MANAGING THE FISHERY AT CHAMPION LAKES PROVINCIAL PARK

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Prepared for

WILDLAND RECREATION 271

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SUMMARY

It is the intention of the Parks Branch, in conjunction with the Fish and Wildlife Branch to begin rehabilitation of the fishery at Champion Lakes Provincial Park in the spring of 1982. Factors adversely affecting the production of game fish here at present include easy access, an abundance of undesirable coarse fish, and poor spawning channel conditions. These conditions can be managed in a variety of ways. My final recommendation is that Third and Second Champion Lakes be treated with a toxin to remove the coarse fish and then be restocked with rainbow trout. First Champion Lake should be stocked with Gerrard rainbow trout which may successfully establish and compete with the coarse fish.

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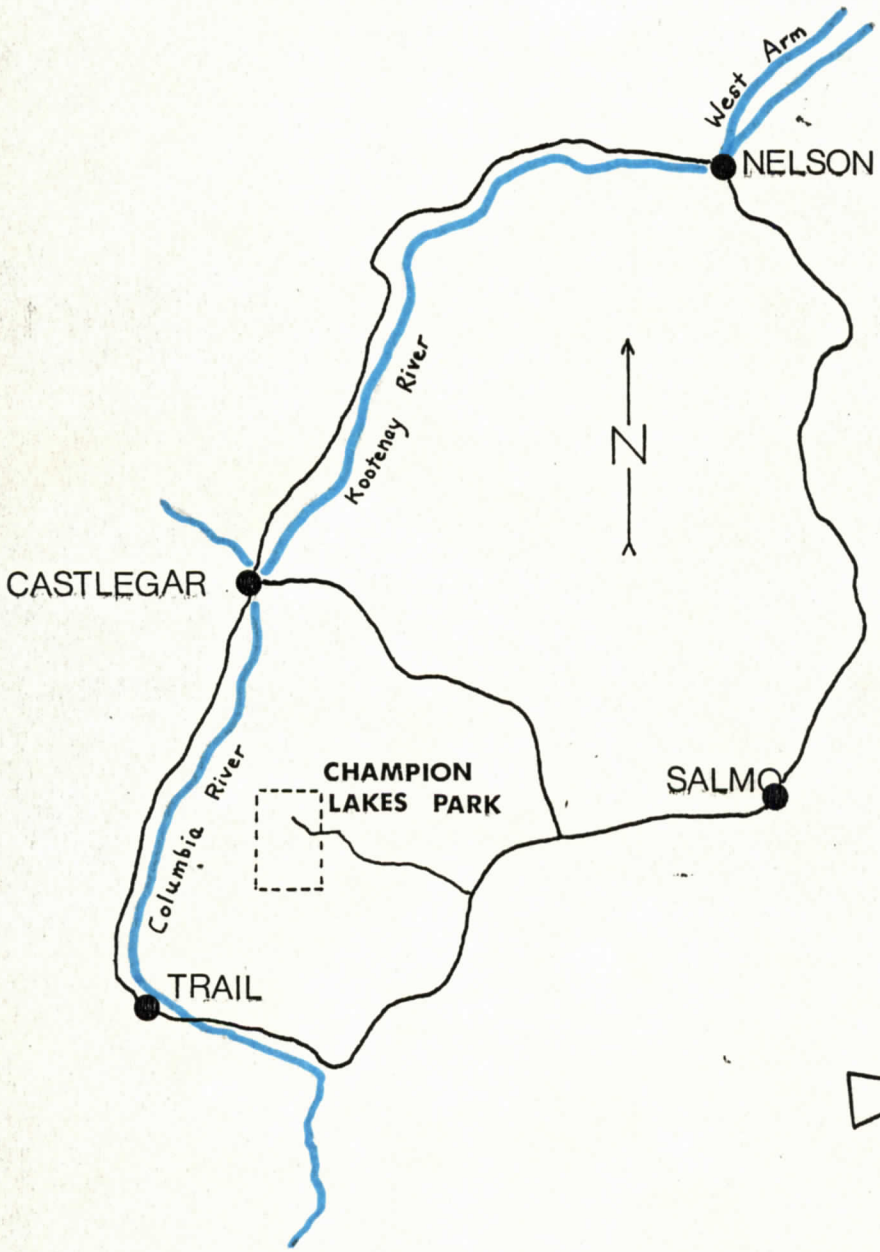
I. INTRODUCTION

The purpose of this report is to evaluate the fishery resource at Champion Lakes Provincial Park and to propose a viable management scheme. The 1976 Interim Policy Statement for Champion Lakes Park stated that "enhancement of the fishery resource in all three Champion Lakes would be desirable to add to the diversity of recreational opportunities available at the Park." More recently (December 1981), the planning division of Parks and Outdoor Recreation in Nelson requested the Fish and Wildlife Branch to proceed with rehabilitating the present fishery. This report will attempt to explain reasons for this rehabilitation and propose some practical methods of managing this fishery.

CHAMPION LAKES LOCATION MAP



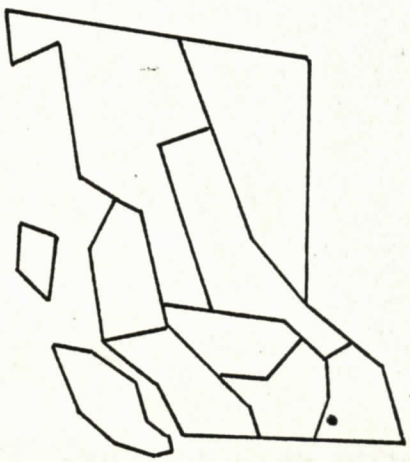


Fig. I

II. LOCATION

Champion Lakes Provincial Park is located 10 km off Highway 3, eight miles northwest of Fruitvale, B. C. The park is 1408 ha in size and located at an elevation of 1065 m.

The park was established in March 1955, to provide a variety of summer outdoor recreational opportunities. It contains five lakes: First, Second, and Third Champion Lakes, Kearns Lake, and Bear Lake. All of the lakes, with the exception of Bear Lake, are interconnected and eventually drain into the Columbia River by way of Landis and Champion Creeks.

This report is concerned with managing the fishery at First, Second, and Third Champion Lakes. Bear Lake is much smaller and relatively inaccessible. Kearns Lake supplies the water to the campground and should not be managed for fisheries so that water quality is not affected by an increase in use by fishermen.

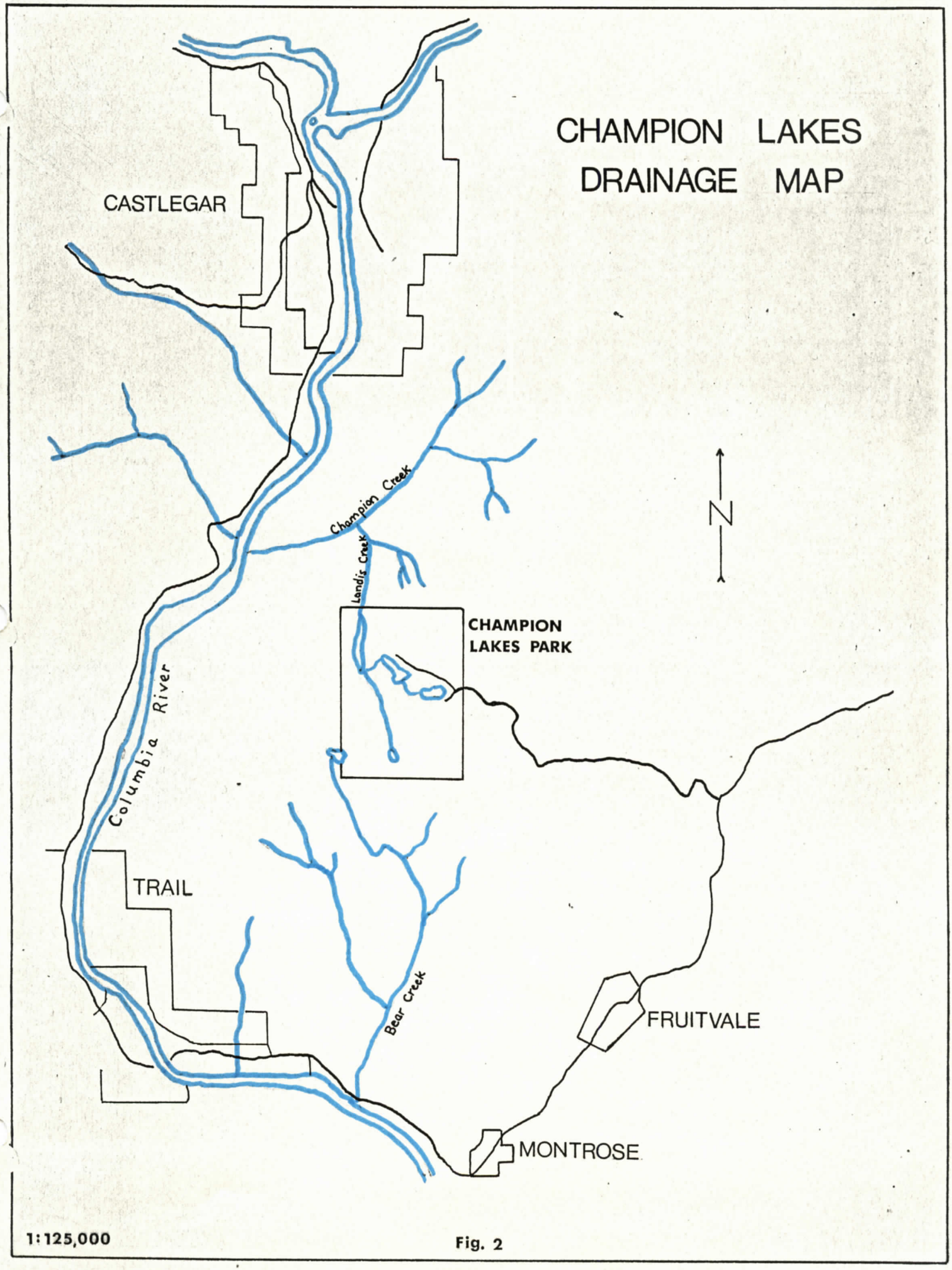

CHAMPION LAKES
DRAINAGE MAP
CASTLEGAR
Champion Creek
Landis Creek
CHAMPION
LAKES PARK
Columbia River
TRAIL
Bear Creek
FRUITVALE
MONTROSE
N
1:125,000

Fig. 2

III. METHODS

Most of the field work for this project was done during the month of October 1981.

A. BIOLOGICAL MEASUREMENTS

Terrestrial and aquatic vegetation lists were prepared after several field trips into the area. Terrestrial vegetation was recorded around the perimeter of all three lakes to a distance of approximately 10 m back from the lakeshore.

A more comprehensive description of the aquatic vegetation prepared by the Aquatic Studies Branch in the summer of 1981 is in the Appendix.

B. PHYSICAL MEASUREMENTS

1. Stream Assessment

Stream assessment methods are self-explanatory except for two:

1) average depth was calculated by averaging five depth readings across the stream and,

2) flow was determined using the floating-chip method.

2. Lake Assessment

Maximum length, maximum width, and maximum effective length were calculated by measuring directly on the map in centimetres and converting to meters using the map scale. Surface area of the lakes was calculated by placing a dot grid over the map and counting the number of dots in each lake. (Each

dot represents a certain area). Shoreline length was determined using the Derby Cartometer. By rolling it around the lake perimeters on the map, a reading in centimeters was obtained. This was converted to meters using the map scale. Mean width was calculated using the formula - $\frac{\text{AREA}}{\text{MAXIMUM LENGTH}}$

Shoreline development was calculated using the formula - $\frac{\text{SHORELINE LENGTH}}{2\ \sqrt{\pi\ \text{AREA}}}$.

Mean depth for Third Lake was taken from survey data obtained from the Fish and Wildlife Branch. Mean depths for Second and First Lakes have not been determined, and time did not permit myself to gather this information. From personal observation, however, I am certain that the average depth of Third Lake is greater than that of the other two lakes.

C. WATER QUALITY MEASUREMENTS

Water samples were taken near the surface at all three lakes. At Third and Second Lakes the samples were taken at approximately mid-lake. Due to the difficulty of boat access to First lake, the sample was taken about 2.5 m from shore. For this reason a secchi disc reading was not obtained at First Lake.

Water samples were put in glass jars and taken to the Selkirk College lab for analysis. Dissolved oxygen and pH levels were determined following instructions in the standard Hach kits.

The total dissolved solids were determined by weighing a beaker, adding the water sample, evaporating the water, and then re-weighing the beaker. Grams/litre were changed to parts per million by cross-multiplying $\frac{\text{GRAMS}}{1000} = \frac{\text{PPM}}{1{,}000{,}000}$

A secchi disc was used to measure the turbidity of the water. It was lowered over the shady side of the canoe to reduce the effect of the wind and the sun on visibility. The day of the readings was partially overcast. The depth at which the disc disappeared when lowered, and the depth at which it reappeared were averaged.

Water temperature was recorded at the surface with a mercury thermometer immersed for one minute.

IV. PRESENT CONDITIONS

A. ASSESSMENT OF BIOLOGICAL CONDITIONS

1. Man's Influence

A) Access - Third Champion Lake is the first lake encountered when one enters the park. It is easily reached by means of a good paved road leading off Highway 3. The road branches when it reaches the lake. The left branch ends in a parking lot at the southeast end of the lake while the right branch follows the north shore to the park campground. A good hiking trail exists around the perimeter of the lake.

Access to Second Lake is by means of a gravel road that runs from the north end of the campground to the northwest tip of Second Lake. The road is in good shape, and at the end is a rough boat-launch area. There is also a hiking trail around the lake.

Access to First Lake is by trail only. One trail begins at the end of the gravel road and it takes fifteen-twenty minutes to hike to the lakeshore approximately mid-way along the lake. This trail ends here and does not continue around the perimeter as in the case of Third and Second Lake. The other trail was built as a canoe portage. It basically follows the stream connecting Second and First Lake and ends where the stream enters First Lake.

B) Fishing pressure - Attendance figures obtained from the Parks Branch for the summer of 1981 show 2972 parties used the overnight campground, and 14,689 parties used the day-use area. However, no statistics are available on numbers of visitors using the lakes for fishing.

ACCESS and FACILITIES

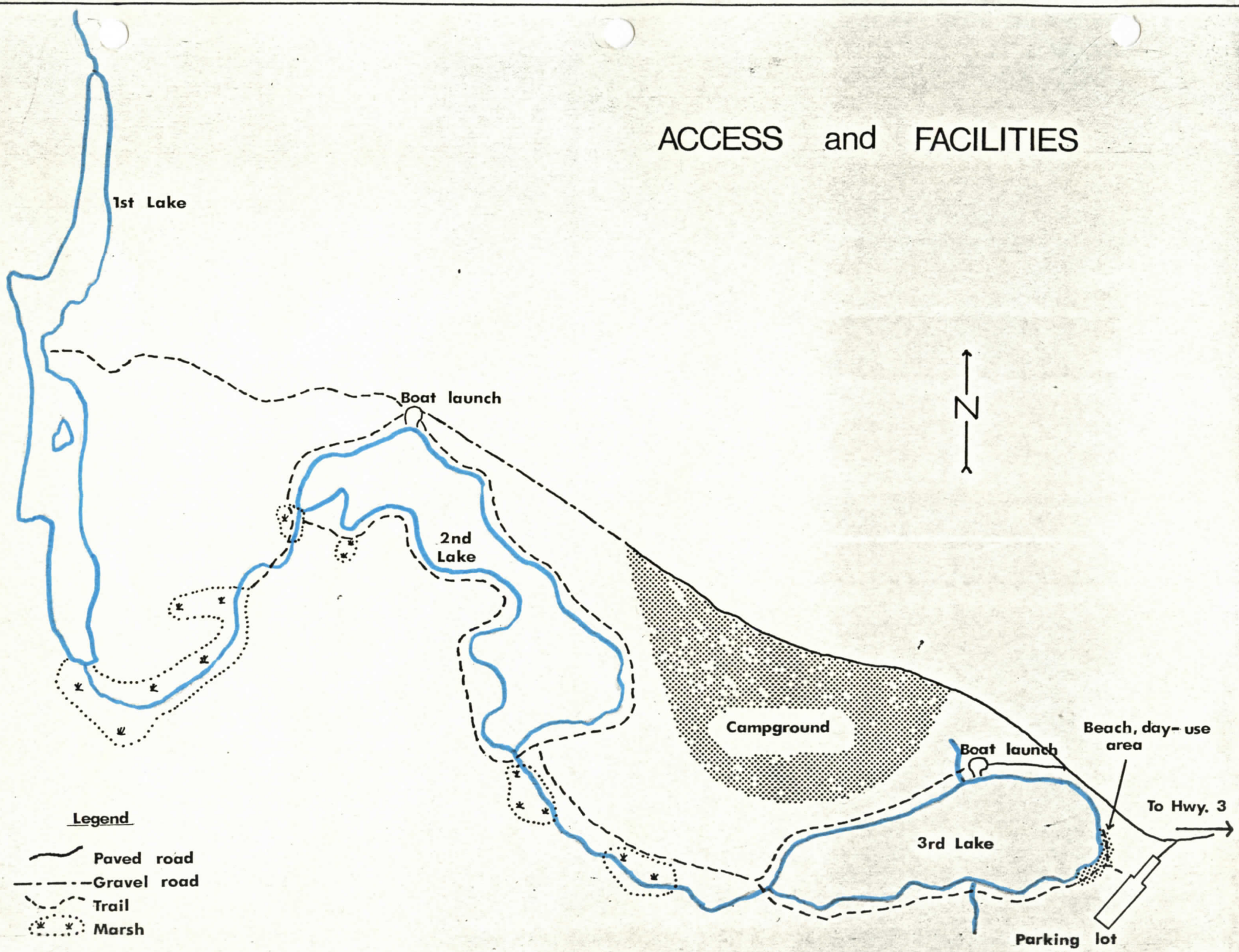


Fig. 3

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If fishing pressure increases with ease of access, then we can assume the pressure is lowest at First Lake, increases at Second Lake, and is greatest at Third Lake.

C) Facilities - The park campground is located between Third and Second Lake and contains ninety sites. Recreational vehicles and trailers to a length of six meters can be accommodated, but no electrical, water, or sewereage hook-ups are provided. Sanitary facilities and drinking water are close to each campsite, and firewood is supplied in the summer. A sani-station is located at the campground entrance.

A swimming beach and float are located at Third Lake along with picnic tables and a changehouse. Above the beach is a parking lot for day-use, suitable for 180 vehicles.

There are boat-launching sites on the north shore of Third Lake and at the west end of Second Lake. Power boats are prohibited in the park.

2) NATURAL INFLUENCE

a) Coarse fish

i) species present - In 1956, the B.C. Game Department planned to poison out the Champion Lakes "since they abound with suckers, shiners, and possible more unknown coarse fish."[3] In June 1974 a wildlife and fisheries inventory was conducted at Champion Lakes Park by T. W. Parkin and G. F. Gunville.[15] with the assistance of park personnel. Gillnets were set at all lakes and numbers caught, species, and sizes were recorded. Species caught

were rainbow trout (Salmo gairdneri), largescale suckers Catostomus macrocheilus), longnose suckers (Catostomus catostomus), and redside shiners (Richardsonius balteatus). Average trout size was approximately 18 cm with average sucker size just slightly larger. Redside shiners average 5 cm.

ii) problems resulting from coarse fish - suckers and shiners are considered coarse fish. As well as competing for food, coarse fish compete for space and, unlike the rainbow, are well adapted to sharing their environment with one another and using it very efficiently. Once coarse fish are established in a lake, they tend to dominate. While a single female trout may produce 1000 to 5000 eggs, a sucker may produce 20,000 to 100,000.

b) Vegetation

i) terrestrial - Champion Lakes Provincial Park is located within the Interior Western Hemlock biogeoclimatic zone. The three Champion Lakes are set in an elevated plateau-like basin which contains considerable regeneration and some old timber. Table 1 is a species list prepared for the area.

prepared from association tables? systematic examination?

TABLE 1

Species List of Terrestrial Vegetation

TREES		
Western Red Cedar	-	*Thuja plicata*
Western Hemlock	-	*Tsuga heterophylla*
Subalpine Fir	-	*Abies lasiocarpa*
Western Larch	-	*Larix occidentalis*
Western White Pine	-	*Pinus monticola*
Douglas Fir	-	*Pseudotsuga menziesii*
Engelmann Spruce	-	*Picea engelmannii*
Paper Birch	-	*Betula papyrifera*
Black Cottonwood	-	*Populus trichocarpa*
Lodgepole Pine	-	*Pinus contorta latifolia*
SHRUBS		
Falsebox	-	*Paxistima myrsinites*
Red-osier Dogwood	-	*Cornus stolonifera*
Oregon Grape	-	*Mahonia sp.*
Thimbleberry	-	*Rubus parvilflorus*
Sticky Current	-	*Ribus viscossimum*
Wild Rose	-	*Rosa sp.*
Devil's Club	-	*Oplapanax horridus*
Sitka Alder	-	*Alnus sitchensis*
Willow	-	*Salix sp.*
Black Mt. Huckleberry	-	*Vaccinium membranaeceum*

TABLE 1 - Continued

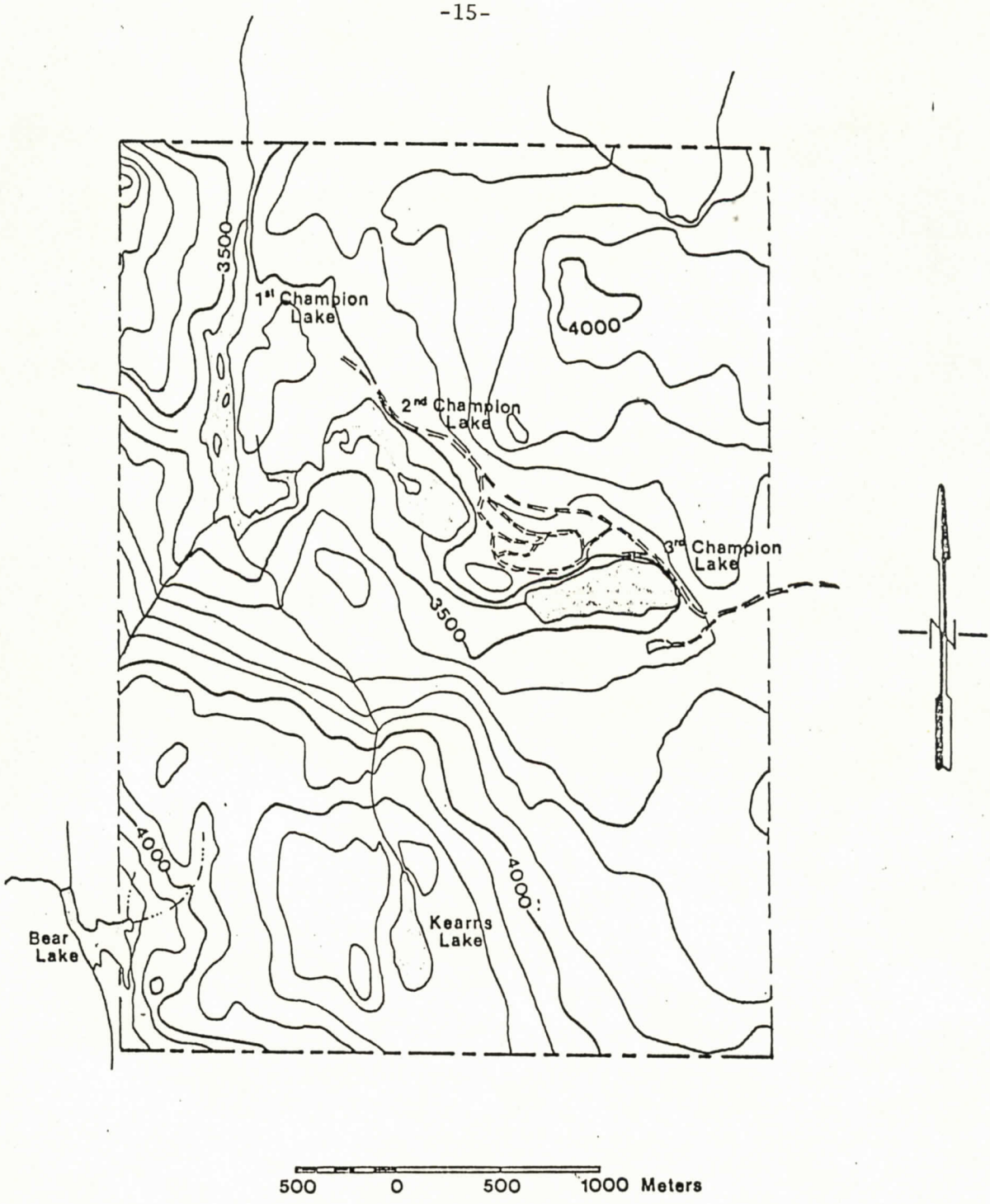
HERBS		
Twinflower	-	Linneae borealis
Yarrow	-	Centaurea sp.
Thistle	-	Cirsium sp.
Queen's Cup	-	Clintonia uniflora
Bunchberry	-	Cornus canadensis
Prince's Pine	-	Chimaphila umbellata
Wild Ginger	-	Asarum caudatum
Northern Bedstraw	-	Galium boreale
Trailing Rubus	-	Rubus pedatus
Foam Flower	-	Tiarella unifoliata
Meadow Rue	-	Thalictrum occidentale
Rattlesnake Plantain	-	Goodyera oblongifolia
Twisted Stalk	-	Streptopus amplexifolia
Wild Strawberry	-	Fragaria glauca
False Solomon's Seal	-	Smilacina amplexicaulis
FERNS		
Bracken Fern	-	Pteridium aquilinum

ii) aquatic - Most of the aquatic species grew in the littoral zone at a depth of less than two meters. Table 2 is a species list.

TABLE 2

SPECIES LIST OF AQUATIC VEGETATION

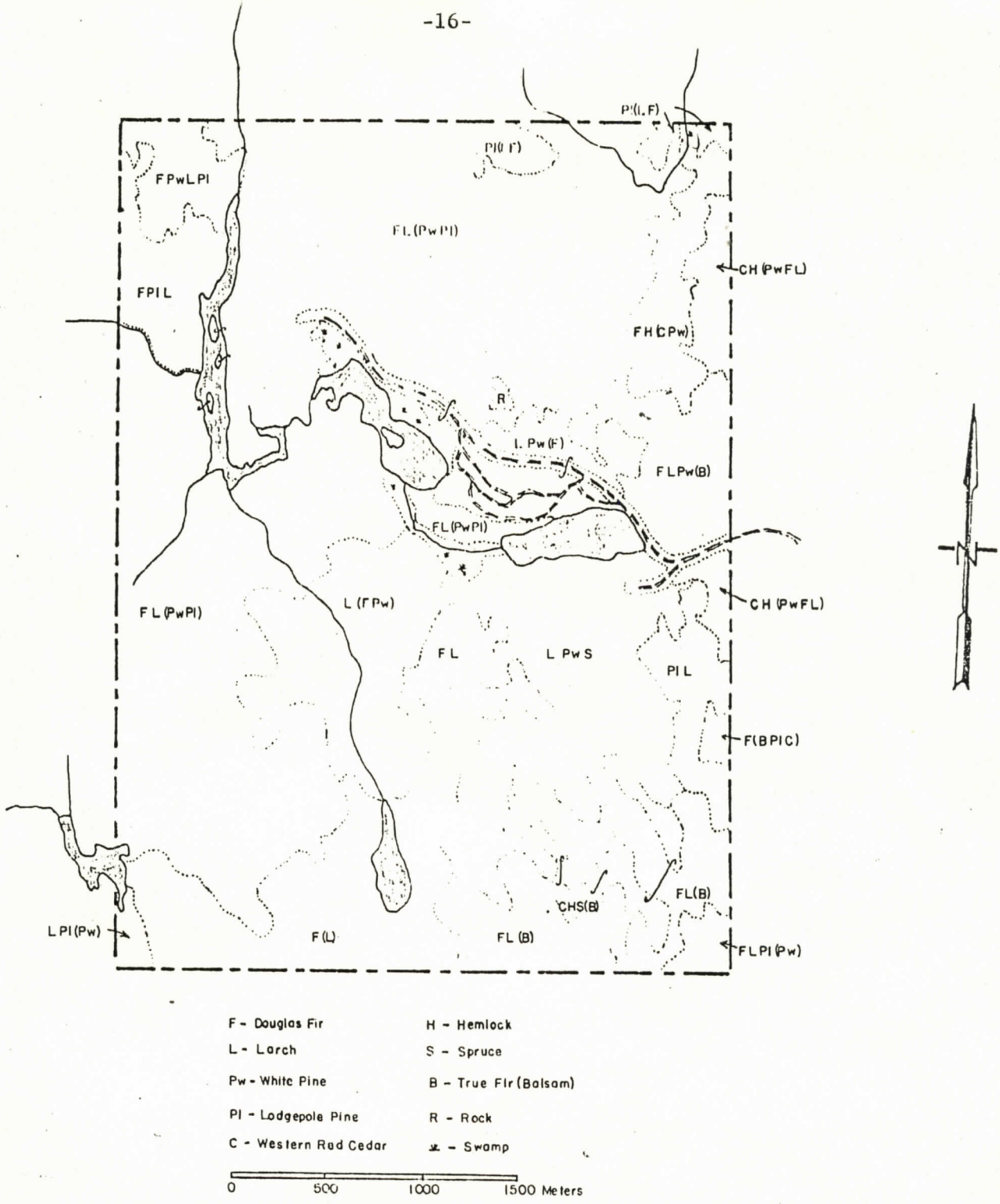
EMERGENTS		
Spikerush	-	*Eleocharis sp.*
Horsetail	-	*Equisetum fluviatile*
Water Smartweed	-	*Polygonum amphibium*
Slender Rush	-	*Juneus tenuis dudleyi*
SUBMERGENTS		
Little Watermilfoil	-	*Myriophylum alterniflorum*
Hornwort	-	*Ceratophylum demersum*
FLOATING SPECIES		
Pondweed	-	*Potamogeton sp.*
Yellow waterlily	-	*Nymphaea polysepalum*



Champion Lakes Park

Topography

Fig. 4



Champion Lakes Park

Ground and Forest Cover

Fig. 5

B. ASSESSMENT OF PHYSICAL CONDITIONS

1. Streams (Spawning Areas)

The potential spawning areas will be considered individually. These are: the two inlets into Third Lake, the channel connecting Third and Second Lake, the channel connecting Second and First Lake, and the outlet of First Lake. These streams will be numbered corresponding to the accompanying map. (See Fig. 6).

Stream 1 - This stream enters Third Lake to the east of the campground. Only the last eight meters before entering the lake appear to contain water year round.

VEGETATION: Cedar, Hemlock, Falsebox

WIDTH: Wet Width - 84 cm, channel width - 84 cm.

DEPTH: Maximum - 38 cm., average -15 cm.

FLOW: Too little to measure

TEMPERATURE: 12^{o} C.

SHADE: dense, 80% crown cover

STREAM BOTTOM: Some sand and small gravel (2-16 mm) at the mouth but the majority is approximately 20 cm. of silt and organic debris from the Cedar - Hemlock overstory.

POOLS: N/A

RIFFLES: N/A

STREAM ASSESSMENT LOCATIONS

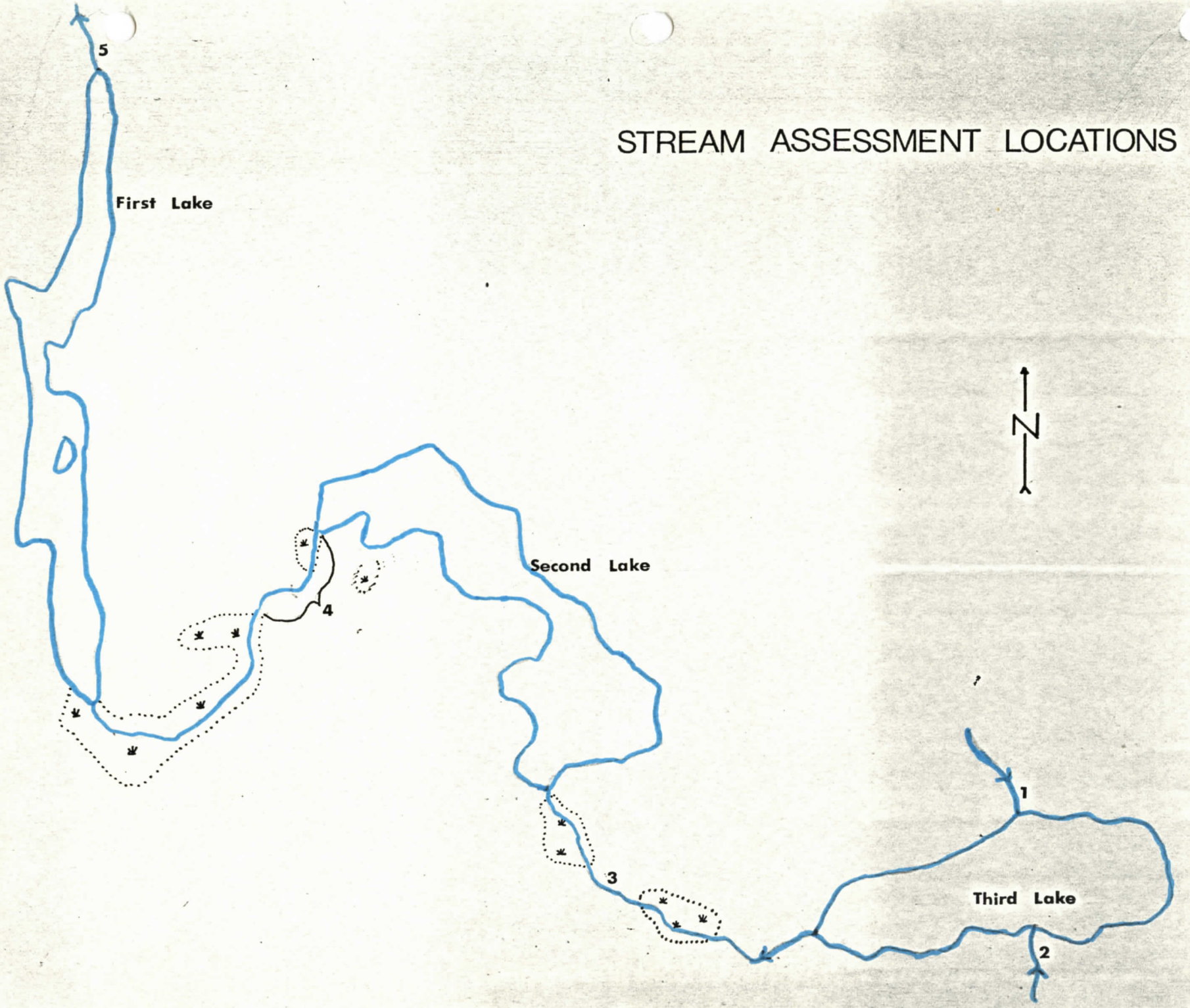


Fig. 6

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Stream 2 - The other inlet into Third Lake, it enters the south side. It appears to be the only suitable spawning area at this lake. The channel extends approximately 75 m back from the lake before it becomes blocked to fish movement by a rise in elevation.

VEGETATION: Cedar, Sub-alpine Fir, Oregon Grape, Falsebox, Black Mountain Huckleberry, Thimbleberry, Red-osier Dogwood, Rattlesnake Plantain, Twinflower, Prince's Pine, Foam Flower.

WIDTH: wet width - 60 cm., channel width - 60 cm.

DEPTH: maximum - 21 cm., average - 18 cm.

FLOW: .4 m/sec.

TEMPERATURE: 11.5°C.

SHADE: 60% Crown Cover

STREAM BOTTOM: Approximately 90% gravels, D90 - 3.5 cm

DEBRIS: some organic litter from the overstory

POOLS: Five

RIFFLES: Three

Stream 3 - This channel connecting Third and Second Lake is approximately 550 m in length. It does not contain water year round, so spawning conditions are poor. A small wooden dam at the outlet (See Fig. 8) constructed to control the water level at Third Lake, restricts or prevents entry and exit to this channel during low flow periods. The channel has little streamside cover and the bottom is mainly a buildup of muck. Three sets of measurements were taken along the length of this channel: 1) the first one below the dam at the Third Lake outlet, 2) the second halfway between Second and Third Lakes, and, 3) the third near where it enters Second Lake.

location should be shown on your map (Pls) & referred to!

MEASUREMENT #1

VEGETATION: Sedges and grasses

WIDTH: wet width - 2.3 m, channel width - 9.5 m.

DEPTH: maximum - 25 cm., average - 10 cm.

FLOW: .12 m/sec.

TEMPERATURE: 11° C.

SHADE: No crown cover

STREAM BOTTOM: Fine gravels underneath a thin layer of silt.

MEASUREMENT #2

VEGETATION: Sedges and grasses

WIDTH: wet width - 1.8 m., channel width - 3.2 m.

DEPTH: maximum - 29 cm., average - 20 cm.

FLOW: .29 m/sec.

TEMPERATURE: 11.5° C.

SHADE: No crown cover

STREAM BOTTOM: Coarse gravels underneath 8 cm. of black muck and organic debris.

MEASUREMENT #3

VEGETATION: Sedges, grasses, Red-osier Dogwood, Alder

WIDTH; Wet width - 21 m, channel width - 21 m.

DEPTH: Maximum - 93 cm., average - 62 cm.

FLOW: .32 m/sec.

TEMPERATURE: 12° C.

SHADE: No Crown Cover

STREAM BOTTOM: Coarse gravels underneath 5 cm of silt and organic debris.

Stream 4 - Approximately 350 m in length, this channel connects Second Lake with First Lake. Both ends of the channel are blocked with beaver dams, making spawning difficult to impossible. Two other dams are present along the channel, along with other debris in the form of small branches and dead-falls. The stream flows into a large marsh as it enters First Lake (see Fig. 9), and it becomes difficult to determine the main stream of flow. Measurements along this channel were taken approximately every 50 m.

MEASUREMENT #1 - Taken just below beaver dam at the outlet; Beaver dam is approximately 6 m wide, 1.5 m. high.

VEGETATION: Cedar, Sub-alpine Fir, Engelmann Spruce, Falsebox, Oregon Grape, Red osier Dogwood, Twinflower.

WIDTH: wet width - 4.6 cm., channel width - 9 m.

DEPTH: Maximum - 30 cm. average - 23 cm.

FLOW: .07 m/sec.

SHADE: 15% crown cover

STREAM BOTTOM: 15 cm. of silt and organic debris on top of gravels; substrate is sand to large gravels; D90 is 3.4 cm

DEBRIS: many branches in the water; some from beaver activity

MEASUREMENT #2

VEGETATION: Cedar, Engelmann Spruce, Subalpine Fir, Red-osier Dogwood, Falsebox.

WIDTH: Wet width - 8 cm., channel width - 10 m.

DEPTH: Maximum - 28 cm., average - 15 cm.

FLOW: .09 m/sec.

TEMPERATURE: 11° C.

SHADE: 30% crown cover

STREAM BOTTOM: 13 cm of silt and conifer debris over gravels; D90 is 3.2 cm.

POOLS: 4 between #1 and #2

RIFFLES: 3 between #1 and #2

MEASUREMENT #3

VEGETATION: Cedar, Engelmann Spruce, Falsebox, Trailing Rubus, Bracken Fern

WIDTH: Wet Width - 3 m., channel width - 6 m.

DEPTH: Maximum - 28 cm., average 20 cm.

FLOW: .12 m/sec.

TEMPERATURE: 11° C.

SHADE: 30% crown cover

STREAM BOTTOM: Some conifer debris, many small branches and logs; D90 is 3.8 cm.

POOLS: Three between #2 and #3

RIFFLES: Five between #2 and #3

MEASUREMENT #4

VEGETATION: Cedar, White Pine, Western Larch, Falsebox, Red-osier Dogwood, Oregon Grape, Bunchberry, Bracken Fern.

WIDTH: Weg width - 4.5 cm., channel width - 7.5 m.

DEPTH: Maximum - 21 cm., average - 13 cm.

FLOW: .28 m/sec.

TEMPERATURE: $10^{o}C$.

SHADE: 35% crown cover

STREAM BOTTOM: 25% organic debris, 75% sand to gravels, D90 is 2.9 cm.

POOLS: 4 between #3 and #4

RIFFLES: 3 between #3 and #4

MEASUREMENT #5

VEGETATION: Cedar, Sub-alpine Fir, Falsebox, Trailing Rubus, Red-osier Dogwood, Bracken Fern

WIDTH: Wet Width - 3 m., Channel width - 6 m.

DEPTH: Maximum - 18 cm., average - 10 cm.

FLOW: .14 m/sec.

TEMPERATURE: 10.5^{o} C.

SHADE: 35% crown cover

STREAM BOTTOM: Sand to medium gravels; D 90 is 3.1 cm.

POOLS: Four between #4 and #5

RIFFLES: Four between #4 and #5

MEASUREMENT #6

VEGETATION: Cedar, Sub-alpine Fir, Western Larch, Falsebox, Oregon Grape, Twinflower, Trailing Rubus, Viola sp.

WIDTH: Wet width - 10 m., channel width - 10 m.

DEPTH: Maximum - 32 cm., average - 23 cm.

FLOW: .03 m/sec.

TEMPERATURE: 10.5^{o} C.

SHADE: 40% crown cover

STREAM BOTTOM: 4 cm. of silt over small to large gravels; D90 is 5.6 cm.

POOLS: Continuous slow moving pools above the beaver dam before entering the marshy area southeast of First Lake.

RIFFLES: None

MEASUREMENT #7

VEGETATION: Cedar, Sub-alpine Fir, Red-osier Dogwood, Queen's Cup, Prince's Pine, Falsebox, Trailing Rubus, Twinflower, Bunchberry.

WIDTH: Wet width - 7 m., channel width - large marshy area

DEPTH: Maximum - 29 cm., average - 15 cm.

FLOW: .83 m/sec.

TEMPERATURE: 11^{o} C.

SHADE: 5% crown cover

STREAM BOTTOM: Silt and organic debris

Stream #5 - This is the outlet of the Champion Lakes at the north end of First Lake. Here it becomes Landis Creek which enters Champion Creek 3.5 km downstream of First Lake, eventually flowing into the Columbia River. The outlet flow is slowed by the presence of a beaver dam approximately

five m across and 1.5 m high, at the head of the creek. Measurements were taken below the dam.

VEGETATION: Douglas Fir, Western Larch, Lodgepole Pine, Falsebox, Black Mountain Huckleberry, Twinflower, Prince's Pine

WIDTH: Wet width - 3 m, channel width - 6m.

DEPTH: Maximum - 16 cm., average - 9 cm.

FLOW: .83 m/sec.

TEMPERATURE: 12.5^{o}C.

SHADE: 10% crown cover

STREAM BOTTOM: 9 cm silt over gravels; D90 is 4.1 cm.

DEBRIS: Stream is criss-crossed with fallen trees but, due to the narrowness of the stream, most are not actually in the water and may not be detrimental to spawning fish.

2. Lakes

Following is a table of physical measurements that may be significant in determining game fish habitat suitability and quality.

TABLE 3

LAKE MEASUREMENTS

	Third Lake	Second Lake	First Lake
maximum length	730 m	950 m	1378 m
max. effective length	730 m	776 m	871 m
maximum width	261 m	348 m	127 m
mean width	183 m	145 m	76 m
length of shoreline	1779 m	3110 m	3247 m
shoreline development	1.37	2.28	2.83
surface area	13.35 ha	13.83 ha	10.46 ha
mean depth	10.7 m	--	--
orientation of main axis	east-west	northwest-southwest	north-south

Some of the above measurements may not be self-explanatory. Maximum effective length refers to the furthest unobstructed length from shore to shore. The significance is that the less obstructed the wind is, the more power it will have to mix the lake waters during spring and fall overturns. Also related to this is the orientation of the main axis. As the prevailing wind in this area is from the west, a lake with a direct east-west axis will benefit the most from the wind's mixing power.

Shoreline development is an indicator of shoreline regularity. A lake with the shape of a perfect circle would have a shoreline development of 1. As the value departs from this number, shoreline irregularity

is indicated. The significance is that the more irregular the shorleline (the larger the number), the larger the littoral zone, and probably the more productive the lake will be.[9]

C. WATER QUALITY CONDITIONS

The following table shows the results of water quality measurements taken at Champion Lakes:

TABLE 4

WATER QUALITY MEASUREMENTS

	Third Lake	Second Lake	First Lake
secchi disk	8.2 m	7.9 m	--
T.D.S.	94 ppm	102 ppm	77 ppm
pH	7.5	7.3	7.3
dissolved oxygen	7.0 ppm	6.0 ppm	6.0 ppm
temperature	13° C.	12.5° C.	13.5° C.

D. ASSESSMENT OF HABITAT SUITABILITY

1. Biological

Fishing pressure is a factor that can be manipulated to increase both fish production and yield. The access to Third and Second Lakes is more than adequate for the size of the lakes. The road to the Second Lake boat launch can be closed off by an existing gate if it were thought necessary. If needed, a gate could be installed at the Third Lake boat launch to reduce fishing pressure.

The most serious biological problem facing game fish production in these lakes is the abundance of coarse fish present. Until these competing species are removed, chances of a thriving fishery here are minimal.

2. Physical

The presence of beaver dams blocking the access to the spawning area probably has a major impact on fish production. Other factors in the streams appear suitable for fish production, but the dam blockage has resulted in a reduced stream flow and subsequent silt-buildup on the spawning gravel. The channel connecting Third Lake and Second Lake does not contain a flow year round and is not a suitable area for spawning.

The lakes are not extremely large and so would not support a huge fishery i.e. like Kootenay Lake. However, no other physical factors appear to have a limiting effect on a game fish population. Third Lake may benefit most from the wind's mixing powers during turnovers because of its east-west axis in relation to the prevailing westerlies.

3. Water Quality

a) Secchi disk - Light penetration in water has a pronounced effect on the growth of aquatic plants. The secchi disk disappears at approximately the region of transmission of 5% sunlight which means that photosynthesis can take place at least as deep as the depth at which it disappears.[9] The readings obtained at Third and Second Lake indicate relatively clear lakes. Because the mean depth of Third Lake (and probably Second Lake) is not much greater than the depth recorded for the secchi disc, good light penetration and possibly high productivity is indicated.

b) pH: The pH range in waters with trout should be between 6.5 and 8.5.[13] The measurements at these lakes fall within this range.

c) Dissolved oxygen (D.O.): Trout require a minimum of 4 ppm to live, and 4.5 to 9.5 ppm is considered good.[2] The levels at these lakes fall within this range. — in summer; what about winter kill???

d) Total dissolved solids (T.D.S.): Total dissolved solid content appears to be the most important factor in determining the general level of productivity in lakes. In a study of 100 British Columbia Lakes,[14] larger gill-net catches of fish were taken in lakes with T.D.S. over 100 than in lakes with T.D.S. less than 100. Lakes with less than 50 ppm were particularly unproductive. Samples from these lakes fall between these two levels and, according to this report, would be low to moderate in terms of fish producitivity. It should be noted, however, the report points out that though T.D.S. is an important factor in determining general productivity it cannot be used alone to predict fish quantities.

1. TOP LEFT: Third Champion Lake, beach/day use area at left side of picture.

2. TOP RIGHT: Second Champion Lake

3. BOTTOM LEFT: First Champion Lake

FIGURE 7

4. TOP LEFT: Wooden dam at outlet of Third Lake in mid September. Flow is non-existent.

5. TOP RIGHT: Same dam in mid-October. Some flow is present.

6. BOTTOM LEFT: Inlet to Second Lake.

FIGURE 8

7. TOP LEFT: Marshy area at inlet to First Lake.

8. TOP RIGHT: Outlet of First Lake (Landis Creek). Many of the logs span the width of the creek without obstructing flow.

9. BOTTOM LEFT: Another shot of Landis Creek.

FIGURE 9

10. TOP LEFT: Beaver dam blocking outlet of Second Lake. It is approximately 6 m. wide, 1.5 m. high.

11. TOP RIGHT: A smaller dam along the channel connecting Second and First Lakes.

12. BOTTOM LEFT: Evidence of recent beaver activity near First Lake.

FIGURE 10

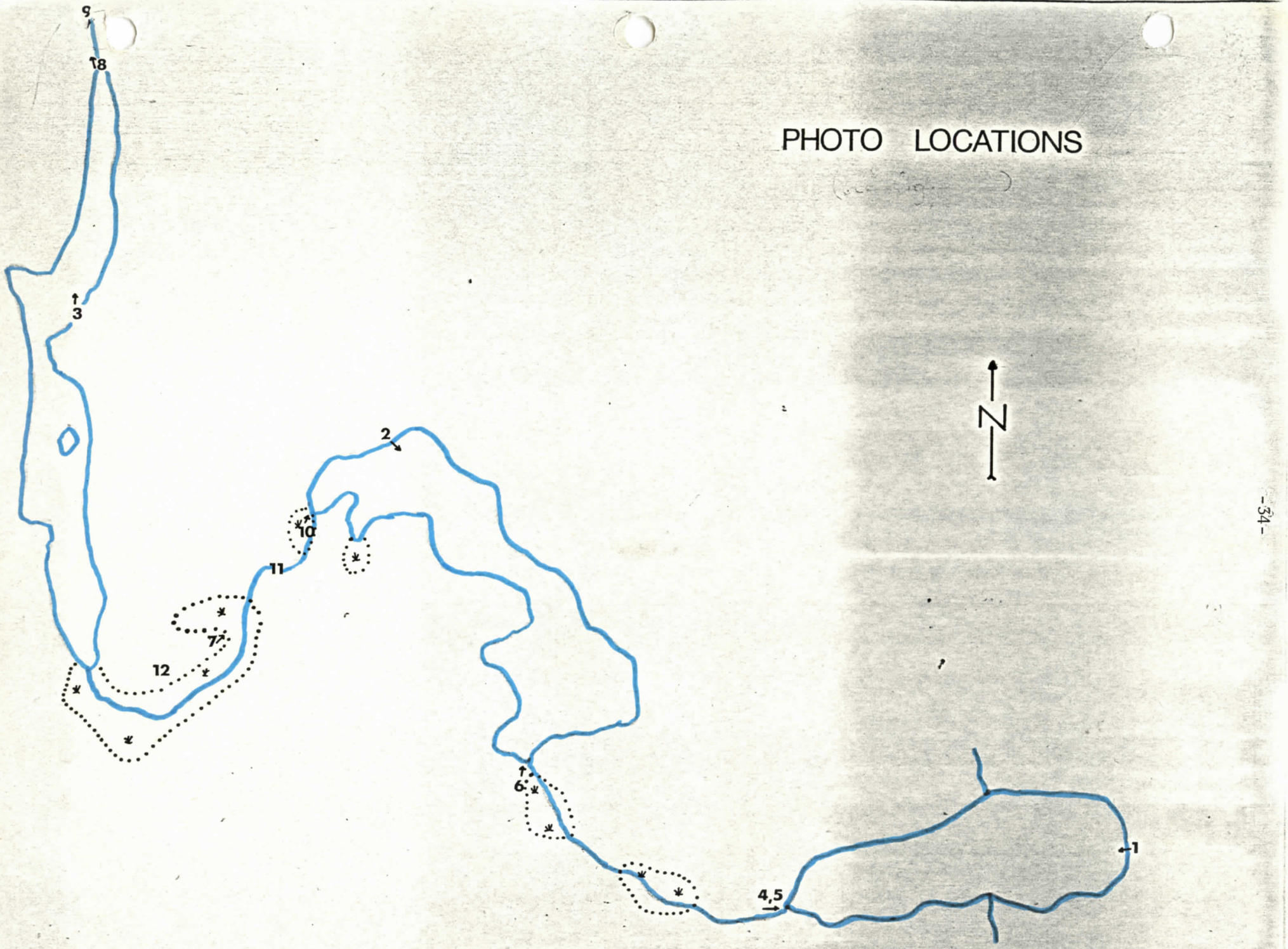

Fig. II

1:7920

V. MANAGEMENT ALTERNATIVES

Obviously there are several ways one could manage conditions affecting the fishery at Champion Lakes Park. They range from total rehabilitation including construction of artificial spawning channels, to leaving the situation as it presently exists. What I believe to be the three practical and viable alternatives are as follows.

Alternative #1 - Stocking all three lakes with "Gerrard" Rainbow Trout. (Important - "Gerrard" rainbow trout are a unique, late-maturing, highly predacious stock that will use coarse fish as a food source. Please read the Habitat Enhancement Proposal, Appendix I).

Advantages

1. This offers an alternative to chemical rehabilitation as the "Gerrard" trout will successfully compete with the coarse fish, often using them as a food source.
2. Present spawning areas may be adequate for their survival, eliminating the need to remove the beaver dams and improve spawning channels.
3. The planting of trout could possibly create a more diverse fishery. "Gerrard" trout can attain sizes greater than 15 kg, while an earlier maturing variety of fish used previously for stocking seldom get larger than 3 kg.
4. It could provide an alternate source of Gerrard stock fish.

Disadvantages

1. It will be at least three years before results of the Gerrard trout project in the East Kootenays will be known, i.e. whether the introduction of Gerrard trout into small (1000 ha) lakes is as successful as hoped.

2. There is presently a limited surplus of Gerrard eggs for stocking.

Alternative #2 - Removal of coarse fish with antimycin, spawning channel improvements, restocking lakes with rainbow trout.

Advantages

1. Coarse fish will be completely removed from the lakes.
2. This course of action has been proven to be successful. It is almost certain to result in a better fishery.

Disadvantages

1. Improving spawning channels would mean removing the beaver dams. (This is only a disadvantage if the dams are still being used and/or the park wants them left for interpretive purposes).
2. This is probably the most expensive alternative due to the price of the antimycin and the cost of manpower required to administer the toxin, improve spawning channels, and restock the lakes.
3. There is a possibility that someone could reintroduce coarse fish into the lake system.

Alternative #3 - A combination of alternatives #1 and #2: Chemical rehabilitation at Third and Second Lakes, Gerrard Trout Planting at First Lake.

Advantages

1. Boat access required for chemical rehabilitation is very good at Third and Second Lakes. A boat would have to be carried in to First Lake.
2. Application of antimycin would be more difficult at First Lake due to the extensive marshy areas. There is also a stronger possibility that a complete kill of the coarse fish may not result.

3. Removal of only one beaver dam might be enough to enable better spawning either at the inlet or the outlet of First Lake.
4. This alternative would allow a comparison between chemical rehabilitation and Gerrard trout planting. If one method appears superior it may be applied to all the lakes.
5. The fishery at Second and Third Lakes will almost certainly improve to a degree. If the Gerrard trout planting in First Lake is successful, it may offer a better reward (i.e. bigger fish) to the fisherman who has to work a little harder to get there because of access.

Disadvantages

1. There is a stronger possibility that coarse fish could be re-introduced into Second and Third Lakes as they would still be present in First Lake.
2. It may be easier and more practical to apply a proven method (i.e. Alternative #2) uniformly to all three lakes.

VI. MANAGEMENT OF PRESENT CONDITIONS

A. STREAM IMPROVEMENTS

1. Obstruction Removal

Beaver dams block the outlet of Second Lake and the inlet and outlet of First Lake, There are also two along the channel connecting Second and First Lake.

The dams blocking the outlets of Second and First Lakes are 6 m across, 1.5 m high, and 5 m across, 1.5 m high, respectively. They could be dismantled by hand, but a faster method would be to use a small charge of dynamite to blow them. The other three dams are much smaller and could be easily dismantled by hand in about half an hour apiece. Removal of these dams would aid spawning efforts, but permission must first be obtained from the Parks Branch. They may be reluctant as there are still beaver in the area and the dams are a good interpretive feature. There is also an active trapline permit within the park.

Stream 4 (See Fig. 10-11) also contains debris in the form of small branches and deadfalls. Some of this provides cover for the fish but most can be removed by hand if it were determined that the debris was blocking the stream.

Stream 5, the outlet of this lake system, is criss-crossed by large fallen trees. (See Fig. 9 (8, 9). These trees are, for the most part, above the stream and do not impede the flow.

2. Other

A major effort would be required to improve Stream 3. As mentioned before, it is blocked at the Third Lake outlet by a wooden dam constructed to control the water level at Third Lake. It does not contain water year round, and I do not know whether removal of the dam would be permitted by the Parks Branch, or, indeed, whether removal would result in a sufficient flow for spawning activity.

The stream basically runs through an open marsh. There is virtually no streamside cover, and the lack of flow has resulted in a mucky organic bottom. To improve this channel, two-thirds of it or approximately 550 m would have to be dredged to remove the silt. Gravel suitable for spawning would have to be layed, cover provided, and some form of construction required (e.g. wing deflectors) to create pools and riffles. Of course, all of these improvements would not take place unless sufficient volume and velocity of water would be there during spawning.

B. COARSE FISH REMOVAL

1. Reasons For Removal

All three Champion Lakes were stocked with rainbow trout in 1960, 1967, 1968, and 1969. First Lake and Second Lake were stocked again in 1975 and 1980. According to a Fish and Wildlife Official in Nelson, [1] the stocking program ceased because the rainbow trout did not increase in numbers or size as was hoped. This lack of increase, according to this official, was caused by the abundance of coarse fish in the lakes. Complete removal of these competing species is neces-

sary to obtain the optimum benefit from a stocking program.

2. Means of Removal

The Fish and Wildlife Branch would effect the removal of coarse fish if the Parks Branch requested it. This would be done by releasing a toxin into the lakes and streams that would kill the fish. Due to the high, rapidly increasing cost of rotenone, which is most commonly used, it may be more economical to use antimycin. If labor costs are included in project costs, antimycin can approximate 50% of the cost of rotenone treatment.[5] It has been used in the United States for over a decade but is not yet licenced by the Food and Drug Administration of Canada. According to a Fish and Wildlife Official in Nelson, however, its licencing is imminent.[1]

Desirable characteristics of antimycin include: 1) irreversible action, 2) nonrepellency to target fish, 3) lack of color and odor in water, and 4) rapid degradation (usually 1-7 days).[4]

Antimycin comes in several different forms, each with its own advantages. Fintrol 5 is 1% antimycin coated on sand which releases the toxicant down to a five-feet depth. Fintrol 15 and Fintrol 30 contain slightly higher concentrations of antimycin which release the toxicant at the 15 and 30 foot depths respectively. Fintrol-Concentrate is a liquid formulation designed for injection into, or spraying on, lakes and streams. Fintrol-Bar is a solid formulation that is suspended in a stream to release its antimycin into the flowing water uniformly over a certain period of hours.[4]

The granular formulations may be spread from aircraft, boat, or by hand using hand or motor-powered spreaders. They are especially

useful in water areas infested with aquatic plants because the sand grains bounce off emergent vegetation and will penetrate dense mats of aquatic vegetation. The liquid formulation can be sprayed from a boat, injected by a pump into deep water in lakes, or metered by a drip system into a stream. A disadvantage of the liquid formulation is that it clings to emergent vegetation and is less likely than the sand formulations to penetrate the water. The solid formulation is suspended in a short length of plastic pipe, mounted vertically below the surface of the water, and is used mostly in streams.[4]

3. Recommended Treatment

It is recommended that treatment take place in mid-September. Third Lake and Second Lake should be treated with the liquid formulation of antimycin. This antimycin should be sprayed or pumped into the water from a boat. Both lakes have boat-launch areas, allowing easy access. First Lake should be treated with the liquid formulation or the granular formulation by spreading from a helicopter because a boat would have to be packed into this lake. For complete results, Fintrol-Bar should be placed at the lake outlets to ensure a total kill in the streams. It should also be placed in the inlet to Third Lake on the south shore approximately 75 m upstream. It is doubtful whether any fish will be upstream of that point.

4. Considerations Before and After Treatment

If all three lakes are treated, some antimycin residues may be dispersed down Landis Creek (the outlet of the system at the north end

of First Lake), which flows into Champion Creek and then into the Columbia River. Though not considered hazardous to humans, wildlife, or livestock whether consumed in water or as food (e.g. treated fish), anticmycin-treated water should not be used for drinking or crop irrigation until fingerling fish of sensitive species (e.g. rainbow trout) survive 48 hours of exposure in live cages in the treated water.[16]

There are no domestic or irrigation water users on any of the three Champion Lakes, or on the creeks interconnecting the lakes. The water for the provincial campground is obtained from an upstream source, Kearns Lake. The only potential water user downstream of First Lake is the Union of Spiritual Communities of Christ which is located on Champion Creek, approximately 5 km from the outlet of First Lake and 1.5 km from the junction of Landis Creek. At present, this licensee is not using the creek water for either domestic or irrigation purposes. If they plan to use the water for domestic purposes during the treatment period, an alternate water supply would be provided until residues reach non-detectable levels.

After treatment there may be dead fish floating in the lakes. Dead fish can be safely eaten by people, but it is not permitted under licensing conditions of the Food and Drug Administration.[5] These fish should be removed from the lakes if observed after treatment.

C. STOCKING STRATEGY

1. Source of Fish

After coarse fish removal, the Fish and Wildlife Branch will determine the number of fish to be planted. The last time these lakes were stocked, First Lake and Second Lake each received 8000 Rainbow Trout. Requests for the fish are made to the hatchery in the fall for delivery in the spring. The hatchery for this project would be the Kootenay Trout Hatchery at Wardner, 50 km. southeast of Cranbrook. After the request is made, the hatchery personnel will do the actual stocking.

2. Methods of Stocking

The good road access to Third and Second Lake allows the fish to be transported and released by a specially equipped truck. For the last planting a 450-litre insulated aluminum tank was mounted in the box of a 3/4 - ton pickup. The water in the tank is constantly re-oxygenated using a compressed oxygen cylinder. As First Lake is inaccessible by road it could be stocked by releasing fish from a helicopter. Stocking would take place in late spring.

The total cost for the 1980 plantings was approximately $250.00 or $125.00/lake.[10] This includes wages, operations, and facility costs. If all three lakes were stocked the total cost would be approximately $600.00.

This figure was reached by:

- 3 lakes @ $125.00/lake = $375.
- approximately 1/2 hr of helicopter time @ $450.00/hr. = $225

$600

3. Management of Stocked Lakes

Fishing should be closed for two seasons after stocking to allow the fingerlings to become established and grow. The public should be informed of this closure through the media, signs within the park, and park personnel. The gravel road leading to the boat-launch area at Second Lake can be closed to vehicle traffic by locking the existing gate at its start. Policing of this fishing closure would be necessary. — for 3-6" fish ??)

D. MONITORING CONDITIONS

1. Monitoring of Fish Numbers

After stocking has taken place an analysis of the improvement efforts should be done. This can be accomplished with a creel census which obtains information from fishermen on kinds of fishing, time of fishing, time spent, species and sizes of individuals caught, etc.

This information can be collected by Parks staff or Conservation Officers by the use of cards which would be turned in after a day of fishing. The results of this census, done over a summer, should indicate stocking success and provide a basis for determining fishing pressure.

Figure 12 is an example of a question card which could be used at Champion Lakes. It is a modified version of an example given in Lagler.[8] The back of the card should contain a small map of the lakes so fishermen will know what lake(s) they fished at. It can also show locations of areas at which the card can be dropped off. e.g. boxes at the boat-launch areas, park headquarters.

QUESTION CARD EXAMPLE FOR CHAMPION LAKES CREEK CENSUS

Lake Name _____ Date _____

Name of Fisherman _____ Address _____

Species Caught	Legal Size		Undersize		
	No.	Average Length	No.	Average Length	
Rainbow Trout					No.in party: ___
Longnose Sucker					No.in party who did not catch any fish: _____
Largescale Sucker					
Redside Shiner					
Unsure					
Other					

Kind of Fishing:

Boat _____ Bobber (still) _____

Shore _____ Bait used:-

Casting _____ 1. Natural _____

Trolling ____ 2. Artificial _____

Time fished to nearest 1/4 hour:

____ Hr. _____ Min.

From _____) a.m.

To _____) p.m.

FIGURE 12

2. Public Awareness

Signs at the park entrance and the boat-launch areas could inform the public of the objectives of the stocking program.

The public should also be informed of the dangers of transporting coarse fish. The Fish and Wildlife Branch have pamphlets about coarse fish which could be made available. An example of such a pamphlet is shown in Appendix IV.

VII. CONCLUSIONS

Study of the fishery at Champion Lakes Park has resulted in identifying the various factors which are adversely affecting it. Until some or all of these factors are addressed the fishery here will not improve. Hopefully the discussion of the problems and the management alternatives to those problems in the preceding pages will be of some use to those responsible for managing this situation. Certainly an improvement in the fishery at this park could only enhance the recreational opportunities this park has to offer.

VIII. RECOMMENDATIONS

My recommendations for managing the fishery at this park are as follows:

1. Alternative 3 under 'Management Alternatives' be implemented.
2. Do not improve access to First Champion Lake.
3. Close fishing for two years after stocking to allow the new population to become established.
4. Creel census when fishing reopens to determine level of success. Creel censuses done in subsequent years may determine if a regular stocking program is necessary.
5. Keep the public informed of management decisions and the reasons for these decisions. This information could be on signs near parking and boat-launch areas and in the form of pamphlets available at the park, through park personnel or through the media.

IX. BIBLIOGRAPHY

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X. APPENDICES

APPENDIX I - Habitat Enhancement Proposal: Introduction and evaluation of Gerrard rainbow trout for stocking small (1000 ha.) lakes in the interior of British Columbia.

APPENDIX II - Vegetation survey notes from July 1981 survey by the Aquatic Studies Branch done at Champion Lakes to determine the distribution of Eurasian water milfoil.

APPENDIX III - Ministry of Environment water quality reports for Second and Third Champion Lakes; November 16, 1981.

APPENDIX IV - Ministry of Environment pamphlet re coarse fish.

HABITAT
CONSERVATION FUND
HABITAT ENHANCEMENT PROPOSAL

LOCATION: Small Lakes near Cranbrook, B.C.

Within Fisheries Management Units, 4-22, 4-21

Regional District of East Kootenay, Kootenay East Provincial Electorial District

PROJECT DESCRIPTION:

Introduction and evaluation of Gerrard rainbow trout for stocking small (1000 ha) lakes in the interior of British Columbia.

ESTIMATED COST: $53,200 for 3-Years.

BENEFITS:

The benefits of this allocation are:

1. Alternative sources of Gerrard stock fish.
2. Creation of trophy fisheries.
3. Evaluation of an alternative to chemical rehabilitation.

VALUE OF GERRARD STOCK RAINBOW IN SMALL LAKES:

"Gerrard" rainbow trout are indigenous to Kootenay Lake in south eastern British Columbia. They are a unique, late maturing, highly predacious stock that attains a size greater than 15 kg. in Kootenay Lake. Historically eggs were collected from Gerrard rainbow from 1912 through 1952. Planting of this stock was probably responsible for the production of 4-8 kg. fish from the lakes in the East Kootenays before 1950's. Egg collections of Gerrard trout ceased in 1952 due to diminished spawning runs. The reduction in the number of spawning Gerrard fish was probably a result of a combination of over fishing, poor logging practices and the egg collection itself.

Since then, lakes in the area have been stocked with "Premier" stock rainbow, an earlier maturing variety of fish that seldom attain sizes greater than 3 kg. In lakes that contain coarse fish, these rainbow compete with, but rarely utilize them as a food source. Generally, because of this competition, survival and the introduction of a late maturing, highly predacious stock could increase the production of trout from lakes with coarse fish without expensive chemical rehabilitation. At the same time, it would diversify angling opportunities in the area by creating trophy fisheries.

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In the last 15 years, the number of spawning Gerrard rainbow trout have increased substantially. For the last four years a pilot program of artificial incuation and rearing of Gerrard rainbow trout has been carried out at Meadow Creek spawning facility for the purpose of enhancing the stocks in Kootenay Lake and gaining life history information by nose tagging data. Presently, there is a limited surplus of Gerrard eggs that may be stocked in small lakes in the East Kootenay. However, with the rapidly increasing angling pressure on Kootenay Lake, the surplus of Gerrard fish probably will not be available in the near future. It is a priority therefore to establish an alternative source of these unique fish to meet the need of both small East Kootenay Lakes and other regions in the province.

PROJECT DESCRIPTION:

Gerrard rainbow will be experimentally introduced into three lakes (Table 1), one containing rainbow trout only, one containing rainbow trout and shiners and one containing rainbow trout, shiners and suckers. The growth and diet of the fish will be monitored in the three lakes over three summers to (a) compare Gerrard rainbow growth with Premier fish in the lake with rainbow only; (b) to determine the extent that Gerrard rainbow utilize redside shiners and suckers and (c) to determine the growth and diet of Gerrard rainbow in lakes with and without a prey species. A creel census will be carried on over the same period, to both monitor the fisheries that develop and their public acceptance.

The Gerrard rainbow would be finclipped and nosetagged before release into the recipent waters to guarantee positive identification through the course of the study.

The lakes are in close proximity to Wardner Hatchery. Two of the three lakes have suitable stream sites for the collection of fish for stripping by Wardner Hatchery personnel.

IMPLICATIONS OF PROPOSAL

The evaluation of Gerrard trout has local, regional and provincial implications. On a local scale the proposal will immediately provide a diversity and increase in angling opportunities. On a regional scale the establishment in other lakes of identifiable Gerrard stock rainbow trout will serve as an alternative source other than Kootenay Lake itself. Provincially the study will evaluate an alternative to lake rehabilitation in those lakes that contain two of the commonly occuring coarse fish in British Columbia. It presently used hatchery Premier stock and most importantly provide an alternative source of Gerrard Stock rainbow eggs to the hatchery system.

. . . 3

Province of British Columbia — Environment

MEMORANDUM

To: P.R. Newroth
Manager
Littoral Studies Section

Date: July 23, 1981

File: 0316533-d-7-e

Re: Champion Lakes survey (July 8, 9) to identify the distribution of Myriophyllum spicatum.

1. Champion Lakes 1-3: General Observations
Only in Champion Lake #3 was M. spicatum identified; none was observed in its outflow channel (Champion Lake 3-2), Champion Lakes #2 or #1, or their outflow channels. M. spicatum was the only water milfoil species recorded in Champion Lake #3 although all areas downstream (Champion Lakes #2, #1 and all outflow channels) had established M. verticillatum. This is the species recorded by P. Warrington during the 1978 survey of Champion Lake #2.

The Champion Lake #3 outlet has been raised by Parks Branch to give additional storage capacity to the lake. They have also constructed an aquatic plant fragment barrier across the lake outlet using a foot bridge as the support structure. Although the barrier was working well it should be checked/cleaned regularly because of its small size. P. Warrington observed one water milfoil leaf on the barrier; identification to the species level couldn't be determined.

The outlets of Champion Lakes #2 and #1 each have a substantial beaver dam with about a 1.5 m head.

2. Champion Lake #3: Aquatic Vegetation Mapping and Documentation (refer to attached map and Vegetation Survey Notes).
a) M. spicatum Distribution. M. spicatum was restricted to two areas of the lake including the southeast corner and the littoral area adjacent to the outlet. Only 5-6 small plants were noted at the outlet. The southeast corner, however, adjacent to the Parks developed recreation area, was documented and mapped as three distinct zones including:

Zone A. This shallow area offshore of an artificial sand beach, had approximately 50 rooted M. spicatum plants (very sparse).

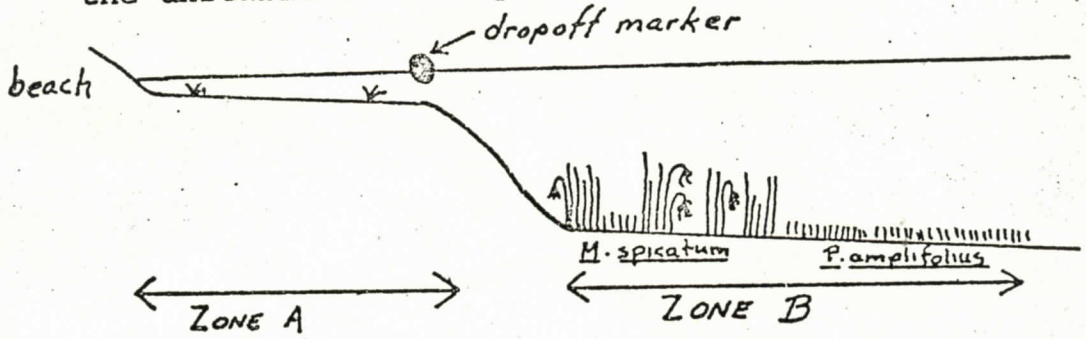
Zone B. This was delimited on the inshore side by an abrupt dropoff. The zone consisted of a dense population of aquatic plants to a depth of about 7 m. Although the dominant species was Potamogeton amplifolius, M. spicatum was a very significant component primarily in a band confined to the inshore edge. No vegetation was noted on

81-07-27

July 27/81

..2

the unstable sand dropoff (see illustration).



There were many regularly spaced single M. spicatum plants or clumps (up to 100 stems). One noteable area had a dense population of M. spicatum about 3 x 10 m. M. spicatum plants in this zone in general were luxuriant, many 1-1.5 m tall, and many with adventitous roots on the top, with negative buoyancy and rooting in the sediment a striking occurrence. I believe this shows the infestation to be increasing in density.

Zone C. This is a broad littoral shelf with a natural bottom (silt/organic) and sparse M. spicatum scattered throughout other vegetation within the zone.

It is important to note that the only M. spicatum infested areas in Champion Lake #3 are those with an artificial sand substrate. The few plants at the outlet are growing in the sand used by Parks Branch, to construct a small dam to increase storage capacity (previously mentioned). The M. spicatum infestation in the southeast corner (Zones A & B) is growing on sand utilized by Parks Branch to construct a recreational beach/swimming area. Groundwater inflow to the area (one spring was noted) could be stimulating plant growth, however, so this generalization may be oversimplified. Artificial sand beaches have resulted in aquatic weed problems in lakes elsewhere in British Columbia; Divers Lake near Nanaimo (Myriophyllum exalbescens Fern.) and Buntzen Lake near Port Moody (Juncus supiniformis Engelm.) are two examples.

The majority of the littoral area of Champion Lake #3 is barren with regards to aquatic plants in general, the major exception being the southeast corner that is infested with M. spicatum. P. Warrington is making arrangements to have a water sample taken and analysed to see whether nutrient limitations are restricting plant growth elsewhere in the lake.

b. Recommendations for treament/control of M. spicatum.

The few M. spicatum plants at the lake outlet and Zone A (southeast corner) should be hand pulled. Zones B & C should be treated with herbicide as it is a well defined and limited area and, I believe, no water use conflicts are present with a Fall treatment. Groundwater seepage into the area (the springs previously mentioned) could reduce treatment effectiveness.

The alternative to chemical treatment in Zones B & C is the use of a diver dredge. There are several limiting factors to the use of this control method including:

- quantity/number of plants. There are many M. spicatum plants in Zone B. Densities were recorded as sparse to moderate but with many dense clumps.
- there is a lot of background vegetation, primarily P. amplifolius. Although M. spicatum is the only Myriophyllum species present, it would be difficult to visually locate all the plants.
- Zone C and the deeper areas of Zone B have silt/organic substrates. Turbidity from dredge operation would decrease dredge effectiveness.
- the presence of bottom debris.

If use of a diver dredge is still considered I would recommend that a dredge supervisor make an on-site inspection to further evaluate the potential effectiveness of dredge use.

Rough M. spicatum affected area calculations based on a Balkwill survey map (1955 soundings, shore outline from an old survey map) are as follows:

total M. spicatum affected area, Zones A, B & C = 2.1 acres (0.8 ha).
M. spicatum affected area, Zones B & C (omit shallow Zone A) = 1.4 acrea (0.6 ha).

R. Nijman

Enc.

cc: R. Adams
M. Maxnuk
M. Wallis
M. Ferguson
P. Warrington

Champion Lake #3. Vegetation Survey Notes (July 8, 1981 survey)

Map

Zone A - (2-3) Artificial sandy beach, gradually sloping from 0 to about 2 m before a sudden slope change at the drop-off. Vegetation density very low, mostly isolated plants. There were no more than 50 rooted M. spicatum plants or fragments in this zone; mostly in very shallow water less than 0.2 m deep. These occurred mostly as isolated plants or clumps of two to four plants except for one large bed of several dozen plants. Other plants found here in rare isolated spots include Elodea canadensis, Ranunculus aquatilis, Potamogeton amplifolius and Sium sauve.

Zone B - (2-3) At the deep water edge of the abrupt drop-off to about 7 m, where the slope becomes shallower again, much of the surface is still covered in the artificial sand. The zone was densely covered in Potamogeton amplifolius and had some Chara sp. and P. natans. This zone may be up to 10 m wide or more in spots but most of the M. spicatum was confined to a band in the shallower portion where density is sparse to moderate (clumps and single plants) and plants are tall (up to 1.5 m) and robust. One dense patch of M. spicatum was about 3 x 10 m. Only scattered M. spicatum plants were found further out in the P. amplifolius bed.

Zone C - (1-2) This is a natural bottom portion of the lake with an organic debris sediment. The deeper portions contained P. natans, Chara and P. amplifolius; the shallow portions P. natans, Equisetum fluviatile, Eleocharis palustris, Potentilla palustris and Nuphar polysepalum. Plant density was quite high here and M. spicatum was scattered throughout the zone, mostly in the intermediate depths.

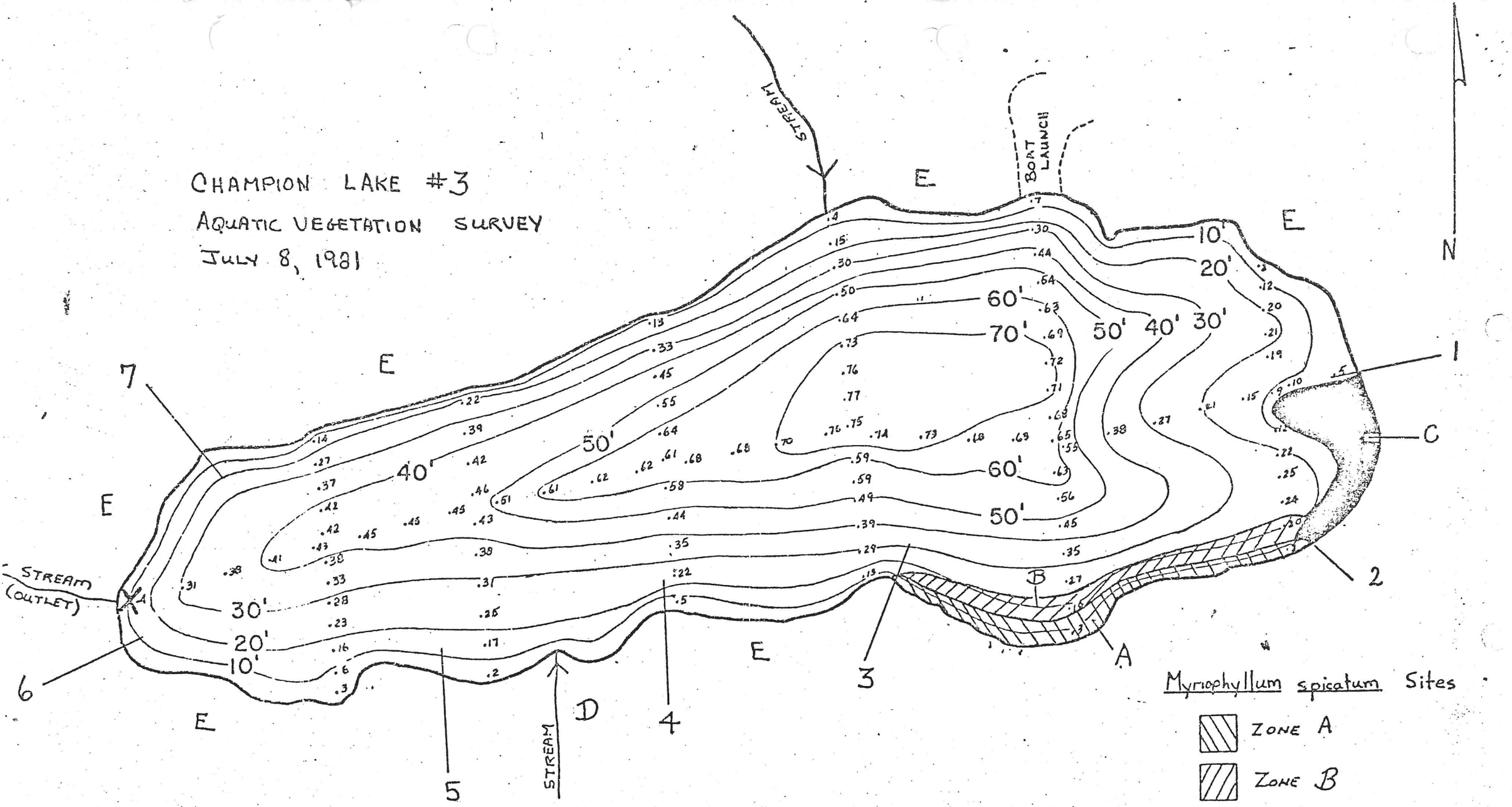
Zone D - (4-5) This area is on either side of an incoming stream and had a higher than normal density of aquatic plants and a bed of Nuphar polysepalum which was not common in the lake. Other plants included P. amplifolius, Potentilla palustris, Equisetum fluviatile, P. gramineus, P. natans, Ranunculus aquatilis and Chara sp.

Zone E - (3-4) (5-6) (6-7) (7-1) This area comprises the rest of the lake which was relatively uniform and undisturbed except for the boat launch and a foot bridge at the exit creek. The portions between (3-4) and (7-1) were of sparse plant density, (6-7) had low density and (5-6) the highest plant density. The bottom was much like Zone C but towards the exit end more wood and debris was found. Plants found generally around the shore included Chara sp., P. amplifolius, Equisetum fluviatile, Eleocharis palustris, Potentilla palustris, P. gramineus, Polygonum amphibium, and rarely Nuphar polysepalum.

CHAMPION LAKE #3

AQUATIC VEGETATION SURVEY

JULY 8, 1981



Scale: 1" = 220'

Myriophyllum spicatum Sites

- ZONE A
- ZONE B
- ZONE C
- × About 6 isolated plants were seen here in deeper water

ENVIRONMENTAL LABORATORY
MINISTRY OF THE ENVIRONMENT

WATER QUALITY REPORT FOR SAMPLE 116975W

TO: DR P WARRINGTON
AQUATIC STUDIES BR
VERNON BC
ATTENTION OF: DR P WARRINGTON

FOR SITE: CHAMPION LAKE #2

SAMPLING DATE(S): OCT 27/81 0000 HRS
SAMPLE TYPE: FRESH WATER
SAMPLING DEPTH: 0.1
SAMPLING LOCATION: SURFACE
SAMPLED BY: AQUATIC STUDIES BR., MOE
DATE RECEIVED BY LABORATORY: OCT 28/81

0040101	PH	7.8 REL UNIT	0110101	SPECIFIC CONDUC	148. UMHO/CM
1070002	HARDNES,T:CACO3	71. MG/L	1081704	NITROGN:AMMONIA	0.017 MG/L
1091703	NITROGN:NO2 NO3	L 0.02 MG/L	1100001	NITROGEN:NO3	L 0.02* MG/L
1111701	NITROGEN:NO2	L 0.005* MG/L	1120003	NITROGN:ORGANIC	0.30 MG/L
1130101	NITROGN:KJELDAH	0.32 MG/L	1140001	NITROGEN:TOTAL	0.32* MG/L
1181703	PHOSPHORUS:ORT	L 0.003 MG/L	1191703	PHOSPHORUS :TOT DISSOLVED	0.006 MG/L
1190103	PHOSPHORUS :TOT	0.020 MG/L	2541802	CALCIUM DISSOLVED	25.3 MG/L
2591801	MAGNESIUM DISSOLVED	1.9 MG/L	2641703	POTASSIUM DISSOLVED	0.4 MG/L

THE APPROXIMATE COST OF THE ABOVE TESTS IS $ 101.00

REMARKS:

FOR ENVIRONMENTAL LABORATORY

SAMPLERS'S COMMENTS: CHAMPION LAKE #3

NOVEMBER 16, 1981 ENVIRONMENTAL LABORATORY PAGE 1
MINISTRY OF THE ENVIRONMENT

WATER QUALITY REPORT FOR SAMPLE 116976W

TO: DR P WARRINGTON
AQUATIC STUDIES BR
VERNON BC
ATTENTION OF: DR P WARRINGTON

FOR SITE: CHAMPION LAKE #3

SAMPLING DATE(S): OCT 27/81 0000 HRS
SAMPLE TYPE: FRESH WATER
SAMPLING DEPTH: 0.1
SAMPLING LOCATION: SURFACE
SAMPLED BY: AQUATIC STUDIES BR., MOE
DATE RECEIVED BY LABORATORY: OCT 28/81

0040101	PH	7.7 REL UNIT	0110101	SPECIFIC CONDUC	129. UMHO/CM
1070002	HARDNES,TICACO3	60.5 MG/L	1081704	NITROGN:AMMONIA	0.007 MG/L
1091703	NITROGN:NO2 NO3	L 0.02 MG/L	1100001	NITROGEN:NO3	L 0.02* MG/L
1111701	NITROGEN:NO2	L 0.005* MG/L	1120003	NITROGN:ORGANIC	0.14 MG/L
1130101	NITROGN:KJELDAH	0.15 MG/L	1140001	NITROGEN:TOTAL	0.15* MG/L
1181703	PHOSPHORUS:ORT	L 0.003 MG/L	1191703	PHOSPHORUS :TOT DISSOLVED	0.007 MG/L
1190103	PHOSPHORUS :TOT	0.009 MG/L	2541802	CALCIUM DISSOLVED	21.1 MG/L
2591801	MAGNESIUM DISSOLVED	1.9 MG/L	2641703	POTASSIUM DISSOLVED	0.6 MG/L

THE APPROXIMATE COST OF THE ABOVE TESTS IS $ 101.00

REMARKS:

FOR ENVIRONMENTAL LABORATORY

SAMPLERS'S COMMENTS: CHAMPION LAKE #3

Fish and Wildlife Branch Regional and Sub-Regional Offices

Region 1
Vancouver Island
324 Terminal Avenue, Nanaimo V9R 5C8
Phone: 754-1371

Region 2
Lower Mainland
4240 Manor Street, Burnaby V5G 1B2
Phone: 435-4137

Region 3
Thompson-Nicola
106-1959 E. Trans-Canada Highway, Kamloops V2C 4A2
Phone: 374-5102

Region 4
Kootenay
310 Ward Street, Nelson V1L 5S4
Phone: 352-2211

Rm. 216, Courthouse, Cranbrook
Phone: 489-2311

Region 5
Cariboo
540 Borland Street, Williams Lake V2G 3W2
Phone: 392-6261

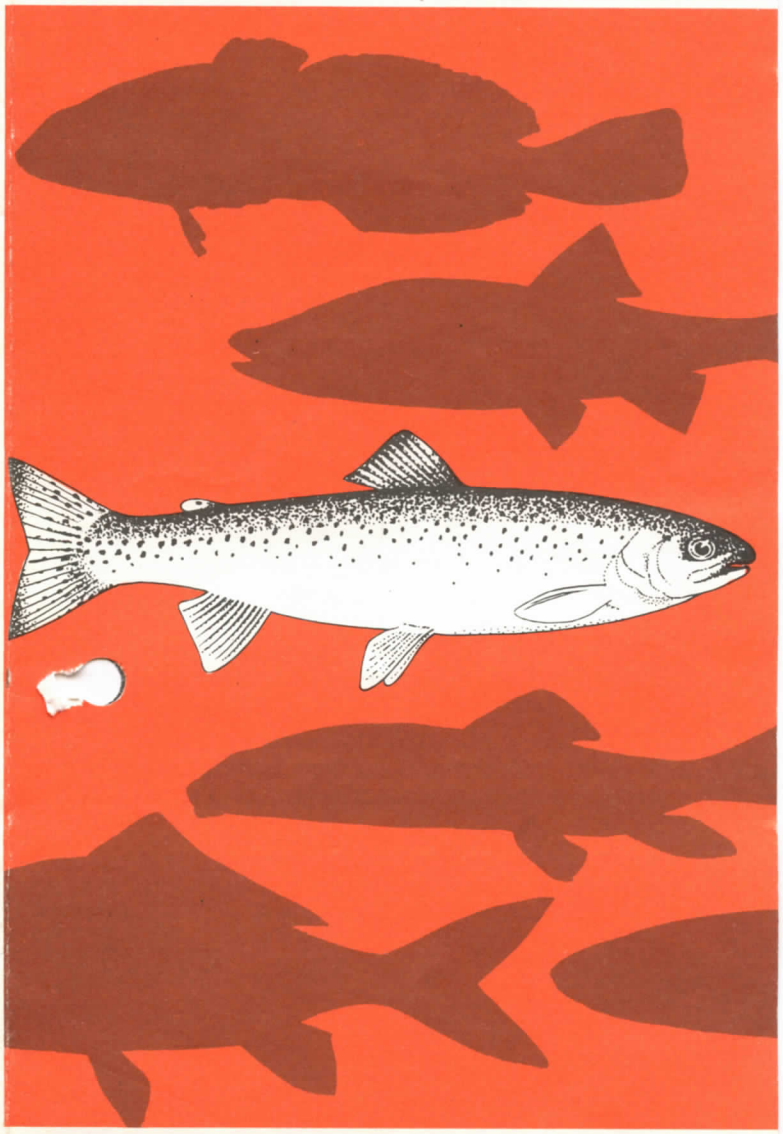
Region 6
Skeena
Courthouse, Smithers V0J 2N0
Phone: 847-4411

Region 7
Omineca-Peace
Plaza 400, 1011-4th Avenue,
Prince George V2L 3H9
Phone: 562-8131

9711-100th Avenue, Fort St. John V1J 1Y2
Phone: 785-8011

Region 8
Okanagan
257 Brunswick Street, Penticton V2A 5P9
Phone: 493-2714

Help! Don't move coarse fish



Province of British Columbia
Ministry of Environment
FISH AND WILDLIFE BRANCH

The Danger to Fish Hatchery Operations

Large populations of coarse fish have forced the closure of one lake this year. Of even greater concern is the threat they pose to nearby brood stock lakes. The B.C. hatchery system is the only one in North America in the enviable position of taking 95% of its eggs from wild trout each year. This places critical importance on the lakes which support egg collection operations — up to 40% of the eggs come from a single lake. If a key brood stock lake is lost to coarse fish, the sport fishing in many lakes will decline.

What's to be done?

Since 1947, the Branch has chemically treated approximately 150 lakes, at least once, to remove or reduce coarse fish. A small lake can be effectively and safely treated with a natural organic substance called rotenone, then restocked soon after. But a large lake cannot. The high and rapidly rising cost of rotenone makes treatment prohibitive. Partial treatments are not effective because coarse fish can normally detect rotenone and escape to other areas of a lake.

Other attempts to control coarse fish are very limited. Barriers placed on streams will allow trout to pass and will deny access to some coarse fish. But many species, like sculpins, suckers and squawfish, do not always need to use streams to reproduce — they can spawn in lakeshore areas.

It's Your Move

The key to controlling the quality of fishing lakes is *you*. What is yours to enjoy is yours to protect. Near some of the most popular fishing lakes, the Branch has placed signs warning the public not to transport live fish or to use them as bait. Both are illegal.

But whatever lakes or streams you visit, remember one important *"Don't"* and one important *"Do."* Your future fishing enjoyment may depend on it.

- *Don't* move live fish from one body of water to another for any reason!
- *Do* report any such moves you see, including the use of live fish as bait!

Make your report *as soon as possible* to:

- the nearest Ministry of Environment Conservation Officer

or the nearest Fish and Wildlife Branch office

or phone Zenith 2235 (toll-free 24 hours, 7 days a week).

Coarse Fish Control and You

You have a multi-million dollar resource to enjoy — and to protect. British Columbia's fishing lakes are exceptional. Yet every year, coarse (sometimes called "trash") or undesirable fish ruin several lakes — eventually causing their closure to anglers.

Quality lake fishing depends on quality fish — a fragile resource.

It's Your Loss

A decline in the number and quality of fishing lakes means a considerable loss in pleasure to the people who enjoy freshwater fishing. Last year these people numbered over 400,000 and spent six million days at their sport. Direct government revenue from licence sales also stands to drop as fishing declines. And what's more, thousands of residents who operate lakeside lodges and resorts, or who supply materials and services to anglers, face a substantial loss of direct income.

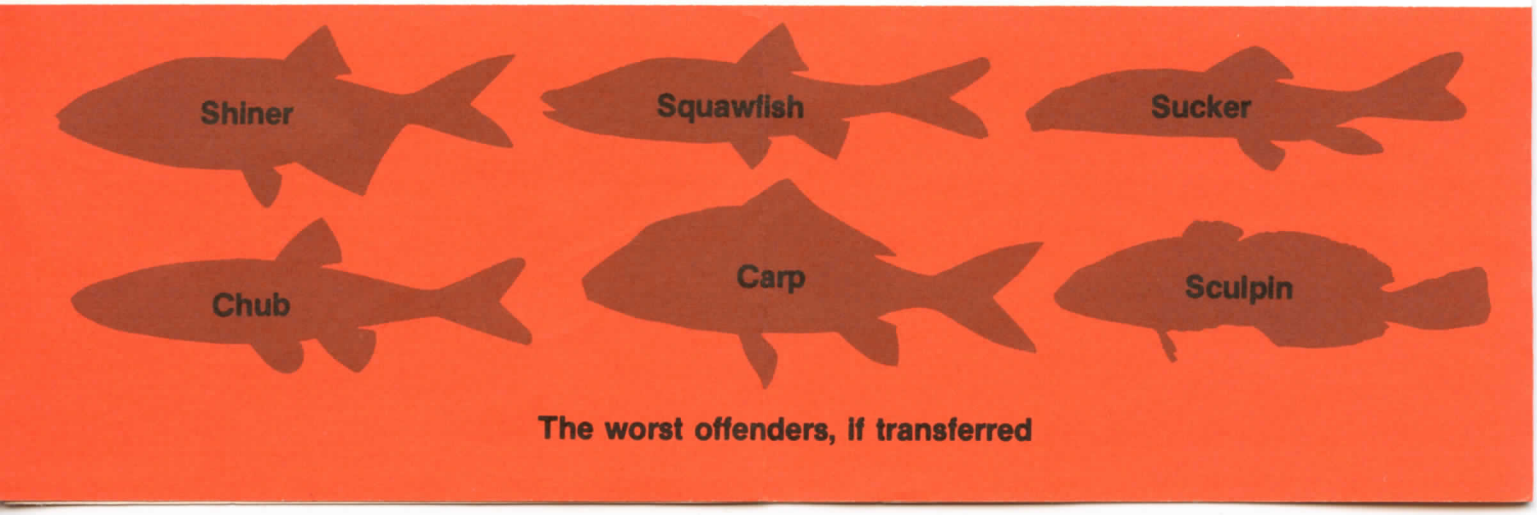
Are You Responsible?

Some of the very people who use and enjoy our lakes extensively are responsible for their closure. For one reason or another, people capture live fish and release them in different lakes and streams — usually with no idea of the problems they create. Some even think they are doing a good deed by tossing a hapless fish over a dam or by introducing coarse fish as food for game species. Children move many fish in play, filling a pail at one campsite and emptying it at another. And then there are the anglers who like to use live fish ("minnows") as bait. All too often, the surviving "bait" escapes or is released in the lake at the trip's end.

The Trouble with Coarse Fish

How can the transfer of a few fish affect our sport fisheries so drastically?

Every year, the Fish and Wildlife Branch of the Ministry of Environment stocks over 500 lakes with six to seven million game fish from the provincial hatcheries. The Branch chooses lakes that are nutritionally rich and often prepares them through chemical treatment, aeration and the restocking of fish food organisms. But all efforts to ensure favourable growth and survival of game fish are wasted if the public introduces other fish to these lakes.



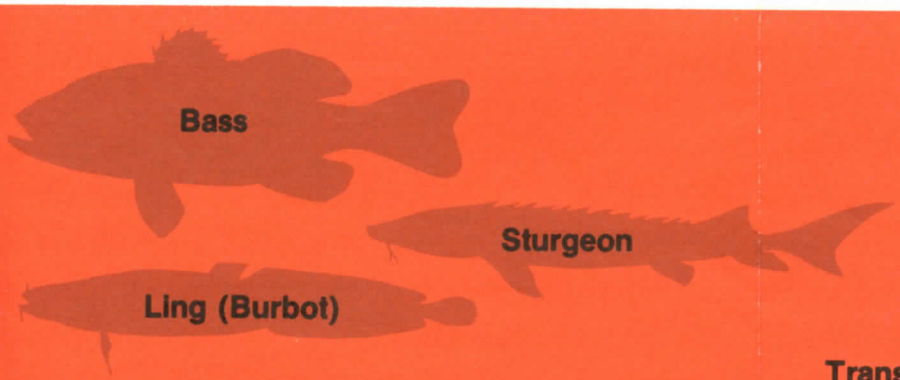
The worst offenders, if transferred

Collecting "minnows" can have disastrous results if they end up in the wrong place.

Once coarse fish are established in a lake, they tend to dominate. While a single female trout may produce 1,000 to 5,000 eggs, a sucker may produce 20,000 to 100,000, and a carp — 300,000! Coarse fish which are not this prolific ensure a high survival rate by caring for their young. Male sticklebacks, and pumpkinseeds, for example, guard their eggs, and protect the newly hatched until they are able to fend for themselves. One or both catfish parent also guard their eggs, and spend several weeks shepherding their young.

Fast rising numbers of coarse fish create serious problems for game fish species. Some coarse fish, like the squawfish, prey directly on fry or eggs, while redside shiners compete with trout for food. All species of coarse fish offer formidable competition for space. And unlike the trout, they are well adapted to sharing their environment with one another and to using it very efficiently. Within a single lake, there may be carp grazing near the bottom, sculpins (often called "bullheads") eating out of the muds and gravels, and chubs feeding on the plankton and from upper level rocks. Trout are then faced with a three-way intrusion on their environment. Their size and numbers drop dramatically.

The benefits of stocking lakes with sport fish are quickly cancelled if coarse fish are re-introduced.



Don't transfer these either

Trout

Transferred *only* by fisheries management