AN ESTIMATION OF CATTLE CARRYING CAPACITY IN THE CORN CREEK, LEACH LAKE AND SIX MILE SLOUGH PORTIONS OF THE CRESTON VALLEY WILDLIFE MANAGEMENT AREA OF BRITISH COLUMBIA

- prepared for -

Canadian Wildlife Service,
Department of the Environment,
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- by -

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Introduction

The primary objective of this study is to review the Creston Valley Wildlife Management Area, evaluate conditions there, and make suitable recommendations as to the grazing land capacity of specific grassland regions within the Area. Available data respecting soils, climate, range management and land uses were reviewed. Cattle grazing capacities are recommended under current land use conditions for the three marsh areas known as Corn Creek Marsh, Leach Lake, and Six Mile Slough.

A secondary objective of the study is to review, evaluate and recommend alternative husbandry methods and sequential techniques which might serve to improve the use and management of grazing resources in the three marsh areas, Corn Creek, Leach Lake and Six Mile Slough.

Consultants used in the study are as follows:

- Campbell L. Sibbald, P.Ag., Calgary, Alberta, agrologist.
- Donald L. Hoover, A.A.C.I., P.Ag., Edmonton, Alberta, accredited appraiser and agrologist.
- Harold G. Hughes, Coaldale, Alberta, air photo interpreter and agricultural technician.

History of the Grazing Area

The Creston Valley Wildlife Management Area is unique in that it is the first Federal-Provincial Wildlife Management Area operating under its own Act in Canada. Funding, administration and operation of the project is shared by the federal and British Columbia governments. The basic concern behind the formation of such a new organization is directed toward wildlife in the management area, and specifically waterfowl management.

The Act under which the organization functions came into being November 11, 1968. It is operated under the Statutes of the province of British Columbia, and the land is provincial Crown land. The first permanent employee came to the organization in September 1966. Management Area employees are not civil servants, but are under contract to both the federal and provincial governments. Present staff consists of Mr. Dwight D. Moore, Supervisor; Mr. Harold O. Casemore, Manager; and Mrs. R. W. H. E. Moore, clerk-typist, accountant. The administration of the area comes under the Creston Valley Wildlife Management Authority, the final authority for which is the Hon. Mr. W. K. Kiernan, Minister of the British Columbia Department of Recreation and

Conservation. Mr. Kiernan is an ex-officio official member of the Management Authority. The two official members are Dr. J. Hatter, Director of the B.C. Fish and Wildlife Branch, and Dr. J. S. Tener, Director of the Canadian Wildlife Service. These members have advisory teams working with them.

Prior to the formation of the Creston Valley Wildlife Management Area, grazing on Leach Lake and Corn Creek Marsh was administered by the British Columbia Forest Service using a system of grazing permits. The Six Mile Slough area was, at the same time, administered by the British Columbia Lands Branch using a system of annual leases with the holders of the leases being able to cut hay or graze cattle on the vegetation within the area. Little or no enforcement of trespass grazing took place prior to 1969. No grazing has taken place on the Six Mile Slough area since 1969 when parts of the area were hayed by the lease holders.

The Six Mile Slough area was heavily grazed in 1967 and 1968. In 1968 an ecological mapping study of the area was completed. There has been little change to the overall vegetation since that time except

that the upland grasses have been reduced from 10% to 15% around the edges due to flooding. Because of the relatively small proportion of these upland grasses, a reduction of this kind is fairly significant.

During the 1971 grazing season, nineteen (19) cattle owners used the area for grazing. Only three of these owners were believed to derive their major income from cattle production. The number of cattle pastured by these owners varied from 2 to 140 head of cows, plus calves. The entry date in 1971 was May 22nd, and two hundred head were grazed in the initial period to June 15th. There were up to 450 cows plus calves using this area during the 1971 grazing season. This includes approximately 120 head of trespass cattle. The stocking rate was based on 2422 Animal Unit Months (A.U.M.) but due to the trespass cattle, the actual usage rate rose to 2922 A.U.M. (An Animal Unit Month is the amount of grazing required for one cow, with or without a calf at foot, for a period of one month.)

All cattle entering the areas legally must carry the owner's brand, and each rancher must also have a valid grazing permit for the grazing season

which ends October 31. The grazing permits are issued on an annual basis by the Management Area staff in Creston. Salt and fencing are provided by the Authority. All fees must be paid on or before the 30th day of November for permits for grazing or haying issued in that year. Commencing April 1, 1972 the fee for grazing and a fee based on the estimated tonnage for hay are payable before the appropriate permit may be issued by the Management Area staff at Creston.

The area, vegetation, soil and grazing conditions were observed on August 24 and 25, 1971. The area was covered by foot, airboat and automobile. Pictures of the vegetation were taken at that time and are included in this report. Samples of the vegetation were taken in three locations by field clipping, to determine the species and yield estimates.

Area Data

The Creston Valley Wildlife Management Area is located in the Creston Valley in the southeastern part of British Columbia. The Creston Valley lies in the Purcell Trench south of Kootenay Lake at elevations below 2500 feet, and extends for fifteen miles in length. It is four to six miles in width and

contains approximately ninety square miles or nearly 57,000 acres.

The area is an intermountain valley drained by the Kootenay River and its tributaries. The Kootenay River enters from the south and flows in a north-westerly direction into the Kootenay Lake. The Goat River flows from the Purcell Mountains and enters the Kootenay system south of Creston. Boundary, Corn and Summit Creeks are the major streams entering the valley from the Selkirk Mountains on the west and Duck Creek from the Purcell Mountains on the east. Over one-half of the Creston flats have been reclaimed through various diking systems. All undiked lands are annually flooded and during excessive spring run-offs the reclaimed lands have also in some cases suffered from periodic flooding. The remainder of the land is benchland which is well above the effects of the Kootenay River. Kootenay Lake lies in the northwest edge of the area. Duck and Leach Lakes are two small lakes near the outlet of Kootenay River into Kootenay Lake.

The unreclaimed lands of the Creston Flats consist of a series of sloughs, potholes, marshes, mud-flats and open lakes. These lands consist of approx-imately 20,000 acres of which 9,650 are open water bodies. The 1968 Ecological Mapping study stated the Creston

Valley Wildlife Management Area consists of approximately 1341 acres of grass sedge meadows, 6730 acres of mudflats, 2228 acres of cattails, bulrushes and horsetail, 3708 acres of willow and poplar, 116 acres of upland trees, 5854 acres of water and 203 acres of reclaimed and agricultural land.

Climatic Conditions

The climate of the Creston area is moderate. Summers are warm and winters are cool, but not as cold as the Prairies, with light to moderate precipitation. The surrounding mountainous topography is oriented northwest to southeast, at right angles to the Pacific air masses that move eastward over the region. As a result the local climate is extremely variable from day to day. Average annual temperature at Creston is 45°F. with extremes of -27°F to 103°F over a ten year period. There are between 3025 and 2800 growing "degree days" at Creston and West Creston respectively. There is an average 132 frost-free days at Creston, with a growing season of 214 days. The growing season along the Creston Flats is 15 days shorter at 199 days.

The average annual precipitation on a long term basis has been measured at 18.94 inches. About one-third of the precipitation occurs in the growing season. Snowfall is low to moderate in the valley

bottom, while on the adjacent mountains it is heavy. Creston has an average yearly snowfall of 55.9 inches. Moisture on some of the light textured soil on the benchland is limited during the growing season, while on the Creston Flats sub-irrigation alleviates most of this problem.

Soils

The soils of the area have built up from the following deposits:

1) Alluvial Deposits: These soils, the Gleysolic and Regosolic Orders, were formed by repeated action of river flooding. Medium silt to coarse sand deposits were deposited near the river, and finer sediments were deposited further back. This type of flooding is evident by the large areas of uniform textured soil. These can vary 20 feet in depth, and occur around the 1744 to 1764 foot elevation. Drainage can vary from very poor to well drained. These soils are where most of the cultivated land and good pasture are located.

2) Glacio-Lacustrine Deposits: These deposits occur on the higher bench lands up to 2400 feet in elevation, and were formed during the melting stage of the last ice retreat. The dominant soil here is Grey Wooded, while the coarser textured soils are Brunisolic. A

fair amount of this land has been cleared and is devoted to forage crops, mainly alfalfa.

3) Glacial Till Deposits: These deposits appear to underlie the above soils and only occur on knolls or where the lacustrine deposits have eroded away. These soils which consist of clay, sand, salt, gravel and boulders were formed during active ice movement. These soils often represent the local bedrock.

4) Deltaic Deposits: The only Deltaic deposits found in this area are around the Goat River drainage system. These are stream-bed deposits. The water holding capacity is very low, making irrigation mandatory during the growing season.

5) Glacial Fluvial Deposits: These deposits occur in relatively minor acreage in this area. These deposits are usually well sorted gravel and sand, horizontally bedded. These soils rapidly drain, producing summer drought conditions.

6) Fluvial Deposits: These deposits are found by the action of heavily loaded water. These are usually quite coarse textured. They are non-arable soils.

Most soils contain low to very low levels of nitrogen, which also reflects their low organic matter content. The lowland soils are also deficient in available phosphorus, whereas some upland soils are high in

phosphorus. Very low levels of potassium exist on the alluvial soils, but the uplands have high levels of potassium. Response to fertilizers with nitrogen, phosphorus and potassium is quite positive in the low alluvial deposit soils.

In general, the soils formed by the Alluvial and Glacio-Lacustrine deposits form some of the best arable land in British Columbia. Some of these soils lend themselves to more intensive forms of cultivation than has previously been experienced.

Vegetation:

Vegetation, soil and grazing conditions in the area were observed on August 24th and 25th, 1971. Pictures included in this report were taken at this time. Field clippings of the vegetation were taken to determine species and yield estimates.

Vegetation in the Wildlife Management Area is predominantly sedges. Other species include horsetail, rushes, other aquatic plants including Sagataria or Duck Potato, fescues, Kentucky blue grass, and clovers. Willow, poplars and coniferous trees were also evident beyond the marsh and grassland areas.

The Beaked Sedge (Carex rostrata) is the most abundant species present in the grass-sedge meadows, with the finer grasses being of very little consequence as far as providing a worthwhile percentage of the total

production. The finer grasses do, however, add to the palatability of the grass-sedge meadows.

The Beaked Sedge has a relatively high protein and phosphorous content and a low crude fibre content. It is a fairly palatable sedge for cattle when eaten as hay or graze, but cattle do not enjoy the sedges as much as finer grasses. Sedges are more palatable in the earlier stages of growth, when the finer grasses are also at their best, but the cattle tend to graze the finer grasses and leave the sedges until later in the season.

In Six Mile Slough the predominant species is Horsetail (Equisetum, spp). This plant grows where there is a prolonged period of flooding which nearly eliminates grasses which, though more nutritious, are less tolerant to flooding. Horsetail which is fed in large quantities in hay, or as a major part of a ration, can poison animals. This limits Six Mile Slough for grazing. In 1969 a system of dikes was originated and more are proposed for most of the grazing area. The dikes will allow sections of the area to be drained and occasionally flooded while controlling both the water level and the time of flooding.

Cattle Population and Forage

There are about 2000 head of cows in the

CRESTON VALLEY WILDLIFE MANAGEMENT AREA - AUGUST 24 and 25, 1971.

Site of Yield Sample #2 (See Appendix #4) in Corn Creek. Approximately 1 and 2/10 miles south of Highway #3 Bridge, and 50 rods out to the east at right angles to the West Creston Road. Meadow and Wood Duck houses on poles.

Salting area.

Near site of Yield Sample #2 (See Appendix #4).

CRESTON VALLEY WILDLIFE MANAGEMENT AREA - AUGUST 24 and 25, 1971.

View of the Leach Lake area.

South of #3 Highway Bridge, showing more desirable grasses grazed down right to the edge of 3 foot tall grass-sedge meadow.

Horsetail in Six Mile Slough (north end - east side)

Horsetail in Six Mile Slough (north end - east side)

CRESTON VALLEY WILDLIFE MANAGEMENT AREA - AUGUST 24 and 25, 1971.

Shows overgrazing in choice grasses (Kentucky Blue, Clover, etc.) on higher ground at south end of Corn Creek Marsh area.

Grass-sedge meadow in Corn Creek area where Yield Sample #1 was taken. (See Appendix #4).

Tall growth in grass-sedge meadow, approximately 1 and 3/10 road miles along the West Creston Road, south of #3 Highway Bridge and 120 feet east of the West Creston Road.

immediate area. Pasture for these is very limited and creates a heavy demand for the grazing on the Wildlife Management Area. A Beef Cattlemen's Association has been formed to try and create a larger beef industry in the area. They might be prepared to undertake trials on various grasses, and fertilization to improve the grass-sedge meadows and other native grass areas.

Carrying Capacity Calculations

The present carrying capacity base established by the B.C. Forest Service in 1969 is 2422 Animal Unit Months. The period for grazing is split. This is to allow grazing before the annual high water period. Cattle are supposed to be removed during the period June 15 to July 15. Cattle are then bred at home and, later, returned to the Management Area pasture.

On August 24 and 25, 1971 field clippings were taken to determine the yield estimates for each area. Results were as follows:

Sample Numbers	Location	Green Wt. Per Sq. Yd.	Green Wt. Per Acre.	Dry Matter Per Sq. Yd.	Approximate Dry Matter Per Acre.
1.	Corn Creek Marsh	23.0 ozs.	7.108 lbs.	9.5 ozs.	2873 lbs.
2.	Corn Creek Marsh	37.0 ozs.	11,343 lbs.	16.0 ozs.	4840 lbs.
3.	Six Mile Slough	38.0 ozs.	11,495 lbs.	17.5 ozs.	5293 lbs.

The average dry weight in the three areas was 4335 lbs. per acre at that time.

Research has proven that the average requirement for cows for an Animal Unit Month amount to 22 lbs. per day or 660 lbs. per month of available forage dry matter. (Canada Department of Agriculture Publication # 1319 "Grassland Ranges in Southern Interior B.C." published in 1968.)

Using the test results from clipping trials in 1971, and the known consumption of cows, the carrying capacity of the area may be calculated. Dry matter per acre, when multiplied by the number of acres in the area gives the approximate pounds of available dry matter in each area. Grass-sedge meadow species are generally 75% as nutritious as good upland grasses, therefore a 25% reduction has been calculated. A further reduction of 40% is taken into account to allow a carry over of seed stalks for the next year. It is important that some seed stalks are still standing at the end of the season in order to maintain the vigor and reproduction of grasses in the area.

Each area has been calculated independently, as follows:

Calculation #1: Corn Creek Carrying Capacity

- 4335 lbs. per acre x 445 acres = 1,929,075 lbs dry matter
- 1,929,075 ÷ 660 = 2922 AUMs
- 2922 x .75 x .60 = 1314 AUMs

The Corn Creek area has a total carrying capacity for the season of 1314 AUMs.

The monthly carrying capacity would be $\frac{1314 \text{ AUM}}{6.5 \text{ months}}$ = 202 cows* with calf at side.

Calculation #2: Leach Lake Carrying Capacity

- 4335 lbs. x 127 acres = 550,545 lbs. of dry matter
- 550,545 ÷ 660 = 834 AUMs
- 834 x .75 x .60 = 375 AUMs.

The Leach Lake area has a total carrying capacity for the season of 375 AUMs. The monthly carrying capacity would be $\frac{375 \text{ AUMs}}{6.5 \text{ months}}$ = 58 cows with calf at side.

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* Corn Creek total dry matter was calculated in the preceding table at 3856 lbs./acre. On this basis, the carrying capacity would be only 180 cows. However, because of the small number of field clipping samples taken, it was decided to average the results from all sites. Therefore the figure of 4335 lbs. per acre has been used here.

Calculation #3 - Six Mile Slough Carrying Capacity

- 4335 lbs. x 120 acres = 520,200 lbs. of dry matter
- 520,200 lbs $\div$ 660 = 788 AUMs
- 788 x .75 x .60 = 354 AUMs

The Six Mile Slough area has a total carrying capacity for the season of 354 AUMs. The monthly carrying capacity would be $\frac{354 \text{ AUMs}}{6.5 \text{ months}}$ = 54 cows with calf at side.

Acreages for these grazing areas were determined by a dot grid using the Vegetation Map in the Ecological Mapping of the Creston Valley Wildlife Management Area completed in 1968 by Renewable Resources Consulting Services Ltd. Acreage tables listed in this study could not be used due to apparent inaccuracies which could not be resolved.

Summary of Carrying Capacity

The carrying capacity was calculated on the grass-sedge meadow areas. Grazing in trees and willows in and around the grass-sedge meadows would be additional. Treed areas will provide a certain amount of grazing and should compensate for any loss in yields on the grass-sedge meadows that could be caused by adverse conditions in a given season.

The total number of Animal Unit Months for the Corn Creek, Leach Lake and Six Mile Slough areas for the season is:

1314 + 375 + 354 = 2043 AUMs.

The period from April 15th to October 31st is six and one-half months. Thus a monthly carrying capacity of

$\frac{\text{2043 AUMs}}{\text{6.5 months}}$ = 314 cows with calf at side for this entire period is available.

Recommendations to Improve Range Management in the Corn Creek, Leach Lake and Six Mile Slough Grazing Areas:

A secondary objective of this study is to "evaluate and recommend on alternate husbandry methods and/or sequential techniques for improved use and management of grazing resources in the three marsh areas". These are as follows:

1) Dike System: The proposed dike system should be reviewed to determine the potential for allowing the land to be drained and control flooded. It is conceivable that this would increase the better grasses, and strengthen the overall pasture usage. This would increase the carrying capacity of the

Wildlife Management Area which would, in turn, increase the revenue from grazing.

2) Fertilization: It is recommended that fertilization trials be carried out on the grass-sedge meadows. The soil in this area is deficient in nitrogen, phosphorus and potassium. There is adequate annual precipitation to give a good response to the fertilizer. Fertilizer trials were carried out by J. L. Mason and J. E. Miltimore from the Research Station C.D.A., Summerland, British Columbia on grass-sedge meadows in the Okanagan Falls area. The use of N, P & K fertilizers resulted in double the yields of dry matter of sedges in that area.

Yield response to N, P and K fertilizers on a native sedge meadow at Okanagan Falls, B.C.

Year	Cut	Yield (kg/ha dry matter)				
		Control	NPK	NP	NK	PK
1967	First	2031	4837	4699	3826	2170
	Second	1844	3075	3075	3075	2022
	Total	3865	7912	7774	6861	4192
1968	First	1656	5108	5645	3533	2872
	Second	913	3621	3475	2585	2039
	Total	2570	9030	9120	6118	4911
2-year mean		3223	8471	8447	6490	4552

Responses of this magnitude should provide adequate revenue to compensate for money spent on fertilizer. Research would have to be carried out to assess the amount of fertilizer required and the response obtained before an actual cost-benefit could be calculated.

3) Grass Seeding: Natural seeding of good species of grass takes a long time. In the better grassland areas, native grasses could be supplemented with a mixture of tame or introduced grasses. Reseeding is expected to raise the volume of forage production, and increase the quality.

4) Salting: All salt areas should be located in areas where the less palatable grasses exist. In most areas, this would be in the sedge meadows. This forces the cattle into these less desirable grasses earlier in the season when these grasses are more palatable. These salt areas should be moved during the grazing period, or at a minimum, on a yearly basis. This would eliminate any area from being too heavily overgrazed.

5) Separating the Grazing Areas: For improved management it is recommended that each area, Corn Creek, Leach Lake, and Six Mile Slough be separated by

a fence. This will allow better grazing of each area, and more control over trespass cattle. Fencing would cost approximately $500.00 per mile for material and labor. Due to high flooding, this may not be possible until the dike system is completed.

6) Entry Date: The entry date could be more firmly established if the dike system and area fences were established. Until then, it appears advisable to have this date semi-flexible to allow for a later entry date in case of high water or flooding.

7) Reduced Grazing - Initial Period: It is recommended that the period from date of entry, approximately April 15th to June 15th have a reduced stocking rate to permit the development of a vigorous stand of grasses and sedges. This reduction should be in the order of 25% of the normal stocking rate. In general, a period of time at the beginning of the grazing season when grazing is a little heavier can be considered slightly better than grazing at the normal rate for the entire grazing season.

8) Trespass Cattle: All regulations regarding trespass cattle must be strictly enforced or all of the preceding recommendations will be invalid.

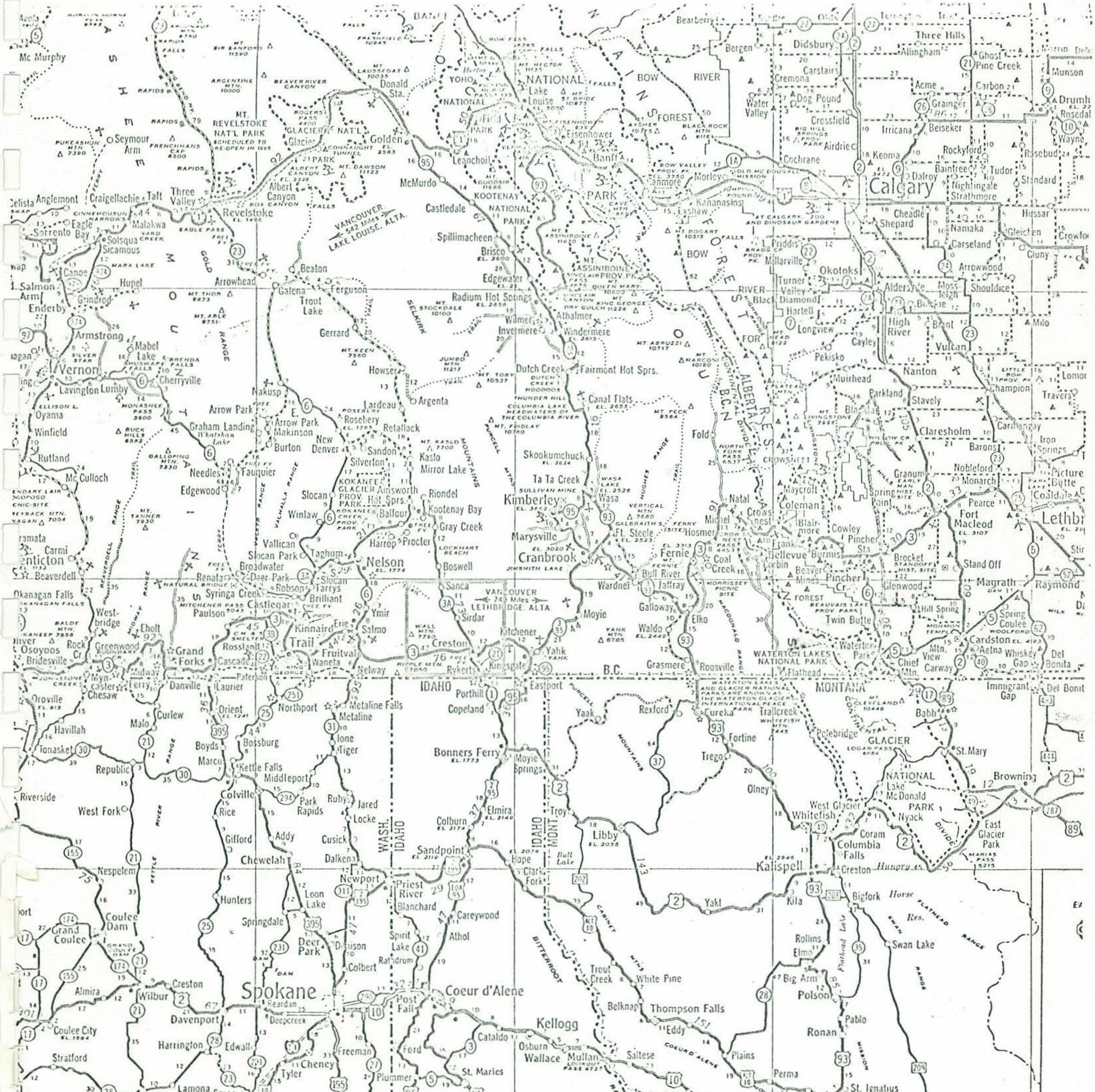
APPENDIX

APPENDIX 1.

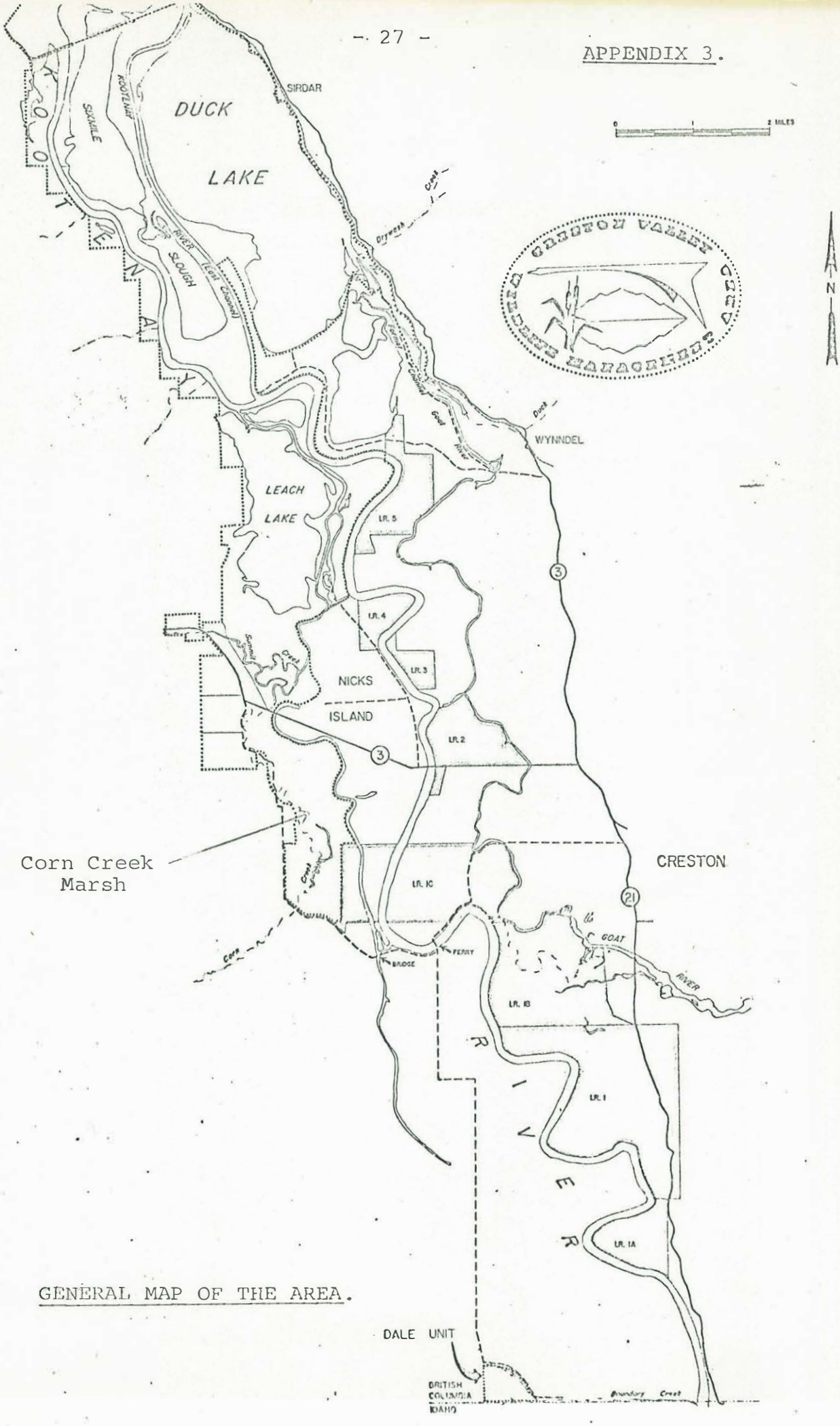
REFERENCE SOURCES

- Soil Survey of the Creston Area by U. Wittneben and P. N. Sprout, British Columbia Department of Agriculture, 1971.
- Management of the Western Range - C.D.A. publication Number 1425 - 1971.
- Range, Its Nature and Use - Lands Division, Alberta Department of Lands and Forests, 1970.
- Range Management Pays - C.D.A. publication # 1382, 1968.
- Grassland Ranges in Southern Interior B.C., C.D.A. publication # 1319, 1968.
- Ecological Mapping of the Creston Valley Wildlife Management Area - Prepared by Renewable Resources Consulting Services Ltd., July 1968.
- Rish Analysis of Weekly Climatic Data for Agricultural and Irrigation Planning - C.D.A. Technical Bulletin # 53, August 1968.
- Temperature and Precipitation Tables for British Columbia Canada Department of Transport, Meteorological Branch, 1967.
- Ninety-nine Range Forage Plants of the Canadian Prairies, C.D.A. publication # 964, 1966.
- Range Management - by George H. Maduram, P.Ag., Alberta Forest Services.
- Alberta Guide to Range Conditions and Recommended Stocking Rates - Alberta Department of Agriculture.

MAP OF AREA APPENDIX 2.

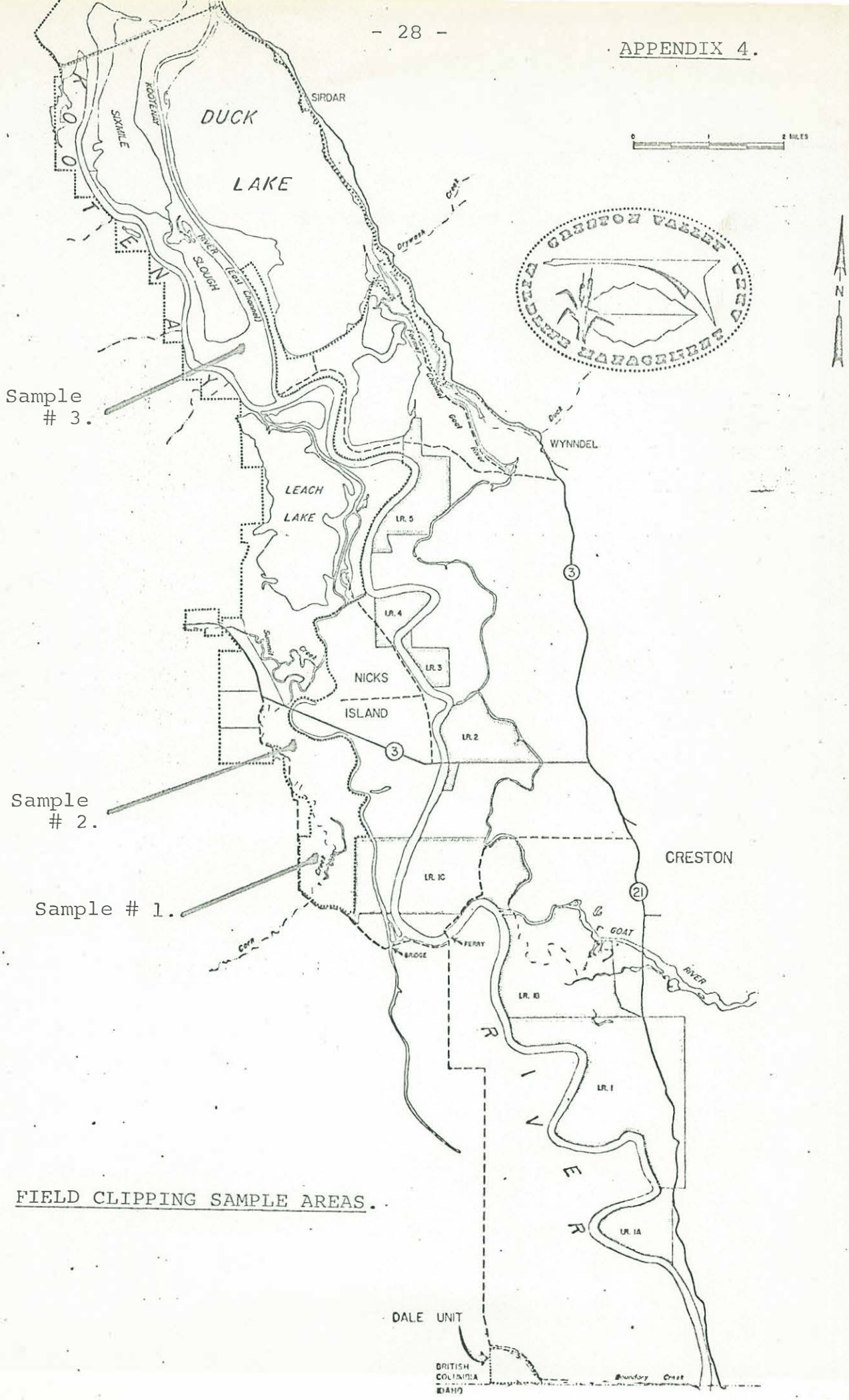


APPENDIX 3.



GENERAL MAP OF THE AREA.

APPENDIX 4.



FIELD CLIPPING SAMPLE AREAS.