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A PLAN FOR THE DEVELOPMENT OF THE DUCK LAKE
WILDLIFE MANAGEMENT PROJECT

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By;

MUNRO, J.A.

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A plan for the development of
the Duck Lake wildlife
management project, 1951.

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A PLAN FOR THE DEVELOPMENT OF THE DUCK LAKE
WILDLIFE MANAGEMENT PROJECT

*These two reports
were made for the
B.C. Game Commission
by J. A. Munro*

BY

J. A. MUNRO

The following recommendations have been prepared on the assumption that Duck Lake, Leach Lake, and public lands adjacent to both lakes, will become available for development as a wildlife management project.

The territory lying to the east of the Kootenay River, including the lands on the east side of Duck Creek channel which the Creston Reclamation Company are prepared to relinquish in return for title to lands in the south-west corner of Duck Lake, is referred to in the following pages as the Duck Lake Area. The territory on the west side of the Kootenay River from the Reclamation north to Kootenay Lake is referred to as the Leach Lake Area. The boundaries of both areas are indicated on the attached map.

It is recommended that the Duck Lake Area be developed as a wildlife refuge in the full sense of this term, and that the Leach Lake Area be developed as a public shooting ground. A combination sanctuary and public shooting ground will increase the hunting potential, as has been fully demonstrated on some of the National Wildlife Refuges in the United States.

It will be observed that the proposed boundaries of the Duck Lake Area extend north to Kootenay Lake, This additional territory is deemed necessary in order to protect one of the flight lines into the refuge. It would seem inadvisable for a refuge to

be completely surrounded by territory on which hunting is permitted.

At this point it may be useful to point out some of the economic and social values inherent in the proposed project. One important value would be the partial fulfilment of an international obligation to provide a measure of protection to migratory waterfowl. This in itself is a definite and worth while accomplishment. Another value would be the provision for public access to hunting grounds which, under management, should provide additional opportunities to harvest part of the annual crop of waterfowl. A third value, and one to be emphasized, is the profit which the City of Creston would derive from its association with the first project of this kind to be developed in Canada. Just as the city of Willows, California, derives great profit from the nearby Sacramento National Wildlife Refuge; just as the city of Brigham, Utah, advertised as the home of the Bear River National Wildlife Refuge, became internationally famous, so Creston, associated with the Duck Lake Wildlife Refuge, would become a mecca for sportsmen and tourists-- to the financial profit of its citizens.

It seems to me, as it does to many other people, that the sum of these values expressed in terms of dollars derived therefrom would eventually be greater than the total value of any crops that might be grown on Duck Lake if it were reclaimed.

THE DUCK LAKE AREA

Duck Lake is important to the maintenance of a waterfowl population, of which pond ducks are an important constituent, that nests in northern latitudes and winters principally in the southwestern United States and in Mexico. In some respects it is unique among waterfowl feeding grounds. Together with Leach Lake it provides some 4,000 acres of open, shallow-water feeding grounds so situated that waterfowl, during a critical stage of their annual life cycle, can use it in almost complete safety. That is to say, because of the wide-spread shallows, large associations of pond ducks are enabled to feed, by dipping, far out from shore where they are reasonably safe from molestation by their natural enemies. There is no other feeding ground of comparable value on the Canadian portion of this flight-line.

Post-breeding male pond ducks are flightless for several weeks after their part in the annual reproductive process has been fulfilled. At this time, the flightless period, all species, with the exception of the baldpate, frequent thick cover until the flight feathers are renewed. These retreats may be adjacent to, or some distance from, the nesting grounds. The birds are wary and secretive in habit and seldom are seen by man. When the ducks have again attained the power of flight they move to other feeding grounds where the moult is continued, and the body fat, lost during the reproductive period, is renewed.

Pond ducks like many other animals are extremely conventional in adhering to a behaviour-pattern that has become established over long ages. Those individuals which adhered to this pattern of

behaviour--in this instance a pre-migratory movement which probably is a definite physiological requirement--were more likely to survive than those which did not. Thus over a long period of time Duck Lake became established as the goal of a definite pond-duck population during the period, roughly, from July 15 to September 1. During this period enormous crops of aquatic vegetation are available in clear, shallow water--in situations where feeding in safety was assured, as was stated earlier. First to arrive, in early July, are adult mallard, chiefly males; then come pintail, green-winged teal, baldpate and shoveller--first the adult males and later the females and young of these species.

Thus the chief function of Duck Lake, considered as a link in the flight-line it serves, is to provide an abundant food-supply and safe resting-places at a crucial time in the annual life-pattern of pond ducks when these are physiological necessities.

The water level of Duck Lake which permits the greatest opportunities for harvesting this food, in late summer and early autumn, is 1,744.25 to 1,744.60. This conclusion was reached after careful study of lake conditions at the changing levels as recorded on the gauge at the pumping station. Levels 1,744 to 1,745 are considered the minimum and maximum to be permitted, at this particular season, when the lake comes under management. It should be noted, however, that at any point between these extremes, or for that matter at any point in the wide fluctuation of the lake level, some portions of the feeding grounds lose their value. If, on the other hand, the level is low, e.g., 1,744-, some areas of lake bottom

supporting aquatic vegetation are exposed and the plants rapidly desiccate in the hot sun (even a drop of one inch at or near this level radically alters the situation); while on the other hand if the level is high, e.g., 1,745, some of the vegetation in deeper places is submerged below the reach of pond ducks. Thus the endeavour has been to discover a range of level which will set the two factors, of water too shallow and water too deep, in some sort of equilibrium. The range given above, viz.; 1,744.25 to 1,744.60, seems to be the best answer to this problem.

Another aspect to be considered in determining the most desirable level is the availability or otherwise of loafing places on shore. These, an essential requirement, are adequately provided at the range level recommended. This range-level is also admirably suited to habitat-improvement.

During March, April and early May, in normal years, the level will be much lower. A satisfactory arrangement would be to permit the lake to reach the desired level and subsequently to retain this level by pumping.

It is unfortunate from the game management viewpoint that water storage to 1,748 is permitted after August 15 in any year. This shortens the period of optimum availability of food and eliminates all of the more desirable shore-loafing places. Because of this many pintail, baldpate, shoveller and green-winged teal leave the lake a month or so earlier than they otherwise would. Mallard, deprived of access to the major food-beds are more readily attracted to adjacent green fields. In brief this disruption of the normal course of events by unseasonable high water reduces the hunting

potential during the early part of the season and worsens the problem of game management in relation to agricultural interests.

The amount of water storage provided by Duck Lake, in comparison with the great areas of Kootenay Lake, is actually quite small, and it would seem the power potential involved is negligible. On the other hand the loss of game management effectiveness, resulting from the late summer rise of water level, is serious, and, it seems to me, entirely out of proportion to the benefit derived from it by the West Kootenay Light and Power Company. Possibly if these facts were submitted to the Company it might agree to forego its present privilege. In any event the situation should be kept in mind for possible action when the Company's privilege expires three years hence.

Habitat Improvement

In the past, few ducks nested successfully on the Duck Lake Area. The reason seems obvious; the nests of all save tree-nesting species would be destroyed by flooding unless the eggs hatched by Mid-May, or unless the nests were located above high-water mark on the foothills. Another adverse factor was scarcity of the foods suitable for young ducks during the flood period.

With the removal of this major adverse factor, vis.; early summer flooding, there is every reason to believe that a nesting population will gradually become established. Indeed, in this first summer (1951) of partial water-stability mallards and green-winged teal have nested successfully and taken their broods to Duck Lake. Undoubtedly the current nesting population is larger than ever it was under primitive conditions and the gradual

building up of a nesting population by natural processes can be anticipated. Doubtless, also, the anticipated natural and gradual increase can be accelerated through a program of habitat-improvement.

The physical characteristics of Duck Lake indicate the desirability of two major modifications of environment, viz.; (a) additional improved nesting territory plus nesting cover, and (b) deepening of certain shallow-water areas to make possible an increase in the supply of food during the spring low-water levels as well as at other times.

Methods recommended to meet these needs are as follows:

Artificial ponds on West Point:

It is recommended that a chain of ponds with connecting channels, and a channel at either end connecting them with the lake, be excavated across the larger of the two points on the west side of Duck Lake (hereinafter referred to as West Point, see map). The ponds should be approximately 300 feet by 100 feet, the channels at least 20 feet wide, and all excavated to a depth which would permit a flow of water from the lake at all water levels. In order to fulfill this requirement it would be necessary to continue the end channels across the lake bottom which is exposed at 1,744 feet (see "Artificial Channels" and "Planting" below). The possibility of making ponds by blasting with dynamite might be explored.

Artificial islands:

It is recommended that a series of islands be constructed in the lake on the north side of West Point. These should be at least 200 feet by 100 feet and approximately five feet in height above the lake bottom with the upper surfaces slightly concave.

If feasible the islands should be constructed from the earth made available by the excavation of ponds and channels. The chief reason for using this material is to render the ponds and channels more attractive to waterfowl by establishing a margin at or near ground level, rather than leaving the earth to form a levee around them. If this is not practicable the islands could be constructed at low water from the earth of the lake bottom. This manner of construction would have one advantage, viz.; the excavations (borrow pits) would establish channels around the islands deeper than the surrounding lake bottom.

Artificial channel, south end of Duck Lake:

A portion of the lake bottom at the south end of Duck Lake is exposed, or covered by only a few inches of water, at 1,744.50 and thereabouts. Probably because of the alternate drying and flooding to which aquatics are subject in this area, few species have become satisfactorily established. To remedy this condition it is recommended that a channel 30 feet wide and 18 inches deep be constructed from Duck Ereek outlet to connect with the proposed channel on the south side of West Point (see map). The earth removed in construction should be dumped at intervals on the north side of the excavation to form additional islands of the same type as recommended above.

Construction of the channel would provide additional territory suitable to the propagation of desirable aquatic plants such as sago pondweed. The islands would provide additional attractive nesting territory (see "Planting" below).

Additional Channels:

There are numerous places where the construction of channels across the shallower portions of the lake would improve the habitat for waterfowl. One such place is a relatively large area to the east and south of West Point.

Improvement of Duck Creek Point:

Duck Creek Point forms the west side of Duck Creek Channel at its outlet and extends for some distance into the lake. It contains the largest thickets of sandspit willow on the proposed refuge as well as several Equisetum marshes in the depressions. This land will be acquired if the proposed trade with the Creston Reclamation Company is carried out. The area could be made more attractive to nesting waterfowl if converted into an island, a modification which could readily and inexpensively be accomplished by cutting a cross channel through one of the depressions (see map).

Improvement of existing marshes:

There are several depressions now grown up with Equisetum on the point referred to above and along the east side of Duck Creek Channel. These could be improved by dredging them to a depth of one foot or so below their present level and by deepening the channels connecting them with Duck Creek (see "Planting" below).

These projects should be undertaken in early spring when the lake level is lowest; even then it might be necessary to lower the lake level, temporarily, by pumping so that machinery could operate freely on exposed lake bottom.

It may be anticipated that mechanical difficulties, not

predicable at this time, will arise during the course of construction and that it will become necessary to adjust the engineering plan in a manner compatible with the biological requirements. Therefore the work should be carried out under the joint supervision of an ornithologist and an engineer. Labour and equipment for construction are available at Creston.

Planting of cover and food plants:

In the first year of operation some experiments in planting might be undertaken without much expense. For example; slips from sandspit willow, Salix fluviatilis, and other willows common locally, should be cut in early March, placed upright in damp sand, and later planted on the islands. The slips should be inserted in the earth, at an angle, for at least half their length. In all probability weeds and native plants including grasses, will soon become naturally established on the islands. Nevertheless it might be advisable to plan for an experimental sowing of brome grass, or other suitable varieties of long-stemmed grasses. Root stalks of round-stem bulrush, Scirpus acutus, should be introduced in suitable places. Care should be taken that the plants are properly identified as this species often is confused with the cattails, Typha sps. entirely different species and of little value to waterfowl. Supplies of round-stem bulrush can be obtained on the recently reclaimed portion of the flats, at the Indian Reserve on the Kootenay Flats south of Creston, where the largest marshes are located, and near Mud Lake south of Leach Lake. Transplanting should be done as early in the spring as possible.

The above are indicated as experimental planting to be carried on concurrently with the first year's development construction.

It is recommended that an extensive program of planting be undertaken as soon as possible thereafter.

The round-stem bulrush referred to above is one of the most important plants in the ecology of a waterfowl marsh. The seeds are eaten by practically all species of ducks, and are available in spring as well as autumn because many of the ripe seeds become mixed with the marsh debris on the bottom of lake or stream and remain there through the winter. The stems provide cover and nesting material for ducks; they are a favourite food of muskrats and the white basal portions are eaten by geese; they provide emerging ladders for the nymphs of dragonflies and damselflies that are entirely aquatic at this stage.

It should be borne in mind that animal food is an important constituent of the diet of all ducks and an essential element in the diet of young during the first several months of life. Thus where animal food is present in substantial amounts brood-survival is likely to be higher than it is where animal food is not in adequate supply. Important among animal foods are the nymphs of dragonflies and damselflies. Both are associated with a round-stem bulrush marsh and are usually more abundant there than in other types of marsh. Both are present on Duck Lake but it is desirable to increase the supply.

It is considered important, therefore, that round-stem bulrush be introduced. Plants should be set along the upper reaches of Duck Creek Channel, in the artificial ponds and channels on West Point, and in the shallows at various places along the shores of Duck Lake. Effort should be directed towards substituting round-stem bulrush for Equisetum in the present marshes (see under the heading "Improvement of existing marshes").

It is probable that the seeds of sago pondweed and other submerged aquatics will drift into the artificial ponds and channels to be constructed across West Point. Nevertheless it would be well to harvest sago-pondweed tubers and winter buds for re-planting in the ponds.

Recommended also is the transplanting of wapato tubers (duck potato). The best local source of supply is located on the slough at West Creston just north of the bridge.

The sandspit willow, referred to earlier, is the commonest species of the genus on the Duck Lake Area and will provide first-class cover for nesting pond ducks. It is desirable to increase the amount of this cover by transplanting, particularly along the west side of Duck Lake where the strip of land between the dyke and the lake shore is narrow. The establishment of willow thickets in such places would improve nesting habitat.

Several acres of lake bottom immediately south of the pumping station on the east side of the lake will be permanently exposed if the maximum level does not exceed 1,745. It is recommended that sandspit willow be planted here also.

The common waxberry, Symphoricarpus racemosa, and wild rose, Rosa Sayi, abundant in places on the slopes above the Kootenay Flats, also are recommended for introduction as cover plants. Incidentally it may be noted that the berries of each are a favorite food of pheasant.

It might be well to mention here that construction of the

remedied before the full nesting potential of the area can be realized. The cleared area should be planted to native trees and shrubs. Here also, in the interest of pheasant propagation, it is recommended that choke-cherry, black haw, wild rose and waxberry be used in re-establishing cover.

It is suggested that enquiries be made regarding a possible responsibility of the Creston Reclamation Company for clearing up the debris of construction.

The dyke itself when topped and side-graded will eventually, by natural means, produce a vegetative cover. Natural processes could be aided through the introduction of desirable plant species such as waxberry. An experimental planting of multiflora rose, used with good results in the western United States, might be tried here.

Wild Rice:

It is considered likely that, from time to time, sportsmen's organizations will urge the planting of wild rice in Duck Lake. This is not recommended. Wild rice is an annual with a low seed-yield per acre in comparison with cultivated grains. In the middle west, where the plant is naturally abundant, and the dominant species in age-old marshes, it is an important waterfowl food. These conditions have not been duplicated elsewhere through introductions, and the value of small successful introductions are sentimental rather than practical. To be of any practical value in waterfowl management a very large acreage would be required. Attempts to introduce wild rice in British Columbia have been almost uniformly unsuccessful,

and, I believe, will continue to be so. Food of this type is much more easily, and much less expensively, supplied by the planting of cultivated grains.

Barley:

It is recommended that a minimum of 50 acres along the base of West Point be broken and sown to barley the first year. Subsequently farming should follow established methods of crop rotation--probably barley, wheat, peas and summer fallow. The work might be done on a share-crop basis, the refuge share of the crop to be left standing.

The cultivation of grain on the Refuge as supplementary duck food would no doubt lessen the pressure on the grain fields of the Reclamation, and thus tend to improve public relations.

Introduction of amphipods:

Reference was made to the animal-food requirements of ducks. This is supplied in part by an abundance of molluscs of several species. An increased supply of dragonfly and damselfly nymphs can be anticipated from a successful introduction of round-stem bulrush. One item, however, important in the diet of some diving ducks, appears to be lacking. I refer to the large fresh-water shrimp Gammarus lymnaeus. The smaller and less important Hyaella azteca appears to be the only species present. To transplant a stock of these animals, so abundant in many small lakes in the Okanagan Valley and elsewhere, should present no difficulty. I recommend this as an experiment.

Introduction of Canada Goose and Mallard:

It is recommended that a stock of tame Canada geese be introduced. Very likely the artificial islands would prove attractive nesting places for them. Probably it would be necessary to pen and feed the geese for several months on suitable locations, for example, on West Point, or on one of the artificial islands, otherwise they might travel to Leach Lake where Canada geese are accustomed to congregate in mid-summer. In winter there is usually an area of open water in Duck Creek Channel near its outlet that would, in part, take care of winter needs. Undoubtedly, however, winter-feeding would be necessary. A successful introduction would almost certainly result in establishing a nesting population--and this would be most desirable.

As noted earlier mallards have nested successfully this year on the Duck Lake area. It is believed that should a stock of ranch-bred mallards be liberated the natural expansion of this population would be accelerated.

Nesting boxes for Wood Duck:

A small number of wood duck nest on various parts of the Kootenay Flats. This population, estimated to number 40 to 50 pair in 1948, appears to be the largest unit to nest in the interior of British Columbia. Unfortunately the population has declined in numbers since 1948, perhaps because many nesting trees have recently fallen. As a possible means of checking this decline it is suggested that a dozen or so nesting boxes be placed in cottonwood trees along Duck Creek Channel and the Kootenay River. The boxes should be made of old, weathered lumber with inside dimensions as follows: height 14", width 12", depth 12". The entrance hole 4"

in diameter should be placed so that the upper edge is at least 3" below the top of the box.

It is suggested that the projects outlined above be undertaken progressively and in the order presented. The number to be undertaken each year will, of necessity, be determined by the amount of funds available for development. Eventually it may be desirable to erect an administration building with living quarters.

Other Recommendations

Hay Cutting:

The amount of hayland in the Duck Lake Area is approximately 300 acres, the quality of the hay is poor. On any nesting ground it is desirable that no vegetation of this type be removed. The growth of previous years, partly dessicated, provides additional cover, and is used also by ducks as nesting material. These facts should be considered when a policy for administering the refuge is being drafted. If the granting of hay-cutting permits is considered expedient this should come under jurisdiction of the Game Commission.

Grazing:

It would be undesirable to allow stock on the Refuge, particularly so after a planting program has been started. Stock eat off much valuable cover and also are liable to trample nests.

Muskrats:

Following a stabilized water-level, the introduction of round-stem bulrush, and a probable increase of other plants native to the area, it can be expected that the muskrat population will

increase. There is little reason for thinking that muskrats, under normal conditions, represent a hazard to waterfowl. Nevertheless the muskrat - waterfowl relationship should be studied. There would seem to be no objection, from a biological view, to the trapping of muskrats on the Refuge.

Angling:

The possibility of increasing the black bass population should be studied by a fisheries biologist. Increased opportunities for successful angling on the Reserve would pay dividends in the form of better public relations.

LEACH LAKE AREA

Habitat improvement on the Leach Lake Area does not appear to be feasible so long as the area is subject to flooding in spring and again in late summer.

However, if the area is to be managed as a public shooting ground it is desirable that a checking station be installed. This is dealt with more specifically in the section below.

Administration

Outlined above is what seems to me a workable plan to be used as a basis for developing the waterfowl potential of the Duck Lake Area. Undoubtedly, however, problems of development and management will arise continually. Moreover, management of this important project which, it is hoped, will serve as a model for other similar

projects in other parts of Canada, entails continual scientific study.

Among the necessary studies which should be undertaken annually are:

- a. Survey of the nesting population of the Duck Lake Area.
- b. Surveys of the food potential on both areas.
- c. The banding of waterfowl.
- d. The study of duck foods by means of stomach analysis to determine, among other things, the relative value, and apparent preferences for, different native food items.
- e. A weekly census of waterfowl populations on both areas.
- f. The crow-waterfowl relationship, and study of the predator-prey problem in general.
- g. The value as food of the common waterweed Anacharis canadensis, now apparently increasing and replacing such valuable items as the Potamogetons. Control of this weed may be desirable and if so methods of control would need to be devised.
- h. A complete record of the annual kill on the Leach Lake Area, including totals of each species with sex and age of each individual bird. This will necessitate the operation of a checking station, during the hunting season, as stated above. It is realized that hunters may enter and leave the area by various routes. However, this difficulty might be overcome by issuing gratis hunting permits containing the proviso that hunters must report at the checking station.

Information obtained through the operation of a checking station will constitute not only a valuable record for statistical use but will provide also a basis for determining the period during which hunting can profitably be allowed, the number of ducks and geese that may safely be taken, and the number of hunters that may be permitted on the area.

Finally, it seems to me, the project is of such importance that the appointment of a full-time biologist - to take charge of development work and to undertake continuous study of the area - is fully justified.

Public Relations

It seems desirable to point out that agricultural interests have by no means given up the hope that at some future time the remaining unreclaimed portions of the Kootenay Flats will become available to them. As to Duck Lake itself, it is now completely dyked. All that would be necessary to turn the lake bottom (or most of it) into farmland would be the relatively inexpensive project of pumping with the equipment now installed. This will be a constant temptation to the agriculturist.

Thus it is strongly recommended that the Sportsmen's Council be asked to set up a standing committee to be known as the "Duck Lake Committee". Its function would be to keep in close touch with local activities, political, social and agricultural, to prepare a plan of action for immediate use should pressure be exerted on the Government to release these lands for any purpose other than game management, and to keep the public informed of work progress on the Refuge, and of its value to British Columbia.

In view of the international interests involved it is recommended that the question of seeking Federal aid be studied. It might be considered advisable to have the entire area established as a Federal Bird Sanctuary under the Migratory Birds Convention Act, with a proviso in the agreement that hunting in the legal open season be permitted on any part of the sanctuary designated as public-shooting ground by Provincial authority. It might well be that such action would provide an additional obstacle in the course of any future drive to divert the lands to agricultural use.