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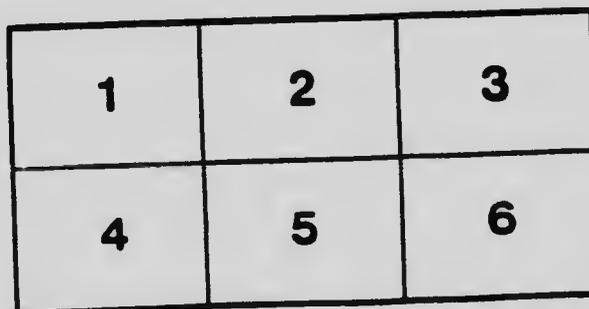
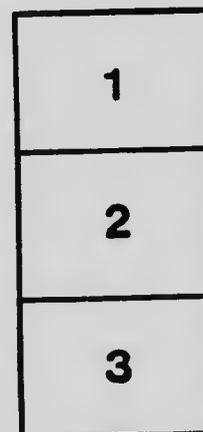
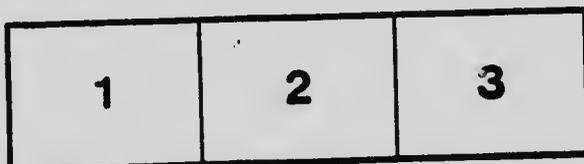
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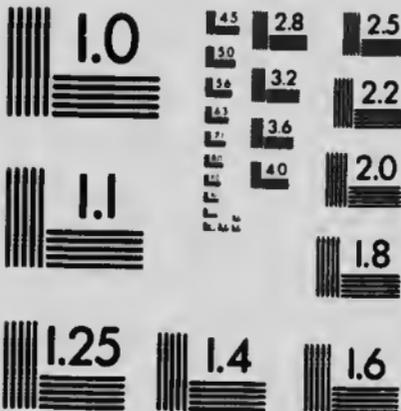
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# Reclamation

CREATION OF AN  
INLAND EMPIRE





# **Kootenay Flats Reclamation**

**IN THE CRESTON VALLEY**

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Project for the Reclaiming of 77,204 Acres  
of Land in the Province of British Columbia  
and the State of Idaho.

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Area in British Columbia, 42,204 Acres  
Area in Idaho, 35,000 Acres

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2—Kootenay Flats in Creston Valley



Portion of the Kootenay Flats in Creston Valley. These Flats are 18 miles long by 5 miles wide.

### LOCATION AND DESCRIPTION.

The Kootenay River has its source in the Canadian Rockies on the eastern border of British Columbia, flows south into the United States, and at Jennings Mountain turns west and into Idaho; thence it flows northward, re-entering British Columbia near Porthill, Idaho. Eighteen miles north of Port Hill, the river flows into the Kootenay Lake, a body of water 72 miles long by from 1 to 5 miles wide. At Procter an outlet to the lake flows west past the City of Nelson, discharging into the Columbia River at Castlegar, B. C. Between Procter and Nelson, the outlet is known as the West Arm of the lake. Two miles below Nelson the rapids begin, and the stream is again known as the Kootenay River.

Above Crossport, Idaho, the Kootenay is a torrential stream flowing through precipitous canyon. At Crossport it emerges upon a flat valley, averaging in width from 2 to 5 miles, which extends due north to the southern extremity of Kootenay Lake. This Valley, which is subject to overflows practically every year in June and July, is a typical flood plain, the banks of the river being from ten to fifteen feet higher than the adjacent lands. The International Boundary Line crosses the Valley at Port Hill, Idaho. The total area of bottom lands subject to overflow between Crossport and the International Boundary is about 35,000 acres, area between this latter point and Kootenay Lake giving 29,732 acres in British Columbia. When the flood water recedes it looks like an Empire. This bottom land is practically free from timber except for the narrow strip of woodland fringing the river banks, and forms a large, continuous area of rich, alluvial land lying in the heart of a mountainous region, containing numerous towns, mining and lumber camps, which constantly demand large supplies of agricultural products.

### CLIMATE.

The elevation of the bottom lands is from 1,755 to 1,770 feet above sea level. Owing to this elevation the warming effect of the large body of water contained in the lake, and the fact that it is located on the western slope of the continental divide, the climate is much milder than would be expected in this latitude. The summers are cool and pleasant, and the winters comparatively mild. The mean monthly temperature ranges from 24 degrees for December and January to 74 degrees for August, with a mean average of 45.5. Occasionally, during August, the thermometer will register as high as 95 degrees, but only for a short time. In December and January it sometimes falls to 10 degrees below zero, but these extremes are unusual. The mean annual precipitation, well distributed throughout the year, is about 28.95 inches.

## AGRICULTURAL CONDITIONS.

The soil is a sandy loam of alluvial origin and is quite uniform in texture. The lower lands or marshes that are wet throughout the year contain considerable more humus than do the higher knolls and river banks. Low-lying soils usually are acid in character, but the soil of the Kootenay Valley is peculiar in that it is distinctly alkaline, and contains a large amount of lime and magnesia in carbonate form. Such land cannot become sour, but at the same time is free from alkali to any injurious extent. Analysis of the soils have been made, samples being taken from the river banks, higher meadow lands and the low meadow or marsh. The more important elements of plant food, calculated in pounds per acre foot are given in the following table.

## CONTENT OF KOOTENAY VALLEY SOIL.

Element.	River bank.	High meadow,	Marsh, wet
	Surface Foot.	wet only during flood stage. Surface Foot.	throughout the the year. Surface Foot.
	Lbs. per acre.	Lbs. per acre.	Lbs. per acre.
Potassium (K) . . .	15,750	13,125	13,500
Calcium (Ca) . . . .	225,000	240,000	32,400
Magnesium (Mg) . .	66,000	72,000	19,980
Phosphorous (P) . .	4,125	4,875	4,230
Nitrogen (N) . . . .	6,750	3,375	33,600
Humus . . . . .	49,875	22,875	79,200

Amounts of the above elements required to produce a crop of the size indicated.

Crop.	Size.	Potas- sium.	Cal- cium.	Magn.	Phosph.	Ni- trogen.
Wheat, grain	50 bush.	13	11	4	12	71
Wheat, straw	2½ tons	45	10	4	4	25
Total . . . . .		58	21	8	16	96
Oats, grain	100 bush.	16	2	4	11	66
Oats, straw	2½ tons	52	15	7	5	31
Total . . . . .		68	17	11	16	97
Clover hay	4 tons	120	117	31	20	160
Timothy	3 tons	71	..	..	9	72
Potatoes	300 bush.	99	..	..	13	63
Sugar beets	20 tons	157	..	..	16	100

In seasons when the rise of water has not been great, considerable amounts of grain, potatoes, ensilage and other crops have been grown on the more elevated lands, while the rest of the bottom lands after the high water, support for the most part a luxuriant growth of wild hay of which many hundreds of tons are harvested every season. A considerable area is given over to grazing which is free on the Canadian side, and several thousand head of cattle and horses find pasture in the late summer and fall. Practically the whole of this area is ready for the plow, and, if protected from floods, would be especially suitable for agriculture owing to the favorable climatic conditions, exceeding fertility of the soil and contiguity of markets. South of the Boundary Line, several thousand acres of this land have been cropped for the last twenty years, yielding enormous crops of grain, potatoes and other hoed crops.

### THE DRAINAGE PROBLEM.

As already stated, the lands flood more or less every year for about 5 weeks in June and July. The existing flood conditions are due, firstly, to breaks in the river banks, causing the flooding of considerable local areas as the river rises, and, secondly, to the high water stage of Kootenay Lake. The river banks now average about ten feet higher than the adjacent lands and judging from records of the past twenty-three years, floods of such magnitude that the river channel is not sufficient to carry the water occur about once in every three years. Where streams enter the river channel the water from the river flows out during the flood season, backing up the streams and flooding the low lands. In some years much land could be reclaimed and cultivated to profit if these natural openings and breaks in the river banks were closed, and the streams leaved from the river to the foot hills. The high water stage of the lake is caused by the incapacity of the present outlet during flood conditions, resulting in the ponding of a certain amount of inflow; this ponding constantly growing up to the time of extreme flood. The outlet from the lake is an arm of the lake itself for some twenty miles, when a series of rapids commences, the grade being increased to such an extent as to pass away the water as it comes. Except at four points the arm of the lake varies from a quarter of a mile to a mile in width. Contractions at these four points greatly reduce the capacity of the channel, but are not sufficient in themselves to cause the extreme rise in the lake of from 18 to 20 feet. The main obstruction is to be found in the natural dam forming the rapids below Grohman Creek. This natural dam has, no doubt, been caused by the wash brought down by this creek in past ages. The larger portion of the flats are at an elevation of from 1760 to 1767, corresponding to a rise of from 4 to 11 feet of the lake, and that every subsequent foot of rise increases the flooded area to only a comparatively small extent. It is not only necessary to prevent flooding, but also to ensure that the water does not rise so close to the surface as to procure

## 6—Kootenay Flats in Creston Valley

soggy and cold land, which although free from surface water would be unfit for cultivation. Partial reclamation is, therefore, not to be thought of; not alone for this reason, but also because numerous dykes and internal pumping plants would have to be built and maintained. Because of the high banks of the river which slope off rapidly to the elevation of the marsh, it would be necessary to place these dykes directly on the river banks where they would be exposed to the scouring action of the swift current. Under present conditions the river banks cave quite rapidly at critical points, and with the flood water confined between dykes and burrowing animals weakening the structures, it is improbable the levees would long withstand the erosive action of the currents, especially at the bends of the river. Thousands of dollars have been wasted in constructing levees on the banks of alluvial streams under similar conditions. Where earth levees are used to control rivers they invariably should be set back at a sufficient distance from the river banks to render them safe from the effects of erosion and caving banks. Failure of levees are quite common, even where the flood-way area is considerable. Partial reclamation by means of levees is the system on which several other attempts on this project have been concentrated, and apart from the unsatisfactory results as regards the area possible to be reclaimed, in view of all the conditions partial or complete reclamation by means of dykes is not to be thought of.

### COMPLETE RECLAMATION.

Complete reclamation requires the carrying away of all flood waters as soon as they have found their way into the lake. The surface of the lake must be kept at such a level as to allow of natural drainage from all or nearly all the low-lying lands without interfering with the low water stage of the lake. The west arm of the lake is the only apparent and natural drain for the lake and watersheds supplying the lake. The Kootenay Lake and its outlet are to be considered in the nature of a reservoir with an outlet emptying over a natural dam into a lower basin, from which the water is carried away by a natural channel. This natural dam at Grohman Creek, or First Rapids, consists of boulders massed across the river, and forming a crest over which the flood waters flow, with three narrow channels at low water.

This dam prevents the lowering of the surface of the lake further than the level of its crest, and is, therefore, to be considered the principal factor in the projected scheme of complete reclamation. Some further obstructions are also to be found along the West Arm. There is little difference between the elevation of the lake surface and the West Arm surface at Nelson at low water, but as soon as the water rises, the Arm takes the character of a range of lakes, one lower than the other, connected by narrow channels. This condition is brought about by contractions of the Arm causing obstructions

at the following points indicated in red on the accompanying map; the Outlet, the Narrows, Harrop Channel, Thirteen-mile Point, Nine-Mile Point and Luna Park Channel. The removal of these obstructions, other than at the Narrows and the Luna Park Channel, is not absolutely necessary for the purposes of reclamation, but the benefits to navigation, wharfs and landings would be such that it would no doubt be worth while undertaking excavations at all the points named, whether it would be essential for reclamation or not. Complete reclamation would appear, therefore, to rest on the removal of the obstructions at the Narrows, Luna Park Channel, and the natural dam at Grohman Creek, otherwise called First Rapids. This natural dam, however, controls the lake level at low water as well as high water. The lowering of the low water stage of the lake is not desirable from either the standpoint of reclamation, or present existing industries, or navigation, so that when removing the natural dam we must replace it with a constructed dam with movable gates through which the flood waters may be released in the desired quantity sufficient to confine the rise of the lake to a certain maximum. It would be necessary that this controlling dam should be built and in operation before any disturbance of natural conditions at Grohman Creek or points on the West Arm could be permitted. Nothing but benefits from these contemplated works could accrue to the towns and industries on the shores of the lake, which have all, more or less, suffered in the past from the high-water stages. On the West Arm the removal of obstructions to navigation, and excessive currents would be of great benefit to all, while at the City of Nelson a large area of level land, at present flooded at a few feet above low water would be permanently reclaimed, adding considerable acreage to the waterfront. No very difficult engineering features are represented anywhere, except it be at First Rapids, and it may safely be considered that the work can be done in two years once the controlling dam is built and in operation.

### CLIMATIC CHANGES.

Something has been said as to the changes in climatic conditions which might be brought about by the reclamation of these lands. There is a possibility that with the change in natural conditions there will be a change in climatic conditions, but it is not anticipated, nor is it reasonable to presume that any such changes will be detrimental to the district. During the flood season there is an enormous evaporation. Under the changed conditions there will naturally be a great decrease in such evaporation. This change will not however affect the general precipitation in the district as the evaporation causing the precipitation in this district has its origin much further west. In draining off the stagnant water, thereby getting rid to a large extent of the mosquitoes, there will be very beneficial effect.

8—Kootenay Flats in Creston Valley



This crop of Ensilage was grown on the Kootenay Flats on a portion which did not overflow that year. 10 acres were planted and the yield was 40 tons to the acre.

The Climatological Service of the Weather Bureau, U. S. Department of Agriculture, in considering the effect of reclamation on climatic conditions report as follows:

"It has never been shown that the construction of reservoirs, the irrigation of large areas or the reclamation of swamp lands has had an appreciable effect upon the climate. It is believed that its effect on the precipitation of the locality will be too slight to be appreciable and would cause no noticeable change in any climatic feature of that region. The precipitation in the lower Kootenay Valley results from the same general causes as that of the entire North Pacific slope. The moisture that is precipitated is mainly carried hundreds of miles by upper air currents."

#### **PREVIOUS ATTEMPTS AT RECLAMATION.**

Previous attempts at both partial and complete reclamation have been made in the past. In the year 1885, Mr. W. A. Bailie-Grohman secured a concession from the Provincial Government to reclaim these lands. His plan was first to divert the Kootenay River into the Columbia at Canal Flats at which point the two rivers are less than 1 mile apart. A canal connecting the two waterways, with lock gates, was built, but the plan was never put to the test. At that time the Canadian Pacific Railway were building their main line into the Columbia Valley in accordance with the surveys which did not consider the possibility of the diversion of the run-off from about 1825 square miles of the Upper Kootenay River watershed, into the narrow gorges through which the Columbia flows. The proposed turning would have necessitated changes as great as they would have been costly, and the Provincial Government, on the protest of the railway company, recognizing the mistake which had been made in granting the concession, immediately annulled it. After the abandonment of this method of reclamation, Mr. Bailie-Grohman began excavation work at Grohman Creek, but this later was given up, Mr. Grohman realizing, as he says, that he had bitten off more than he could chew. In 1893 an English company, known as the Alberta and British Columbia Exploration Co., Ltd., to which Mr. Bailie-Grohman had turned over his concession, misled by incompetent advice, based on insufficient data, abandoned altogether the widening of the outlet, and expended considerable sums in an attempt at partial reclamation by means of dykes. The levees constructed were of insufficient size and cross-section, and were crevassed in numerous places by the first flood. For many years interest has been displayed in the drainage of the Kootenay Valley, both in Idaho and British Columbia, and a number of reports have been submitted, but, as a rule, the conclusions have been based on insufficient data.

### THE KOOTENAY FLATS

The total area contained in the bottom lands of the lower Kootenay Valley is about 77,204 acres divided into two portions; that in Idaho and that in British Columbia. In the latter we have an area of 42,204 acres which is divided up as follows:

	Acres.
1. Land directly reclaimed by the disposal of flood water . . .	16,250
2. Sloughs and lakes to be reclaimed by constructed drainage channels after disposal of floodwater . . . . .	4,114
3. Reclamation farm . . . . .	7,705
4. Indian Reserve . . . . .	1,663
5. Lands at north end Kootenay Lake and along West Arm (approx.) . . . . .	3,500
6. Lakes and sloughs considered unreclaimable as yet . . . . .	6,427
7. Kootenay River and other channels. . . . .	2,545
	42,204

Of this total we can consider only Nos. 1, 2, 3, 4 and 5 as reclaimable, and, therefore, able to contribute to the cost of reclamation; a total of 33,232. Of this 20,364 acres is held by the Crown in the right of the Province of British Columbia, the balance being held as aforementioned in the Reclamation Farm owned by the Alberta and British Columbia Exploration Co. Ltd.; lands at north end of lake and along West Arm alienated from the Crown, and the Indian Reserve. In British Columbia there is a Drainage Act entitled "An Act respecting the Drainage, Dyking and Irrigation of Lands, Chap. 18, 1913," under the terms of which the majority in value of the owners may petition for the formation of a drainage district with powers to assess all lands within such district according to the benefits to be received from such proposed drainage works. The question has arisen as to whether the Indian lands could be assessed or not. In 1914 the Royal Commission on Indian Affairs for the Province of British Columbia investigated the situation, and recommended the Government of the Dominion of Canada contributing on behalf of the Indians, pro rata to any work of reclamation of Valley lands.

In Idaho the area is about 35,000 acres as given by the Department of Drainage Investigations at Washington, D. C. With the exception of some 6,000 acres of Indian lands, the whole of this area is alienated from the State. A Drainage Act, similar to that enacted in British Columbia, is provided, with power to spend the whole or any portion of the money raised under the assessments, in a foreign country, so that the lands in Idaho are thereby enabled to contribute to the cost of reclamation works, beneficial to Idaho lands, which might be carried out in Canada.

The legal machinery is, therefore, already in existence on both sides of the line for the formation of a drainage district, the assessment of lands to be benefited and the carrying out of the proposed works.

In 1912 the Government of the Province of British Columbia began an investigation into the causes of the flooding of the bottom lands, and the feasibility of reclaiming them. Some twenty thousand dollars was expended in this survey work and sufficient data gathered to determine the feasibility of the project. Further information has yet to be gathered. In 1915, and the following year, an investigation into the flood control and drainage of the lands in Idaho was made by the Bureau of Drainage Investigations, Department of Agriculture, at Washington, D. C. In September, 1917, an International Drainage Conference was held at Creston, B. C., which was attended by a large number of interested people from Idaho and South Eastern British Columbia, as well as by two ministers of the Provincial Government and Provincial, Dominion and Federal engineers. The Hon. T. D. Pattullo, Minister of Lands for the Province, speaking at this meeting said:

**"The scheme merits thorough investigation, and if the data thus assembled warrants undertaking the project, the Government will carry it out."**

The Hon. John Oliver, Minister of Agriculture for the Province and then acting Premier, said:

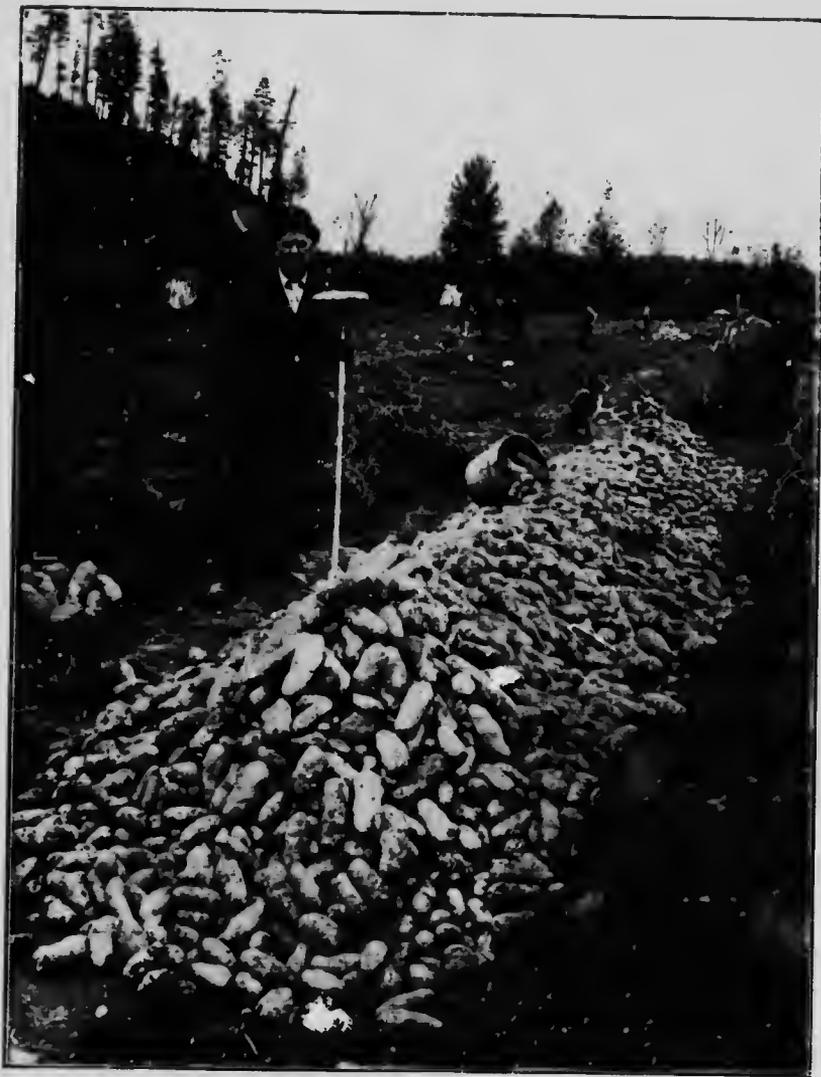
**"If the practicability and feasibility of the undertaking is demonstrated, then it is up to this Government, or any other government, to get on with reclamation."**

In October a joint meeting of all the engineers was held at Nelson, B. C., when plans were made to continue investigations along certain defined lines during the coming summer in both Idaho and British Columbia.

These reclaimed lands would be admirably suited for community settlement. The rehabilitation of the returned soldier will become after the war, one of the greatest and most costly of provincial problems. Here the returned soldier, weakened by months of trench warfare, would find climate, social, and general agricultural conditions such that relaxation and labor would be under the most congenial and profitable conditions.

### BENEFITS TO THE PROVINCE.

There is no project in the southern interior which would have such far-reaching effects as the reclamation of this great area. The process of reclamation has been in operation through this province for many years. Large areas are being reclaimed from timber, stumps or stones; other districts are being reclaimed by irrigation. In this case our immediate problem is to reclaim this large area from overflow for a period of five or six weeks. There need be no particular difficulty in the settlement of the land afterwards, and bringing it at once to a state of production. Once this flooding is prevented, the tractor with the gang plow can start on the first furrow. The fertility is such that enormous production will follow, and the situation as one continuous area in the heart of a populous portion of the province with large powers of consumption and purchase assures a market for the whole production. There is no similar area in the province of like fertility and so favorably situated which can be brought under production with as little cost as this. In normal times we are importing some twenty-five million dollars per annum of agricultural produce into the province. What proportion of this is used in the Kootenays may not be known, but it is safe to assume that once this land is under production the needs of south-east British Columbia in agricultural products can be taken care of. The agricultural possibilities of these lands is one of the greatest potential assets of the Kootenays, but these possibilities cannot be realized except by advance expenditures of considerable sums not usually required in agricultural development. We can never meet our indebtedness to our sister provinces, or other parts of the world, unless we produce. We can never develop the province towards its needs unless the State will take up the larger schemes. Such a problem as this should be taken up and carried through to completion by the Provincial and Dominion Governments acting in unison with the governments of the United States and the State of Idaho, and now when the governments and peoples of both these countries are closer together than at probably any previous time in history, surely it is the psychological moment to act. The project is a big one, but it should not be left to languish because of its magnitude, and the fact that private enterprise apparently cannot adopt itself to development on such a scale. Successful land settlement, especially when the cost of development is relatively high, as is the case with our logged-off lands, demands that payments for the land shall be distributed over a long period of years, a consideration not attractive to private enterprise. It is not sufficient that the State should shirk its responsibilities in such a project, on the ground that without special consideration we can provide for the settler after his arrival somewhere upon the millions of acres of vacant lands in other portions of the province. Even though the settler does find such a location, it is not likely to be of such a character as to confer upon either the settler or the State the maximum benefit, and anything



This tract of land, situated on the Kootenay Flats, was reclaimed by dykes and planted to Burbank Potatoes without any other treatment to the ground, either before planting or during growth, than a first ploughing. This was a virgin crop and yielded 520 bushels to the acre. The Potatoes were of good grade, except that they were a little too large, averaging about Twenty-One Ounces each.

#### 14—Kootenay Flats in Creston Valley

short of such maximum benefit in these times of world shortage, when production is so badly needed is inexcusable, if otherwise it could have been obtained.

#### CONCLUSION.

Land is, in the last analysis, the basis of all wealth, and if after the economic feasibility of this project shall have been definitely established by careful investigation, the several governments concerned are unwilling to show their faith in the development of this western country by giving it some measure of practical support, then indeed there exists no moral justification for encouraging settlement or expecting outside or inside capital to assume the burdens of development. Ever and always the primary problem of State development has been to create conditions that will make it possible for many individuals to dwell in peace and plenty where only a few have dwelt before; to so conserve and administer our natural resources as to serve the purpose of maximum use with a minimum of loss, and to reclaim our waste places for commerce and industry that will serve the needs of an ever-expanding population. Throughout all time agriculture has been the leading industry, and whatever makes for a better and broader agriculture makes equally for a broader and better civilization. It is just as legitimate, and no more socialistic that the reclamation and agricultural development of these lands should be sponsored by our governments, than that railroad development should be encouraged by cash subsidies, land grants and bond guarantees as has been done heretofore in this Province and throughout our Dominion.

It is believed that the lands can be reclaimed at a cost of about \$25 per acre. Such an expenditure would reclaim a large proportion of the acreage, which could then be brought into production. In succeeding years expenditure would need to be made on internal drainage works on the flats themselves until finally the whole area would be reclaimed and placed under cultivation. After the construction of the controlling dam, which would probably mean a charge of about \$6 per acre, it would be advisable to carry out the work in stages, at first expending a sum equivalent to only a small charge per acre and noting the effect on the high water. The information thus gained will be of value in determining future works and their carrying out in every succeeding stage. The Hon. John Oliver, Minister of Agriculture for the Province of British Columbia has expressed himself as of the opinion that reclamation would be an economical proposition at \$75 per acre. It is considered that a conservative valuation of this land when reclaimed, based on its productiveness, would be \$200 per acre. Without doubt, these lands will stand for a very high reclamation charge in the course of years, but it is of the utmost importance that such charges should be levied so that production may be able to meet them as they fall due, after making all allowances for crop and other failures incidental to farming and beyond control by the human agency.

*Fertile as the Delta of the Nile—15*

Average precipitation . . . . .	Inches.
Rainfall . . . . .	28.95
Snow . . . . .	20.55
	84

Elevation of Kootenay Flats, 1760 to 1767 feet above sea, corresponding to rise of 4 to 11 feet of lake.

Average rise Kootenay Lake . . . . . 18 to 20 feet.

Rise of Kootenay Lake, 1894 (highest flood known, 32 feet.

Area of Kootenay Lake, 112,000 acres (approx) 72 miles long by 1 to 5 miles wide.

Drainage area Kootenay Lake, 22,600 square miles.

**Kootenay River—**

Length in British Columbia . . . . .	263 miles.
Length in United States . . . . .	125 miles.

Drainage area in Canada . . . . .	388 miles.
Drainage area in United States . . . . .	19,885 sq. miles.
	5,047 sq. miles.

19,885 sq. miles

Maximum discharge Crossport, Idaho, flood, 1916, (second highest flood known), 126,000 sec. ft.

Width, 600 to 800 feet.

Depth, 50 to 100 feet.

Average height of banks above low water, 25 to 30 feet.

Average height of banks above bottom lands, 10 feet.

Length of channel, Crossport, Idaho, to Kootenay Lake 1.9 times the length of the Valley.

Estimated lowest outflow, Kootenay Lake, 6,000 sec. feet.

Average winter months, 9,000 sec. feet.

**Kootenay Flats—**

Acreage in Idaho . . . . .	35,000
Acreage in British Columbia . . . . .	29,732

The Kootenay Lake and Kootenay River, which winds through these lands, and is navigable by large lake steamers, would provide transportation for such of the agricultural products as would find a market in the several lake towns and the many mining and lumber camps tributary thereto.



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Calgary, Alta.



**KOOTENAY  
WATERSHED.**

CANADA  
UNITED STATES

Columbia

Kootenay Flats

KOOTENAY RIVER

Furber

KOOTENAY RIVER

Salmon

Snake

Walla

Walla

KOOTENAY

RIVER

