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FINAL REPORT

PRESENCE AND DISTRIBUTION OF EXOTIC FISH SPECIES IN THE OKANAGAN WATERSHED

Prepared for:

Okanagan Nation Fisheries Commission
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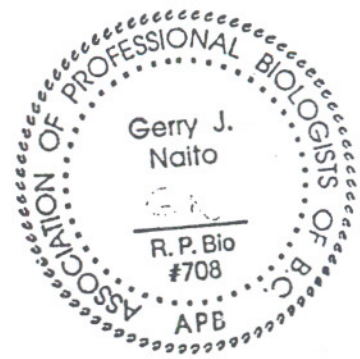

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NAITO ENVIRONMENTAL

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1. INTRODUCTION

Sockeye salmon (*Oncorhynchus nerka*) historically ranged as far upstream as Okanagan Lake in the upper Columbia River system. However, Okanagan Lake sockeye were extirpated as a result of construction of several dams on the Okanagan River that blocked upstream fish migration. The Okanagan Nation is investigating the viability of re-establishing an anadromous sockeye salmon population to Okanagan Lake, which would involve providing fish passage facilities at one or more fish passage barriers (dams) on the Okanagan River upstream of Oliver, British Columbia.

One obstacle in gaining support from fisheries managers for the re-introduction of sockeye salmon to Okanagan Lake is a concern that provision of fish passage facilities will allow exotic (i.e., introduced) fish species to colonize Okanagan Lake from the south. The concern is that colonization by these exotic species would further disrupt the natural ecosystem already subject to impacts of introduced species such as mysid shrimp.

The exotic fish species of concern are already present in Osoyoos Lake, and many have also colonized Vaseaux Lake. However, exactly which exotics are present in the Okanagan Basin and the extent of their distribution is unclear. Therefore, if the species of interest are already present in Okanagan Lake, the concern of colonization resulting from providing sockeye passage into Okanagan Lake would be unfounded. Until this uncertainty is resolved, fisheries managers will continue to raise the colonization concern as an obstacle to realization of the Okanagan Nation's objective of restoring sockeye salmon to their historic range in the Okanagan.

Naito Environmental was requested by the Okanagan Nation Fisheries Commission (ONFC) to summarize existing information on the presence and distribution of exotic fish species in the Okanagan region to clarify what degree of concern about colonization by exotics is warranted, and what steps can be taken to address this concern. The information summary is also expected to be of value to the BC Ministry of Environment, Lands and Parks (MELP) for regional fisheries planning and management purposes.

Funding for this study was provided under the Salmonid Renewal Program of Fisheries Renewal BC through the Okanagan-Similkameen-Boundary Fisheries Partnership.

2. METHODS

The research methods consisted of reviewing existing data and conducting telephone or personal interviews. A one-day visit to the MELP office in Penticton was made on July 30, 1999, to review file data and various reports. Other information was derived from BC Ministry of Fisheries reports, consultants' reports, and other publications. Interviews were conducted with staff of fishing tackle retail shops from Vernon to Osoyoos, a biologist with the BC Ministry of Environment, Lands and Parks (MELP) in Penticton, staff of the Summerland Trout hatchery, and local Okanagan anglers. Interviewees were asked what their knowledge was of the presence and distribution of specific introduced fish species in the Okanagan region. A list of all persons or establishments contacted in collecting information for this study is provided as Appendix 1. Telephone numbers are provided to facilitate re-contacting interviewees if further information is desired.

It was initially envisioned that a comprehensive listing of fish species presence and distribution in the British Columbia portion of the Okanagan Basin would result from this study. However, due to funding limitations, a narrower approach focussing only on the introduced species was adopted.

3. RESULTS

McPhail and Carveth (1993) indicate the presence of 12 introduced fish species in the Okanagan sub-region of the Columbia Region, and a thirteenth (brown bullhead, *Ameiurus nebulosus*) with uncertain status. Investigations for the present study revealed a fourteenth possible species (walleye, *Stizostedion vitreum*). More than half of these 14 exotic fish species have moved into the Okanagan region from the state of Washington via the Okanagan River. An upstream fish passage barrier (dam) at Okanagan Falls at the outlet of Skaha Lake seems to be the present upstream limit of fish species that have invaded the Okanagan system by this route. The 14 exotic fish species that are known or reported to be present in the Okanagan drainage basin, and their present distribution status, are summarized below in Table 1.

Details of the reported distributions of these 14 fish species in the Okanagan drainage basin are presented below in Sections 3.1 through 3.13.

3.1 BROOK TROUT

The brook trout (*Salvelinus fontinalis*) has been introduced as a sport fish throughout the Okanagan and is now widely established, including in Okanagan Lake.

3.2 LAKE TROUT

Lake trout (*Salvelinus namaycush)* were introduced as a sport fish to Kalamalka Lake in the 1970s, with the last stocking in 1977. The introduced fish thrived, but have apparently had limited success in reproducing, as sport catches appear to consist only of individuals from the original stocking. One angler reported observing what he believed to be a younger age class of lake trout ("2-3 pounds") in Kalamalka Lake "about two years ago" (E. Popovich, pers. comm.), but he has only captured large individuals in the 9 kg size range. A total of 16 lake trout entered in a 1987 fishing derby sponsored by Central Hardware in Enderby ranged in weight from 7 to 12 kg. A few specimens have been captured by anglers in Okanagan Lake. These are presumably fish that migrated downstream from Kalamalka Lake via Vernon Creek.

3.3 LAKE WHITEFISH

Lake whitefish (*Coregonus clupeaformis*) have become established in the large valley bottom lakes in the Okanagan region, where they were introduced in the early 1900s with a view to establishing a commercial fishery. An attempted commerical fishery in 1929 was unsuccessful (Carl, Clemens, and Lindsey 1959), but lake whitefish support a popular sport fishery in early fall for anglers fishing from log booms near the mouth of Bear Creek on the west side of Okanagan Lake.

Table 1. Names and distribution status of exotic fish species known or reported to be present in the Okanagan drainage basin.

Common Name	Scientific Name	Distribution Status North of Okanagan Falls
1. brook trout	*Salvelinus fontinalis*	established throughout
2. lake trout	*S. namaycush*	present in Kalamalka Lake; occasional catches from Okanagan lake
3. lake whitefish	*Coregonus clupeaformis*	established in large valley-bottom lakes
4. largemouth bass	*Micropteris salmoides*	established south of Okanagan Falls; no reports north of there except Shannon Lake
5. smallmouth bass	*Micropteris dolomieui*	established in Okanagan Lake and valley-bottom lakes to the south
6. pumpkinseed	*Lepomis gibbosus*	established throughout
7. black crappie	*Pomoxis nigromaculatus*	reliable reports from Okanagan Lake
8. walleye	*Stizostedion vitreum*	unconfirmed reports from Okanagan River
9. yellow perch	*Perca flavescens*	established throughout
10. black bullhead	*Ameiurus melas*	reasonably reliable report from Duck (Ellison) Lake at Winfield
11. brown bullhead	*Ameiurus nebulosus*	uncertain
12. tench	*Tinca tinca*	unconfirmed report from Kalamalka Lake
13. carp	*Cyprinus carpio*	established throughout
14. goldfish	*Carassius auratus*	no reports north or south of Okanagan Falls

3.4 LARGEMOUTH BASS

Largemouth bass (*Micropteris salmoides*) are known from Shannon Lake near Westbank and from various waters south of Okanagan Falls, including Okanagan River and Vaseaux, Tugulnuit, and Osoyoos lakes. The Shannon Lake population is isolated from Okanagan Lake, as Shannon Lake has no outlet stream. There are rumours of largemouth bass being present in Bear (Lambly) Lake (C. Sommer, pers. comm.), where yellow perch have already been unlawfully introduced. If true, this would give largemouth bass ready access to Okanagan Lake via North Powers and Powers Creek, which flow from Bear Lake. However, the reliability of this report is suspect, as the proprietor of Bear Lake Fishing Resort is not aware of bass in the lake and suspects that the reported bass may have been yellow perch that were mis-identified.

3.5 SMALLMOUTH BASS

Previous to 1987, smallmouth bass (*Micropteris dolomieui*) were present only in waters south of Okanagan Falls, including Okanagan River and Vaseaux and Osoyoos lakes. In spring of 1987, MELP introduced smallmouth bass from Christina Lake (Kettle River system) to the south end of Skaha Lake. These fish became established, and have extended their range northward, being reported from the north end of Skaha Lake in 1992. More recently, a pair of smallmouth bass were observed in the kokanee spawning channel of Mission Creek at Kelowna by an experienced bass angler during the kokanee fry outmigration in spring of 1998 (Dan Taylor, pers. comm.).

3.6 YELLOW PERCH

Yellow perch (*Perca flavescens*) in BC probably originated from Washington, where they were first introduced in 1890 (Carl, Clemens and Lindsey 1959). Previously confined to Shannon Lake and waters south of Okanagan Falls, they are now established throughout the large valley-bottom lakes of the Okanagan. In addition, they have been unlawfully transferred to Bear (Lambly) Lake west of Kelowna and to Pinaus Lake and Little Pinaus Lake at the headwaters of Equesis Creek west of Vernon. There is also rumoured to be another small mountain lake in the vicinity of Bear Lake where yellow perch are present (C. Sommer, pers. comm.). Yellow perch are also believed to be present in Rose Valley Reservoir (D. Smith, pers. comm.).

3.7 PUMPKINSEED

Pumpkinseed (*Lepomis gibbosus*) are another species that presumably originated from Washington, being first detected in the Okanagan in Osoyoos Lake. Possibly due to their small size and bright attractive colouring that would make them appealing aquarium fish, they have now been unlawfully introduced to various waters including Swan Lake north of Vernon (B. Smaha, pers. comm.; R. Redstone, pers. comm.) and Okanagan Lake (Coast River Environmental Consultants Ltd. 1999a, 1999b).

3.8 BLACK CRAPPIE

In the Okanagan, black crappie (*Pomoxis nigromaculatus*) are reported to be established in waters south of Okanagan Falls (McPhail and Carveth 1993). However, two anglers interviewed for this study report catching crappie in the north arm of Okanagan Lake along the Okanagan Indian Reserve (J. Webster and Dan Taylor, pers. comm.). These reports are considered reliable. Other reports from Duck (Ellison) Lake (C. Sommer, pers. comm.) and Shannon Lake (D. Taylor, pers. comm.) are considered probable mis-identifications of yellow perch.

3.9 WALLEYE

There are anecdotal reports of anglers catching walleye (*Stizostedion vitreum*) in the Okanagan River in the vicinity of Osoyoos Lake (C. Sommer, pers. comm.; J. Niehaus, pers. comm.). This author received one anecdotal report of walleye from the Okanagan River south of Osoyoos Lake (D. Taylor, pers. comm.), while another was believed to be for the

river upstream of Osoyoos Lake (W. Derdau, pers. comm.). While unconfirmed, these reports are considered highly plausible, as walleye have been introduced to the Columbia River system in Washington and have since expanded their range north into British Columbia via other river systems. They are established in the Kettle River downstream of Cascade Falls, and Columbia River downstream of Hugh Keenleyside Dam, with unconfirmed reports from Wasa sloughs in the upper Kootenay (McPhail and Carveth 1993).

3.10 BULLHEAD (CATFISH)

The black bullhead or catfish (*Amieurus melas*) is established in the Okanagan system downstream of Okanagan Falls (McPhail and Carveth 1993). Carl, Clemens and Lindsey (1959) state that many early records of this species dating from 1896 in the Washington state portion of the Columbia River system may have been based on brown bullhead (*Amieurus nebulosus*) rather than *A. melas*, suggesting that the brown bullhead is present in Washington state. McPhail and Carveth (1993) note that the two species are often confused, and state that the present distribution of brown catfish in the BC portion of the Columbia system is unclear.

Cindy Sommer (pers. comm.) of A and C Sports Ltd in Kelowna reports catching a catfish around 1997 in Ellison (Duck) Lake north of Kelowna. This report is considered reasonably reliable, and Duck Lake provides shallow, silty water habitat where catfish are typically found. It may be possible to verify this report by examining catch data from a commercial carp fishery in this lake (D. Smith, pers. comm.).

3.11 TENCH

Tench (*Tinca tinca*), a carp-like fish, are established in the Okanagan system south of Okanagan Falls. Based on this distribution, they presumably originated from Washington, where they were introduced in 1895 (Carl, Clemens, and Lindsey 1959). A possible tench was reported in spring of 1997 stranded in a ditch tributary to Coldstream Creek which flows to Kalamalka Lake. The observer identified the fish as a tench when shown pictures of carp and tench in Carl, Clemens and Lindsay (1959).

3.12 CARP

Carp (*Cyprinius carpio*) are widespread throughout the large valley-bottom lakes of the Okanagan region. They are believed to have originated from the state of Washington, where they were first introduced in 1882 (Carl, Clemens, and Lindsey 1959).

3.13 GOLDFISH

Goldfish (*Carassius auratus*) are an ornamental fish species that has recently been found in Gardom Lake between Enderby and Salmon Arm. This lake drains to the Shuswap River, but is at the divide between the Shuswap and Okanagan drainages, presenting a potential threat of spreading to Okanagan Lake via Deep Creek. Previous to being detected in Gardom Lake, the nearest record to the Okanagan was in a large pond at Salmon Arm (Carl, Clemens and Lindsey 1959).

4. DISCUSSION

4.1 EXOTIC FISH SPECIES OF CONCERN

From a fish passage point of view, the exotic fish species of concern to fisheries managers are those that occur south of Okanagan Falls but have not made their way upstream into Skaha and Okanagan Lakes. Based on results of this study, these fish species are largemouth bass and walleye, and possibly bullhead (catfish) spp., and tench, although these latter two species may already be present in the north Okanagan. The effects of invasion of Okanagan Lake by these fish species are unknown, but could include negative impacts to native fish fauna as well as wildlife such as waterfowl. Introduced fish species are often associated with declines in popular sport fish such as trout (Nelson 1998). Potential effects of the four exotic fish species of concern on native fish and wildlife are discussed below.

Largemouth bass are a predatory fish, with principal food comprised of fish, frogs, crayfish, and other animal items (Carl, Clemens and Lindsey 1959). For this reason, they may compete directly with favoured sport species such as rainbow trout, and prey on juvenile rainbow trout and the endangered Okanagan Lake kokanee. Bass tend to be territorial ambush predators, which would tend to minimize their predation impact on a pelagic species such as kokanee. However, there may be considerable effects on other fish and wildlife species that inhabit shoreline cover areas.

The walleye is another predatory fish, with a diet consisting largely of small fish. Furthermore, it is an active swimmer that is capable of travelling long distances (Carl, Clemens and Lindsey 1959). These characteristics potentially make it the greatest threat to native Okanagan Lake fish stocks, including kokanee, of the four exotic species of concern. While reports of walleye in the south Okanagan are considered unconfirmed, it is likely only a matter of time before they become established south of Okanagan Falls, as they have already successfully colonized other BC rivers from the south.

Bullheads (catfish) are bottom-feeding fish that typically occupy ponds, sloughs, and backwaters of lakes and rivers where the water is often shallow and silty (Carl, Clemens and Lindsey 1959). These same authors state that "accurate information concerning the effects of catfish upon trout is not available." This is likely true for effects on other fish and wildlife species.

The tench is described as a sluggish, carp-like fish (Carl, Clemens and Lindsey 1959) and presumably has habits and diet similar to carp. This would include rooting up muddy bottoms in search of bottom organisms. Therefore, impacts of tench invasion might be similar to those presently caused by carp, such as food competition with native species and increased water turbidity in feeding areas.

4.2 REPORT LIMITATIONS

This report was based on limited research that included a one-day visit to the MELP office in Penticton, review of readily-available reports, telephone calls to fishing tackle retail shops, and inquiries to a few other individuals. Due to budget limitations, there was only opportunity to review MELP files for the large valley-bottom lakes, which did not prove as useful as hoped, as no new information was uncovered. Subsequently, it was learned that

commercial fishery data are available that may shed further light on the subject of exotic species distributions. There may also be other pertinent data at the MELP office that was not uncovered during the one day of research.

All of the new information on exotic species distribution in the Okanagan that was obtained for this study resulted from telephone interviews with local shopkeepers and anglers. Therefore, it is quite possible that further information could be obtained if this line of research were continued by contacting members of local fish and game clubs.

5. CONCLUSIONS AND RECOMMENDATIONS

There are four fish species that could potentially invade Okanagan Lake if fish passage were provided to allow upstream migration of sockeye salmon: largemouth bass, walleye, bullhead (catfish) spp., and tench. Some of these species (especially bullhead) may already be present in waters tributary to Okanagan Lake. The effects of invasion of Okanagan Lake by the four exotic fish species of concern are unknown, but could include negative impacts to native fish fauna as well as wildlife such as waterfowl. The two predatory species, largemouth bass and walleye, may have greater impacts than the other species.

The findings of this study lead to the following recommendations:

1. All of the new reports of exotic fish species in the Okanagan resulted from telephone interviews with sports shops and anglers. Therefore, this research should be extended to members of fish and game clubs throughout the Okanagan to collect further information on presence and distribution of exotic fish species in the Okanagan. In particular, the reports of walleye in the Okanagan River should be confirmed.
2. Examination of case studies should be undertaken for locations such as Osoyoos Lake and reservoirs in the United States where exotic species introductions have already occurred. This will allow prediction of the probable impacts of introductions of the four exotic fish species of concern, especially the predatory walleye and largemouth bass, to Okanagan Lake. Largemouth bass and walleye are both popular sport fish. Therefore, there are likely many examples of their introduction to new habitats, and the resultant effects of these introductions on species such as trout and kokanee.
3. Fisheries managers in Washington State should be contacted to seek information on the effects that walleye and largemouth bass introductions have had on native Washington fish fauna.
4. The commercial fishery data at the Penticton office of MELP should be examined for any records of the four exotic species of concern. Bullhead and tench are possible species that may be revealed in the records from the carp fishery on Ellison (Duck) Lake. If these data do not confirm presence of these species, fish inventory work specifically targeted at bullhead and tench could be undertaken. However, the potential effects of introduction of these two species are probably much less than would result from predatory fish such as largemouth bass and walleye.

6. REFERENCES

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Popovich, Ed. 1999. Personal communication. Recreational angler, Kelowna, BC. Conversation with G. Naito, November 25, 1999.

Redstone, Ron. 1999. Personal communication. Recreational angler, Vernon, BC. Conversation with G. Naito, November 22, 1999.

Smaha, Barry. 1999. Vernon Outdoor Store, Vernon, BC. Conversation with G. Naito, November 1999. (250) 558-1523.

Smith, Dave. 1999. Personal communication. Fisheries biologist, BC Ministry of Environment, Lands, and Parks, Penticton. Conversation with G. Naito, November 25, 1999. (250) 490-8253.

Sommer, Cindy. 1999. Personal communication. A and C Sports Ltd., Kelowna, BC. Conversation with G. Naito, November 24, 1999. (250) 763-8033.

Taylor, Dan. 1999. Personal communication. Self-employed fisheries technician, Kelowna, BC. Conversation with G. Naito, November 25, 1999.

Webster, Jason. 1999. Personal communication. Fisheries technician, Chara Consulting, Lumby, BC. Conversation with G. Naito, November 22, 1999. (250) 547-0107.

APPENDIX 1

List of Persons or Places Contacted for Exotic Species Study

Contact	Affiliation	Location	Telephone No.
	Bear Lake Fishing Resort	Kelowna	(250) 470-7311
Cadden, Rob	Bear Creek Sports Ltd.	Kelowna	(250) 861-4838
Derdau, Waldemar	Herby's Fly and Tackle	Vernon	(250) 545-9820
	Gateway Marine	Osoyoos	(250) 495-7231
Haas, Gordon	BC Ministry of Fisheries	UBC, Vancouver	(604) 222-6769
Harding, Ted	SHIP Environmental Consultants	Victoria	(250) 361-1512
Hatfield, Todd	Westland Resource Group	Victoria	(250) 592-8500
Hogaboam, Lane	Rutland Sports Centre	Kelowna	(250) 765-6956
Matthews, Steve	MELP Fisheries biologist	Penticton	(250) 490-8243
	My Tackle Box	Kelowna	(250) 860-1298
Niehaus, Jeff	Herby's Fly and Tackle	Vernon	(250) 545-9820
Popovich, Ed	Recreational angler	Kelowna	(250) 765-4681
Redstone, Ron	Recreational angler	Vernon	(250) 542-7484
Reid, Shawna	Coast River Environmental Services Ltd.	Vancouver	(604) 264-7522
Robertson, Jennifer	Coast River Environmental Services Ltd.	Vancouver	(604) 264-7522
Smaha, Barry	Vernon Outdoor Store	Vernon	(250) 558-1523
Smith, Dave	MELP Fisheries biologist	Penticton	(250) 490-8253
Sommer, Cindy	A and C Sports Ltd.	Kelowna	(250) 763-8033
Steinley, Sandy	Kenkraft Sales Ltd.	Vernon	(250) 545-5101
Taylor, Dan	Self-employed fisheries technician	Kelowna	(250) 712-0442
Walmsley, Mark	Westland Resource Group	Victoria	(250) 592-8500
Webster, Jason	Fisheries technician, Chara Consulting	Lumby	(250) 547-0107
Wolff, Klaus	Fish culturist, BC Ministry of Fisheries	Summerland Trout Hatchery	(250) 494-0491