Bull Trout Management and Recovery in Alberta

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Abstract: Increasing concerns about Alberta's declining bull trout *(Salvelinus confluentus)* populations led to the establishment of the Bull Trout Task Force in 1993. From 1993 to 1997, the task force began numerous initiatives to facilitate recovery efforts and was instrumental in helping the provincial government develop and implement Alberta's Bull Trout Management and Recovery Plan. The recovery plan, which recognized the bull trout as a species of Special Concern, was implemented in 1995. It included a number of recovery actions such as a 'no-harvest' regulation for bull trout in all provincially-managed water bodies. Although the recovery plan recommended that a review of the plan be conducted in 2000, the review did not occur, and the plan has never been updated.

This paper summarizes the results of a February 2004 questionnaire that was sent to stakeholders and biologists/managers to solicit feedback about the success and limitations of bull trout recovery efforts in Alberta; discusses the involvement and expectations of the Bull Trout Task Force regarding recovery efforts; discusses some of the successes and limitations of recovery efforts; and provides some management recommendations for bull trout in Alberta.

Although there have been some successes, such as a 20-fold increase in spawners in one adfluvial population and increased awareness about bull trout, there are insufficient population and long-term monitoring data to indicate that there has been widespread recovery of Alberta's bull trout populations. Where successes have occurred, they have resulted largely from enacting 'no-harvest' regulations rather than implementing actions to correct other factors that are impacting bull trout populations. Illegal harvesting, insufficient funds and resources for fisheries management, and habitat degradation appear to have been most responsible for limiting the success of recovery efforts in the province. Eleven management recommendations are provided which highlight the need for long-term commitments of funds and resources and increased collaboration and cooperation among groups involved in recovery efforts to increase the success of bull trout recovery efforts.

Key Words: bull trout, *Salvelinus confluentus,* management, recovery, Alberta, recovery plan

Introduction

Growing concerns about the status and plight of the bull trout *(Salvelinus confluentus)* throughout Alberta caused various government agencies and stakeholders to implement recovery actions in the early and mid-1990s to reverse the declining trend of the province's bull trout

populations. Similar concerns and actions occurred during this time throughout most of the bull trout's range in North America. For example, at the same time that Alberta Fish and Wildlife Services (Alberta F&W) announced a recovery plan for the bull trout (Berry 1997), the U.S. Fish and Wildlife Service was considering a petition to list the bull trout under the *Endangered Species Act* (USFWS 1997). Although the U.S. Fish and Wildlife Service initially ruled that the listing was "warranted, but precluded" (USFWS 1997), the petitioners won an appeal of the ruling, and the bull trout was subsequently listed as a threatened species throughout its range in the conterminous U.S. (Lohr et al. 2001). Similar actions occurred in British Columbia (B.C.). In 1995, the B.C. Fisheries Program developed 'A Strategic Plan for the Conservation and Management of Char in B.C.' in which the bull trout was provincially designated as blue-listed (Pollard and Down 2001).

One of the key steps in stimulating bull trout recovery efforts in Alberta occurred in January 1993 when the Bull Trout Task Force (Brewin 1997) was established to "facilitate the recovery of Alberta's bull trout populations." The task force included representation from provincial (Alberta F&W) and federal (Parks Canada, and Fisheries and Oceans Canada) agencies, private and academic biologists, several conservation organizations, and industry. Immediately following its creation, the Bull Trout Task Force implemented a number of recovery efforts (Brewin 1997) which included

- establishing a province-wide poster campaign which asked anglers to voluntarily release all bull trout captured because harvestable surpluses of the species no longer existed;
- promoting a 'No Black—Put It Back' slogan which was developed to help anglers identify bull trout and to remind them about the lack of harvestable surpluses;
- spearheading efforts to support a Private Members Bill in the Alberta Legislature to have the bull trout recognized as an official emblem of the province and to help raise awareness about the plight of the species (Blake 1997);
- organizing an international conference on the management and ecology of bull trout (MacKay et al. 1997); and
- working with management agencies to implement recovery actions.

Alberta F&W used the Bull Trout Task Force as a vehicle to consult the public about Alberta's Bull Trout Management and Recovery Plan (Berry 1997), which was released to the public in May 1994 and was implemented in April 1995. The plan included several management actions which were to be implemented immediately, as well as several which were to be addressed by 2000.

Alberta F&W implemented a zero bag limit for bull trout; the National Parks took similar action. On 1 April 1994, Banff National Park became the first jurisdiction in Canada to implement a jurisdiction-wide zero bag limit for bull trout. Jasper, Waterton Lakes, Yoho, and Kootenay National Parks implemented similar regulations the following year (Brewin 1997).

Although Alberta's Bull Trout Management and Recovery Plan called for an evaluation and update of the plan in 2000, a thorough review has not yet been conducted. As such, the policies outlined in the plan still remain in effect. This paper, prepared in partnership with the Northern Lights Fly Tyers and Fishers Club, Edmonton, and the Calgary Hook and Hackle Club, provides a review of bull trout recovery efforts in Alberta by

- summarizing the results of a February 2004 questionnaire that was sent to stakeholders (e.g., anglers and industry) and biologists (e.g., fisheries managers and private and academic biologists) to solicit feedback about the successes and limitations of bull trout recovery efforts in Alberta;
- discussing the involvement and expectations of the Bull Trout Task Force regarding recovery efforts;
- discussing some of the successes and limitations of recovery efforts; and
- providing some management recommendations for bull trout in Alberta.

Although this paper discusses the status of bull trout populations in some watersheds, it is not intended to be a provincial status report. Such a report was published in 2002 (Post and Johnson 2002), and Alberta F&W is currently updating regional status reports that were originally presented at the Friends of the Bull Trout Conference in 1994 (Fitch 1997; Hunt et al. 1997; Rhude and Stelfox 1997; Walty and Smith 1997).

Methods

Questionnaire and Survey

A questionnaire was developed to solicit feedback from stakeholders (e.g., anglers, members of partner organizations, and industry representatives) and active and retired resource managers (e.g., fisheries managers, private and academic biologists, former Bull Trout Task Force members, and professional staff working for conservation organizations) regarding the success of bull trout recovery efforts in Alberta. The questionnaire consisted of a series of Likert scale questions that used a '1–5 Disagree–Agree' (or 'Poor–Good') response scale; several closed questions; and two open questions. One of the closed questions allowed respondents to be categorized based on their background and experiences related to bull trout recovery efforts in Alberta. The two open questions asked respondents to list the three largest factors, in decreasing order, that they felt contributed the most to the success and the lack of success of bull trout recovery efforts. A scoring system was developed for these questions which gave three points to the first choice listed by each respondent, two points to their second choice, and one point to their third choice. The questionnaire also advised respondents that if they felt uncomfortable about answering any questions (e.g., due to lack of information), they could leave those questions blank.

The questionnaire was reviewed by an anonymous individual and then distributed via email along with a cover letter that explained the survey's purpose and background. The questionnaire was sent to approximately 125 individuals in February 2004. Several of these individuals were asked to distribute the questionnaire and cover letter to others in their organization (e.g., representatives of organizations that partnered in the survey [the Northern Lights Fly Tyers and Fishers, Calgary Hook and Hackle Club] and other conservation organizations). The cover letter requested that responses be returned via email or fax within 2.5 weeks.

Literature Review and Professional Expertise

In addition to the survey results, this paper is based on a review of the literature; on discussions with various resource managers and biologists; on the author's involvement in native fish management, recovery, and stewardship activities in Alberta during the last 17 years; and on the author's role as Chairman of the Bull Trout Task Force throughout its existence.

Results and Discussion

Survey

Thirty-three responses to the 2004 survey were received. Respondents were placed into two groups: stakeholders, which included anglers, industry representatives, and members of the two organizations that partnered in the survey (hereafter referred to as 'Stakeholders' [n = 19]); and biologists (private, academic, and government), resource managers, and former Bull Trout Task Force members (hereafter referred to as 'Biol/Acad/BTTF' [n = 14]). This allowed comparisons to be made between the two groups.

When respondents were asked how bull trout populations have generally responded to recovery efforts since 1994/95, more respondents felt that populations had increased than had remained stable or decreased, but most (67.6%) believed there was insufficient information to make any conclusions (Table 1). Less than 8% of each respondent group felt that recovery efforts for bull trout had been more successful in the National Parks than in provincially managed waters since 1994/95 (Table 2); the largest percentage of each group felt that similar levels of success had occurred in the two jurisdictions.

Table 1. Responses to closed question which asked which answer best described respondents' opinion about province-wide population level responses of bull trout to recovery efforts undertaken in Alberta since 1994/95.

Respondents	*Populations have generally…*			
	increased	*remained stable or decreased*	*insufficient information to make conclusions*	*other*
Biol/Acad/BTTF (*n* = 14)	14.3%	0.0%	78.6%	7.1%
Stakeholders (*n* = 20*)	25.0%	5.0%	60.0%	10.0%
Total (*n* = 34*)	20.6%	2.9%	67.6%	8.8%

*One respondent who answered 'other' also provided another answer.

Table 2. Responses to closed question which asked which answer best described respondents' opinion about bull trout recovery efforts in provincial waters vs. waters managed by the National Parks in Alberta since 1994/95.

Respondents	*Compared to bull trout recovery efforts in provincial waters, recovery efforts have seen…*			
	more success in the national parks	*less success in the national parks*	*similar success in the national parks*	*unable to comment*
Biol/Acad/BTTF (*n* = 14)	7.1%	14.3%	57.1%	21.4%
Stakeholders (*n* = 20)	5.0%	20.0%	45.0%	25.0%
Total (*n* = 34)	6.1%	18.2%	51.5%	24.2%

When respondents were asked about the progress made in implementing protective angling regulations and ensuring anglers were aware of them, both groups felt that relatively 'good' progress has been made since 1994/95 (Table 3). Both groups also believed that 'neutral' to 'good' progress has been made in ensuring that anglers could correctly identify bull trout from other harvestable species (Table 3). Additionally, both groups felt that, on average, 'poor' progress has been made in preventing the deliberate poaching of bull trout since 1994/95 (Table 3). On average, both groups were 'neutral' about the progress made since 1994/95 in addressing data gaps so that managers could better manage bull trout populations (Table 3).

When asked about the progress made in corrective and preventative actions taken regarding habitat degradation, water diversions, fish entrainment and fish introductions, which are impacting bull trout populations in Alberta, both groups of respondents generally believed that more progress has been made in preventative rather than corrective actions since 1994/95 (Table 4); however, with the exception of preventative actions taken regarding new fish introductions, respondents generally believed that 'poor' progress has been made in correcting the factors that are impacting Alberta's bull trout populations.

Table 3. Mean score on a five-point Likert scale (1 = 'very good'; 2 = 'good'; 3 = 'neutral'; 4 = 'poor'; 5 = 'very poor') based on respondents' answers regarding the progress made in the following bull trout management actions undertaken in Alberta since 1994/95.

Respondents	*Implementing and making anglers aware of protective angling regulations for bull trout*	*Ensuring anglers could correctly identify bull trout from other species they are still allowed to harvest*	*Preventing deliberate poaching of bull trout*	*Addressing data gaps so managers can better manage bull trout populations*
Biol/Acad/BTTF (n = 14)	1.71 (SD = 0.47)	2.50 (SD = 1.09)	3.71 (SD = 1.07)	3.14 (SD = 1.17)
Stakeholders (n = 19[a])	1.74 (SD = 1.24)	2.63 (SD = 1.12)	4.05 (SD = 0.97)	2.67 (SD = 1.18)
Total (n = 33[b])	1.72 (SD = 0.98)	2.58 (SD = 1.09)	3.91 (SD = 1.01)	2.90 (SD = 1.18)

[a] n = 15 for addressing data gaps
[b] n = 29 for addressing data gaps

Table 4. Mean score on a five-point Likert scale (1 = 'very good'; 2 = 'good'; 3 = 'neutral'; 4 = 'poor'; 5 = 'very poor') based on respondents' answers regarding the progress made since 1994/95 towards addressing factors that are impacting bull trout in Alberta.

	Degraded habitats		*Water diversions*		*Entrainment*		*Fish introductions*	
Respondents	*correct*[a]	*prevent*[b]	*correct*	*prevent*	*correct*	*prevent*	*correct*	*prevent*
Biol/Acad/ BTTF	3.84 (SD = 1.07, n = 13)	3.31 (SD = 1.25, n = 13)	4.00 (SD = 0.95, n = 12)	3.92 (SD = 1.08, n = 12)	4.23 (SD = 0.93, n = 13)	4.00 (SD = 1.00, n = 11)	3.62 (SD = 0.96, n = 13)	2.92 (SD = 1.28, n = 13)
Stakeholders	3.26 (SD = 0.87, n = 19)	3.26 (SD = 1.05, n = 19)	3.94 (SD = 0.66, n = 17)	3.82 (SD = 3.82, n = 17)	3.94 (SD = 3.94, n = 16)	3.75 (SD = 3.75, n = 16)	3.06 (SD = 3.06, n = 17)	2.24 (SD = 2.24, n = 17)
Total	3.50 (SD = 0.98, n = 32)	3.28 (SD = 1.11, n = 32)	3.97 (SD = 0.78, n = 29)	3.86 (SD = 0.83, n = 29)	4.07 (SD = 0.84, n = 29)	3.85 (SD = 0.86, n =27)	3.30 (SD = 0.99, n = 30)	2.50 (SD = 1.07, n = 30)

[a] refers to corrective actions taken to address activities that were grandfathered in prior to 1994/95
[b] refers to preventative actions taken to prevent post-1994/95 activities from further impacting bull trout populations

When respondents were asked about their agreement with the statement that "Bull trout populations had recovered in many parts of the province, and evidence (e.g., fishery inventory data, and/or angler catch rates) suggests that harvestable surpluses likely exist in many parts of the province", both groups generally 'disagreed' with the statement (Table 5). In contrast, both groups 'strongly' agreed with the two-part statement "Before changes to existing angling regulations are made, scientific studies will be needed to confirm that harvestable surpluses exist. Where regulations are changed to allow harvest, a commitment to monitoring population responses will be needed so that managers can respond quickly and revise these regulations if

monitoring data reveals angler harvest is contributing to population declines" (Table 5). Both groups of respondents generally 'agreed' with the statement "A COSEWIC (Committee on the Status of Endangered Wildlife in Canada) status report for bull trout is needed, and a status report would likely reveal bull trout should be listed and would likely warrant an 'Endangered', 'Threatened', or 'Vulnerable' ranking" (Table 5).

Table 5. Mean score on a five-point Likert scale (1 = 'strongly agree'; 2 = 'agree'; 3 = 'neutral'; 4 = 'disagree'; 5 = 'strongly disagree') based on respondents' answers regarding their agreement with statements concerning the status of bull trout populations and bull trout management actions.

Respondents	*Agree that populations have recovered and evidence suggests harvestable surpluses exist*	*Agree that if some angling is opened to allow for some bull trout harvest, monitoring population trends should be required to allow for adaptive management*	*Agree that a COSEWIC status report is needed, and if conducted, it would likely reveal that the bull trout should be listed under SARA*
Biol/Acad/ BTTF	4.07 (SD = 1.21, *n* = 14)	1.08 (SD = 0.27, *n* = 14)	2.23 (SD = 1.69, *n* = 13)
Stakeholders	4.16 (SD = 1.26, *n* = 19)	1.26 (SD = 0.81, *n* = 19)	1.94 (SD = 1.39, *n* = 18)
Total	4.12 (SD = 1.22, *n* = 33)	1.18 (SD = 0.64, *n* = 33)	2.06 (SD = 1.50, *n* = 31)

When asked an open-ended question about the top three factors that have contributed most to the success and lack of success of bull trout recovery efforts in Alberta, a variety of answers were provided, some of which could be grouped into categories (Tables 6 and 7). For example, "catch-and-release-only angling regulations" was the most common and highest scoring single answer that respondents gave as a factor that has contributed most to the success of bull trout recovery efforts (Table 6); however, it, like bait bans, was also an example of "more restrictive angling regulations", which was also provided as an answer by some respondents. Combining answers into the category 'more restrictive angling regulations' further showed how important respondents felt more restrictive angling regulations have been in contributing to recovery efforts.

Table 6. Top three factors that respondents believed had contributed the most to the success of bull trout recovery efforts in Alberta (all respondents combined).

Factor	*First choice*	*Second choice*	*Third choice*	*Score*
Catch-and-release-only regulations	17	4	2	61
More catch-and-release-only waters throughout Alberta			3	3
Bait bans			3	3
More restrictive angling regulations (only)	3	3	1	16
More restrictive regulations (above four categories combined)	*20*	*7*	*9*	*83*

Table 6. Top three factors that respondents believed had contributed the most to the success of bull trout recovery efforts in Alberta (all respondents combined) (cont'd).

Factor	*First choice*	*Second choice*	*Third choice*	*Score*
Education	3	10	1	30
Increased awareness	3	3	1	16
'No Black—Put It Back' campaign	1	2		7
Fish identification		3		6
Increased awareness of managers and public to sensitivity of bull trout to harvest		1		2
Designating bull trout as an official provincial emblem			1	1
Education and awareness (only)	3		1	10
Increased education and awareness (above seven categories combined)	*10*	*19*	*4*	*72*
Increased research/inventories/monitoring			6	6
Control of non-natives			1	1
Improved management and cooperation among Alberta F&W and nongovernment organizations			1	1
Direct management interventions	1		1	4
Improvements to fisheries management (above four categories combined)	*1*		*9*	*12*
Improved habitat protection		*1*	*4*	*6*
Improved enforcement (including Streamwatch)		*1*	*1*	*3*
Increased compliance with regulations			*1*	*1*
Admission by government that fisheries are in decline			*1*	*1*
Reject premise that recovery has been successful	*2*			*6*

Other answers could be grouped into broader categories such as 'increased education and awareness', and 'improvement to fisheries management' (Table 6), and 'poaching', and 'insufficient resources/funding (Table 7). Several respondents gave two-part answers (e.g., no harvest regulations and increased awareness); consequently, the number of answers provided was greater than the sample size.

Table 7. Top three factors that respondents believed had contributed the most to the lack of success of bull trout recovery efforts in Alberta (all respondents combined).

Factor	*First choice*	*Second choice*	*Third choice*	*Score*
Poaching	10	8	1	47
Lack of enforcement	7	3	4	31
Misidentification of fish by anglers	1	1	4	9
Poaching (above three categories combined)	*18*	*12*	*9*	*87*

Table 7. Top three factors that respondents believed had contributed the most to the lack of success of bull trout recovery efforts in Alberta (all respondents combined) (cont'd).

Factor	*First choice*	*Second choice*	*Third choice*	*Score*
Lack of fisheries inventory information and research	2	4	1	15
Insufficient resources/funding (only)	3	7	3	26
Insufficient resources/funding (above two categories combined)	*5*	*11*	*4*	*41*
Habitat destruction	*8*	*6*	*3*	*39*
Government inaction/ineffectiveness/lack of adaptive management	*4*	*1*	*1*	*15*
Old attitudes and public ignorance	*2*	*2*	*1*	*11*
Competition/hybridization with non-natives	*1*	*1*	*2*	*7*
Handling and hooking-related mortalities		*1*	*3*	*5*
Barriers to fish passage/habitat fragmentation		*2*	*1*	*5*
Lack of shared goals	*1*			*3*
Increased access into remote areas	*1*			*3*
Drought and weather patterns		*1*	*1*	*3*
Off-highway vehicle users/recreationists			*2*	*2*
Effect of long-term removal of biomass			*1*	*1*
Complexity of aquatic ecosystems			*1*	*1*
Lack of Species at Risk legislation			*1*	*1*

Based on the scores assigned to respondents' answers, the top three factors that have contributed to the success of bull trout recovery efforts were, in decreasing order, more restrictive angling regulations, increased education and awareness, and improvements to fisheries management (Table 6). It is also noteworthy that two respondents rejected the premise that recovery efforts have been successful. Poaching, followed by insufficient resources/funding, and habitat destruction were the most common answers given as factors that have limited the success of bull trout recovery efforts (Table 7).

Responses to Priorities Identified in Alberta's Bull Trout Management and Recovery Plan

Alberta's Bull Trout Management and Recovery Plan listed a number of "Musts, by the Year 1995" and "Wants, by the Year 2000" (Berry 1997). Table 8 lists these "Musts" and "Wants", as well as some of the progress that has been made in these areas since the plan went into effect on 1 April 1995.

Relatively good progress has been made in implementing many of the "Musts, by the Year 1995" (Table 8). Except for one "Must" (No. 7)—maintaining a large minimum size limit where bull trout harvest is allowed, which was not implemented because the no-harvest regulation was enacted in all provincial waters when the plan went into effect—action has been taken on all of

the other management recommendations. The results of the 2004 survey, however, suggested that the attention given to some of the "Musts" became weaker over time. For example, the 2004 survey results showed that respondents identified poaching as the most common factor that has limited the success of bull trout recover efforts.

Although some of the "Wants, by the Year 2000" received relatively good attention, poor progress has been made in addressing several of the others (Nos. 3, 4, 5, 6, 7, and 9) (Table 8). Among the "Wants" that received poor attention was the evaluation and updating of the Management and Recovery Plan in 2000 (No. 9). This was also a priority documented by the Bull Trout Task Force (Table 8), but budget constraints on Alberta F&W prevented it from being conducted.

Table 8. List of "Musts" and "Wants" documented in Berry (1997) and the progress made towards them since Alberta's Bull Trout Management and Recovery Plan was implemented on 1 April 1995.

"Musts, by the year 1995"	*Representative examples of progress made towards implementing the "Musts"*
1) Implement a province-wide zero bag limit angling regulation for bull trout	• Catch-and-release-only regulations implemented by Alberta on 1 April 1995 remain in effect • Although independent of the provincial plan, no-harvest regulations were implemented in Banff National Park on 1 April 1994 and in Jasper National Park and Waterton Lakes National Park on 1 April 1995
2) Communicate to the public the management and biological requirements of bull trout conservation, and promote public involvement in recovery efforts	• The Bull Trout Task Force implemented numerous education and awareness initiatives (e.g., 'No Black—Put it Back' slogan, signage campaigns, and public service announcements for TV and radio) which are discussed in Brewin (1997) • Alberta also produced several education tools (e.g., Alberta Bull Trout Teacher's Guide, and an Endangered Wildlife brochure on bull trout) • Hall (2003) conducted a follow-up survey to Boxall and LeFrancois (1997) and reported that awareness about the bull trout's plight had increased from 5.5% to 91.2% of licensed anglers who were sampled
3) Educate anglers about proper identification (ID) of bull trout and other species that could still be harvested	• The Bull Trout Task Force's 'No Black—Put it Back' slogan was widely promoted, and many Bull Trout Task Force educational initiatives in Brewin (1997) focused on fish ID • Stelfox et al. (2001a) reported anglers had a 48% pass rate on a fish ID test but found improved success with use of appropriate education materials • Subsequent to Stelfox et al. (2001a), Alberta and Trout Unlimited Canada posted an interactive fish ID test on the internet at www3.gov.ab.ca/srd/fw/fishing/FishID/index.html
4) Develop specific operational plans from the provincial plan for each Fisheries Management Area with bull trout	• Plans were apparently developed but were not shared with stakeholders; consequently, most stakeholders were not aware of the details of the operational plans

Table 8. List of "Musts" and "Wants" documented in Berry (1997) and the progress made towards them since Alberta's Bull Trout Management and Recovery Plan was implemented on 1 April 1995 (cont'd).

"Musts, by the year 1995"	*Representative examples of progress made towards implementing the "Musts"*
5) Review and update permanent, all-year and seasonal closures to consider difference in geographical timing between watersheds	• This has been an ongoing action. As new data become available that suggest more protective regulations are needed, Alberta F&W consults stakeholders about proposed changes to angling regulations, and if the proposed changes are supported by stakeholders, the changes are later implemented
6) Review and update bait bans to reduce bait-related hooking mortalities	• This has been an ongoing action. As new data become available, actions described immediately above are generally undertaken • An exception is Chain Lakes Reservoir. Alberta re-introduced bull trout into the reservoir in 2000, but they did not implement a bait ban; subsequent fisheries investigations in the reservoir failed to capture any bull trout
7) Maintain a large minimum size limit with a strict catch limit where some harvest of bull trout can be permitted	• The no-harvest regulation remains in effect across the entire province, and there have not been any fisheries where bull trout harvest has been permitted since 1995
8) Set priorities on district enforcement needs for public education, protection of critical bull trout habitat, and regulation enforcement	• Excellent progress was initially made by several enforcement districts • Ramstead (1997) describes a district enforcement program on the Muskeg River that initially demonstrated some very good successes. The Bull Trout Task Force created a special award to recognize the enforcement and education initiatives implemented in the mid-1990s on the Muskeg River. Subsequently, however, the population collapsed due to suspected poaching problems by an encampment on, or near, the upper reaches of the Muskeg River • The results of the 2004 survey conducted as a part of this review suggest illegal harvesting continues to limit the success of bull trout recovery efforts.
"Wants, by the Year 2000"	*Representative examples of progress made towards implementing the "Wants"*
1) Inventory bull trout populations throughout their known range	• In the last ten years, programs like the Alberta Conservation Association's Cooperative Fisheries Inventory Program have collected fisheries inventory information throughout much of the bull trout's range in Alberta. These surveys, however, are frequently one-time surveys that are used to collect absence-presence and catch-per-unit-effort data, and are often conducted in waters that have not been sampled before, or where sampling has been very infrequent. As a result, population trend data is still lacking in many waters where bull trout occur

Table 8. List of "Musts" and "Wants" documented in Berry (1997) and the progress made towards them since Alberta's Bull Trout Management and Recovery Plan was implemented on 1 April 1995 (cont'd).

"Wants, by the Year 2000"	*Representative examples of progress made towards implementing the "Wants"*
2) Conduct specific studies of life history, including movements and critical habitat requirements	• Several studies were conducted in the first 4–5 years after the plan was implemented (e.g., Belly, Highwood, Berland, McLeod and Kakwa Rivers, and Oldman and Lower Kananaskis Reservoirs). Although some studies have been conducted since 1999 (e.g., Elbow River and Abraham Reservoir), they have been less common in the last five years
3) Determine bull trout carrying capacity of various habitats, the conservation needs to perpetuate populations, and the numbers that constitute a harvestable surplus	• Post et al. (2003) described a model for assessing the amount of angler pressure an adfluvial bull trout population could sustain with, and without, a permitted harvest • The lack of long-term population trend data limits the use of models to reliably estimate the harvestable surplus of many bull trout populations, particularly for fluvial and stream-resident populations
4) Investigate a barbless-hook-only regulation for its potential to reduce hooking mortality and implement appropriate regulations based on study results	• Very few studies on hooking mortalities of bull trout have been conducted in Alberta • An exception is Ryerson and Sullivan (2001) who looked at the use of treble and single hooks but did not examine barbed versus barbless hooks. • Although the previous Alberta Guide to Sportfishing Regulations (e.g., ASRD 2002) clearly indicated that there was no scientific justification for implementing a barbless-hook-only regulation, beginning 1 April 2004, Alberta will have a barbless-hook-only regulation for all provincially-managed fisheries (ASRD 2004)
5) Conduct studies to understand the interaction between land use impacts and natural events that limit or enhance bull trout populations	• Numerous studies have been conducted to examine the effects of land-use impacts on aquatic habitat throughout the species' range (e.g., Brewin and Monita 1998); however, the understanding of the interactions among individual land use impacts, natural events, and the cumulative effects of many different land-use activities in a watershed, is limited • Limited long-term monitoring data on all but a handful of bull trout populations also limits the understanding of how bull trout populations respond to the combined effects of land-use impacts and natural events
6) Determine the importance of mountain whitefish (*Prosopium williamsoni*) and other fish as prey for bull trout	• Studies examining predator-prey relationships between bull trout and fish prey species have been very limited
7) Assess impacts of brook trout (*Salvelinus fontinalis*) hybridization on the genetics, sterility, and extinction of bull trout populations	• Although genetic samples from suspected bull trout X brook trout hybrids are often archived (e.g., Stelfox et al. 2001b), to date there has been limited research to confirm the level of hybridization or to understand the effects of hybridization on population extinctions of bull trout in Alberta

Table 8. List of "Musts" and "Wants" documented in Berry (1997) and the progress made towards them since Alberta's Bull Trout Management and Recovery Plan was implemented on 1 April 1995 (cont'd).

"Wants, by the Year 2000"	*Representative examples of progress made towards implementing the "Wants"*
8) Measure the level of competition between bull trout and introduced species under conditions of reduced angling pressure	• Some studies in Alberta have examined species interactions between bull trout and introduced species • Dr. D. Schindler's lab at the University of Alberta has conducted brook trout removal studies inside Banff National Park • Stelfox et al. (2004) examined population level effects of brook trout suppression by anglers on native bull trout and cutthroat trout (*Oncorhynchus clarki*) • Dr. J. Volpe's lab (University of Alberta) currently has a study underway to examine bull trout interactions with non-native brook trout • Studies in other jurisdictions have also examined interactions between bull trout and other salmonids (e.g., see species interactions in Brewin et al. 2001)
9) Evaluate and update Alberta's Bull Trout Management and Recovery Plan and maintain it as an evolving document that incorporates new information as it becomes available	• A review and update of Alberta's Bull Trout Management and Recovery Plan has not occurred. When Trout Unlimited Canada inquired about this at their annual meetings with Alberta F&W staff in 2000 and 2001, they were told the review was budget dependent and Alberta F&W did not have the resources to conduct a review (T. Blake, pers. comm.)

Responses to the Bull Trout Task Force's Recommendations

In addition to priorities set for bull trout recovery efforts by Alberta F&W, the Bull Trout Task Force developed its own priorities based on input from stakeholders and fisheries managers. After the Bull Trout Task Force hosted the Friends of the Bull Trout Conference in Calgary in May 1994 to help educate people working with, and concerned about, the management and biology of bull trout, it was given funding to host the 'No Black—Put It Back' workshop. This workshop brought together the managers, private and academic biologists, and stakeholders who attended the conference as a means of developing priorities for research, monitoring, and education programs in Alberta. The Fisheries Advisory Committee, which was responsible for allocating fisheries-related funding for the Alberta Fish and Wildlife Trust Fund, indicated that the priorities identified by the Bull Trout Task Force would be used over a three- to five-year period to govern an annual budget of $200,000–$400,000 for bull trout research, monitoring, and education programs in Alberta (Bull Trout Task Force 1995). Based on the workshop results, the Bull Trout Task Force recommended that approximately 2/3 of the funds be used for biological studies (e.g., research and monitoring projects), and the remaining 1/3 for education initiatives and human dimensions studies. The Bull Trout Task Force also recommended that nine fluvial and three adfluvial bull trout populations across the province be used as 'index populations', and

that long-term monitoring projects be conducted on these populations. The research priorities that came out of the workshop included identifying critical habitats for all life history types (i.e., fluvial, adfluvial, and stream resident) and life stages of bull trout; developing a predictive model that could be used to estimate when populations had harvestable surpluses; conducting hooking mortality studies; and implementing studies to help determine the impacts of land-use activities on bull trout and their habitats.

Many of the Bull Trout Task Force's recommendations for funding bull trout-related projects were not addressed, largely because the administration of the Trust Funds was passed from the provincial government to a Delegated Administrative Organization (DAO) (i.e., the Alberta Conservation Association). When this occurred, the DAO developed it own priorities. Other fisheries issues (e.g., Alberta also implemented management and recovery plans for walleye [*Stizostedion vitreum*], Arctic grayling [*Thymallus arcticus*], and northern pike [*Esox lucius*] shortly after the plan for bull trout was implemented) and basic fisheries inventory needs all had to compete for the same funds; consequently, limited funds were available for bull trout projects.

Before disbanding in 1997, the Bull Trout Task Force published its final recommendations (Brewin 1997). Many of these (e.g., the need for a predictive harvestable surplus model), had been previously published (BTTF 1995), while others were new. Some of these recommendations have been subsequently addressed by different organizations. For example, the Bull Trout Task Force recommended that regular bull trout status reviews be done. Post and Johnson (2002) conducted the first post-1995 status review, and discussions within Alberta F&W indicate an upcoming review is expected to occur in 2004 (H. Norris, pers. comm.). Although unrelated, COSEWIC also recently announced that it has funding available for a status review of bull trout in Alberta, B.C., and the Yukon. Several other recommendations have received little or no action. For example, one of the Bull Trout Task Force's final recommendations included a review of Alberta's Bull Trout Management and Recovery Plan, and as previously mentioned, no reviews or updates of the plan have occurred to date.

Successes of Bull Trout Recovery Efforts in Alberta

Several factors suggest there is insufficient evidence to conclude that recovery efforts for bull trout have resulted in widespread population recovery. For example, approximately 2/3 of respondents (Biol/Acad/BTTF and Stakeholders combined) in the 2004 survey indicated that there were insufficient data to make conclusions about bull trout population responses to recovery efforts. Post and Johnson (2002), in their status review of bull trout in Alberta, also indicated that "Further population surveys and long-term population monitoring are required to determine the status of bull trout populations in Alberta."

It is important to recognize that many declines of Alberta's bull trout populations occurred over a number of decades. In many cases, reports of declining populations occurred about a century before the recovery plan was implemented (e.g., Prince et al. 1912; Colpitts 1997; Brewin

1999); consequently, it should not be expected that many populations would recover within approximately one generation. One response in Table 7 suggested that long-term removal of biomass prior to recovery efforts was an important factor that limited recovery success. Given that bull trout are a late-maturing species that occupies cold and unproductive environments, it should be expected that it will likely take several generations for some populations to demonstrate a successful recovery.

One system, Lower Kananaskis Lake, for which long-term population trend data are available and where no-harvest regulations for bull trout were implemented several years before the province-wide regulation came into effect, saw more than a 20-fold increase in the spawning population from 1992 to 2000 (Mushens et al. 2003). This, however, is an anomaly. Most other systems for which long-term monitoring is available saw some minor increases in some years, but the increases were sometimes short-term, and after several years, declines to pre-1995 levels sometimes occurred (e.g., Kakwa River system [Post and Johnson 2002; Doran et al. 2003]).

There is evidence that public awareness about bull trout and their sensitivity to harvest and habitat disturbances has increased. For example, in 1993, Boxall and LeFrancois (1997) conducted a study on the attitudes and behaviours of Alberta's licensed anglers towards bull trout before many of the education and awareness initiatives were implemented by the Bull Trout Task Force and others. In a follow-up survey conducted in 1999, Hall (2003) found that awareness about the bull trout's plight in Alberta had increased from 5.5% of licensed anglers in 1993 to 91.2% in 1999. Hall (2003) also found that by 1999, 79.5% of licensed anglers were aware that the bull trout had been designated as a species of Special Concern, and that 91.2% of licensed anglers were aware of the province-wide no-harvest bull trout regulations even though they were implemented only in 1995.

Limitations of Bull Trout Recovery Efforts in Alberta

The heavy reliance on more restrictive angling regulations and the lack of action to address other factors that were impacting the province's bull trout populations have likely limited the success of bull trout recovery efforts in Alberta. Over-harvesting contributed to the species' decline, but others factors such as introductions of non-native species, habitat degradation, water diversions, and fish entrainment, which occurred prior to 1995, have also played a role (Berry 1997; Fitch 1997; Hunt et al. 1997; McCart 1997; Rhude and Stelfox 1997; Walty and Smith 1997). Efforts to correct these other factors have been limited. Although Alberta F&W and Trout Unlimited Canada used anglers to attempt to suppress non-native brook trout in the Quirk Creek watershed (Elbow River system) (Stelfox et al. 2001b), and the University of Alberta and Parks Canada conducted some experimental brook trout removal studies in Banff National Park, other corrective actions to control non-native populations that existed prior to 1995 have been either extremely limited or nonexistent.

The results of the 2004 survey showed that while respondents felt there has been a 'good' response to implementing protective regulations for bull trout and to ensuring anglers are aware of those regulations, the respondents also indicated that was a 'poor' response to preventing the illegal harvest of fish. Poaching was the factor that was most commonly identified as limiting the success of bull trout recovery efforts in the province.

The survey also indicated that there had been a 'poor' response towards actions to correct other impacts that were occurring prior to 1995. Although improved awareness among stakeholders and regulatory agencies has helped limit the impacts of new activities on the bull trout and its habitats, corrective actions to address the impacts from land- and water-use activities that occurred prior to 1995 have been limited. For example, little action has been taken to restore flows or to better manage reservoir levels of pre-1995 licensed water diversions that are impacting bull trout habitat or water quality (i.e., stream temperatures). Additionally, there has been little action on preventing entrainment of bull trout in diversion canals or hydro turbines in cases where pre-1995 activities contributed to bull trout mortalities. One exception to this was the installment, in 1999, of a fish screen on the headgates of the main diversion canal of the Mountain View Irrigation District to prevent entrainment of adult bull trout from the Belly River into the diversion canal (Clayton 2001). Subsequent investigations, however, have confirmed that juvenile bull trout are still becoming entrained in the canal (Eisler and Brewin 2002).

Another deficiency of recovery efforts is related to the resources that have been provided for recovery efforts. For example, although the Bull Trout Task Force developed priorities for research, monitoring, and education, the level of annual funding that had been committed towards bull trout recovery efforts for a three to five-year period was not received. The lack of funds and resources available for research, inventories, education, and enforcement was also commonly identified by survey respondents as one of the factors that limited the success of recovery efforts in the province.

Other sources also suggested that the level of funding that has been made available for bull trout and fisheries management in Alberta has limited the success of recovery efforts and/or the ability to monitor the success of recovery efforts. For example, in their status review, Post and Johnson (2002) indicated that "Further population surveys and long-term population monitoring are required to determine the status of bull trout in Alberta." Additionally, the Alberta Ethics Commissioner (2002) stated that with respect to funding resources, "This is a long-standing criticism of fisheries management in Alberta and recommendations relating to the need for increased resources are included in the May 1980 Report of the Legislative Assembly's Own Select Committee on Recreational and Commercial Fishing Industries in Alberta."

Recommendations

The following recommendations are based on this review of bull trout recovery efforts in Alberta:

1. One of the critical components of any species at risk recovery plan is the securement of funding to meet the long-term needs (i.e., for research, inventories, education, and enforcement) of successful recovery efforts. Recovery planning requires an ongoing long-term commitment of resources; soft or short-term commitments of required resources should not be expected to provide many success stories.
2. A greater commitment to population surveys and long-term monitoring programs that allow bull trout population trends to be monitored is required. This is applicable to waters managed by the province and by Parks Canada.
3. The results of the 2004 survey strongly suggest that poaching is a serious problem that has affected the success of bull trout recovery efforts. Greater priority needs to be placed on enforcement and education to improve compliance. A variety of options to deter poaching will also be needed (e.g., increased patrols, increased education, increased participation of anglers and the public in reporting suspected poaching activities, and increased penalties for convictions).
4. Most of the 2004 survey respondents strongly agreed that if angling regulations are revised to permit some angler harvest, then the harvested populations will have to be carefully monitored. Monitoring will be needed to ensure that managers can quickly revise regulations if population trends indicate that the level of harvesting that is occurring is not sustainable. It is recommended that 'catch-and-release-only' regulations remain in effect for all populations until long-term population monitoring data are gathered and demonstrate that a harvestable surplus exists. A firm commitment also needs to be made to ongoing monitoring of angling use before any regulation changes are made. If these commitments cannot be maintained, or monitoring reveals that populations have declined to a pre-determined threshold level, then angling regulations should be changed back immediately to 'catch-and-release-only'.
5. In the last decade, habitat protection in Alberta has taken a very site-specific approach (e.g., Alberta Environment's Codes of Practice for various instream activities). More attention needs to be given to ensuring that cumulative effects of multiple land- and water-use activities (including past, present, and future activities), many of which are not subjected to the review of a regulatory agency (or the conditions of a Code of Practice), are adequately understood and that ecosystem thresholds are not exceeded.
6. Many impacts from historical activities continue to affect bull trout and their habitats. Where possible, stakeholders and government agencies should work together to identify those factors for which corrective actions would be most effective. In order to facilitate greater participation, incentives for industry, agriculture, and small businesses need to be created.

7. Continued efforts to identify critical habitats used by bull trout are needed. This information should be provided to regulatory agencies, and to industry and proponents of other land- and water-use activities so that they can plan their activities appropriately to avoid creating detrimental impacts on these critical habitats.
8. Although public education and communication initiatives have been successful in raising awareness among stakeholders about the plight of Alberta's bull trout populations, it is important that regulatory agencies and stakeholders continue to give ongoing attention to these initiatives.
9. Many organizations in Alberta have taken an active role in, and conducted excellent work towards, bull trout recovery efforts; however, to increase efficiency and effectiveness, a coordinated approach to bull trout recovery activities is needed. Attention should be given to maximizing
   - intra-province coordination and collaboration among stakeholders and government agencies so that interested groups are informed about what initiatives are occurring, and so that they can best maximize the benefits of limited resources that are available for species recovery efforts. For example, a program similar to the 'Native Fish Initiative' that the Alberta Council of Trout Unlimited Canada proposed (Antoniuk 2002) would likely provide many benefits to bull trout and other native fish species at risk in Alberta.
   - inter-jurisdictional cooperation. The province shares bull trout populations with several National Parks (e.g., Oldman, Bow, Red Deer, Athabasca River systems), as well as the province of British Columbia (e.g., Peace River system), and the state of Montana (e.g., southern tributaries of the Oldman River). Improved cooperation and collaboration among agencies is required to maximize the effectiveness of the limited resources that are available for bull trout management, monitoring, research and education, and to better manage shared populations. The U.S. Fish and Wildlife Service stresses the importance of improved international cooperation to help recover bull trout populations that Montana and Alberta share, and that are listed as Threatened under the U.S. *Endangered Species Act* (USFWS 2002).
10. Alberta's Bull Trout Management and Recovery Plan recommended that a review of the plan should be done within five years of the plan being implemented so that it would be an evolving document that would be updated as new information became available. This review is overdue and needs to occur.
11. The National Parks need to give greater attention to keeping the public informed about the actions being taken to manage and protect bull trout populations within Banff National Park, Jasper National Park, and Waterton Lakes National Park. They also need to ensure that the public is aware of the successes and limitations of their efforts to manage and protect fisheries and aquatic resources in the National Parks.

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