact that input data have been derived provincially over varying conditions. It is interesting to note from this that no one variable is a major contributing factor in the consideration of crop damage, when applied over the entire province. If regressions are conducted for smaller geographic areas a clearer definition of significance and higher correlations are expected. Our approach to the problem was deliberately carried out in the manner described since information valid provincially was a primary consideration. Further analyses are providing refinement of results on a regional basis.

Since the damage water-body relationships provided by the regression analysis were not clearly defined, a separate Chi^2 analysis was conducted to test the association, if any, between damage sites and distance to water bodies of any size (Table 7). The result was statistically significant ($Chi^2=269.71$ with 18 d.f.) and we may reject the hypothesis that there is no association between damaged sites and proximity to water. In fact, the association is so strong that the Chi^2 for the first two elements of the first water-size category is sufficient in itself to reject the hypothesis of independence. The similar strong association occurs for the category 320+ acres within two miles.

Therefore we can conclude that not only is there a strong association between various sizes of water categories, and distance to damage sites, but that water bodies of 30–50 acres and 320+ acres are statistically the most important categories relating to damage occurrence. This may well be a reflection of

Table 6

Statistical order of significance of 12 variables related to damage intensity and number of damage acres

Ranked order	Damage intensity per quarter section		Number of damaged acres per quarter section	
	Independent variable	Correlation coefficient%	Independent variable	Correlation coefficient%
1	D_2	6.166	P_A	−6.733
2	P_4	−4.628	POT	−5.592
3	P_A	4.369	P_1	−5.390
4	Dist	−3.943	D_3	+3.903
5	P_3	−2.736	D_4	−1.612
6	P_1	−2.686	Dist	+3.698
7	POT	1.309	P_3	−3.382
8	P_2	−2.319	D_1	−3.029
9	P_0	0.277	P_0	+1.635
10	D_1	4.327	P_2	−1.084
11	D_3	3.620	D_2	+0.646
12	D_4	2.465	P_4	+0.943

Dist: Distance to nearest town.
Pot : Number of potholes on quarter section.
D_1 : Distance to nearest 30- to 50-acre body of water.
D_2 : Distance to nearest 51- to 160-acre body of water.
D_3 : Distance to nearest 161- to 320-acre body of water.
D_4 : Distance to nearest body of water over 320 acres.
P_A : Annual precipitation.
P_O : Precipitation during week of claim.
P_1 : Week's precipitation one week before claim.
P_2 : Week's precipitation two weeks before claim.
P_3 : Week's precipitation three weeks before claim.
P_4 : Week's precipitation four weeks before claim.

Table 7

Distance of damage sites from potholes of various sizes

Distance in miles	30-50 acres	51-60 acres	161-320 acres	320+ acres	Total
0-1.0	1,640	979	590	1,271	4,480
1.1-2.0	706	413	164	320	1,603
2.1-3.0	353	140	44	123	660
3.1-4.0	187	65	31	35	318
4.1-5.0	114	36	27	27	204
5.1-6.0	106	20	23	5	154
6.1-7.0*	13	3	1	5	22
7.1-8.0	14	0	3	3	20
8.1-9.0	2	0	0	0	2
9.1-10.0	0	4	0	0	4
10.0+	0	0	1	1	2
Total	3,135	1,660	884	1,790	7,469

Chi^2=269.71 with 18 d.f.

Highly significant at P=.001

*In the calculation of Chi^2 - distance categories greater than 6.1 miles were disregarded since the matrix contains classes with frequencies of less than 5.

the relative numbers of water bodies in each size category and this is presently being assessed. The management implications of these data are extremely important for the design of damage prevention or control programs and the ranking of priority areas throughout the province.

The influence of shooting on damage

Approximately 50 per cent of the respondents to our mail questionnaire favoured shooting as a method of damage control followed by scarecrows (30 per cent) and chasing (21 per cent), suggesting that shooting is the most popular control method (Table 8). The issuance of pre-hunting season shooting permits is based on the premise that individual farmers have a right to protect their crops, and that this is an effective means of doing so.

To test the effectiveness of shooting permits as a means of reducing damage intensity, we conducted an analysis in which the intensity of damage suffered by those who had shooting permits was compared with the intensity of damages suffered by those without shooting permits. The results are tabulated in Table 9.

A Chi^2 analysis of these results (Chi^2=9.2 with 9 d.f.) indicates that the damage intensity suffered was independent of whether the farmers sustaining damage held a shooting permit or not.

The Chi^2 test indicating independence may be due to the lack of constant surveillance and continual shooting to prevent damage. However, in practical terms such measures are not feasible over large areas and the data support

Table 8

Number of farmers using various methods of damage control

	1968		1967		1966		Other	
	No.	%	No.	%	No.	%	No.	%
Shooting	304	50.2	235	46.8	297	52.2	309	54.6
Scarecrows	189	31.2	157	31.3	190	33.4	180	31.8
Chasing	140	23.1	107	21.3	122	21.4	111	19.6
Machines in field	94	15.5	67	13.3	82	14.4	73	12.9
Acetylene exploder	12	2.0	8	1.6	16	2.8	13	2.3
None	217	35.8	195	38.8	192	33.7	189	33.4
Other control means	42 (did not specify year)							
Total	606		502		569		566	

Table 9

Damage intensity related to issuance of shooting permits

Damage intensity suffered, %	Farmers claiming compensation: with shooting permit	Farmers claiming compensation: without shooting permit	Total
10	2	17	19
20	42	388	430
30	53	609	662
40	52	577	629
50	76	933	1,009
60	33	663	696
70	36	569	605
80	49	617	666
90	13	275	288
100	144	2,133	2,277
Total	500	6,783	7,283

($Chi^2 = 9.^2$ with 9 d.f.)

the thesis that displacement of ducks by shooting increases actual damage loss on a regional basis.

Upon plotting quarter sections covered by shooting permits for the past five years in Alberta an immediate and unmistakable trend was evident which showed concentrated densities of permits in close proximity to major cities (Calgary, Edmonton, Lethbridge and others) independent of the density of damage claim locations.

This suggested that permits were being used as a means for urban hunters to engage in pre-season waterfowl hunting and in fact an indication of widespread abuse of the intent of permits. It is known that on some occasions urban hunters solicit farmers to apply for permits for the purpose of a pre-season hunt.

However, in plotting distribution of permits, we could not conclude that they were an ineffective means of preventing damage. In fact, in some areas permit saturation coincides with infrequent damage sites, and this could be interpreted as evidence of their effectiveness.

It is well documented that shooting is effective in preventing damage on an individual crop site if the site is under continual surveillance. However, we were most interested in the impact of shooting on a regional basis since displacement of waterfowl from site to site may result in greater total damage to the region than if waterfowl were unmolested by shooting. This thesis is commonly held since ducks have been thought to trample more grain than they consume. Field evidence tabulated by Benson (1952) in Saskatchewan showed that damage per duck day for a 100-acre barley field with known duck populations was 3.8 lbs. of which approximately 8 ounces can be attributed to actual consumption.

Therefore, we may form a hypothesis that on a regional basis less total dollar loss would be incurred by allowing ducks to feed undisturbed once they have established a feeding pattern, since displacement increases the number of damage sites and intensity of damage due to trampling decreases exponentially with time, resulting in greatest losses soon after the flock lands on the field.

Management implications of the findings

From the analyses conducted to date, several inferences can be drawn regarding damage prevention, control and compensation. First, stratification of the province into damage susceptibility zones allows the consideration of damage amelioration programs as an alternative to compensation. In high damage concentration areas, lure crops may provide a more economic long-term solution than compensation. Findings on water body relationships and data obtained from actual plotting of damage sites (particularly those that have sustained damage for several years) provide a basis for the location of permanent lure crops which would prevent damage in many instances.

Factors influencing damage intensity suggests that a category of lure crops to contain damage (once a feeding pattern has been established) based on purchase of crops on these sites is feasible and would reduce overall damage losses in a region.

Analysis of variables influencing damage will provide some basis for predicting the location and magnitude of damage expected in future years.

Questionnaire and computer data reveal the magnitude of damage in a provincial context. This allows consideration of potential demands on wildlife agencies for compensation or mitigation programs required to reduce losses to farmers.

Summary and conclusion

1. Waterfowl damage to grain crops in Alberta constitutes a major economic program. Calculated provincial actual losses for 1968 range between three and six million dollars.

2. The existing compensation program reimburses farmers for approximately 35 per cent of actual losses incurred.

3. Questionnaire data suggest that, on average, about 35 per cent of Alberta farmers suffer damage in any one year, of which approximately one in six claim compensation.

4. Damage susceptibility zones in Alberta have been geographically identified.

5. Waterfowl depredations are a function of length of harvest rather than start of harvest.

6. Damage sites are closely correlated with water bodies in the size categories 30–50 acres and 320+ acres.

7. Shooting does not decrease damage intensity (per cent damage).

8. Shooting is likely to increase total regional damage losses.

9. The most important variables which we were able to subject to a step-wise regression analysis, influencing damage intensity (either positively or negatively) were found to be distance to water bodies 51–160 acres, and precipitation in the fourth week prior to damage.

10. The most important variables which we were able to subject to a step-wise regression analysis influencing number of acres damaged (either positively or negatively) were found to be annual precipitation, and number of pot-holes on a damaged quarter section.

11. Additional data and study on a regional basis is required if design of programs for damage amelioration are considered.

Appendix A

Explanation of punched card data form

Column	Information	Source	Remarks
1	Quarter	Adjusters report	SE=1, SW=2, NW=3, NE=4
2-3	Section	Adjusters report	
4-5	Township	Adjusters report	
6-7	Range	Adjusters report	
8	Meridian	Adjusters report	Use last digit of meridian. e.g. 104th=4
9-12	Municipality	Map of municipal boundaries	Type & Number Improvement district=1 Municipality=2 County District=3 Special area=4 etc. e.g. 1123 (Improvement district no. 123)
13	C.L.I./	CWS waterfowl inventory maps	0 if not present
14-19	Date of damage	Adjusters report	MMDDYY e.g. Oct. 3, 1967=100367
20-22	Damaged acres	Adjusters report	To nearest acre
23-25	Damage intensity	Adjusters report	To nearest 1%, 100% has special symbol.
26	Type of crop	Adjusters report	Wheat=1, barley=2 oats=3, mixed=4 etc.
27-28	Yield prior to damage (Bu/acre)	Adjusters report	To nearest bushel
29-32	Compensation paid/1/4	Adjusters report	To nearest $1
33-35	Distance to nearest town	1:250,000 scale map	To nearest 1/2 mile, e.g. 16 ½ = 165
36-37	No. of potholes on quarter section	1:50,000 scale map	

38-40	Distance to 30-50 acre waterbody	1:50,000 scale map	To nearest 1/10 mile, e.g. 9.5=95
41-43	Distance to 51-160 acre waterbody	1:50,000 scale map	To nearest 1/10 mile
44-46	Distance to 161-320 acre waterbody	1:50,000 scale map	To nearest 1/10 mile
47-49	Distance to 320 + acre waterbody	1:50,000 scale map	To nearest 1/10 mile
50-51	Precipitation for week of damage claim	Weekly summaries of precipitation	To nearest 1/10 inch e.g. 4.3=43
52-53	Precipitation for one week prior to damage	Weekly summaries of precipitation	To nearest 1/10 inch
54-55	Precipitation for two weeks prior to damage	Weekly summaries of precipitation	To nearest 1/10 inch
56-57	Precipitation for three weeks prior to damage	Weekly summaries of precipitation	To nearest 1/10 inch
58-59	Precipitation for four weeks prior to damage	Weekly summaries of precipitation	To nearest 1/10 inch
60-62	Annual precipitation	Dept. of Transport, Meteorological Branch	To nearest 1/10 inch e.g. 19.3=193
63-65	Commercial value/Bu (current year)	Dominion Bureau of Statistics	$1.85=185
66-67	Blank		
78-80	Claim voucher number		

Recommendations of the 33rd conference

Members of the committee
C.B. Forbes, chairman J.P. Fitzgerald
D.A. Benson, secretary M. Prime

Recommendation 1

That the conference express its appreciation for the splendid hospitality rendered by the following: The Alberta Fish and Game Association, the Edmonton Fish and Game Association, and Ducks Unlimited (Canada) for the social hours and dinner wines; to the provincial secretary of the Alberta Government for the banquet, the staff of Elk Island National Park for bison and elk meat, and Alberta Fish and Wildlife Division for fish; to Mr. & Mrs. A.E. Oeming for the conducted tour and lunch at the Alberta Game Farm; to the Alberta Forest Service, Alberta Fish and Wildlife Division and University of Wisconsin for the flight to Elk Island National Park and the Rochester Research Station; to the City of Edmonton for the Klondike show at the dinner; and to the Department of Indian Affairs and Northern Development for the reception of delegates, the provision of conference facilities and for the organization of the programs.

Recommendation 2

That the conference express its appreciation to the United States Fish and Wildlife Service for making it possible to have its representatives Messrs. Noble Buell, Alan Studholme, and Walter Crissey, at the 33rd Federal-Provincial Conference; to the Fish and Wildlife Branch of the Alberta Department of Lands and Forests for its hosting of the conference; and to the Royal Canadian Mounted Police for its growing support and co-operation at both provincial and federal levels.

Recommendation 3

That the conference express its appreciation to Dr. David Munro for the contribution he has made to the success of these conferences and also to the development and quality of wildlife management in the provincial and territorial, federal and international arenas over many years of dedicated service.

Recommendation 4

Whereas the Canada Fur Council, under its terms of reference, is concerned with promoting the use of Canadian wild furs and recommending appropriate research and development towards this end, and

Whereas, competitive fur species produced throughout the world are being vigorously promoted through the expenditure of large sums of money, both in Canada and abroad, to the apparent detriment of Canadian wild furs, and

Whereas, many Canadians, particularly in the northern regions, continue to depend on wild fur for a significant portion of their livelihood,

It is recommended that the 33rd Federal-Provincial Wildlife Conference support the Canada Fur Council in its endeavour to mount a more aggressive promotion program for Canadian wild furs, both at home and abroad, and recommend the council review its past activities and functions as a first step in considering a feasible approach to promotion, research, and development aimed at expanding the use and market value of this important renewable resource.

Recommendation 5

Since it is recognized that because of the lack of uniformity in dealing with polar bear pelts, undesirable avenues for escape of hides to commercial outlets exist, and

Since the polar bear technical committee recommended a uniform pelt marking system which would be mandatory for all bear hides which are bought or sold in Canada,

Therefore, it is recommended that under the leadership of the CWS a system for marking hides be developed for approval by each agency, to apply to all polar bear hides bought or sold in Canadian provinces or territories, or exported from them.

Recommendation 6
That the Canadian Wildlife Federation continue to provide leadership and co-ordination for annual educational programs during National Wildlife Week and that the themes to be covered by these programs be "Endangered Wildlife in Canada" in 1970 and "Preservation of Wetland Habitat" in 1971. It is further recommended that provincial and territorial resource departments participate fully in these programs and that they develop liaison with departments of education to encourage maximum use of the program in schools.

Recommendation 7
That provincial and territorial resource departments give consideration to establishing hunting regulations which will take advantage of the opportunities provided by revision of the firearms section of the Criminal Code to allow young persons to obtain training and experience in hunting under the supervision of licensed adults.

Recommendation 8
That the conference request the Canadian Wildlife Service to give further consideration to allowing the use of raptorial birds as a method for the taking of waterfowl through amendment to Section 16 of the Migratory Bird Regulations.

Recommendation 9
That the federal, provincial, and territorial wildlife agencies formally encourage their professional staff to speak out in public on the social implications of their research on environmental degradation, specifically including the environmental consequences of present trends in the growth of human populations.

Recommendation 10
That the Canadian Wildlife Service encourage expansion in the activities of Canadian waterfowl technical committees by arranging and co-ordinating annual or semi-annual technical meetings with members of provincial technical staffs to discuss and formulate regional management plans required to improve and standardize data gathering and interpretation for the purpose of better waterfowl management.

Recommendation 11
It is recommended that the role and responsibilities of each province and territory and CWS in respect to waterfowl management and research should be clearly defined on the basis of appropriate negotiations between each province and CWS, responding to the individual needs and capacities of each province and the recognized responsibility of the CWS in respect of an international resource.

The Science Council of Canada

Dr. W.J.D. Stephen

Many of you have probably asked what the Science Council is all about. You may consult at your leisure the act of parliament which established the Science Council of Canada in May 1966, but I will briefly outline some of the pertinent details.

The Science Council consists of 25 members chosen from among persons in universities, industry and government having a specialized interest in science and technology, and four associate members from such agencies as Treasury Board, the Economic Council of Canada, and the Science Secretariat of the Privy Council. The Science Council is thus concerned with national science not just federal government science.

In April 1969, the Science Council became a crown corporation with a permanent instead of a borrowed staff. This move enhances objective examination of federal government programs, and removes conflict of interest between the Science Council's need to publicize its results and the federal cabinet's need to make timely announcements of policy. During the period that the Science Council was not a crown corporation, the services required to carry out its duties were provided by the Science Secretariat of the Privy Council office. Now the services required are provided by a small professional staff, some on term appointments and others on contract for special projects.

The Science Council assesses in a comprehensive manner Canada's scientific and technological resources, requirements, and potentialities; and to makes recommendations thereon to the prime minister. The main function is, therefore, advisory. The Science Council has no authority over the expenditures of any government or its agencies. In particular, it is the duty of the council to give consideration to, and make reports and recommendations on, the adequacy of the scientific and technological research and development being carried on in Canada. Consideration must also be given to the priorities that should be assigned to specific areas of scientific and technological research; the effectiveness, development, and use of scientific manpower; and the long-term planning for research and development. Consideration must be given to the factors involved in Canada's participation in international scientific affairs, the responsibilities of departments and agencies of the Government of Canada, in relation to those of other organizations, in developing and maintaining cooperation; and the exchange of information concerned with science and technology, economic or social aspects of life.

The present interests of the Science Council are essentially threefold. The council attempts to develop a strategic policy for the use and application of science and technology by Canada, as the nation seeks to attain its social and economic goals. Evidence of the council's main effort in pursuing that objective is Science Council Report Number 4, "Towards a National Science Policy for Canada". An important component of the science policy proposed by the Science Council is the concept of major programs defined as "large multi-disciplinary mission-oriented projects having as a goal the solution of some important economic or social problem and in which all sectors of the scientific community must participate on an equal footing."[1] Examples of major programs such as atomic weapon development, the space race, and so on, have tended to have some war-time or cold war motivations. The challenge to Canada is to develop major programs with peace-time objectives. The Science Council is already considering ways and means of initi-

[1]Towards a national science policy for Canada. Sci. Council Rep. (4):29.

ating programs on urban development and on transportation.

The other major area of interest is in studies of specific disciplines and areas of science and technology. The Science Council is conducting studies of disciplinary areas such as fisheries and wildlife to enquire into the "health" of those scientific areas and to ascertain the extent to which the needs of society are reflected in their levels of activity.

In general discussion on the scope and aims of the special study on fisheries and wildlife, the following points emerged. The study should be future oriented and should seek to highlight needs and opportunities for the next 10 and 20 years. Statistical material collected should show important trends; and timeliness and cost-utility of collecting data should override 100 per cent completeness. Timeliness is related to the need for correlation with a number of special studies currently being conducted by the Science Council into agricultural research and development, basic biology, forest resources research, and marine sciences and technology.

The Science Council special study on fisheries and wildlife resources is being undertaken by Dr. D.H. Pimlott, with the assistance of Dr. C.J. Kerswill and Dr. R.J. Bider. Dr. P.A. Larkin is chairman of the Science Council committee to whom Dr. Pimlott reports. The committee consists of Professor C.E. Law, Dr. A. Labrie, W.W. Mair, D.F. Miller, Dr. A.W.H. Needler, K.H. Loftus, R.J. Passmore, I. Langman, Dr. J.M.R. Beveridge, and Dr. E.S. Deevey. The special study was initiated April 28, 1969 and the first draft of the report is scheduled to be presented to Dr. Larkin's committee on August 27, 1969. It is anticipated that the results of the technical report will be published early in 1970, and policy recommendations made to the prime minister in spring 1970.

Strong direction was given to Dr. Pimlott by the Science Council Committee on Fisheries and Wildlife to determine the goals of scientific fisheries and wildlife activities and relate them to the national goals as outlined in Science Council Report Number 4. In seeking such information from fish and wildlife administration agencies and from working scientists, lack of clear goals stated in meaningful terms became apparent. Research problem areas could be described by many of the scientists, but to what end they would be pursued, and for how long, was not immediately evident. Faced with such aimlessness, many scientists seem to have resigned themselves to managing the resources into mediocrity, if not to oblivion.

Most of the scientists employed by fisheries and wildlife administrative agencies have their fundamental training in the life sciences. They find, however, that many, if not most of the current and near-future resource management questions lie in the physical and social sciences. Lacking clear direction and facing a full range of problems, intelligent, well-trained, industrious persons with life science orientation commonly find that they are answering questions that management is not asking, or they are frustrated because they are unable to provide solutions to the problems they see at hand.

Science is not magic, but a method for improving the probability of achieving a desired outcome from a given set of events. Science is thus a part of the decision-making process, but it is not the only decision-making device. By merely tossing coins one could expect to be "right" half the time.

Some scientists, admittedly, do not achieve a 50 per cent score on desirability of solu-

tions. That may result from working through a rear-view mirror; looking to the past instead of the present and the future. Results of research must be timely. They must also provide answers to the relevant questions. There are many reasons of course for low scores on "desirable outcomes." The most probable cause of an "undesirable event" is lack of clear understanding of what is wanted. Anything that happens then can be undesirable.

Science and technology can contribute to administration of fisheries and wildlife resources but the responsibility lies with three groups of people: the project leader, the research manager and the executive (Werner, 1963). Those groups must clearly understand the continuous and interlocking responsibilities for planning scientific activities. Goals must be set and kept under constant review so that planning is based on realities and not on illusions. There must be patience and consistency, tempered by common sense, in pursuing the goals — despite setbacks inherent in research. Finally, but most important, there must be courage to make decisions clearly and cleanly.

I want neither to intrude unnecessarily upon your deliberations nor to pre-judge the final results which will be presented by Dr. Pimlott. In closing, I would say, many of you have been asked to provide input to the study of science as applied to fisheries and wildlife management; you, therefore, have an opportunity to introduce information objectively, if you think it desirable to reorient fisheries and wildlife programs, along with those for other renewable resources. I have presented some observations made since my association with the Science Council and the Fisheries and Wildlife Resources Study. In conclusion, I would plead with you to present your views to Dr. Pimlott on the desirable future development of fisheries and wildlife research and management in Canada over the next 10 and 20 years.

Literature cited

Werner, J. 1963. Effective planning for research (p. 53-59) in management of scientific talent. Ed. J.W. Blood. Amer. Mgmt. Ass. Rep. No. 76. Amer. Mgmt. Ass., New York. 240 p.

Response to the feedback form

1. General comments on conference objectives and format.

Since time did not permit everyone to take part or — take part fully — in the discussion of conference objectives and format, we would appreciate further comments and suggestions on any of the items discussed, or any other suggestions you may have.

2. Comments and suggestions on any aspect of this conference.

Summary of replies

Seventeen replies were received. One person said that he had enjoyed the conference, two felt that the meeting was well conducted. One person considered that the conference objectives were sound and that the format should not be changed.

Suggestions and recommendations have been grouped under three headings: subject matter of the conference; methods used in the conference; other suggestions.

Subject matter of the conference

General

One person asked for fewer technical papers, and one for more papers oriented "to science and wildlife management." This person suggested that the professional, rather than the

administrative people present the papers. Two persons suggested more general topics. One person, anticipating change in the subject matter of the conference, stated that it would be necessary to define more clearly the roles of the observers and the official delegates, and considered that the agenda might be made up of the traditional items and "flexible topics."

One person combined his suggestion on subject matter with a proposal on method. He suggested group study of a single topic, followed by presentation at the conference of the results of the study. This would replace the present varied agenda, and would fit in with the proposal for a discussion of provincial problems by the provincial directors.

One person made a fairly sustained argument for a major shift in content as follows:

> "It is more and more evident that no discipline can continue to operate within a closed cell. This applies particularly to the wildlife field which attempts to regulate the use of a resource which is greatly influenced by the activities of organizations which are beyond our control. I, therefore, suggest that more of the discussions at the conference be related to these interface areas between wildlife and other environment and resource areas. This should be done with a view to establishing optimum levels of interaction between resource fields and maximum level of ecological consideration in the establishment of all programs and projects which relate to exploitation of resources and to the environment generally."

Another member of the conference made a similar plea for widening the range of the conference's subject matter.

Provinces and territories

Five people recommended discussion of provincial and territorial problems, and three suggested one day for such a discussion. One person wrote, "Too often one finds proceedings being wound up hurriedly by CWS chairmen when the sugject matter tends to wander away from solely federal-provincial interests. One day might be allowed for discussions involving programs or problems of a federal-provincial or purely provincial-territorial nature – not of interest to CWS." Coupled with this was a suggestion that a representative of the host province act as chairman for part of the conference. The importance of selecting papers to reflect this kind of interest was also noted: "We suffer by not hearing of problems which may be common but which have to be solved in different ways in different regions," and "airing the problems associated with dual management might lead to better co-ordination and co-operation."

Migratory Bird Regulations

Two members considered that more time should be devoted to discussion of the Migratory Bird Regulations. One of the two thought the time could be secured by cutting out the "long-winded resolutions, consultants enquiries, report of the fur council, etc." In this connection one member suggested that the U.S. bureau representative be asked "to review on a flyway basis the general status of waterfowl, at least ducks."

Some specific suggestions

In addition to these general suggestions on subject matter a number of fairly specific suggestions were made: discussion of inter-provincial waterfowl and big-game management; a review of national pollution problems; a five-minute summary of each province's highlights; discussion of the resolution concerning the division of responsibility between the federal and provincial govern-

ments. Two members suggested that papers be presented from resource consumer groups. One suggested a hunter group. The other suggested a natural history group leading a discussion on non-game wildlife.

Methods used in the conference

Three persons judged the panel discussion good or enjoyable. One liked the panel discussion because it involved more people. One person recommended that the candour of the discussions be retained.

Two persons, however, thought the conference "went dead" at times, and these two and one other person suggested that the presentations be followed by small groups, or workshops, which might report to a plenary session. One person thought that the degree of informality led to inattention.

One person remarked very favourably on the informal aspects of the conference and recommended, if this could be done, that opportunities for informal meetings be increased.

Other suggestions

The technical committees

One delegate suggested that one member of each technical committee give a summary of all the agency information for the region. These two reports would replace the series now presented, would "be more meaningful, and save about an hour of time." One of the observers from the U.S. bureau suggested that his information might be of more value if presented at the meetings of the technical committees.

The "free day"

Members of the conference have mixed feelings about the free day. One considered it a "fine idea but wasteful." One would prefer a free morning and working afternoon rather than a longer four-day conference. One wants to keep the free day. Three others assumed that, if a session were set up for provincial and territorial directors, a fourth day would be used for this purpose.

The recommendations

One person suggested that recommendations be distributed at least half a day in advance and, that the person(s) proposing them be identified and expected to discuss them.

The press

One person suggested that there might be better press coverage if summaries were distributed with papers.

Name-tags

One person recommended that name-tags be used.

"Thank-you's"

Two members thought the "long-winded thank-yous" a waste of time which could be eliminated.

Comments of the observer

Subject matter

Suggestions on subject matter would be inappropriate from the observer but it is clear the nature of the conference has in fact changed and the range of discussion widened. The most satisfactory way to develop the content of the conference discussions is through a planning process which begins in the fall and continues until early in the new year. This planning process should be initiated by the Canadian Wildlife Service but entered into fully by the provincial directors. Since the planning must be done largely by correspondence the first round of correspondence

should occur early in the fall and, as suggested at the conference, emphasis—perhaps the whole first exchange—should be on the content of the conference discussions, with little or no attention to administrative details.

Methods

One member noted that if discussions and format are to change and the conference is to become "something more than an executive-type meeting" then the roles of delegates and observers must be clarified. As it stands, the conference has formal business which the delegates must attend to, and the present seating arrangement is satisfactory for this purpose. But if the object is to exchange ideas and experience in general discussion, then the seating arrangement is inhibiting. It should be possible to reorganize the general discussion sessions so that all participants are on an equal footing and feel equally free to take part.

I would also endorse the suggestions that small groups or workshops be used which would, if necessary, report to a plenary session. In addition to widening participation and creating greater interest, the use of small groups is also more productive, if the sharing of experience and the gathering of new ideas is one of the objectives of the session.

All papers that members were expected to discuss were distributed in advance, so that there was no point in reading them to the meeting, yet this was what some panelists did. The purpose of prior distribution was, therefore, defeated and the panel presentation took half of the half day devoted to it, i.e. until the coffee break. Only one speaker injected a new issue that had not been included in the paper. The procedure followed at Whitehorse, of asking discussants to lead off the discussion, was more useful and interesting and would probably have started a more lively exchange at Edmonton. Mr. Walden's very effective wrap-up might have been even more useful as the lead-in to a discussion of the papers, since many of his comments represented his own point of view and would have been as appropriate, or more so, at the beginning.

One member recommended that, if possible, something be done to provide informal opportunities for discussion which proves so valuable. As he pointed out, the impromptu, spontaneous conversations at coffee breaks and similar events are a chief feature. Some conferences do make formal opportunities for such experience by establishing a lounge for members when they are not in working sessions. Snacks and other refreshments are served, two or three may talk together, and a larger group may meet. The lounge becomes the social center of the conference community and serves exactly the suggested function.

The time allotted to the conference seems to be insufficient for the work envisaged. Two suggestions were designed to "save" time. Suggestions of reports from representatives of the two technical committees rather than a series of reports, and reduction in the "thank-you" resolutions both have merit. If, in addition to general discussions similar to that of the panel, discussions were focussed on provincial problems and the free day were retained, the conference would have to be extended for one day. As one of the delegates remarked, the emphasis towards the end of the final day, if not all afternoon of the final day, is on finishing off, and some matters get less than satisfactory treatment. It is unfortunate when this happens, especially if the topics are important to anyone at the meeting. An extra day, however, will not eliminate the last-minute rush and dwindling attendance, unless the suggestion is followed that the fourth day be carefully programmed to deal with problems of the provincial directors. In this way, interest and participation can be maintained until the end of the conference.

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