AN EXPERIMENT IN VEGETATION CONTROL BY WATER LEVEL MANIPULATION AND CONTROLLED GRAZING
CRESTON VALLEY WILDLIFE MANAGEMENT AREA
and
INDIAN RESERVE LANDS, CRESTON, B.C.

NOVEMBER 15, 1968.

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D. D. Moore.

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The Problem

Large portions of the Lower Kootenay Indian Reserve marsh lands near Creston, B.C. are covered with dense, contiguous stands of bulrush (Scirpus acutus L.) five to six feet high. Only a small portion of the total area presently contains vegetation types suitable to cattle or wildlife, or both, because water levels within these marshes fluctuate up to 12 feet. The peak level is in mid-June, and water recedes gradually as winter approaches. In wet summers water remains in most parts of the marshes but even the deepest potholes go dry in August with prolonged hot weather. Livestock graze and waterfowl nest successfully only on the highest ground during peak run-offs. Flooding each spring keeps present muskrat numbers far below those which might otherwise be expected. Vegetation suitable for grazing is destroyed by silting.

As water levels fall, the marshes are productive for a short period. Livestock graze the area exposed by receding water but rapidly growing bulrush soon forms a barrier to grazing. Waterfowl broods utilize the small open water areas until they are over-grown with emergent vegetation. Upland vegetation rarely invades the dense emergent stands or pioneers the mud flats which appear during early fall. Little open water is available as an attraction to waterfowl during the hunting season. The limited water areas are surrounded by vast stands of tall dense reeds. As a result, few hunters frequent the area. Muskrats move to the few remaining water areas available during the late fall but muskrat survival is low as those potholes usually freeze to the bottom by early winter.

Optimum utilization and greater economic return from grazing, wildlife and recreation would be realized when water levels and vegetation are managed.

The Area

An experiment is proposed to manage vegetation and water levels. The experiment or demonstration will be conducted on Indian Reserve 1A, Lot 9997, which is a part of the lands presently under lease for waterfowl management by the Canadian Wildlife Service. The area is approximately one and one half miles north of the Canadian Customs port of Rykerts. This site was chosen for the ease of water supply and minimum dyke requirements. Included within the proposed experimental unit are 100 acres of private land.

The parcel is a C-shaped piece of marsh land (Figure 1, Page 7), 500 acres in size, with a total perimeter length of 4.6 miles, 2.7 miles of which border the Kootenay River. Table 1, Page 10, shows acreages of the experimental unit within each of six, two-foot contour intervals. The lowest land elevation is just below 1752.0' a.s.l.; the highest is 1764.0', along the river bank.

The predominant vegetation types within the experimental area include bulrush (Scirpus acutus L.) with an understory of cattail (Typha latifolia L), cattail and poplar and willow with an understory of grass and sedges. Suitable grazing area within the experimental unit presently totals not more than 135 acres. Table 2, Page 11, lists the acreages of vegetation types. Figure 2, Page 8 , shows the distribution of vegetation over the area.

Present Values

The Indian Reserve is grazed through a system of applications and permits

administered by the Lower Kootenay Indian Band. Approximately 45 head grazed the fenced section of the experimental unit between late June and November 1, 1968, yielding $125 to the Band.

Daily and seasonal waterfowl hunting permits for the Indian Reserve marshes are now sold by the Band. As nearly all of the hunting takes place north of the experimental unit, a maximum recreational value of $20 could be assigned the unit for 1968.

Muskrat harvests from the experimental unit have been nearly non-existent over the past two years.

The Experiment

The experiment is designed to reveal the beneficial effects of controlled grazing and managed water levels, applied jointly, on dense stands of the bulrush - cattail vegetation type. Rank, emergent vegetation will be removed and replaced by native species of grasses and sedges. Once established, these plants will materially increase the grazing potential of the experimental unit. With the timely application of the correct amounts of water, the openings created by grazing in the bulrush stands will attract waterfowl during the gunning season. The deeper water will ensure winter survival of muskrats.

These techniques will have application to the other marshes within the Creston Valley.

The area will be enclosed with three short, low dykes (total length 1900') having a top width of 12 feet to permit vehicular travel with a top elevation of 1760' a.s.l. The dyke slopes will be 5:1 and shall be planted

with suitable vegetation only if required. The northernmost dyke, a suitable access route, may be gravelled to a depth of 6 inches if necessary. Approximately 33 yards of gravel would be required. A dragline will be required for dyke construction. Dyke construction costs are based on $.50 per cubic yard.

The three dykes, if constructed during February or March, would prevent flooding from both the Kootenay River and the adjacent marshes to the north.

To permit the application of water enhancing wildlife and recreational values, a pump is required. The most suitable pumping source is the Kootenay River which would usually have its lowest silt load in the fall, when water for flooding is required. The trailer-mounted, diesel-powered pump would be placed on the river bank dyke. Ditching (150') is required for its installation and operation. A pumping capacity of 226,000 g.p.h. is required to fill the experimental area to the 1754' contour in 30 days. The maximum head is 16' (1760' - 1744') as determined from available Kootenay River water level data.

Water removal is most easily accomplished by gravity. An 18", 46' long, corrugated steel culvert having a capacity of 12 c.f.s. (7 f.p.s.) will be installed through the northernmost dyke. The elevation at the culvert top is 1750' a.s.l. A simple flap gate at the southern end of the culvert would prevent water loss. The culvert would drain the unit in 21 days when water levels on the north side of the dyke are lowest (Figure 3, Page 9).

Cattle will be used to graze and trample 25 acres of contiguous bulrush stands enclosed by a fence. Cattle will be donated for the purpose of the experiment. Drinking water and salt, will be provided. Fifty animals will be placed within the enclosure for a period of 2 to 3 weeks and daily observations,

visual and photographic, made of the vegetation removed.

Experiment Requirements and Timing

The Lower Kootenay Indian Band must approve the experiment by a Band Council resolution prior to any construction.

A dyke easement is required from Kootenay Forest Products for the construction of the south dyke.

A water licence may be required from the B.C. Water Rights Branch for pumping.

Dyke construction and culvert installation will begin during mid-February, 1969. These activities will require approximately 20 days. The work will be contracted.

The 25-acre cattle enclosure and facilities for watering will be built by local labour at the same time dykes are constructed. Members of the Indian Band may be employed for this labour.

Cattle, obtained from local farmers on loan, will be placed in the enclosure on April 1, 1969. They will be removed 14 to 21 days later, the length of time being dependent upon the rate of bulrush removal. The grazing on the remainder of the unit will remain as in 1968; i.e. 45 head for 4.5 months.

The pump, being portable, can be installed immediately prior to the commencement of operation on August 15, 1969. The 150 foot ditch between the Kootenay River and the pump site (the river dyke, Figure 1) will be dug in early August. Continuous operation of the pump for 30 days will result in a water

level of approximately 1754' over 200 acres. Pumping will be necessary during September, October and November at the rate of 5 days per month to maintain a constant water level.

The culvert in the north dyke will be opened on the 15th of March, 1970, to permit the drainage of the unit.

Table 3, Page 12, summarizes the costs of the experiment. Table 4, Page 13, presents the costs and benefits capitalized over a 20 years period at 6 per cent. The cost-benefit ratio is extremely favourable.

The Future

Since water levels can be managed, many combinations of future utilization patterns exist.

Continued vegetation removal through grazing can be practiced until an optimum vegetation pattern exists.

The area might be cross-fenced permitting grazing rotation. Irrigation and fertilization practices can be followed to advantage with a substantial increase in grazing capacity of the land.

The area can be readily planted to forage and other crops. A rotation of planting, grazing and flooding is visualized.

The demand for hunting and the value returned to the Indian Band through the sale of permits and guiding could well exceed the grazing-forage production value in the future. Such a demand would dictate a nearly continuous flooding scheme.

FIGURE 1

The experimental unit including Indian Reserve IA showing proposed dyke locations, contours and the area to be flooded.

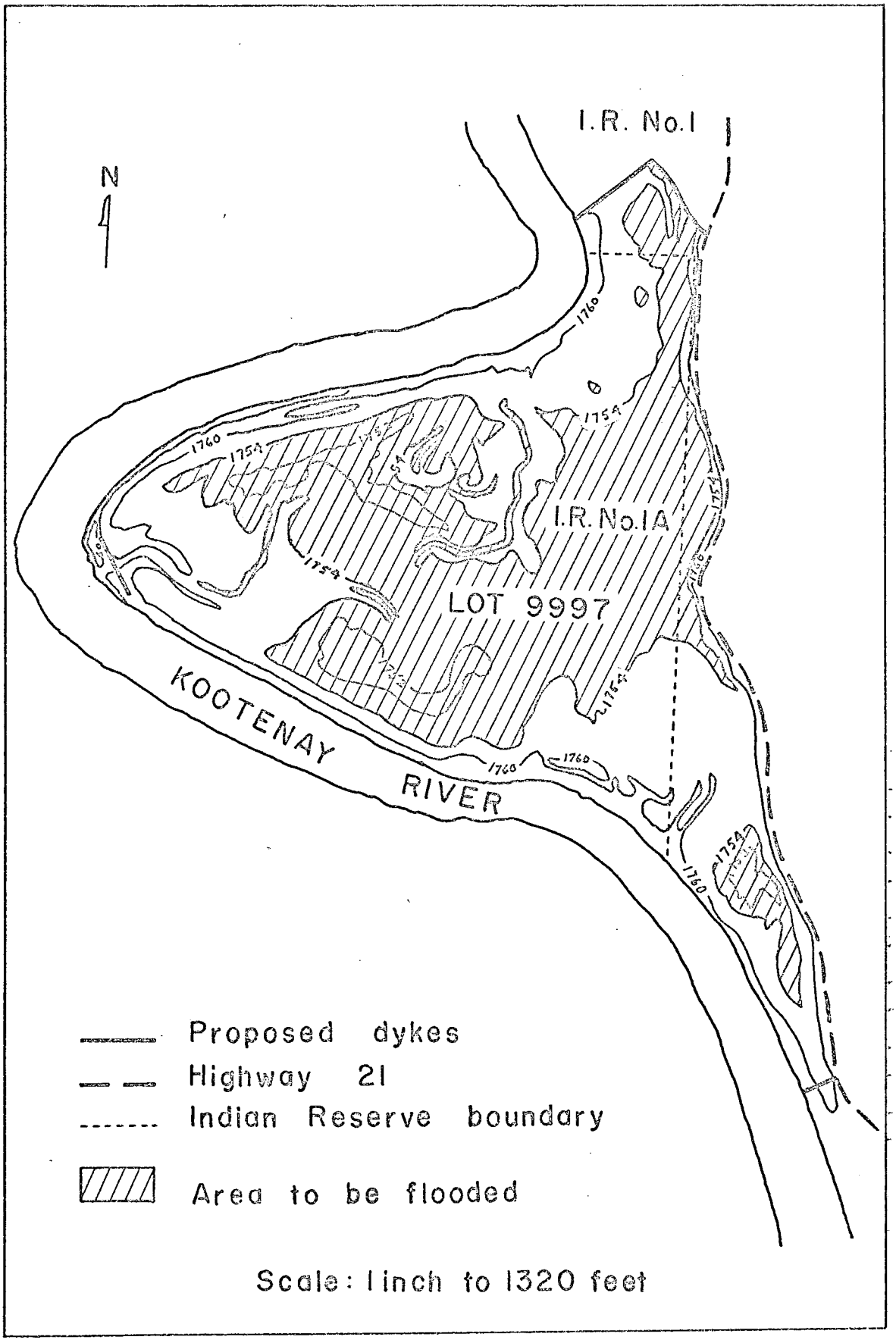
I.R. No.1
N
1760
1754
I.R. No.1A
LOT 9997
KOOTENAY RIVER
Proposed dykes
Highway 21
Indian Reserve boundary
Area to be flooded
Scale: 1 inch to 1320 feet

FIGURE 2

Six vegetation types, mud flats and water areas within the experimental unit. The cattle enclosure is shown.

Data from Renewable Resources Consulting Services Ltd., Edmonton, Alberta, July, 1968.

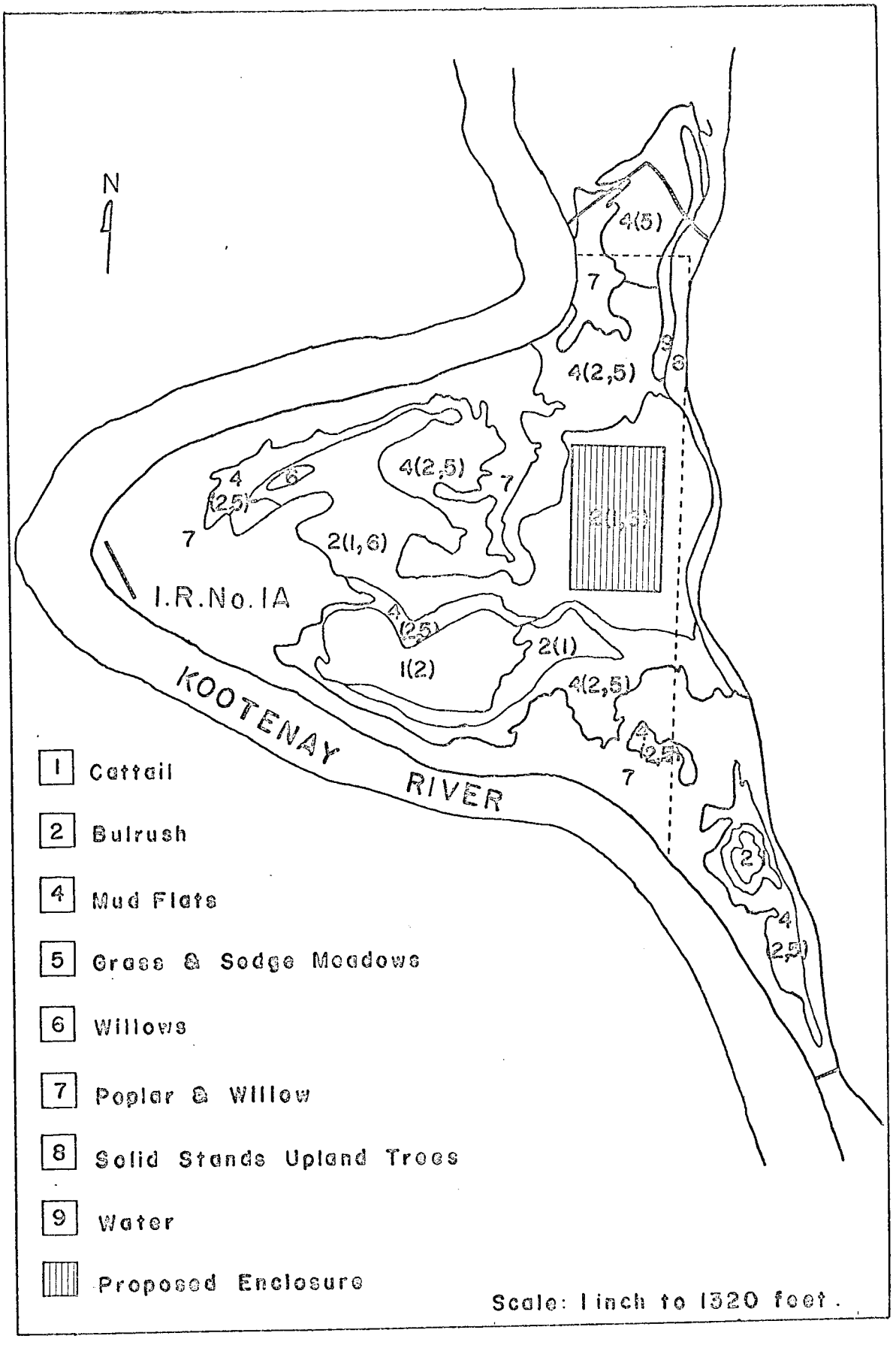
N
4(5)
7
4(2,5)
3
3
4(2,5)
7
4
(2,5)
6
7
2(1,6)
2(1,6)
I.R.No.1A
4
(2,5)
2(1)
1(2)
4(2,5)
KOOTENAY RIVER
4
(2,5)
7
2
4
(2,5)
1 Cattail
2 Bulrush
4 Mud Flats
5 Grass & Sedge Meadows
6 Willows
7 Poplar & Willow
8 Solid Stands Upland Trees
9 Water
Proposed Enclosure
Scale: 1 inch to 1320 feet.

FIGURE 3

Present unmanaged and proposed water levels of the experimental unit.

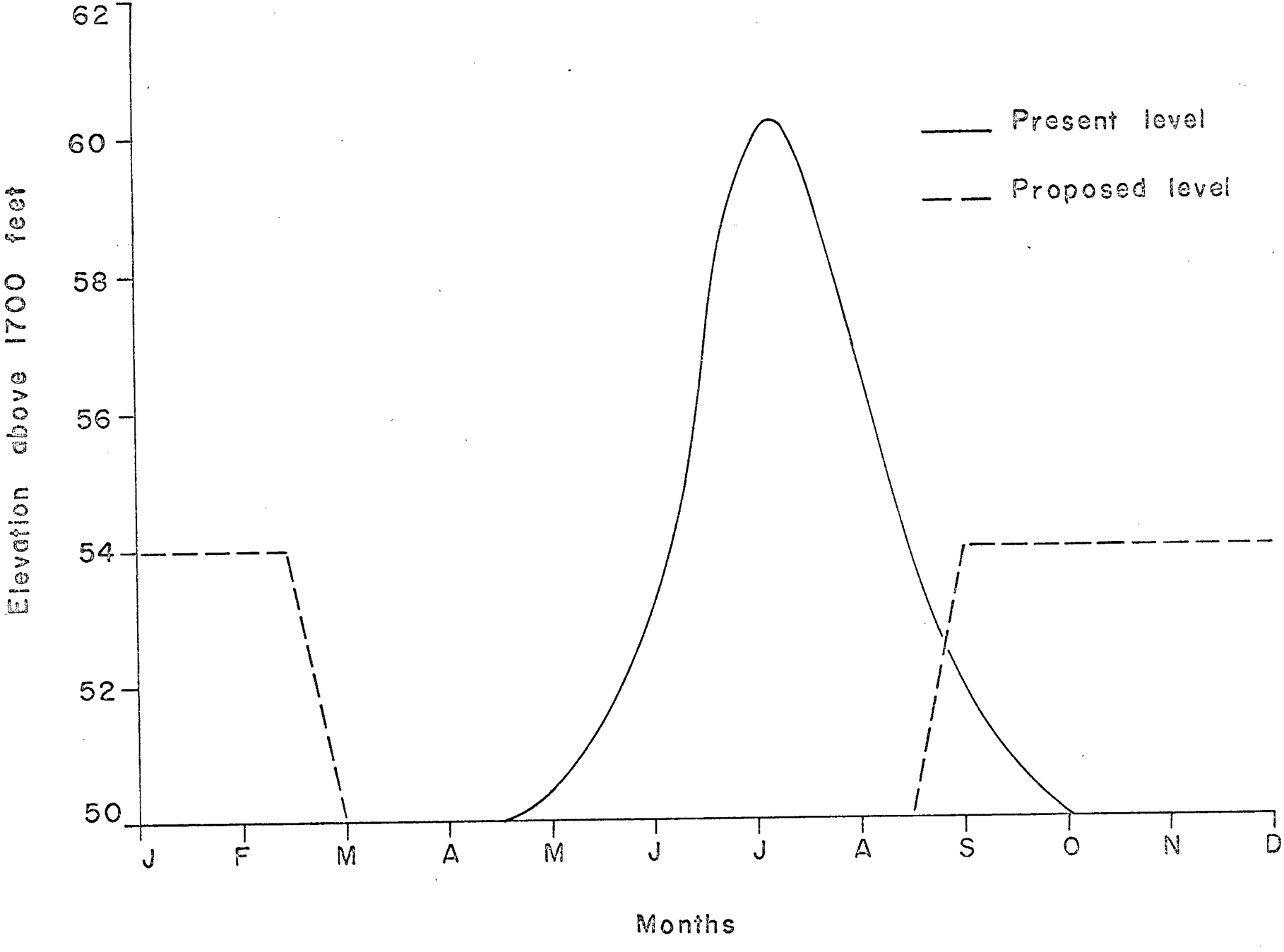
62
60
58
56
54
52
50
Elevation above 1700 feet
Present level
Proposed level
J
F
M
A
M
J
J
A
S
O
N
D
Months

Table 1. Acres within contours - proposed experimental area, including Indian Reserve IA.*

Contour (elevation in feet above sea level)	Acres Within Contour
1752	17.3
1754	231.4
1756	302.5
1758	373.1
1760	428.4
1762	462.1

** Total area outside I.R. IA - 100.6 acres

*** Total area within I.R. IA - 404.2 acres

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* Planimetered from 1947 Columbia River Basin Contour Maps, 1" = 1000' scale.

** That area between the Kootenay River, the east I.R. IA boundary, highway 21 and the proposed south dyke.

*** That area between the north proposed dyke, the Kootenay River, highway 21 and the east I.R. IA boundary.

Table 2. Acreages of seven vegetation types, water and mud flats within the experimental unit, April, 1968.*

Vegetation Type	Acreage
Cattail	31.2
Bulrush	106.8
Grass & Sedge	0.0
Willows	3.4
Poplar and Willow	187.7
Upland Trees	39.0
Mud Flats	133.2
Water	3.4
Total	504.7 acres

*From Figure 2 (data from Renewable Resources Consulting Services Ltd., Edmonton, Alberta, July, 1968).

Table 3. Specification and costs of materials and construction, experimental unit, Indian Reserve IA.

Dykes

top elevation - 1760', 12' top, 5:1 slope

	length	cubic yards	
north	1650'	11,784.2	
river	100'	933.3	
south	150'	295.0	
Totals	1900'	13,012.5	at $.50/cu.yd. = $6,506.25

Gravel for north dyke (1600') - 33 cu.yds. at $3.00/cu.yd. = 99.00

Pumo - portable diesel

To flood 200 acres 2' deep = 400 ac.ft.

6" evapotranspiration loss = 100 ac.ft.

water to be moved 500 ac.ft. (162,914,400 gals. U.S.)

16 feet maximum lift

50 feet to river source

50 feet to outlet

To fill in 30 days = 3800 g.p.m.

226,000 g.p.h. 8,500.00

Fencing

25 acre enclosure (1320' x 825')

4 strand fence

twisted steel stays -	$50.00
fence post clips -	5.00
16 rolls wire at $12/roll -	195.00
35, 7' steel fence posts at $1.85 -	65.00
Total	315.00

Culvert - to drain unit in 21 days - 184.00

46' x 18" waterproof, corrugated steel

at $4.00 per foot plus a flap gate 50.00

(2 - 18' lengths and
(1 - 10' length)

GRAND TOTAL $15,654.25

Table 4. Costs and benefits capitalized at 6 per cent over 20 years, experimental unit, Indian Reserve IA.

Direct Costs			
Dykes	-	$6,600	$6,600
Pumps	-	6,000	8,500
Culverts	-	240	240
Fencing	-	315	315
Operation	-	400/yr.	4,588
Maintenance	-	300/yr.	3,441
		Present worth of costs	$23,684
Benefits			
Direct benefit to Indian Band			
Net return muskrat harvest (400 at $.65 each - ($250)			$2,867
Sale of grazing permits (1000 a.u.m. at $1.00/a.u.m. - $1,000)			11,470
Guiding (250 hunter days at $10/day - $2,500)			28,675
Sale of hunting permits (500 hunter days at $3/day - $1,500)			17,205
		Present value of direct benefits	$60,217
Indirect benefit to Indian Band or beneficial user			
Hunting (500 hunter days at $2/day - $1,000)			$11,470
Grazing ($3/cow profit for 135 animals for 4.5 mos. - $1,823)			20,910
		Present value of indirect benefits	$32,380