An Assessment of Bull Trout and Lake Trout Interactions in Flathead Lake, Montana

Panel Report - Polson, MT

November 17-19, 1997

Executive Summary

A panel of fishery scientists met in Polson, MT, November 17-19, 1997, to assess the most likely reasons for the recent decline of bull trout in Flathead Lake and to examine options for restoring that species in the drainage. Lake trout have come to dominate the fish community of Flathead Lake since the introduction of the opossum shrimp, and now represent the greatest obstacle to restoring the bull trout population. The panel concluded that the lake trout population has to be reduced by 70 to 90 percent from present levels if bull trout are to return to population levels of the 1980s. Such a reduction is possible through intensive netting, but a control program would have to be continued indefinitely. Once the lake trout are reduced, some chance exists that the fishery for kokanee salmon can be restored. An alternative is to manage Flathead Lake for introduced lake trout and lake whitefish, foregoing protection of the adfluvial bull trout and westslope cutthroat trout, and concentrating effort to protect the natives in other parts of the drainage. This alternative option, however, would probably result in further decline or extinction of bull trout in Flathead Lake.

Introduction

In November 1997, Montana Fish, Wildlife and Parks, the Confederated Salish and Kootenai Tribes, and the U.S. Fish and Wildlife Service, under the sponsorship of the Montana Bull Trout Restoration Team, convened a panel of experts (Appendix I) in Polson, MT, to assess actions necessary to protect native adfluvial bull trout *Salvelinus confluentus* in Flathead Lake. The panel was directed to focus on the goals of the Montana Bull Trout Scientific Group which are to ". . . increase bull trout spawners to attain the average redd count level of the 1980s and maintain this level for 15 years (three generations) in the North and Middle Fork Flathead River monitoring areas; provide for a long-term stable or increasing trend in overall populations; and provide for spawning in all core areas." Redd counts averaged a total of 391 in the eight monitoring streams during the 1980s, and since 1992 the average count has been 120 redds.

The proceedings began when local experts described what is known about the fish community in the Flathead Drainage and what factors influence community structure and trends in population abundance. Introduction of opossum shrimp *Mysis relicta* to the aquatic community in Flathead Lake seems to have resulted in an extraordinary increase in recruitment of lake trout *Salvelinus namaycush* since the mid-1980s. The lake whitefish *Coregonus clupeaformis* population, a species

which co-evolved with lake trout, has also increased. Kokanee salmon *Oncorhynchus nerka* have virtually disappeared from the lake, and bull trout, westslope cutthroat trout *Oncorhynchus clarki lewisi*, and yellow perch *Perca flavescens* populations have declined.

The panel's deliberations began with a series of questions from the panel itself, proceeded to a series of questions prepared by the organizing committee, and ended with consideration of questions posed by local resource managers (Appendix II). A summary of the obstacles to goal attainment, the panel's responses to questions (Appendix II), and the panel's conclusions are described.

The reader will discover that all panelists did not offer an opinion on all questions. There was no requirement to respond to all questions, and one panelist was absent for the final day of deliberations.

Obstacles to Attainment of Bull Trout Goals

The expanding lake trout population was judged by most panelists to be the primary reason for the recent decline of other fish populations (Questions 1, 2, and 3a-3c) and the significant obstacle to attaining the bull trout goals. The panel estimated that about half of the recent decline in several fish species was the result of predation by lake trout. The remainder of the decline was attributed to a combination of competition with lake trout and other unnamed factors (Questions 4a-4c), including by-catch of bull trout. Under present management, most panelists judged that lake trout, lake whitefish, and opossum shrimp populations will remain at today's levels for at least the next 20 to 30 years, but other fish populations will decline even further (Table 1). Opossum shrimp are not expected to collapse on their own (Question 5).

Table 1. Panelists' response to the following question: "What do you think is most likely to happen to members of the aquatic community in the next 20-30 years if there is no change in current management?"

	Number of Panelists	Predicted Trend		
Species	Responding	Decline	Stable	Increase
Lake trout	12	3	9	
Lake whitefish	12	3	9	
Bull trout	12	11	1	
Westslope cutthroat trout	12	11	1	
Yellow perch	11	6	4	1
Opossum shrimp	12	1	10	1

Although lake trout were judged to be the primary cause for the recent decline of the native species (bull trout and westslope cutthroat trout), there are several other factors contributing to long-term decline of these species in the basin. Spawning and early rearing habitat for adfluvial species has been reduced in the basin by as much as 70 percent as a result of dam construction and habitat alteration. Incidental harvest and hooking mortality of bull trout in the lake and river fisheries may also be a significant source of mortality, but there were few data to permit a judgment. Some biologists are concerned that lake trout and brook trout *Salvelinus fontinalis* populations may expand or be moved by humans and could colonize disjunct waters (isolated lakes elsewhere in the Flathead drainage), which they currently do not occupy, but that provide important refuges for the natives. Northern pike *Esox lucius*, another effective piscivore, are also widespread throughout the system. The present and future role of this species in the fish community of Flathead Lake is unknown. For the purposes of this assessment, panelists were instructed to focus just on the existing Flathead Lake fish community.

Once the panel had drawn some conclusions regarding the character and consequences of the changes that had occurred in the aquatic community, the next order of business was to determine whether the bull trout goal is attainable and, if so, what methods are likely to provide the greatest potential for success.

Pursuit of the Goal

No panelist was convinced that angling, net fisheries, disruption of spawning, or some combination of these methods to control lake trout was a sure bet to restore bull trout to 1980s population levels (Questions 6a-6d). There was some inconsistency between questions, because most panelists concluded there is a 70 to 90 percent chance that lake trout can be reduced to the extent needed to restore bull trout to 1980s population levels (Question 7). There was greater doubt across the panel as to whether other species would respond similarly (Questions 3a-3c).

The biomass of lake trout that must be removed from the lake was judged by most panelists to be 70 to 90 percent of present levels (Questions 8a and 8b). The population of catchable (14 inches and longer) lake trout in Flathead Lake is currently estimated at over 200,000 fish. Annual mortality of near 70 to 90 percent was judged possible with some combination of angling, netting, and disruption of spawning (Questions 9a-9d), but use of pound nets on the spawning shoals was cautiously judged most likely to be successful (Questions 10a and 10b) without doing further harm to bull trout. Several panelists were concerned about by-catch of bull trout in any lake trout removal effort.

Management Options

Managers were interested in the panel's judgment regarding options for the fishery. Several panel members were surprised at the liberal regulations used to manage the lake trout fishery. The panel's judgment was mixed as to whether or not the trophy

lake trout fishery could be maintained under present regulations (Question 11), but most panel members concluded that it is possible to retain the trophy fishery by reducing the catch (Question 12). Although the panel thought it possible to maintain the trophy lake trout fishery, they did not believe that managers could both maintain a trophy fishery and attain the recovery goals for bull trout (Questions 13 and 14).

Finally, the panel members requested an opportunity to set aside their scientific objectivity and express individual opinions as to how they would proceed if they were given management responsibility for the Flathead Lake program. One panelist would manage the lake as a lake trout-lake whitefish complex and do all possible to protect the disjunct populations of bull trout in other parts of the basin. Nine panelists argued that they would try to reduce the lake trout and work to protect the native species in the basin, but at least one of these panelists did not believe it likely that the support and resources needed to meet this goal would be put in place. One panelist argued that alternatives of managing for a lake trout fishery, or of managing to restore native species, should be left to the public. The associated discussion included several recommendations for a strong public information campaign directed to all publics, not just the fishing public. The panel was clearly convinced that managers must choose whether to attempt restoration of native species and possibly kokanee at the expense of lake trout, or manage for lake trout. But, the panelists agreed, managers could not successfully do both.

Management Information Needs

1. A monitoring program is required to provide a recruitment index for lake trout, age at maturity, growth indices, and angler catch.

2. Panel members agreed that available management models developed for lake ecosystems similar to Flathead Lake should be used to assess the likely outcome of each management option so that a management direction can be identified in the near future. The "what if" exercises made possible by these models will help local managers and researchers make valuable assessments, and the results will help the public understand what is likely to happen given different management scenarios.

Research Needs

Many research needs were identified during the panel's deliberations. Some of these needs are included in the following list.

1. One of the most discussed research needs was the need to learn the distribution and abundance of bull trout populations in the basin outside Flathead Lake and describe threats to the disjunct populations.

2. Develop a better baseline of lakewide demographic information on all important fish species including age structure, growth, maturity, harvest, and recruitment patterns. This might be accomplished by a combination of trawl and gillnetting surveys that use a more complete series of meshes to sample both small and large fish.

3. What is the amount of incidental by-catch of bull trout in the lake and river fisheries?

4. Are there fluvial or resident bull trout in the principal tributaries of Flathead Lake?

5. What are the interactions among bull trout, brook trout, westslope cutthroat trout, and other species? The complex changes that have occurred in the lake (because of the species introductions) and the possibility that there may be patterns of interaction that have never been studied (because this particular community has not occurred anywhere else), leaves open many questions about the structure and dynamics of the fish community. Suggestions included preparation of a comparative lakes synthesis looking at various combinations of lake trout, bull trout, and westslope cutthroat trout and the fish community outcomes, and monitoring trends of bull trout populations in lakes with recent lake trout introductions.

6. Document temporal outmigration patterns of bull trout smolts from the river into the lake. There is a need to look at life-history patterns to see whether there is evidence of a change in early survival that is consistent with the lake trout hypothesis. Age-at-emigration and relative contribution of different age emigrants to adult returns might be a useful approach.

7. Document lake trout predation on bull trout smolts near stream mouths.

8. Monitor trends in lake trout abundance in response to population reduction if a control program is implemented.

9. Estimate mortality, age-at-maturity, and growth of lake trout in response to population reduction if a control program is implemented.

10. Document changes in the fish community in response to lake trout population reduction if a control program is implemented.

11. Improved characterization of bull trout spawning and nursery areas.

Conclusions

1. Introduced species are causing the recent decline of native bull trout and westslope cutthroat trout and of kokanee salmon in Flathead Lake.

2. There seem to be two mutually exclusive management scenarios possible for the Flathead Lake fish community. The lake could be managed as a lake trout-lake whitefish community, or the lake could be managed for restoration of the native species and introduced kokanee fishery. However, the panel concluded that there is very little possibility that native species could be sustained or kokanee successfully reintroduced in the presence of abundant lake trout.

3. It is possible to control lake trout to the extent required to restore bull trout to near 1980s population levels (panel judged 70 to 90 percent chance) by using entrapment gear on the spawning shoals.

4. A control program may have to continue indefinitely, but this is an area for experimental management with monitoring.

5. Only 7 of 12 panelists concluded that there is at least a 50 percent chance that the kokanee salmon population can be restored to 1980s levels if the lake trout are reduced by 70 to 90 percent.

6. There is little chance that a change in angling regulations for lake trout will be sufficient to permit return of bull trout and other native species.

7. There is little chance that a sport fishery for lake trout can be retained if the native species are to be restored. There is some chance that the present fishery may not persist anyway..... either because the regulations are far too liberal or because there is a pulse of fish moving through the system and the system could stabilize at some lower level.

Appendix I

Panelists

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Leon Carl
Ontario Ministry of Natural Resources, Peterborough, Ontario, Canada

David B. Donald
Environment Canada, Regina, Saskatchewan, Canada

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Fish Biologist, Henderson, NV

Bruce Rieman
Rocky Mountain Research Station, U. S. Forest Service, Boise, ID

James Selgeby
Fish Biologist, Iron River, WI

APPENDIX II

Panelist's Responses to Questions - Each asterisk represents the response of one panelist.

QUESTION	PERCENTAGE OR PROBABILITY										
	0	10	20	30	40	50	60	70	80	90	100
1. Redd counts for migratory bull trout have declined. What do you think the probability is that lake trout are a primary direct or indirect cause for the decline in numbers of adult, migratory bull trout spawners?								* *	* * *	* * *	* * *
2. What is the probability that the lake trout-bull trout interaction is preventing attainment of bull trout recovery goals (average 1980s levels maintained for at least 15 years)?								* *	* * * *	* * * *	*
3a. With successful control of lake trout, what is the probability that the kokanee population will recover to 1980s levels?	* *	* *	*			* *	*	* *	* *		
3b. With successful control of lake trout, what is the probability that the yellow perch population will recover to 1980s levels?	*	*				*		* * * *	* * * *		*
3c. With successful control of lake trout, what is the probability that the westslope cutthroat trout population will recover to 1980s levels?	* *	*				* * * *		* *	* * *		
4a. What percentage of the recent bull trout decline would you attribute to predation by lake trout?		* *		* *		*	* * *		* *	*	*

QUESTION	PERCENTAGE OR PROBABILITY										
	0	10	20	30	40	50	60	70	80	90	100
4b. What percentage of the recent bull trout decline would you attribute to competition with lake trout?	* * * *	*	* *	* * * *	*						
4c. What percentage of the recent bull trout decline would you attribute to factors other than lake trout predation and competition?	* *	* * * *	* *	*	*			*		*	
5. What is the probability that *Mysis* will collapse and allow bull trout to recover on their own?	** ** ** ** **	* *									
6a. What percent recovery of bull trout populations, to early 1980s levels, can be achieved by changes in angling regulations?	* * ** **	*	* * *	* *							
6b. What percent recovery of bull trout populations, to early 1980s levels, can be achieved by commercial fishing?			*		* * *	* * * *	*	*	*		
6c. What percent recovery of bull trout populations, to early 1980s levels, can be achieved by disruption of spawning lake trout?	* * *	*	* *		*		* * *	* *			
6d. What percent recovery of bull trout populations, to early 1980s levels, can be achieved by a combination of 6a, b, and c?					*	*	*	*	* * *	* * * *	

QUESTION	PERCENTAGE OR PROBABILITY										
	0	10	20	30	40	50	60	70	80	90	100
7. What is the probability that lake trout can be reduced to the extent required to attain bull trout recovery goals (average 1980s levels maintained for at least 15 years)?				*	*		* * *	* * *	* * * *		
8a. What percent reduction in lake trout biomass would be necessary to provide the opportunity for a viable kokanee fishery (assume 50,000 fish harvest, 25,000 days of angler use) to be re-established through stocking?	*				*	*	* *	* * *	* * * *		
8b. What percent reduction in lake trout biomass would be necessary to provide the opportunity for bull trout recovery goals (average 1980s levels) to be achieved?					*	*	*	* * * *	* * * * *		
9a. What level of annual mortality of lake trout could be achieved by changes in angling for lake trout?		* *	* * *	* *		* *	* *				
9b. What level of annual mortality of lake trout could be achieved by commercial fishing for lake trout?					* * *	* * *	* *	* *		*	
9c. What level of annual mortality of lake trout could be achieved by removal and/or disruption of spawning lake trout?	*		*	* *	* * *	*	* *	*			
9d. What level of annual mortality of lake trout could be achieved by a combination of 9a, b, and c?						* *	* * *	* *	* *	* *	

QUESTION	PERCENTAGE OR PROBABILITY										
	0	10	20	30	40	50	60	70	80	90	100
10a. What is the probability that the level of lake trout reduction needed to reach bull trout recovery goals (average 1980s levels maintained for at least 15 years) can be attained by sportfishing?	* * * ** ** **		* * *								
10b. What is the probability that the level of lake trout reduction needed to reach bull trout recovery goals (average 1980s levels maintained for at least 15 years) can be attained by deployment of pound nets on spawning shoals?		*		*	*	*	* *	* * *	* *	*	
11. What is the probability of maintaining the trophy lake trout fishery with the present fishing regulations?		* *	* * * *		*			* *	*		
12. What is the probability of maintaining the trophy lake trout fishery with modifications to present fishing regulations?			*		*		*	* * * *	*	*	
13. What percent recovery of bull trout populations would be achieved by removing the slot limit on lake trout?	** ** ** **	* *	*	*							
14. What percent of the bull trout recovery goals can be achieved while maintaining a recreational lake trout fishery?	*	* * *	*	* * *	*	*		*			