

Fish Survey in Recently Dewatered Western Irrigation District Irrigation Canals

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October 2002

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1.0 Executive Summary

Headwater canals within the Western Irrigation District irrigation system were sampled for fish by AQUALITY Environmental Consulting Ltd. on October 8 and 9, 2002 following the fall canal dewatering. The purpose of this work was to (i) identify stranded fish in the canals, (ii) quantify stranded fish in ten pre-selected pools, (iii) comment on the condition of stranded fish, (iv) comment on the significance of the amounts of fish trapped and (v) suggest potential remediation measures to minimize fish loss. Several sites along A, B and C canals were inspected immediately downstream of Chestermere Lake, and eleven holding locations (pools) were identified. Of the eleven sites identified as potential holding pools, only four were found to be inhabited by fish, and only two of those sites contained greater than three fish. Northern Pike (*Esox lucius*) were the most abundant fish found in the canal system, and were represented by several size classes. Other fish found in the survey included Mountain Whitefish (*Prosopium williamsoni*), Longnose Sucker (*Catostomus catostomus*), Rainbow Trout (*Oncorhynchus mykiss*), Brown Trout (*Salmo trutta*) and Yellow Perch (*Perca flavescens*).

All fish collected were in good health, with no apparent lesions or ectoparasites. More intensive sampling will be required to determine if the amounts of fish trapped were significant, or if the loss of these fish have a significant impact on their populations. Some suggested solutions to minimize fish entrapment in the WID canal system were to:

- (i) exclude fish from entering into the Canal works,
- (ii) eliminate deep pool habitat within the Canal system that fish find favorable,
- (iii) rescue fish from concentrated, predictable locations for re-release back into the Bow River following fall dewatering,
- (iv) provide a flushing process to herd the fish into deeper water bodies, or
- (v) do nothing and monitor the status quo.

2.0 Introduction

The Western Irrigation District (WID) has been providing water to agricultural operators in southern Alberta since 1907. Water is withdrawn by a diversion structure on the Bow River immediately downstream of the Calgary Zoo. From there, water flows east to Chestermere Lake, then flows southeast to Langdon, Strathmore and Gleichen, and north and east toward Standard and Rockyford. The Bow River water source is world-renowned for its blue-ribbon trout fishery, and boasts over 3000 trout per mile of river (McLennan 1998). The growth of the blue-ribbon fishery began with Rainbow Trout stocking efforts in the mid-1920's, which parallels the timelines of irrigation growth. Currently, it is not known how many fish make their way into the WID diversion and how many of these become trapped in the WID irrigation canal system.

To gain some understanding of the magnitude of potential fish loss, the WID hired Aquality Environmental Consulting Ltd. to identify and quantify fish stranded following the normal fall dewatering (i.e. when diversion activities cease and canals are allowed to run dry). Canal dewatering typically occurs around the Canadian Thanksgiving weekend, and can take up to a week for the canals to drain. The majority of fish are assumed to move to the safety of deeper waters within the canal system such as Chestermere Lake, Langdon Reservoir and Bruce Lakes during the dewatering process. However, some fish do remain in the deeper pools of the canals. The purpose of this work was to (i) identify the species of stranded fish, (ii) quantify stranded fish, (iii) comment on the condition of stranded fish, (iv) comment on the significance of the amounts of fish trapped and (v) suggest potential remediation measures. WID has not previously undertaken work of this nature, so the purpose of this study was to capture a snapshot of the system as a basis for further study, if warranted.

3.0 Methods

Headwater canals within the Western Irrigation District were sampled by Aquality Environmental Consulting Ltd. on October 8 and 9, 2002 following the fall canal dewatering. Sites immediately downstream of Chestermere Lake were selected along Canals A, B and C (Figure 1). Eleven sites were identified by WID operations staff, which had deep enough water to potentially hold fish. These sites were typically deep pools, found immediately downstream of large drop-structures where a plunge pool was an integral part of energy dissipation.

Seine nets (20m long by 2m deep, mesh size approximately 5mm) were used to block downstream passage of fish (where necessary), while pools were seined with a smaller (5m long by 1.5m deep, mesh size approximately 5 mm) two-man pocket seine net. Seine hauls were made

through the sites until fish were no longer collected. Seining was effective at sites that were less than 1m deep, and less effective at increasingly deeper sites.

4.0 Results

4.1 Results Summary

The October 8 and 9 2002 WID canal sampling locations appear in Figure 1. Sites 1-6 on Canal A were visited by Jay White, Nolan Yaskiw and Darcy Tetrault on October 8, while sites 7-11 on Canal B and C were visited by Jay White, Nolan Yaskiw and Wes Sproule on October 9.

A summary of the numbers of fish collected appear in Table 1. Fish were collected at four of the eleven sites visited. Two sites immediately downstream of Chestermere Lake contained the majority of fish on Canals A and B. Three small Longnose Suckers were collected at the other two inhabited sites.

Table 1: Numbers of fish seined by AQUALITY on October 8 and 9, 2002 along eleven dewatered WID canal headwater sites.

Site	Northern Pike	Mountain Whitefish	Longnose Sucker	Rainbow Trout	Brown Trout	Yellow Perch
1	0	0	0	0	0	0
2	29	19	7	0	0	0
3	0	0	3	0	0	0
4	0	0	0	0	0	0
5	0	0	3	0	0	0
6	0	0	0	0	0	0
7	139	9	24	23	2	1
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0



Figure 1: Sites sampled by AQUALITY on October 8 and 9, 2002 along dewatered WID canal headwater sites.

Figure 2: The author poses with one of two Brown Trout captured during the study.

4.2 Detailed Site Results

Site 1: Samplings taken at the bottom of the drop structure of the main gate at the southeast corner of Chestermere Lake. The pool was isolated, shallow and sampled thoroughly.

Site 2: Samplings were limited to upstream of the deepest waters, where nets were effective and could touch bottom. The large, deep pool under the railway tracks was inaccessible to seine netting. Large Rainbow Trout and Mountain Whitefish were seen feeding at the water surface under the bridge. One hour of creel surveying resulting in two strikes on a dry fly, but no fish were landed.

Site 3: Samplings were taken at the bottom of a rock weir along Canal A south of the main gate. The pool was shallow, isolated and sampled thoroughly.

Site 4: Samplings were taken immediately upstream of Canal A highway crossing north of Langdon at the first drop structure (a stone weir). The pool was not isolated and the water depth was 1-1.5m throughout.

Site 5: Samplings were taken immediately upstream of Canal A highway crossing north of Langdon at the second drop structure (a stone weir). The pool was not isolated and the water depth was 1-1.5m throughout.

Site 6: Samplings were taken immediately upstream of Canal A highway crossing north of Langdon at the third drop structure (a stone weir). The pool was not isolated and the water depth was 1-1.5 m throughout.

Site 7: Samplings were taken immediately downstream of Canal B between drop structure and Hwy #1. The deepest pool was found immediately below large culvert draining into the canal on east side of canal. The pool was not isolated, and the water depth was 1-2 m throughout.

Site 8: Samplings were taken downstream of McKilroy's slough in very shallow (30-60 cm), clear water. Minnow sized fish noted in weedy patches, but none were caught in seine nets.

Site 9: Samplings were taken further downstream of McKilroy's slough in clear, deep pool downstream of gravel road crossing. The pool was not isolated and the water depth was 0.5-1.5 m throughout.

Site 10: Samplings were taken in Canal C downstream of split from Canal B, on the north split. The pool was not isolated and the water depth was 0.5-1 m throughout.

Site 11: Several kilometres of B Canal were inspected from the C split to approximately 2 kms downstream of the Chudobiak property. Several small (15-25 cm) Northern Pike juveniles were spotted, but none were seined. The pools were not isolated and the water depth was 0.5-1 m throughout.

5.0 Conclusions and Recommendations

5.1 Summary of fish collections

Four of eleven pre-selected sites along the upper headwaters of the Western Irrigation District canal system downstream of Chestermere Lake were found to contain fish. Only two sites were found to contain more than three fish, and both were located immediately downstream of Chestermere Lake. Fish species collected (in order of abundance) were Northern Pike (*Esox lucius*), Longnose Sucker (*Catostomus catostomus*), Mountain Whitefish (*Prosopium williamsoni*), and at one site only, Rainbow Trout (*Oncorhynchus mykiss*), Brown Trout (*Salmo trutta*) and Yellow Perch (*Perca flavescens*). All fish collected were in good condition, and had no obvious lesions or ectoparasites.

5.2 Significance of findings

Assuming that the fish collected in this survey will die throughout the winter months, then it follows that the species and proportions of fish collected in this survey represent the species and proportions of fish removed from the system yearly (i.e. mostly Northern Pike, to some lesser extent White Suckers, Mountain Whitefish and to a much lesser extent Rainbow and Brown Trout). Our repeated seine samplings of isolated pools < 1m deep were quite effective in removing fish, however deeper sites were less effectively sampled. Further, it is quite possible that the majority of fish that are stranded in the WID canals are in the deeper pools that were the most difficult to sample. If this is true, then we have underestimated the number of fish trapped in deeper pools.

Some of the pools have significant depth and may provide for winter survival for some species, and so we cannot confirm that all fish are lost. Salvage licences from Sustainable Resource Development allow fish harvesting on some canal waters, which provides the local community fish for a food source. Although the irrigation system lands are on private property, the sites are remote and the public are not bound to inform the WID of their activities.

To properly determine how many fish may be trapped in WID canals, future studies should identify how many deep pools exist in Canals A, B, and C, and should quantify how many fish there are on average within each pool (by performing mark-recapture studies within these pools). With this information, the number of fish stranded in deep pools of the WID system could be more accurately quantified. Larger (deeper) seine nets, mixed-mesh gill nets, backpack electroshocking and boat electroshocking should be considered for future sampling undertakings. The estimated total number of fish trapped along the entire canal network could then be compared to the source populations. To assess whether or not the loss of fish would have a significant impact on the population, each species will have to be addressed separately.

The Northern Pike collected in this study are likely to have originated from Chestermere Lake, which has an established pike fishery (Council 2001). This may explain why we saw many small pike in this study downstream of the lake. As well, due to the multiple age-classes of pike in Chestermere Lake (Council 2001), we assume that pike must also be safely overwintering there. Because of the suitability of shallow water in the canals for pike habitat, this species will likely be the most impacted by canal dewatering. As well, there were numbers of juvenile pike in shallow waters between pools seen, but not sampled. By not including a measure of the abundance of these fish, we are likely to underestimate fish stranding. In this case, the underestimate is potentially very high because there are very long stretches of shallow water. Although pike were not caught at every site in this study, there existed suitable habitat for pike at every site visited.

The trout species collected in this study are likely to have originated from the Bow River, entering the canal at the WID headworks diversion. The Bow River contains a managed trout fishery, with different regulations for eight different sections of the River (Alberta Sustainable Resource Development 2002). There are specific regulations for catch limits specified for all trout species including Mountain Whitefish. The loss of the small number of fish identified in this survey are likely negligible when compared to the larger Bow River fishery. As well, the impacted fish populations were limited to localized deep pockets downstream of Chestermere Lake. However, we have likely underestimated the trapped fish population sizes due to the unexpected depths of some study pools sampled. The age of the trout observed (most were mature fish, 2 to 3 years) also raises the question of long-term trout survival within the system. We cannot assume that all fish collected in our study were not in the canal system last year. The apparent lack of smaller, younger trout may be attributed to the abundance of pike preying on these fish throughout the canal system.

5.3 Remediation options

There are several options that will need to be explored to remediate the loss of fish in dewatered canals, if it is shown that the loss of these fish causes an adverse effect. For example, remediation measures for Northern Pike will be much more difficult than for any other species, because they were found spread throughout the canal system. Coldwater trout species however, were found concentrated in predictable locations (i.e. the deepest pools). Further, the source of the fish in the canal system is most likely from both outside the canal system (trout from the Bow River) and from within the system (Northern Pike and Longnose Suckers from the reservoirs along the Canal).

The suggested solutions for fish entrapment in the WID canal system would be to:

- (i) exclude fish from entering into the Canal works, though a major Provincial investment may not be warranted based upon the apparent fish loss,
- (ii) eliminate deep pool habitat within the Canal system that fish find favourable if the structural requirements allow,
- (iii) rescue fish from concentrated, predictable locations for re-release back into the Bow River following fall dewatering if the fish can stand the stress of handling,
- (vi) provide a flushing process to herd the fish into deeper water bodies, or
- (vii) do nothing and monitor the status quo.

The three types of fish exclusion structures are physical, behavioural and both. While the most logical place for a fish exclusion structure is at the WID diversion structure at the Bow River,

having exclusion screens at the outflows from Chestermere Lake may also be effective at keeping coldwater (trout) species out of the rest of the system. However, these screens may not be effective for cool water (pike and sucker) species.

If deep pool habitats are eliminated below drop structures, it may encourage fish to move to safe deep waters during fall dewatering (i.e. within Chestermere Lake or Langdon Reservoir). Deeper pools could be filled in with rocks to decrease their depths and make them less favourable to fish. However, this cannot be considered at sites where the pool depth is an integral part of energy dissipation. Further, this may need to be re-thought where it is shown that fish are overwintering in some of the deepest pools.

If the majority of fish trapped in dewatered canals can be identified as originating from a few, predictable pools, then a fish rescue operation may mitigate some fish losses. How such an arrangement would work on WID private lands, for an operation that is outside of its irrigation mandate, would need further discussion.

Chemical astringents used for fish “herding” may be released into the canal headworks at the start of the dewatering phase to move the fish downstream to deeper water bodies. This would work well for Site 7, as the McKilroy slough is immediately downstream. This may also be an effective method to move fish from deeper pools to shallower locations downstream where they would be easy to capture.

The status quo is always an option. The amount of fish captured in this study and assumed to be lost would not indicate a major problem. Accepting this amount of operational loss has been the practice for the last 90 years. However, the WID intends to continue to monitor fish populations within the canals and to observe the variance from season to season. This report will form the basis to build upon and measure future changes.

6.0 References Cited

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