Central Lake Ontario Conservation

Instream Barrier Action Plan

Action Plan #17

February 2017

Contents

1. INTRODUCTION 1-1
1.1 PURPOSE 1-1
1.2 CONTEXT OF THIS ACTION PLAN AND WATERSHED PLANNING 1-2
2. METHODOLOGY 2-1
3 Top Barriers For Removal 3-1
4 Lynde Creek Watershed 4-1
5 Oshawa Creek Watershed 5-1
6 Black/Harmony/Farewell Creek Watershed 6-1
7 Bowmanville/Soper Creek Watershed 7-1
8 Small Watersheds 8-1
9 CONCLUSION 9-1
10 REFERENCES 10-1
11 Appendix 1 – Lynde Creek Watershed 11-1
12 Appendix 2 - Oshawa Creek Watershed 12-1
13 Appendix 3 - Black/Farewell/Harmony Creek Watershed 13-1
14 Appendix 4 - Bowmanville/Soper Creek Watershed 14-1
15.0 Appendix 5 - Small Watersheds 15-1

Central Lake Ontario Conservation

EXECUTIVE SUMMARY

This document assesses all known instream barriers that are potentially impacting fish movement within the CLOCA jurisdiction. Each instream barrier has been documented using standardized metrics, including: quality of biotic life within proximity of barrier; extent of barrier; quantity of habitat restricted; quality of habitat restricted; and other considerations for barrier removal. Scores are allocated to each of these metrics and the overall score summed to determine relative importance of removal. Individual barrier information is presented in the appendices to this report and are organized by watershed. Based upon the scores in each watershed, the top 10 barriers recommended for removal are presented in Section 3. Oshawa and Bowmanville Soper Creek accounted for 8 of the 10 barriers and Black/Harmony/Farewell and Lynde Creek watersheds had one each in the top 10. There were no barriers in the Small watersehds identified for removal in the top 10 list. Prioritizing barriers for removal in this manner places an emphasis on restoring barriers located in the healthiest sections of the watershed and where sensitive species are abundant. Natural barriers (debris barriers, beaver dams) were not considered as they are temporary and part of a natural system.

The only watershed not found in the top 10 barriers for removal section are the Small Watersheds.

This Instream Barrier Action Plan supports implementation of recommendations contained within CLOCA's Watershed Plans including the evaluation of instream barriers to assess whether barriers need to be removed and prioritizing of barriers for removal. With this information in hand, CLOCA can work with our partners on improving aquatic habitat throughout the jurisdiction.

1. INTRODUCTION

Instream barriers may be any type of water control structure, culvert, or weir that obstructs or limits fish movement from accessing habitat, or causes fish to congregate at the base of the barrier for prolonged time periods. Not only do instream barriers have direct effects on fish, but they also effect water quality and habitat conditions within the stream. Impoundment of water behind a physical structure causes the sediment to settle out from the stream water, leading to silt build-up in the pond and sediment deprivation downstream. Sediment deprivation downstream of the barrier causes an increased rate of stream bank erosion as the sediment-reduced water has more energy to scour stream banks. The higher energy flow can also increase erosion of sediments in depositional areas of the lower stream reaches. Sediment accumulation in a pond requires periodic dredging. If a pond is not properly managed, the amount of sediment accumulates and water capacity in the pond is restricted. This eventually results in sediment being carried over the barrier and flushed downstream smothering fish spawning beds and habitat.

Instream barriers can disconnect resident fish communities. There is some uncertainty if this is beneficial or detrimental to certain native communities. Brook Trout, for example, were distributed throughout the watersheds historically. Currently, they live primarily in headwater areas, where suitable conditions still exist, and are generally disconnected, by instream barriers, from competing populations of non-native Salmon and Trout. Limited competition is thought to be beneficial for protecting native Brook Trout populations. However, the isolation of Brook Trout conspecific populations can cause a genetic bottleneck effect, resulting in population declines long-term. In addition, by having a barrier in place it limits their ability to avoid stochastic events, long-term climate change impacts, reduces the number of life history strategy options (e.g. migratory or residential), and limits dispersal for the purpose of exchanging genetics and repopulating neighbouring habitat. Barriers can also act as an obstacle, controlling upstream movement of invasive aquatic species. It is unclear which factor is more relevant to the success of upstream fish species, therefore, further site specific research may be warranted where these situations arise.

1.1 PURPOSE

The identification and evaluation of instream barriers is an important component in Central Lake Ontario Conservation Authority's (CLOCA's) efforts to protect, restore and enhance fish and aquatic habitat. Most barriers within CLOCA's jurisdiction have been assessed through various dam inventory projects. The purpose of this report is to create a barriers action plan prioritizing removal of instream barriers. Existing instream barriers impact on aquatic ecosystems were evaluated watershed wide. The result is a prioritization of instream barriers for removal. Prioritization was assessed using five metrics associated with the site and upstream watershed. Metrics included were quality of biotic life, habitat quality and quantity upstream, the extent of the barrier, and the risks associated with removing the dam. It is recognized that the biological considerations do not take into account important cultural, social and economic factors associated with the barriers. When known, these considerations will be mentioned but not factor into the prioritization scoring. This report classifies barrier removal on a biological basis only. Knowing what barriers will

provide the best value, in terms of ecological improvement, is important when selecting one of many barriers in a watershed. The information presented in this Action Plan provides the rationale needed to support restoration and funding opportunities.

It is acknowledged that there are data gaps around some of the barriers. In most cases the lack of information is a result of barriers being located on private property. When new data becomes available, this information will be incorporated into this document. Barriers caused by debris jams or beaver activity were not considered in this Action Plan as these are deemed to be 'temporary natural' barriers. When these barriers come to our attention, CLOCA staff will assess the barrier and provide the municipality/landowner with appropriate recommendations.

1.2 CONTEXT OF THIS ACTION PLAN AND WATERSHED PLANNING

The goal of watershed planning is to provide a framework to protect, restore and enhance a healthy and resilient watershed. A Watershed Plan examines the environment and human activities within a watershed area and assesses the relationships between these activities to determine how the ecosystems of the watershed should be managed to ensure that they retain their ecological integrity. In 2012 and 2013, Watershed Plans for CLOCA's 4 large watersheds were completed; the Watershed management recommendations that were made in these plans will, when implemented, work to achieve specific watershed goals and targets. In order to achieve these goals, CLOCA identified a suite of tools, including 24 Action Plans, to direct and support the implementation of the Watershed Plan recommendations. Action Plan #17, The Instream Barriers Action Plan, investigates and evaluates known barriers to confirm ecological impact on aquatic functions, necessity to remove the barrier and to prioritize barrier removal.

CLOCA Action Plans

The 24 Action Plans described in the Watershed Plans work to achieve specific health objectives, contributing to the fundamental goal of a healthy and resilient watershed. All of the Action Plans address watershed concerns, issues and actions identified during development of the Watershed Plans. These plans will provide greater detail for achieving specific watershed goals and targets, and will provide the framework and implementation planning necessary to complete future on-the-ground monitoring, research, restoration and rehabilitation work. Some of the Action Plans are designed to be implemented at a larger scale, i.e., the CLOCA jurisdiction, while other Action Plans will be directed to specific watersheds, subwatersheds, or even a site specific area. While CLOCA is taking the lead on preparing these Action Plans, the completion of some specific plans will compliment, support and/or inform Regional and/or Municipal programs. These plans will provide greater detail for achieving specific watershed goals and targets, and will provide the framework and implementation planning necessary to complete future on-the-ground monitoring, research, restoration and rehabilitation work.

Action Plan #17; The Instream Barrier Action Plan will identify and evaluate existing instream barriers. Five metrics were considered in the evaluation of each barrier: quality of biotic life in proximity to the barrier; extent of passage; quantity of upstream habitat restricted; quality of

upstream habitat restricted; and other considerations for barrier removal. This evaluation enables the priorization of barrier removal throughout the jurisdiction and within individual watersheds.

Planning Context

CLOCA provides planning advice, as set out in a Memorandum of Understanding (MOU), with our partner municipalities. This MOU recognizes CLOCA's expertise in the areas of watershed management, natural heritage and natural hazard planning, and identifies CLOCA as the agency to provide advice and comments on these matters. CLOCA not only provides comments on planning applications relating to the identification, function and significance of natural heritage and hydrological features and systems, and reviews studies that assess impacts on watershed resources, advice is also provided to support the implementation of the Authority's resource management plans including Watershed Plans and Action Plans. CLOCA also reviews and comments on projects conducted in accordance with the Environmental Assessment Act, bringing local environmental and watershed knowledge into the review and assessment process. A number of instream barriers are associated with the transportation network (road crossings). The knowledge gained through this Action Plan provides more information important in the consideration, review and restoration recommendations associated with municipal capital projects and infrastructure improvements. CLOCA's involvement in both the local land use and EA review processes ensures that regard for the integrity of the Natural Heritage System (NHS) can be maintained throughout the planning process, and the information and recommendations contained within this Action Plan can be applied.

2. METHODOLOGY

Prioritization Rationale

This action plan focuses on the biological concerns of removing barriers and makes note of cultural, economic, and social concerns if known. The cultural, economic and social concerns will not factor into the score. The following outlines each of the metrics considered for assessing the benefits of barrier removal. There are a total of five metrics. Four of the metrics are assessed a quantitative score outlined below. One metric, other considerations for barrier removal, is qualitative. The four quantitative metrics are scored out of five for a total possible score of 20. The higher the score, the more beneficial removing the barrier, from a biological standpoint. The qualitative metrics acts as a red flag and can signal when more background research is necessary prior to barrier removal.

Metric: Quality of Biotic Life Within Proximity of Barrier

Within the jurisdiction of the Central Lake Ontario Conservation Authority, there are highly diverse natural features and differing amounts of human alteration that impact the composition of fish communities. Different fish communities have different habitat needs, migration strategies, and ecological, recreational and economical significance. For example, typically, Blacknose Dace are more adaptable and tolerant to changes in habitat and water quality than Slimy Sculpin. Generalist species can thrive in nearly any habitat and for this reason, there is greater benefit in improving connectivity where sensitive species exist.

This metric can be scored using an Index of Biotic Integrity (IBI). The purpose of the IBI is to translate the fish community information into a stream health score. Since each species of fish have different sensitivities and tolerances, understanding the composition of the community can provide insight into the biological integrity or health of that site. Generally, if a site is dominated by sensitive, coldwater species, it will result in a higher score, whereas, areas dominated by species very tolerant to land use change will have a lower score. The average IBI score between the nearest sites upstream and downstream is used. For sites to be considered, they must be located before any major confluences and without any significant feature between it and the barrier. In order for an IBI score to be awarded, certain criteria must be met to ensure consistent and comparable data (e.g. sampled using the Ontario Stream Assessment Protocol (OSAP)). The IBI is scored out of 100, therefore, the average IBI score will be divided by 20 to have a maximum score of 5 for high quality fish communities and a minimum score of 0 for low quality fish

communities. For more information on the IBI and how it determines quality of the fish community, please refer to the Central Lake Ontario IBI Methodology.

Metric: Extent of Barrier

All barriers are not created equal. Some are vertical barriers while others create velocity barriers. Fish species vary in their ability to overcome each of these types of barriers. Rainbow Trout, for example, are able to overcome some vertical barriers by jumping, if given the right conditions (e.g. pool depth), but may not be able to overcome certain velocity barriers within a long straight stretch of culvert. Although adult Salmonids (Rainbow Trout, Chinook Salmon, etc.) may be able to pass vertical barriers, most other fish are not capable of jumping and this will be a barrier at any stage of their life. Also, an area may become impassible at different life stages or during different flow conditions.

This metric was divided into three categories. The first consists of barriers that are only considered a barrier to small, non-jumping fish that are not known to migrate long distances (e.g. most "minnows") and will be scored a one. The second is any barrier non-jumping fish are not able to pass, including larger migratory fish (e.g. Smallmouth Bass), and will receive a score of three. For example, Rainbow Trout are able to pass in the spring but low water levels prevent Chinook Salmon from passing in the fall. It would also include a barrier where migratory fish are spending too much time passing. Research has demonstrated the negative impacts of fish stacking up behind barriers increasing the amout of time required to migrate to spawning grounds. Determining what is too much time is relatively arbitratry at this point and is usually based on professional judgement. That being said, certain situations may call for the need to ascertain how long fish are taking to pass a barrier. The third

category consists of barriers in which no fish can pass, be it a vertical barrier, low flow, or velocity barrier, and will be scored a five. A score of five can also be awarded to the following situations: areas where some Salmon and Trout are able to pass (Rainbow Trout and Chinook Salmon) but, other Salmon or Trout with limited jumping ability (e.g. resident Brook Trout), are present. The fragmentation of these resident populations could have genetic consequences and may be putting them at a disadvantage when competing against other migratory salmonids. Another situation where a score of 5 may be allocated is where species at risk are present and unable to pass (Redside Dace).

Metric: Quantity of Habitat Restricted

The quantity of habitat each barrier restricts is important when determining priority for removal. If all conditions associated with certain barriers are equal except one restricts access to 20km more stream length, it will be deemed more important to remove. This is calculated by measuring the kilometers of upstream habitat that would be newly accessible to downstream fishes. If another barrier exists upstream, the additional area accessible would only be calculated up to the next barrier. These numbers will be re-calculated as barriers are removed that are in series with others.

In order to score this metric, all barriers had upstream habitat calculated. For every 10km of newly accessible habitat, 1 point is scored. The minimum score is 0 which is applied when 0km is made accessible, and the maximum score is 5, based on 50km or more being made accessible. Since only a few sites had more than 50km of habitat upstream, it was decided to limit the score to 5 at 50km in order to have a more evenly distributed metric.

Metric: Quality of Habitat Restricted

The biological importance of habitat upstream is dependent on the quality and type of habitat that exists. If, for example, upstream habitat is poor quality and highly degraded with little habitat for specific purposes (e.g. spawning for Rainbow Trout), there is less incentive to restore connectivity. On the other hand, if the habitat is high quality and diverse, gravel beds and high groundwater input for example, there is more incentive to restore connectivity as it could be beneficial habitat for many species, and specifically, spawning and refuge for Salmon and Trout.

There are many factors that contribute to the quality of the upstream habitat. Generally speaking, the less anthropogenic disturbance upstream of a barrier the better the habitat will be. Since there are many ways to measure disturbance, multiple measures were used for this metric. Water temperature, riparian cover, and impervious surfaces are the three metrics that were used to determine the score.

Historically, CLOCA's jurisdiction was predominately a coldwater system. Deviation from a coldwater thermal regime will be synonymous with poorer water quality and increased disturbance. If the thermal regime has deviated to warmwater, the barrier will be assigned a score of one, coolwater will be assigned a score of three, and if the system remains coldwater it will be scored a five. The scoring classifications are based on instream temperature loggers that are part of the aquatic monitoring program at CLOCA. The data is analyzed and awarded a thermal designation based on the CLOCA temperature analysis methodology.

Adequate riparian cover can provide thermal benefits but is also associated with better water quality, reduced erosion, and more natural channel morphology. Adequate riparian cover is 30m on both sides of the creek as identified by Environment Canada in How Much Habitat is Enough, 2013. If riparian cover upstream of the barrier is limited, the health of the stream may be impacted. Different thresholds appropriate for the CLOCA jurisdiction have been selected to separate high, average, and poor quality based on riparian cover. Percent riparian cover was divided by 20 to provide a score out of 5.

The third component of habitat quality is upstream impervious surfaces. Impervious surfaces decrease water quality and alter ecological flows, which contributes to altered channel morphology and reduced channel diversity. The greater the amount of impervious cover upstream of the barrier, the more potential for various impacts and reduced quality of habitat. Impervious cover was calculated upstream of the barriers. If impervious cover upstream of the site was greater than 20%, the score will be 0, and if 0%, the score will be 5. This puts the recommended threshold not to exceed 10%, (Environment Canada, 2013) at a score of 2.5. Conditions have deviated from pristine, but there is still some potential for a good fish community.

The final score for this section will be calculated by adding the score of each component, thermal, riparian and impervious cover, and dividing that sum by three to be out of 5.

It is understood that many different metrics could be used to provide an idea of habitat quality upstream. Percent forest cover, percent natural cover, benthic invertebrate IBI, percent agricultural lands are a few examples. The three metrics outlined above were chosen in part because of data availability, but also because they have consistently been found to have strong relationships with fish community health within CLOCA.

Metric: Other Considerations for Barrier Removal

Long-term barriers, especially those which have drastically changed stream form (e.g. pond habitat upstream), can significantly change many aspects of stream flow dynamics and force biotic life to adapt to its new form. Simply removing the barrier can have negative effects on the downstream habitat and the biotic life within the area that have adapted to this new form. Releases of large amounts of sediment and/or protection of native Brook Trout populations may prove to be more valuable than increasing connectivity for downstream biota. This metric will have to be assessed on an individual basis. If Brook Trout populations are involved, genetic sampling should be completed to determine the long-term sustainability of those populations. In addition, comparing fish communities upstream and downstream of the barrier to determine potential interspecific competition effects should be completed. In regards to sediment, the amount that has accumulated upstream of the dam will have to be determined, the quality of sediment that would be released, and if the release rate of sediment could be managed (e.g. stop logs). In some situations, barriers were created or are now maintained to control the spread of invasive species. Certain barriers may be important to reduce accessible area and/or spawning habitat for invasive species, such as, Sea Lamprey and Round Goby.

Originally this metric was given a quantitative score, but it was found to influence the total score too significantly. The scoring was changed to qualitative, and rather than contribute to the overall score, it can be used as a flag for the barriers that have other considerations to be considered before removal. If the score for a barrier is found to be high but the site has been flagged to have other potential biological concerns, the barrier will not be removed until these concerns can be assessed.

Total Score

All scores will be summed to determine the barriers that are most beneficial for removal. The maximum possible score is 20 and the minimum score is one. A barrier scoring one will have nearly no benefit for removal whereas a barrier scoring 20 is a high priority for removal from a biological perspective. These results can be used to actively try to mitigate barriers with the highest scores or to passively select the most suitable location

for barrier removal once resources becomes available. It allows for quick decisions to be made on sound biological reasoning. If any of the metrics importance changes, it is relatively easy to adapt this document and the related scores within to reflect those changes to ensure an up-to-date, scientifically sound approach.

When barriers have been restored, the metric scores will be removed from the evaluation sheet and restoration will be indicated. In some situations, there may be limits to the amount of restoration that can occur. For example, BARBOW08 had passage improved, but full barrier removal was not possible due to landowner uses and it's role in Sea Lamprey control. Therefore, it remains a barrier but partial restoration will be indicated on its individual evaluation sheet.

3 Top Barriers For Removal

Within CLOCA, the top 10 barriers identified for priority removal are identified in Table 1. The only watershed not represented in the top 10 list is the Small watersheds. The larger watersheds, specifically Bowmanville/Soper and Oshawa Creek, have barriers consistenly scoring high because it contains the healthiest fish communities and habitat and are much larger. The larger watershed plays a role due to quantity of habitat restricted being calculated as a metric. As this scoring system was meant to prioritize habitat for sensitive, specialist species, these results are expected. The Oshawa Creek Watershed has a total of 20 instream barriers, five of which fall within the top 10 barriers for removal. One barrier in both the Black/Harmony/Farewell Creek Watershed (20 total barriers) and the Lynde Creek Watershed (11 total barriers) have been identified in the top 10 for priority removal. Five of the barriers in the top 10 do have other considerations for removal (flagged as a yes these and highlighted yellow in the table below). These situations will need to be further investigated to ensure the disadvantages of removing the barrier do not outweigh the advantages.

Table 1: Summary of the top 10 barriers for removal based on biological metrics within the CLOCA jurisdiction.

Barrier Code	Metric Scores					
	Quality of Biotic Life	Extent of Barrier	Quantity of Habitat	Quality of Habitat	Other considerations before removal	Total Score
BARBOW02	3.1	5	5	4.1	Yes	17.2
BAROSH05	4.8	5	2.8	3.7	Yes	16.3
BARBHF11	4.1	3	4.3	3.8	No	15.2
BARLYN08	5.0	5	1.5	3.7	No	15.2
BAROSH15	4.8	5	1.5	3.9	Yes	15.2
BARBOW05	4.4	5	1.1	4.5	No	15.0
BAROSH14	4.8	5	1.3	3.8	Yes	14.9
BAROSH06	4.3	5	1.2	4.1	No	14.6
BAROSH16	4.2	3	2.0	3.4	Yes	14.6
BARBOW09	4.4	3	2.9	4.0	No	14.3

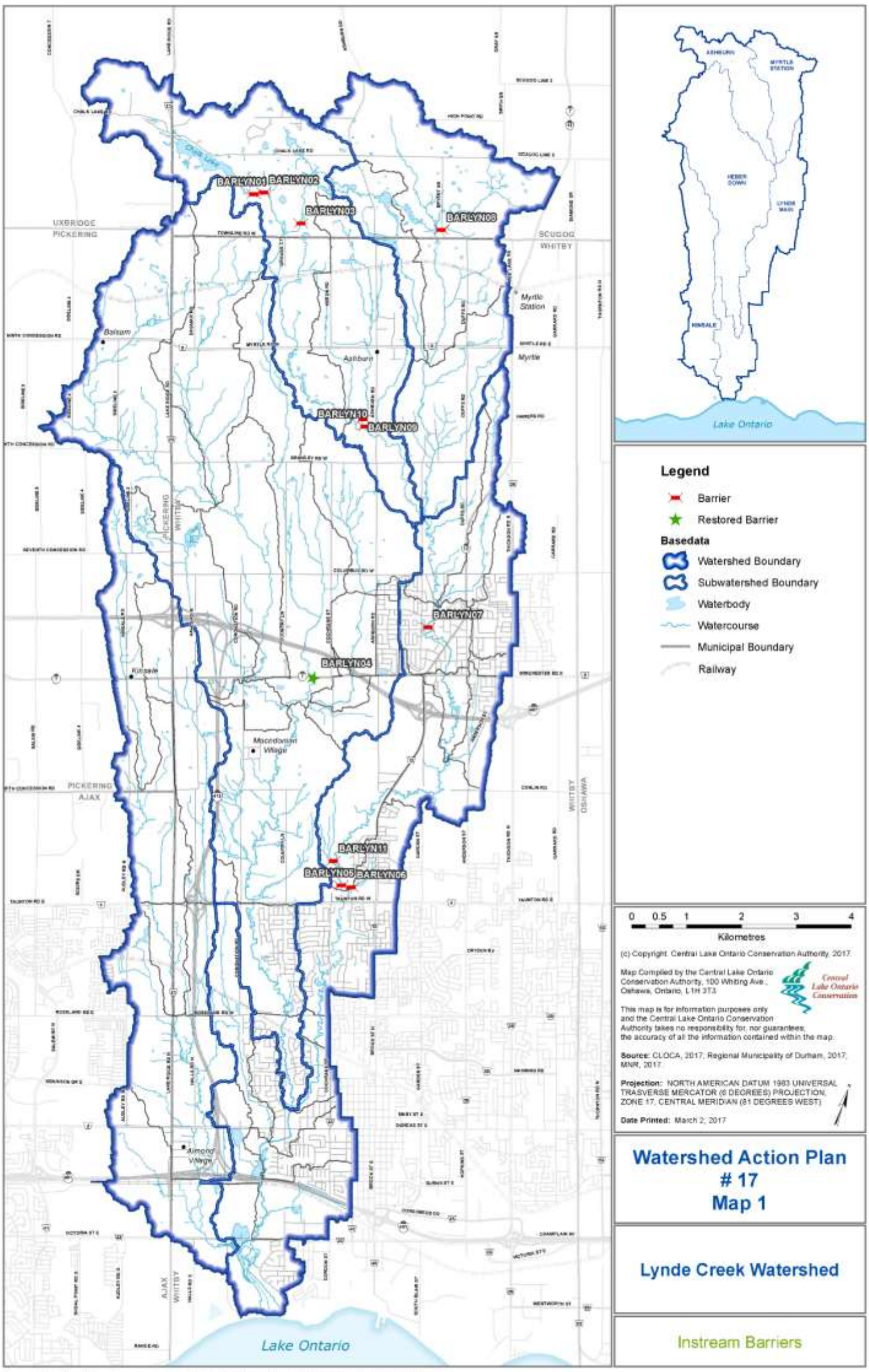
This report will be revisited on a regular basis to update information, identify barriers that have been restored, or new barriers that have been discovered. It is important to note that landowner permission is required to gain access to many of these barriers and as landownership changes overtime, these permissions may also change, affecting future opportunities to gather more information or conduct restoration projects.

4 Lynde Creek Watershed

Lynde Creek Watershed currently has 10 known barriers (Map 1). One barrier, the Hwy #7 Box Culvert, (BARLYN04) was removed through the widening of Highway #7. Most of the existing barriers are found in the middle reaches or headwaters. BARLYN08 has the highest score which is mainly driven by the large quantity of habitat upstream. None of the barriers have flags under the other considerations metric which indicates no further studies are required prior to removal. There are a couple reasons for this. Brook Trout are present in the watershed and given there are fewer similar species to complete with, opening up habitat to the resident species is always seen as a positive. Brown Trout, Brook Trout's major competitor, was never stocked in Lynde watershed and has never been documented here. Rainbow Trout and Chinook Salmon are present but in lower numbers than most of the other watersheds. Redside Dace is also present in Lynde Creek. They are unable to pass barriers that require jumping. Therefore, for recovery of this species at risk, barrier removal is recommended within their Recovery Strategy. There are three barriers (BARLYN09, 10 and 11) within Redside Dace habitat. A summary of all of the barriers within this watershed are listed in the below table. Cells containing dashes (---) reflect gaps in the data, green coloured cells identify those barriers that have been restored. The individual information sheets for the barriers are found in the appendix to this document.

Table 2: Summary of the scores for each of the barriers located within Lynde Creek Watershed.

Barrier Code	Metric Scores						Top 5 Removal Priority
	Quality of Biotic Life	Extent of Barrier	Quantity of Habitat	Quality of Habitat	Other considerations for Removal	Total Score	
BARLYN01	0.1	5.0	0.3	3.8	No	9.2	
BARLYN02	0.1	5.0	0.1	3.8	No	9.0	
BARLYN03	---	5.0	---	---	---	---	
BARLYN04	RESTORED						
BARLYN05	0.9	3.0	1.4	3.1	No	8.4	
BARLYN06	0.7	3.0	0.1	---	No	---	
BARLYN07	1.7	3.0	5.0	2.6	No	12.3	2
BARLYN08	5.0	5.0	1.5	3.7	No	15.2	1
BARLYN09	0.3	5.0	1.0	3.4	No	9.7	5
BARLYN10	0.4	5.0	2.5	3.6	No	11.5	3
BARLYN11	0.9	5.0	1.4	3.1	No	10.4	4

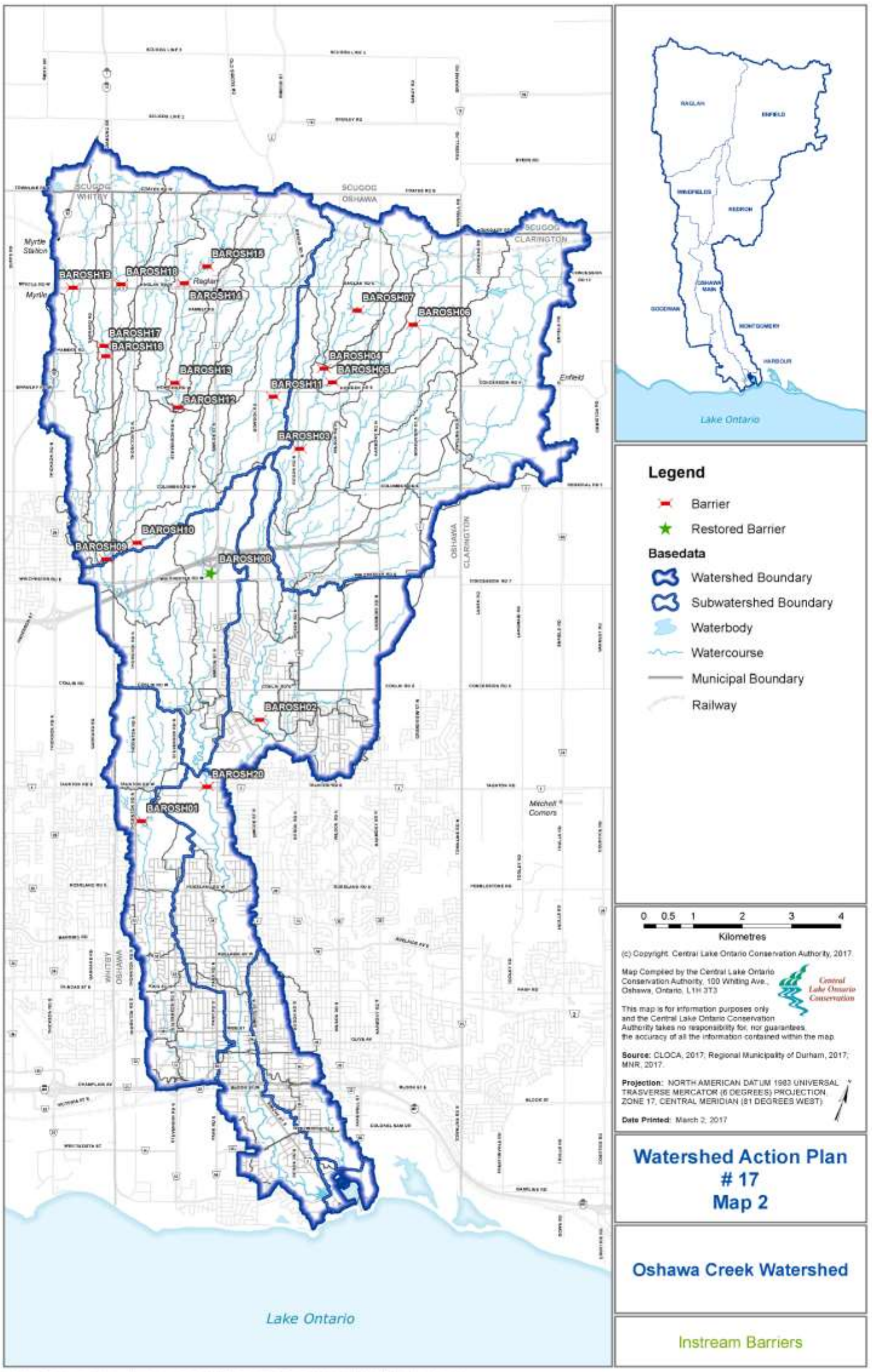

BARLYN01
BARLYN02
BARLYN03
BARLYN08
BARLYN10
BARLYN09
BARLYN07
BARLYN04
BARLYN11
BARLYN05
BARLYN06
UXBRIDGE
PICKERING
SCUGOG
WHITBY
Myrtle Station
Ashburn
Myrtle
Brooklin
Macedonian Village
Almond Village
PICKERING
AJAX
WHITBY
OSHAWA
Lake Ontario
Legend
Barrier
Restored Barrier
Basedata
Watershed Boundary
Subwatershed Boundary
Waterbody
Watercourse
Municipal Boundary
Railway
0 0.5 1 2 3 4
Kilometres
(c) Copyright. Central Lake Ontario Conservation Authority. 2017.
Map Compiled by the Central Lake Ontario Conservation Authority, 100 Whiting Ave., Oshawa, Ontario, L1H 3T3.
This map is for information purposes only and the Central Lake Ontario Conservation Authority takes no responsibility for, nor guarantees, the accuracy of all the information contained within the map.
Source: CLOCA, 2017; Regional Municipality of Durham, 2017; MNR, 2017
Projection: NORTH AMERICAN DATUM 1983 UNIVERSAL TRASVERSE MERCATOR (6 DEGREES) PROJECTION, ZONE 17, CENTRAL MERIDIAN (81 DEGREES WEST)
Date Printed: March 2, 2017
Watershed Action Plan
17
Map 1
Lynde Creek Watershed
Instream Barriers
ASHBURN
MYRTLE STATION
HEBER DOWN
LYNDE MAIN
KINSALE
Lake Ontario

5 Oshawa Creek Watershed

Oshawa Creek Watershed has 19 known barriers (Map 2) of which, many are located near or in the headwaters. There is one barrier which has been restored (BAROSH08). Much of the main branch through the City of Oshawa is open to fish migration whereas the headwaters are more segregated and resident salmonids become more common. A summary of all of the barriers within this watershed are listed in Table 3. Cells containing dashes (---) reflect gaps in the data and green coloured cells identify barriers that have been restored. Yellow coloured cells identify those barriers (7) where possible impacts to upstream fish populations may occur if the barrier is removed. It is recommended that the necessary information to confirm risk to fish populations be gathered. Until then, consideration of removing these barriers are deferred. Of the 5 priority barriers in the Oshawa Creek watershed, only one barrier (BAROSH06) does not have other considerations which require further study prior to restoration. Individual information sheets for the barriers are provided in the appendix to this report.

Table 3: Summary of the scores for each of the barriers located within Oshawa Creek Watershed.

Barrier Code	Metric Scores						Top 5 Removal Priority
	Quality of Biotic Life	Extent of Barrier	Quantity of Habitat	Quality of Habitat	Other considerations for removal	Total Score	
BAROSH01	0.1	5.0	1.0	2.3	No	8.4	
BAROSH02	1.7	3.0	5.0	3.1	No	12.8	
BAROSH03	4.4	3.0	1.6	3.8	Yes	12.8	
BAROSH04	4.5	5.0	0.3	3.7	Yes	13.5	
BAROSH05	4.8	5.0	2.8	3.7	Yes	16.3	1
BAROSH06	4.3	5.0	1.2	4.1	No	14.6	4
BAROSH07	5.0	---	0.2	4.1	No	---	
BAROSH08	RESTORED						
BAROSH09	1.8	3.0	5.0	3.3	No	13.1	
BAROSH10	0.1	5.0	3.1	2.9	No	11.1	
BAROSH11	0.1	---	0.9	3.1	No	---	
BAROSH12	4.1	3.0	0.1	3.6	No	10.8	
BAROSH13	4.1	3.0	0.4	3.8	No	11.3	
BAROSH14	4.8	5.0	1.3	3.8	Yes	14.9	3
BAROSH15	4.8	5.0	1.5	3.9	Yes	15.2	2
BAROSH16	4.2	5.0	2.0	3.4	Yes	14.6	5
BAROSH17	4.2	---	1.7	3.5	Yes	---	
BAROSH18	0.3	5.0	1.8	3.3	No	10.4	
BAROSH19	0.2	---	1.0	2.8	No	---	
BAROSH20	1.9	3.0	4.7	2.6	No	12.2	

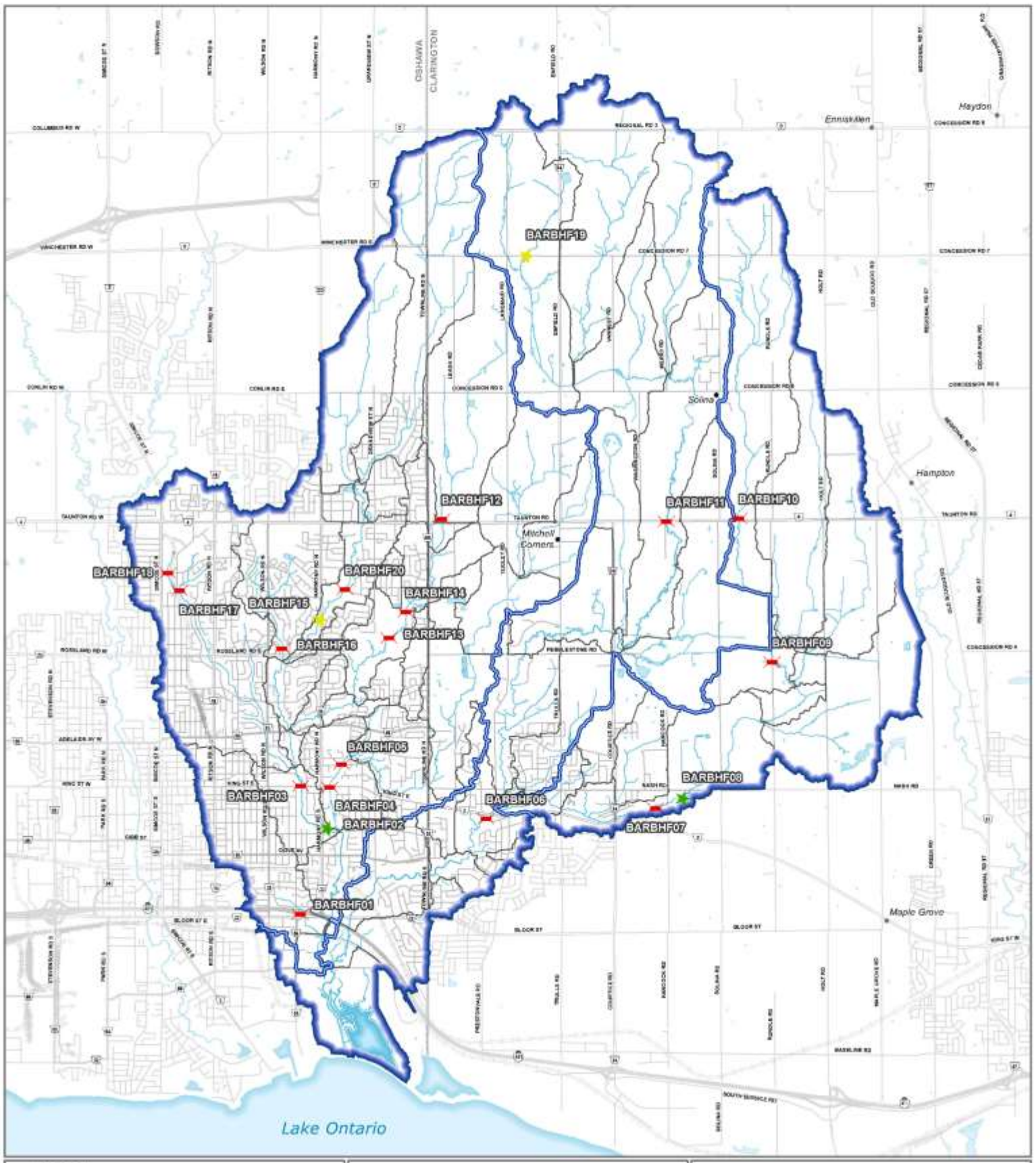

SCUGOG
WHITBY
SCUGOG
OSHAWA
SCUGOG
CLARINGTON
Myrtle Station
Myrtle
Raglan
Enfield
Mitchell Corners
OSHAWA
CLARINGTON
WHITBY
OSHAWA
BAROSH19
BAROSH18
BAROSH15
BAROSH14
BAROSH17
BAROSH16
BAROSH13
BAROSH12
BAROSH11
BAROSH07
BAROSH06
BAROSH04
BAROSH05
BAROSH03
BAROSH10
BAROSH09
BAROSH08
BAROSH02
BAROSH20
BAROSH01
Lake Ontario
RAGLAN
ENFIELD
MYRTLE
REGION
OSHAWA MAIN
GODERICH
MONTGOMERY
HARBOUR
Lake Ontario
Legend
Barrier
Restored Barrier
Basedata
Watershed Boundary
Subwatershed Boundary
Waterbody
Watercourse
Municipal Boundary
Railway
0 0.5 1 2 3 4
Kilometres
(c) Copyright. Central Lake Ontario Conservation Authority, 2017.
Map Compiled by the Central Lake Ontario Conservation Authority, 100 Whiting Ave., Oshawa, Ontario, L1H 3T3
This map is for information purposes only and the Central Lake Ontario Conservation Authority takes no responsibility for, nor guarantees, the accuracy of all the information contained within the map.
Source: CLOCA, 2017; Regional Municipality of Durham, 2017; MNR, 2017.
Projection: NORTH AMERICAN DATUM 1983 UNIVERSAL TRASVERSE MERCATOR (6 DEGREES) PROJECTION, ZONE 17, CENTRAL MERIDIAN (81 DEGREES WEST)
Date Printed: March 2, 2017
Central Lake Ontario Conservation
Watershed Action Plan
17
Map 2
Oshawa Creek Watershed
Instream Barriers

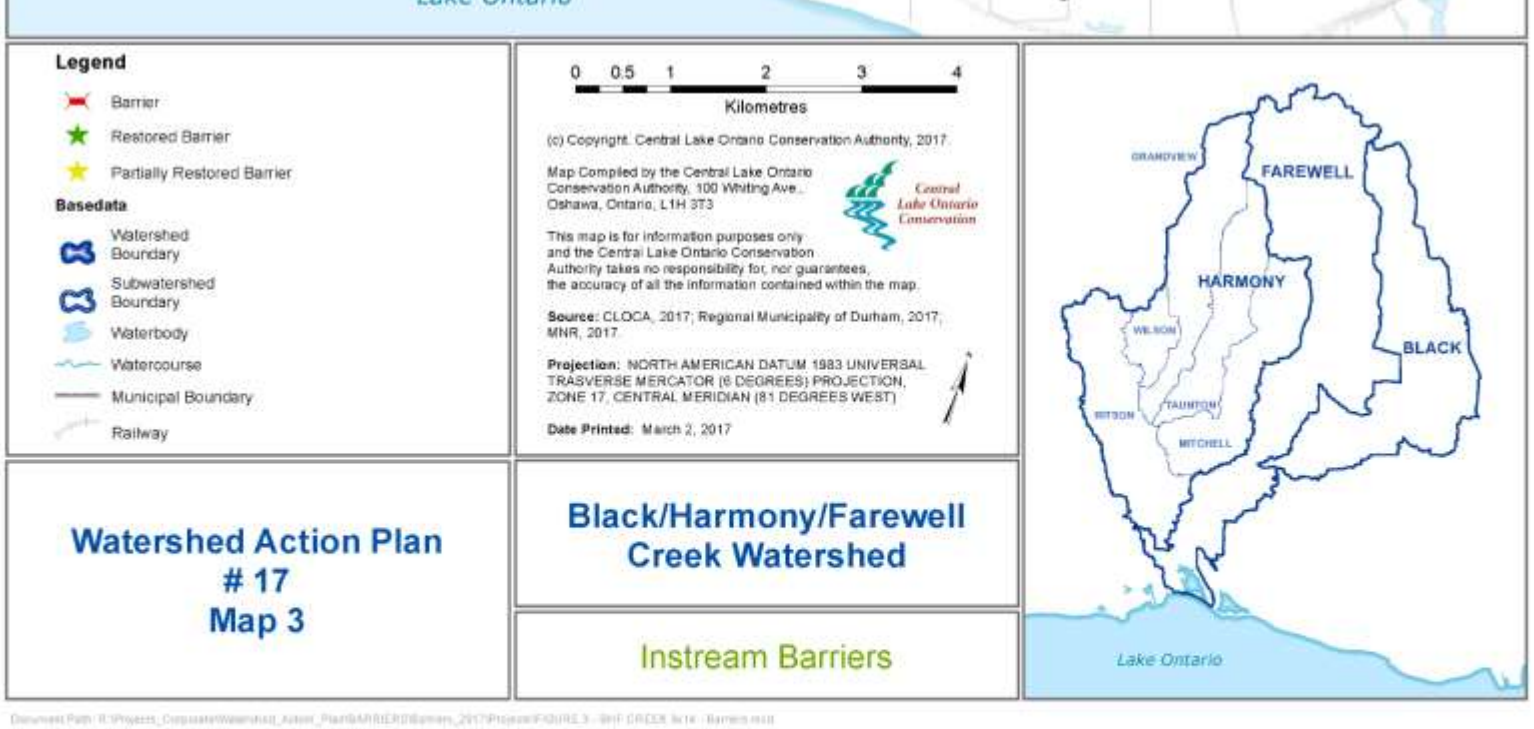
6 Black/Harmony/Farewell Creek Watershed

The Black/Harmony/Farewell Creek Watershed has 18 known barriers. Two of these barriers have been partially restored (BARBHF15 and BARBHF19) and another 2 barriers have been fully restored (BARBHF02 and BARBHF08). These barriers are spread throughout, making much of the watershed inaccessible for non-jumping fish. Some barriers may be important for invasive species management but otherwise there are few with other considerations for removal. A summary of all of the barriers are listed below and details for each barrier follow in the appendix to this report. Cells containing dashes (---) reflect gaps in the data and green coloured cells identify those barriers that have been restored. Further investigation of 2 barriers is required (shaded yellow in the table below) as they may be a barrier to the upstream movement of invasive and/or non-native species such as Round Goby and Sea Lamprey. Until that information is collected and confirmation obtained, restoration of these barriers shall not be considered.

Table 4: Summary of the scores for each of the barriers located within Black/Harmony/Farewell Creek Watershed.

Barrier Code	Metric Scores						Top 5 Removal Priority
	Quality of Biotic Life	Extent of Barrier	Quantity of Habitat	Quality of Habitat	Other considerations for removal	Total Score	
BARBHF01	0.3	3.0	0.5	1.7	Yes	5.5	
BARBHF02	RESTORED						
BARBHF03	0.2	3.0	1.2	2.3	No	6.7	
BARBHF04	0.2	3.0	0.1	2.1	No	5.4	
BARBHF05	0.2	3.0	2.4	2.1	No	7.7	5
BARBHF06	2.7	3.0	4.2	3.4	Yes	13.3	2
BARBHF07	1.1	3.0	0.1	2.1	No	6.3	
BARBHF08	RESTORED						
BARBHF09	0.2	---	0.3	3.1	No	---	
BARBHF10	0.1	3.0	1.3	3.5	No	7.9	4
BARBHF11	4.1	3.0	4.3	3.8	No	15.2	1
BARBHF12	0.3	1.0	0.8	3.0	No	5.1	
BARBHF13	0.3	3.0	1.3	2.5	No	7.1	
BARBHF14	0.2	3.0	0.1	2.4	No	6.7	
BARBHF15	0.2	1.0	0.1	2.5	No	3.8	Partially Restored
BARBHF16	0.1	5.0	0.5	1.7	No	7.3	
BARBHF17	0.0	5.0	0.1	1.7	No	6.8	
BARBHF18	0.0	5.0	0.1	1.7	No	6.8	
BARBHF19	0.0	1.0	0.2	3.4	No	4.6	Partially Restored
BARBHF20	0.2	3.0	2.5	2.4	No	8.1	3


BARBHF19
BARBHF12
BARBHF11
BARBHF10
BARBHF18
BARBHF20
BARBHF14
BARBHF17
BARBHF15
BARBHF13
BARBHF16
BARBHF09
BARBHF05
BARBHF08
BARBHF03
BARBHF04
BARBHF06
BARBHF02
BARBHF07
BARBHF01
OSHAWA
CLARINGTON
Enniskillen
Haydon
Solina
Hampton
Mitchell Corners
Maple Grove
Lake Ontario


Legend
Barrier
Restored Barrier
Partially Restored Barrier
Basedata
Watershed Boundary
Subwatershed Boundary
Waterbody
Watercourse
Municipal Boundary
Railway
0 0.5 1 2 3 4
Kilometres
(c) Copyright. Central Lake Ontario Conservation Authority, 2017.
Map Compiled by the Central Lake Ontario Conservation Authority, 100 Whiting Ave., Oshawa, Ontario, L1H 3T3
This map is for information purposes only and the Central Lake Ontario Conservation Authority takes no responsibility for, nor guarantees, the accuracy of all the information contained within the map.
Source: CLOCA, 2017; Regional Municipality of Durham, 2017; MNR, 2017.
Projection: NORTH AMERICAN DATUM 1983 UNIVERSAL TRASVERSE MERCATOR (6 DEGREES) PROJECTION, ZONE 17, CENTRAL MERIDIAN (81 DEGREES WEST)
Date Printed: March 2, 2017
Central Lake Ontario Conservation
GRANDVIEW
FAREWELL
HARMONY
BLACK
WILSON
TAUNTON
MITCHELL
WITSON
Lake Ontario
Watershed Action Plan
17
Map 3
Black/Harmony/Farewell Creek Watershed
Instream Barriers

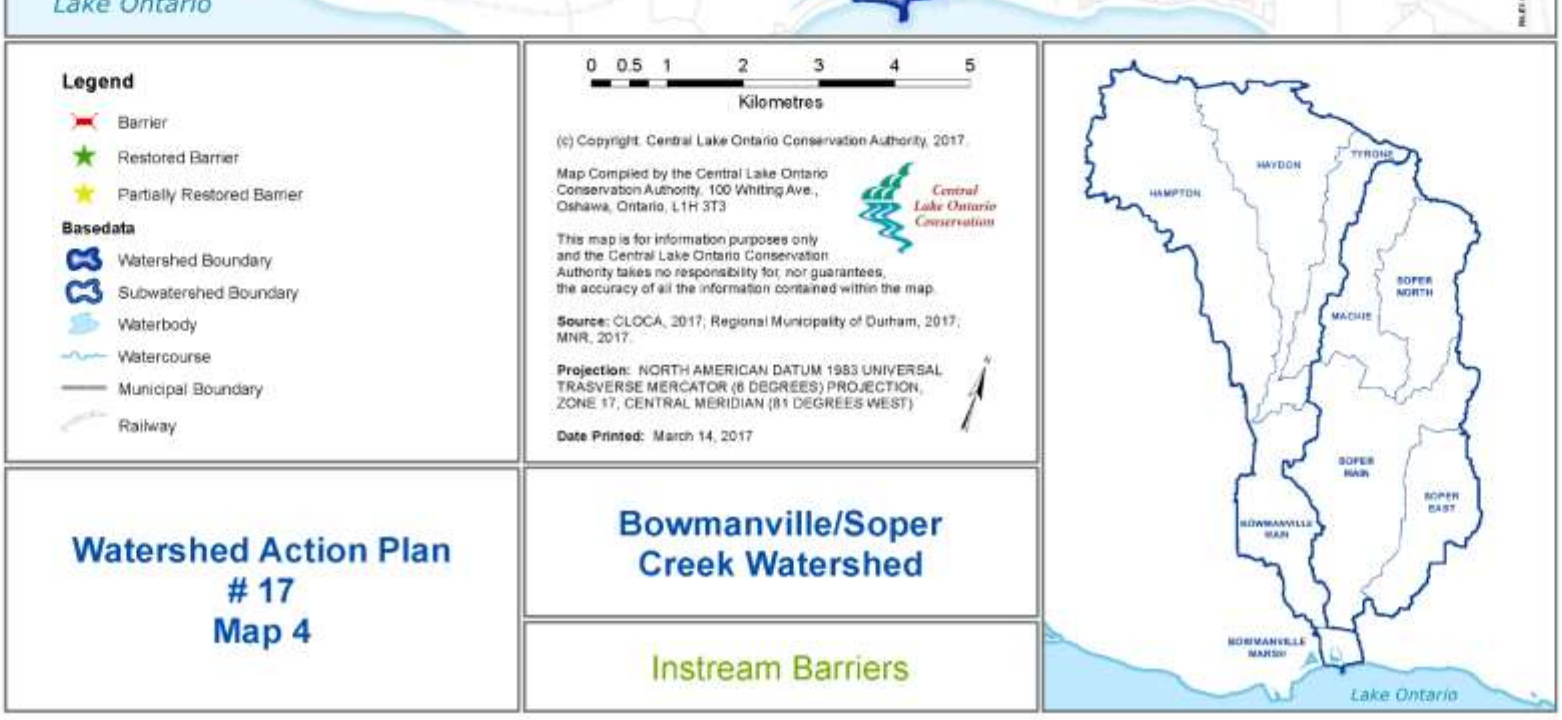
7 Bowmanville/Soper Creek Watershed

Bowmanville/Soper Creek Watershed has 16 known barriers. One barrier has been fully restored (BARBOW17) and 2 have been partially restored (BARBOW08 and BARBOW14). The barriers are spread throughout much of the watershed with the majority located in the headwaters. There headwater sites often have Brook Trout located upstream that creates a need for further investigation. Some of the barriers located lower in the watershed are components of invasive species management in the Bowmanville and Soper Creek Watersheds. Many of the barriers located within this watershed are large in size and have historical uses associated with them (e.g. Saw Mill). A summary of all of the barriers within this watershed are listed in the below table. Cells containing dashes (---) reflect gaps in the data, green coloured cells identify those barriers that have been restored. Yellow coloured cells identify those barriers where possible impacts to upstream fish populations may occur if the barrier is removed. It is recommended that the necessary information to confirm risk to fish populations be gathered. Until then, consideration of removing these barriers are deferred. Individual information sheets for each of the barriers are available for review in the appendix to this report.

Table 5: Summary of the scores for each of the barriers located within the Bowmanville/Soper Creek Watershed.

Barrier Code	Metric Scores						Top 5 Removal Priority
	Quality of Biotic Life	Extent of Barrier	Quantity of Habitat	Quality of Habitat	Other considerations for removal	Total Score	
BARBOW01	2.5	5.0	2.7	4.1	Yes	14.3	4
BARBOW02	3.1	5.0	5.0	4.1	Yes	17.2	1
BARBOW03	4.8	3.0	0.3	4.4	No	12.5	
BARBOW04	3.0	5.0	2.0	4.1	Yes	14.1	
BARBOW05	4.4	5.0	1.1	4.5	No	15.0	2
BARBOW06	4.4	5.0	0.2	4.6	No	14.2	5
BARBOW07	2.7	1.0	5.0	3.5	No	12.2	
BARBOW08	1.7	3.0	0.4	3.6	Yes	8.7	Partially Restored
BARBOW09	4.4	3.0	2.9	4.0	No	14.3	3
BARBOW10	0.1	5.0	0.2	3.5	No	8.8	
BARBOW11	0.3	5.0	0.4	3.6	No	9.3	
BARBOW12	---	5.0	0.4	3.2	No	---	
BARBOW13	0.3	5.0	0.4	3.1	No	8.8	
BARBOW14	2.1	1.0	1.8	3.7	No	8.6	Partially Restored
BARBOW15	2.6	1.0	5.0	3.6	No	12.2	
BARBOW16	2.6	3.0	0.6	2.9	No	9.1	
BARBOW17	RESTORED						


BARBOW01
BARBOW02
BARBOW03
BARBOW04
BARBOW05
BARBOW06
BARBOW07
BARBOW08
BARBOW09
BARBOW10
BARBOW11
BARBOW12
BARBOW13
BARBOW14
BARBOW15
BARBOW16
BARBOW17
Burketon
Enfield
Hayden
Enniskillen
Tyrone
Solina
Hampton
Kirby
Leskard
Mitchell Corners
Maple Grove
SCUGOG
CLARINGTON
MANVERS
OSHAWA
Lake Ontario

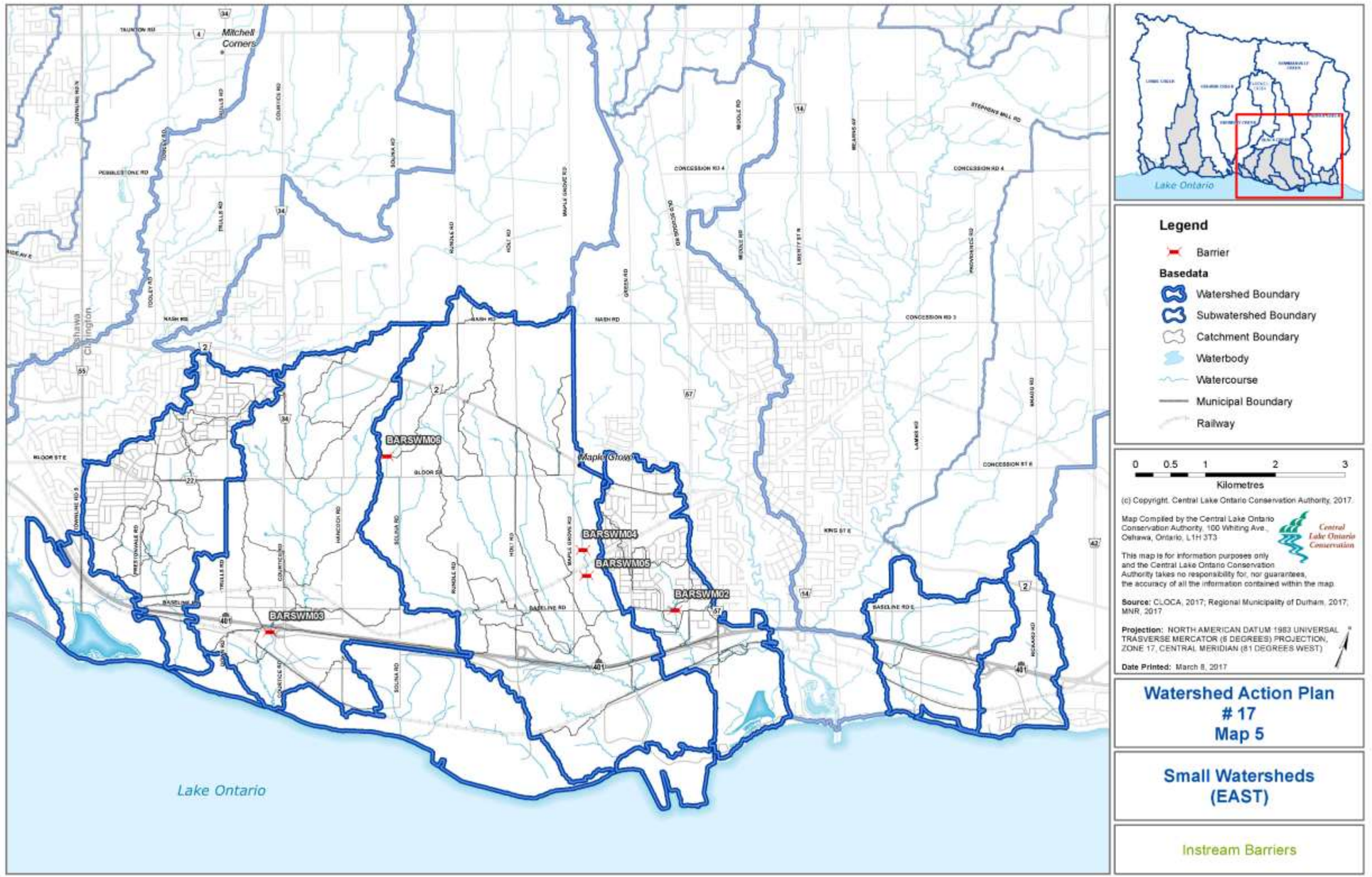

Legend
Barrier
Restored Barrier
Partially Restored Barrier
Basedata
Watershed Boundary
Subwatershed Boundary
Waterbody
Watercourse
Municipal Boundary
Railway
0 0.5 1 2 3 4 5
Kilometres
(c) Copyright. Central Lake Ontario Conservation Authority, 2017.
Map Compiled by the Central Lake Ontario Conservation Authority, 100 Whiting Ave., Oshawa, Ontario, L1H 3T3
This map is for information purposes only and the Central Lake Ontario Conservation Authority takes no responsibility for, nor guarantees, the accuracy of all the information contained within the map.
Source: CLOCA, 2017; Regional Municipality of Durham, 2017; MNR, 2017.
Projection: NORTH AMERICAN DATUM 1983 UNIVERSAL TRASVERSE MERCATOR (6 DEGREES) PROJECTION, ZONE 17, CENTRAL MERIDIAN (81 DEGREES WEST)
Date Printed: March 14, 2017
Central Lake Ontario Conservation
Watershed Action Plan
17
Map 4
Bowmanville/Soper Creek Watershed
Instream Barriers
HAMPTON
HAYDON
TYRONE
SOPER NORTH
MACHIS
SOPER MAIN
SOPER EAST
BOWMANVILLE MAIN
BOWMANVILLE MARSH
Lake Ontario

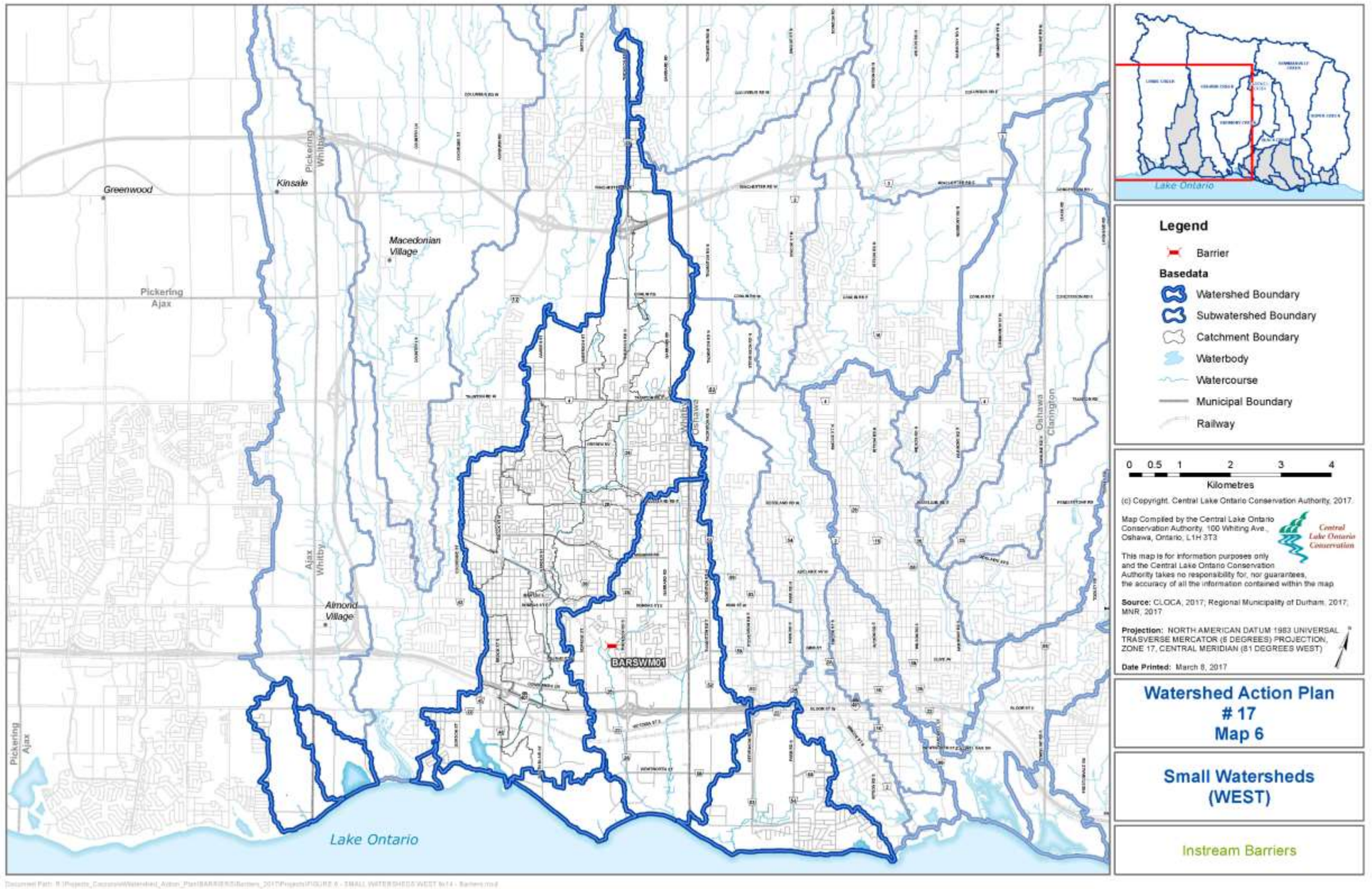
8 Small Watersheds

The Small Watersheds have 6 known barriers. These barriers range in location and size but in most cases are found to have minimal impacts given the current degraded state of these fisheries. The one exception to this is the barrier found in Tooley Creek. Tooley Creek Watershed is found, more often than not, to produce YOY Rainbow Trout even with this barrier in place. Removal is thought to only increase the number of Rainbow Trout this watershed can produce. A summary of all of the barriers within this watershed are listed in the below table. Cells containing dashes (---) reflect gaps in the data. Individual information sheets for each of the barriers are provided in the appendix.

Table 6: Summary of the scores for each of the barriers located within the Small Watersheds.

Barrier Code	Metric Scores						Top 5 Removal Priority
	Quality of Biotic Life	Extent of Barrier	Quantity of Habitat	Quality of Habitat	Other considerations for removal	Total Score	
BARSMW01	0.0	3.0	0.6	1.5	No	5.1	3
BARSMW02	0.0	---	0.1	1.6	No	---	
BARSMW03	0.2	3.0	2.0	3.0	No	8.2	2
BARSMW04	0.0	5.0	0.3	3.4	No	8.7	1
BARSMW05	0.0	---	0.1	3.4	No	---	
BARSMW06	0.0	---	0.2	2.6	No	---	


Mitchell Corners
Maple Grove
BARSWM06
BARSWM04
BARSWM05
BARSWM02
BARSWM03
Lake Ontario
Oshawa
Clarington
Lake Ontario
Legend
Barrier
Basedata
Watershed Boundary
Subwatershed Boundary
Catchment Boundary
Waterbody
Watercourse
Municipal Boundary
Railway
0 0.5 1 2 3
Kilometres
(c) Copyright. Central Lake Ontario Conservation Authority, 2017.
Map Compiled by the Central Lake Ontario Conservation Authority, 100 Whiting Ave., Oshawa, Ontario, L1H 3T3
This map is for information purposes only and the Central Lake Ontario Conservation Authority takes no responsibility for, nor guarantees, the accuracy of all the information contained within the map.
Source: CLOCA, 2017; Regional Municipality of Durham, 2017; MNR, 2017
Projection: NORTH AMERICAN DATUM 1983 UNIVERSAL TRASVERSE MERCATOR (6 DEGREES) PROJECTION, ZONE 17, CENTRAL MERIDIAN (81 DEGREES WEST)
Date Printed: March 8, 2017
Central Lake Ontario Conservation
Watershed Action Plan
17
Map 5
Small Watersheds
(EAST)
Instream Barriers


Greenwood
Kinsale
Pickering
Whitby
Macedonian Village
Pickering
Ajax
Ajax
Whitby
Oshawa
Whitby
Oshawa
Clarington
Almond Village
BARSWM01
Pickering
Ajax
Lake Ontario
Lake Ontario
Legend
Barrier
Basedata
Watershed Boundary
Subwatershed Boundary
Catchment Boundary
Waterbody
Watercourse
Municipal Boundary
Railway
0 0.5 1 2 3 4
Kilometres
(c) Copyright. Central Lake Ontario Conservation Authority, 2017.
Map Compiled by the Central Lake Ontario Conservation Authority, 100 Whiting Ave., Oshawa, Ontario, L1H 3T3
This map is for information purposes only and the Central Lake Ontario Conservation Authority takes no responsibility for, nor guarantees, the accuracy of all the information contained within the map.
Source: CLOCA, 2017; Regional Municipality of Durham, 2017; MNR, 2017
Projection: NORTH AMERICAN DATUM 1983 UNIVERSAL TRASVERSE MERCATOR (6 DEGREES) PROJECTION, ZONE 17, CENTRAL MERIDIAN (81 DEGREES WEST)
Date Printed: March 8, 2017
Watershed Action Plan
17
Map 6
Small Watersheds
(WEST)
Instream Barriers

9 CONCLUSION

The purpose of this report is to provide ecologically based rationale for prioritizing barrier removals. Barriers may serve many purposes, however, the consequences of barriers for fish communities and overall biodiversity have been well documented. Many of the barriers within the CLOCA jurisdiction are old and in ill-repair. The combination of the ecological harm with the liability of dam failure provide a strong rationale for restoration of the creeks through barrier removal. Removing a barrier is typically expensive and requires thorough planning. This Action Plan helps to identify the best areas to spend valuable time and money where, ecologically, we can ensure the most effective results.

This plan evaluates all currently documented barriers in the CLOCA jurisdiction. It is likely there are unknown barriers within the watersheds. When information for these barriers becomes available, it will be added to the database and this Action Plan. As barriers are restored or partially restored, this information will also be added to the database and the Action Plan.

Removal of all barriers within CLOCA's jurisdiction will not likely be seen, but by removing the barriers that cause the most harm ecologically, improvements in the fish communities and in overall stream function will result. This is another step towards ensuring we have healthy watersheds for today and tomorrow.

10 REFERENCES

Baker, L.S., Felton, G.K., Russek-Cohen, E. (2005). Use of Maryland biological stream survey data to determine effects of agricultural riparian buffers on measures of biological stream health. Environmental Monitoring and Assessment 117: 1-19.

Environment Canada (2013). How Much Habitat is Enough? Third Edition. Environment Canada, Toronto, Ontario.

Harding, J.S., Benfield, E.F., Bolstad, P.V., Helfman, G.S., Jones III, E.B.D. (1998). Stream Biodiversity: The ghost of land use past. Proceedings of the National Academy of Sciences 95: 14843-14847.

Jones III, E.B.D., Helfman, G.S., Harper, J.O., Bolstad, P.V. (1999). Effects of Riparian Forest Removal on Fish Assemblages in Southern Appalachian Streams. Conservation Biology 13(6): 1454-1465.

Moore, D.J. (2012). Index of Biotic Integrity for wadable portions of the Central Lake Ontario Conservation Authority. Central Lake Ontario Conservation Authority, Oshawa, ON.

Stanfield L.W (editor). (2010). Ontario Stream Assessment Protocol.Version 8.0.Fisheries Policy Section.Ontario Ministry of Natural Resources. Peterborough, Ontario. 376 pages.

Utz, R.M., Hilderbrand, R.H., Raesly, R.L. (2010). Regional differences in patterns of fish species loss with changing land use. Biological Conservation 143:688-699.

Wang, L., Lyons, J., Kanehl., P., Bannerman, R., Emmons, E. (2000). Watershed Urbanization and changes in fish communities in southeastern Wisconsin streams. Journal of the American Water Resources Association 36(5): 1173-1189.

Wang, L., Lyons, J., Kanehl, P. (2001). Impacts of Urbanization on Stream Habitat and Fish Across Multiple Spatial Scales. Environmental Management 28(2): 255-266.

Wenger, S.J., Peterson, J.T., Freeman, M.C., Freeman, B.J., Homans, DD. (2008). Stream fish occurrence in response to impervious cover, historic land use, and hydrogeomorphic factors. Canadian Journal of Fisheries and Aquatic Sciences 65: 1250-1264.

Wheeler, A. P., Angermeier., P.L., Rosenberger, A.E. (2005). Impacts of new highways and subsequent landscape urbanization on stream habitat and biota. Reviews in Fisheries Science 13:141-164.

11 Appendix 1 – Lynde Creek Watershed

BARLYN01

Metric	Score	Summary of Findings
Quality of Biotic Life	0.1	**Downstream Community: IBI Score =** 1 (LD09). **Upstream Fish Community: IBI Score =** 1 (LDS3). Species present at both of these sites are tolerant
Extent of Barrier	5.0	Was originally built to create a pond for irrigation and livestock watering. The pond is regulated by a top draw outlet structure that is approximately 1.5m higher than the creek. This is a complete barrier to all fish.
Quantity of Habitat	0.3	This barrier restricts 2.6km of upstream habitat
Quality of Habitat	3.8	**Water Temperature**: Cool- 3.69 (TLLY34)
		Riparian Cover Upstream: 70.58% = 3.53
		Impervious Cover Upstream: 2.79% = 4.30
		Quality of Habitat Score: 3.84
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**9.2**	

BARLYN02

Metric	Score	Summary of Findings
Quality of Biotic Life	0.1	**Downstream Community: IBI Score =** 1 (LD09). **Upstream Fish Community: IBI Score =** 1 (LDS3). Species present at both of these sites are tolerant.
Extent of Barrier	5.0	Was originally built to create a pond for irrigation and livestock watering. The pond incorporated a top-draw outlet structure within the berm which is approximately 2m above creek elevation. The barrier is not passable for any fish.
Quantity of Habitat	0.1	This barrier restricts 300m of upstream habitat
Quality of Habitat	3.8	**Water Temperature**: Cool- 3.69 (TLLY34)
		Riparian Cover Upstream: 70.75 = 3.51
		Impervious Cover Upstream: 2.79% = 4.30
		Quality of Habitat Score: 3.8
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**9.0**	

BARLYN03

Metric	Score	Summary of Findings
Quality of Biotic Life	---	**Downstream Community: IBI Score =** Not Available **Upstream Fish Community: IBI Score =** Not Available This pond was stocked with Rainbow Trout in the 1970s. Stocking success unknown.
Extent of Barrier	5.0	Is approximately 5m higher than the creek elevation and was built to create a pond for recreational purposes. The pond is a bottom-draw.
Quantity of Habitat	---	Location of barrier unknown.
Quality of Habitat	---	**Water Temperature**: Not Available
		Riparian Cover Upstream: Not Available
		Impervious Cover Upstream: Not Available
		Quality of Habitat Score: Not Available
Other considerations for removal	---	Not Available
Notes		Barrier location needs to be determined prior to scoring completed.
Total Score	**---**	

BARLYN04

Metric	Score	Summary of Findings
Quality of Biotic Life		**Downstream Community: IBI Score =** **Upstream Fish Community: IBI Score =**
Extent of Barrier		This barrier has been removed through the widening of Highway 7. It has been designed to pass Redside Dace.
Quantity of Habitat		
Quality of Habitat		**Water Temperature:** **Riparian Cover Upstream**: 3[illegible]1% = 1.5 **Impervious cover Upstream** **Quality of Habitat Score:**
Liabilities		
Other considerations for removal		
Total Score		

BARLYN05

Metric	Score	Summary of Findings
Quality of Biotic Life	0.9	**Downstream Community: IBI Score =** 14 (LA07). High diversity of species with Longnose Dace, Blacknose Dace and Rainbow Darter being some of the most commonly found. **Upstream Fish Community: IBI Score =** 22 (LA08). High diversity of species with Rainbow Trout, Longnose Dace, and Rainbow Darter being the most commonly found.
Extent of Barrier	3.0	Originally installed to retain water to drive grist mill machinery. The dam is opened during the spring and fall to accommodate the passage of anadromous fish. With all stop-logs in place, the pond is 1.5m higher than the creek elevation. The stop-logs have not been installed since the Town of Whitby has owned the property.
Quantity of Habitat	1.4	This barrier restricts 14.3km of upstream habitat
Quality of Habitat	3.1	**Water Temperature**: Cool- 4.03 (TLLY16)
		Riparian Cover Upstream: 45.79% = 2.29
		Impervious Cover Upstream: 7.59% = 3.10
		Quality of Habitat Score: 3.1
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. Since it is already opened up for migratory fish, it would be beneficial to also be passable for non-jumping fish.
Total Score	**8.4**	

BARLYN06

Metric	Score	Summary of Findings
Quality of Biotic Life	0.7	**Downstream Community: IBI Score =** 14 (LA07). High diversity of species with Longnose Dace, Blacknose Dace and Rainbow Darter being some of the most commonly found. **Upstream Fish Community: IBI Score =** No site
Extent of Barrier	3.0	This barrier is thought to restrict movement of non-jumping fish but, given this creek ends in 100m in an online stormwater pond there is no benefit to passing migratory species.
Quantity of Habitat	0.1	This barrier restricts 100m of upstream habitat
Quality of Habitat	---	**Water Temperature**: No logger data
		Riparian Cover Upstream: 51.88 = 1.34
		Impervious Cover Upstream: No data
		Quality of Habitat Score: ---
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. Since it is already opened up for migratory fish, it would be beneficial to also be passable for non-jumping fish.
Total Score	---	

BARLYN07

Metric	Score	Summary of Findings
Quality of Biotic Life	1.7	**Downstream Community: IBI Score =** 40 (LA15). This site has high diversity with a mix of sensitive and tolerant species. Most commonly found species are Rainbow Trout, Blacknose Dace, Longnose Dace, and Mottled Sculpin. **Upstream Fish Community: IBI Score =** 26 (LA16). Sampling results from 2001 were quite different from 2009. 2001 was dominated by tolerant species. In 2009 the fish community was largely Rainbow Trout, Mottled Sculpin and even a couple Brook Trout.
Extent of Barrier	3.0	Originally built to retain water to drive grist mill machinery. Pond is currently used for recreational purposes. The dam is opened in the spring of the year to accommodate rainbow trout spawning runs and drawn down in the winter to relieve siltation problems. With all stop logs in place the dam is 1.5m higher than the creek elevation. The dam also incorporates a 1.5m long concrete apron.
Quantity of Habitat	5.0	This barrier restricts 50.8km of upstream habitat
Quality of Habitat	2.6	**Water Temperature**: Cool- 4.63 (TLLY18)
		Riparian Cover Upstream: 42.25% = 2.11
		Impervious Cover Upstream: 15.49% = 1.13
		Quality of Habitat Score: 2.6
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. Since it is already opened up for migratory fish, it would be beneficial to also be passable for non-jumping fish.
Total Score	**12.3**	

BARLYN08

Metric	Score	Summary of Findings
Quality of Biotic Life	5.0	**Downstream Community: IBI Score =** 100 (LE05). Only Brook Trout found at this site. **Upstream Fish Community: IBI Score =** No Catch (LE06).
Extent of Barrier	5.0	A corrugated steel culvert with concrete sections added. The upstream corrugated steel section has failed and has slumped into the creek and the most downstream concrete section has been undermined and does not carry flow throughout most of the year.
Quantity of Habitat	1.5	This barrier restricts 15.1km of upstream habitat
Quality of Habitat	3.7	**Water Temperature**: Cold- 4.99 (TLLY35)
		Riparian Cover Upstream: 37.85 = 1.89
		Impervious cover upstream: 3.6% = 4.10
		Quality of Habitat Score: 3.7
Other considerations for removal	No	Since Brook Trout are found downstream of this barrier, it is believed that there are no biological consequences for removal.
Total Score	**15.2**	

BARLYN09

Metric	Score	Summary of Findings
Quality of Biotic Life	0.3	**Downstream Community: IBI Score =** 10 (LD10). Rainbow Trout are present at this site by the majority of the biomass comes from tolerant species, such as, Blacknose Dace, Longnose Dace and Fathead Minnow. **Upstream Fish Community: IBI Score =** 0 (LD04). Only tolerant species found at this site. No Salmonids present at time of sampling.
Extent of Barrier	5.0	Information on the extent of this barrier is not available, but it is thought is a barrier to most fish as Rainbow Trout are found downstream but not upstream. Since Redside Dace are also found in the area and this is a potential barrier to them, this barrier has been scored a 5 for extent.
Quantity of Habitat	1.0	This barrier restricts 9.9km of upstream habitat.
Quality of Habitat	3.4	**Water Temperature**: Cool- 4.39 (TLLY14)
		Riparian Cover Upstream: 30.09 = 1.50
		Impervious cover upstream: 2.38% = 4.41
		Quality of Habitat Score: 3.4
Other considerations for removal	No	Since no sensitive salmonids are in the area and Redside Dace are and would benefit from access to new habitat, the removal of this barrier would be positive from a biological perspecitive.
Total Score	**9.7**	

BARLYN10

Metric	Score	Summary of Findings
Quality of Biotic Life	0.4	**Downstream Community: IBI Score =** 6 (LDS1). This site is predominately tolerant species (Blacknose Dace, Creek Chub) but some Rainbow Trout and Mottled Sculpin are documented. The area is also known to have Redside Dace. **Upstream Fish Community: IBI Score =** 10 (LD10). Rainbow Trout are present at this site but the majority of the biomass comes from tolerant species, such as, Blacknose Dace, Longnose Dace and Fathead Minnow.
Extent of Barrier	5.0	This barrier is not possible to pass for non-jumping fish. This includes Redside Dace which have been found in the area. For that reason, it is scored a 5.
Quantity of Habitat	2.5	This barrier restricts 25.3km of upstream habitat
Quality of Habitat	3.6	**Water Temperature**: Cool- 4.39 (TLLY14)
		Riparian Cover Upstream: 43.37 = 2.17
		Impervious Cover Upstream: 2.97% = 4.25
		Quality of Habitat Score: 3.6
Other considerations for removal	No	Since no sensitive salmonids are in the area and Redside Dace would likely benefit from access to new habitat, it is thought biologically that the removal of this barrier would be positive.
Total Score	**11.5**	

BARLYN11

Metric	Score	Summary of Findings
Quality of Biotic Life	0.9	**Downstream Community: IBI Score =** 14 (LA07). High diversity of species with Longnose Dace, Blacknose Dace and Rainbow Darter being some of the most commonly found. **Upstream Fish Community: IBI Score =** 22 (LA08). High diversity of species with Rainbow Trout, Longnose Dace, and Rainbow Darter being the most commonly found.
Extent of Barrier	5.0	This barrier is not passable for non-jumping fish. This includes Redside Dace which have been found in the area.
Quantity of Habitat	1.4	This barrier restricts 14.3 km of upstream habitat
Quality of Habitat	3.1	**Water Temperature**: Cool- 4.39 (TLLY14)
		Riparian Cover Upstream: 44.73% = 2.24
		Impervious Cover Upstream: 7.59% = 3.10
		Quality of Habitat Score: 3.1
Other considerations for removal	No	Since no sensitive salmonids are in the area and Redside Dace are and would likely benefit from access to new habitat, it is thought biologically that the removal of this barrier would be positive.
Total Score	**10.4**	

12 Appendix 2 - Oshawa Creek Watershed

BAROSH01

Metric	Score	Summary of Findings
Quality of Biotic Life	0.1	**Downstream Community:** IBI Score = 1 (0B08). Although there is a diverse fish community downstream consisting of nine species, only two of these species are not highly tolerant. None of the species within this reach are migratory besides the White Sucker. Johnny Darter and Rock Bass are the two species that are medium sensitivity. **Upstream Fish Community:** IBI Score = 0 (0B09). There is only three species, all of which are very tolerant. Removal of this barrier might allow for more diversity upstream, but species downstream of the barrier are not reliant on the upstream habitat for any specific use.
Extent of Barrier	5.0	This barrier is believed to be a barrier to all fish. There is a 0.5m drop to a 0.3m deep pool.
Quantity of Habitat	1.0	The barrier restricts access to 9.8km of total stream length upstream.
Quality of Habitat	2.3	**Water Temperature**: Cool- 4.06 (TLGN03)
		Riparian Cover Upstream: 40.48% = 2.02
		Impervious Cover Upstream: 16.21% = 0.95
		Quality of Habitat Score: 2.3
Other considerations for removal	No	It is likely that sediment would be released from the structure if it were to be removed. Since it is a stop log structure, there could be opportunity for seasonal management and/or slow releases of sediment. There are few biological consequences to removal as there are no species protected by this barrier. There are likely conflicts of interest with land owner as it is used as an irrigation reservoir and is a feature on the golf course.
Total Score	**8.4**	

BAROSH02

Metric	Score	Summary of Findings
Quality of Biotic Life	1.7	**Downstream Community:** IBI Score = 9 (0E05)**.** A mix of tolerant and sensitive species found at this site. Rainbow Trout, Brown Trout and Mottled Sculpin are all found here in addition to many tolerant species. This is likely in part because of the impact of Camp Samac Pond. **Upstream Fish Community:** IBI Score **=** 57 (OE17). Upstream is home to a strong population of Brown Trout as well as Rainbow Trout, Mottled Sculpin and various others.
Extent of Barrier	3.0	It is not a complete barrier for Salmonids between mid-October to May, but at other times of the year it is a barrier to all fish. The dam has to be continually managed to allow for Salmonid migration. The drop was measured to be 3.96m into a pool with a maximum depth of 1.5m. It is known to be a difficult barrier to pass, even for Salmonids, when stop logs are out.
Quantity of Habitat	5.0	This barrier restricts access to 98.3km of upstream habitat
Quality of Habitat	3.1	**Water Temperature**: Cool- 3.44 (TLOA07)
		Riparian Cover Upstream: 36.23% = 1.81
		Impervious Cover Upstream: 3.88% = 4.03
		Quality of Habitat Score: 3.1
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. Each year sediment is released downstream when the stop-logs are removed to allow salmonid migration therefore reducing the amount of accumulated sediment within the pond footprint.
Total Score	**12.8**	

BAROSH03

Metric	Score	Summary of Findings
Quality of Biotic Life	4.4	**Downstream Community:** IBI Score = 81 (OE10). Brown Trout and Rainbow Trout found downstream along with Blacknose Dace and Mottled Sculpin. **Upstream Fish Community:** IBI Score = 94 (SOE2b). Rainbow Trout, Brown Trout and Brook Trout are all found upstream of barrier. Mottled Sculpin are also found.
Extent of Barrier	3.0	Unknown – depends partially on height of stop log management. With all stop logs in, the height of the barrier is 2.4m. Based on Rainbow Trout populations being found upstream of the barrier, it is likely that jumping fish are able to pass at some times of the year.
Quantity of Habitat	1.6	This barrier restricts access to approx. 16.25km of upstream habitat
Quality of Habitat	3.8	**Water Temperature**: Cold- 4.87, 4.69 (TLOA34, TLOA18). Average: 4.78
		Riparian Cover Upstream: 43.77% = 2.19
		Impervious Cover Upstream: 2.58% = 4.36
		Quality of Habitat Score: 3.8
Other considerations for removal	Yes	Possible impact to Brook Trout populations upstream. There are two other ponds upstream that might be protecting Brook Trout populations but all of their roles are not confirmed at this point. There are possible sediment release concerns and conflict of interest with landowner as the barrier is currently used for irrigation and recreation purposes.
Total Score	**12.8**	

BAROSH04

Metric	Score	Summary of Findings
Quality of Biotic Life	4.5	**Downstream Community:** IBI Score = 81 (OE10). Brown Trout and Rainbow Trout found downstream along with Blacknose Dace and Mottled Sculpin. **Upstream Fish Community:** IBI Score = 98 (SOE1). Brook Trout and Sculpin are found upstream of this barrier.
Extent of Barrier	5.0	This barrier is prevents all fish from passing at all times of the year.
Quantity of Habitat	0.3	This barrier restricts access to approx. 2.41km of upstream habitat
Quality of Habitat	3.7	**Water Temperature**: Cold- 4.87, 4.69 (TLOA34, TLOA18). Average: 4.78
		Riparian Cover Upstream: 38.76 = 1.94
		Impervious Cover Upstream: 2.01 = 4.50
		Quality of Habitat Score: 3.7
Other considerations for removal	Yes	Possible impact to Brook Trout populations upstream. There are two other ponds upstream that might be protecting Brook Trout populations but all of their roles are not confirmed at this point. There are possible sediment release concerns and conflict of interest with landowner as the barrier is currently used for irrigation and recreation purposes.
Total Score	**13.5**	

BAROSH05

Metric	Score	Summary of Findings
Quality of Biotic Life	4.8	**Downstream Community:** IBI Score = 94 (SOE2B). Rainbow Trout, Brown Trout and Brook Trout all found downstream of barrier. Mottled Sculpin also found. **Upstream Fish Community:** IBI Score **=** 99 (SOE2). Brook Trout and Sculpin found upstream of both the east and west barriers.
Extent of Barrier	5.0	Barrier to all fish at all times of the year. The east barrier has an over 3.0m drop with a maximum pool depth of approx. 0.2m.
Quantity of Habitat	2.8	East branch – 27.8km of habitat restricted
Quality of Habitat	3.7	**Water Temperature**: Cold- 4.69, 4.48 (TLOA18, TLOA22). Average: 4.59
		Riparian Cover Upstream: 44.88% = 2.24
		Impervious Cover Upstream: 2.68% = 4.33
		Quality of Habitat Score: 3.7
Other considerations for removal	Yes	There could be severe consequence to the long-term sustainability to the Brook Trout populations above each the west and east barriers. Further analysis required.
Total Score	**16.3**	

BAROSH06

Metric	Score	Summary of Findings
Quality of Biotic Life	4.3	**Downstream Community:** IBI Score = 86 (OE13/OE15). Only Sculpin found at site during 2000 sampling although upstream of site two Brook Trout were captured. In 2007 it was a "no catch". During 2012 sampling only Brook Trout were captured. **Upstream Fish Community:** IBI Score = Not Available as no sites have been assessed upstream of the barrier.
Extent of Barrier	5.0	This is a barrier to all fish at all times of the year.
Quantity of Habitat	1.2	This barrier restricts approx. 11.8km of habitat upstream
Quality of Habitat	4.1	**Water Temperature**: Cold- 5.00 (TLOA16) in 2007. The barrier is a top-draw culvert which could be causing warming.
		Riparian Cover Upstream: 51.88% = 2.59
		Impervious Cover Upstream: 1.62% = 4.60
		Quality of Habitat Score: 4.1
Other considerations for removal	No	The fish community upstream of the barrier needs further assessment. Until further evidence is presented, the removal of this barrier looks favorable, potentially opening up habitat to Brook Trout.
Total Score	**14.6**	

BAROSH07

Metric	Score	Summary of Findings
Quality of Biotic Life	5.0	**Downstream Community:** IBI Score = 100 (SOE1). Exclusively Brook Trout and Sculpin found downstream. **Upstream Fish Community:** IBI Score **=** No sites are located upstream of the barriers.
Extent of Barrier	---	Unknown
Quantity of Habitat	0.2	The barriers restrict 1.9km of upstream habitat
Quality of Habitat	4.1	**Water Temperature**: Cold- 4.69 (TLOA18)
		Riparian Cover Upstream: 62.67% = 3.13
		Impervious Cover Upstream: 2.01% = 4.50
		Quality of Habitat Score: 4.1
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. It would likely benefit the current coldwater community by allowing access to more habitat
Total Score	---	

BAROSH08

Metric	Score	Summary of Findings
Quality of Biotic Life		**Downstream Community:** IBI Score = 6 (OA18). This site is located on the main branch and not on the small tributary where the barrier is located. **Upstream Fish Community:** IBI Score = no Sampling records upstream
Extent of Barrier		Unknown
Quantity of Habitat		This barrier restricts 1.5km of upstream habitat
Quality of Habitat		**Water Temperature**: Cool- 4.56 (TLOA09)
		Ri[illegible]n Co[illegible] Upstream:
		[illegible]pervious Cove[illegible]pstrea[illegible]3.97% =[illegible]1
		C[illegible] of Habit[illegible]core:
C[illegible]er consid[illegible]tions [illegible] re[illegible]oval		There [illegible] no kno[illegible] biolog[illegible]l conseq[illegible]ces [illegible] re[illegible]val of [illegible]s barrier.
Total Score		

BAROSH09

Metric	Score	Summary of Findings
Quality of Biotic Life	1.8	**Downstream Community:** IBI Score = 25**.** OADW and OA15 were found to have high diversity, including Darters, Sculpin, other minnows, and Brown and Rainbow Trout. **Upstream Fish Community:** IBI Score **=** 90(west branch)/3(east branch). OC01 and SOD1 were the closest sites located upstream. OC01 had many Brown and Rainbow Trout as well as Sculpin. SOD1 appeared to be more impacted, especially during 2007 and 2012, as there was a mix of sensitive species and tolerant species often associated with online ponds.
Extent of Barrier	3.0	The barrier is designed to be not passable but is managed to be passable between December and April. The drop is 1.83m.
Quantity of Habitat	5.0	This barrier restricts 58.1km of upstream habitat
Quality of Habitat	3.3	**Water Temperature**: Cool- 3.83 (TLOA01)
		Riparian Cover Upstream: 34.90% = 1.75
		Impervious Cover Upstream: 3.46% = 4.14
		Quality of Habitat Score: 3.3
Other considerations for removal	No	This barrier does not appear to be important for Brook Trout protection. Considerations would be regarding sediment release and conflict of interest with Golf Course interests as it is currently used for irrigation purposes. Determining the impacts this barrier has on migratory Salmonids and if the impacts can be mitigated through better management or a fish ladder may be better alternatives.
Total Score	**13.1**	

BAROSH10

Metric	Score	Summary of Findings
Quality of Biotic Life	0.1	**Downstream Community:** IBI Score = 3 (SOD1). Downstream of the barrier Rainbow Trout and Brown Trout were captured in 2000 but none found in 2007. There are eleven recorded species downstream of the barrier but most are tolerant species. **Upstream Fish Community:** IBI Score = 2 (SOD2). No Salmonids have been caught directly upstream of this barrier. Six species have been recorded, mostly tolerant, except for Johnny Darter, which, is moderately sensitive. Rainbow Trout are often observed at the downstream side of this barrier in the spring. They would benefit from accessing the habitat upstream.
Extent of Barrier	5.0	It is believed to be a barrier to all fish at all times of the year. The drop is 1.3m and maximum pool depth is approx. 2.0m
Quantity of Habitat	3.1	This barrier restricts 30.8km of upstream habitat
Quality of Habitat	2.9	**Water Temperature**: Cool- 3.06 - Immediately downstream of the barrier (TLOA26). It is possible the pond formed by the barrier is increasing the water temperature.
		Riparian Cover Upstream: 32.82% = 1.64
		Impervious Cover Upstream: 3.84% = 4.04
		Quality of Habitat Score: 2.9
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. This would open up a lot of habitat to Rainbow Trout as well as other species wishing to migrate. No Brook Trout are located upstream.
Total Score	**11.1**	

BAROSH11

Metric	Score	Summary of Findings
Quality of Biotic Life	0.1	**Downstream Community: IBI Score = 1** (OD02/OD03). Sculpin and Johnny Darter were found at OD02, Sculpin being sensitive and Johnny Darter being moderately sensitive. Another six tolerant species were also caught. OD03 had less diversity with only tolerant species. Only Creek Chub and Blacknose Dace were present. **Upstream Fish Community: IBI Score =** Only one site was located upstream (SOD8) and a no catch was recorded. Resampling of this site is recommended.
Extent of Barrier	---	Unknown – No Salmonids are present in this branch making the possibility for jumping fish to pass an unknown. It is assumed barrier to all other non-jumping fish. Since no salmonids are found upstream, it will be assumed no fish are able to pass.
Quantity of Habitat	0.9	This barrier restricts approx. 8.6km of upstream habitat
Quality of Habitat	3.1	**Water Temperature**: The only logger is TLOA15 located 2.5km downstream. This logger was found to be cold- 4.92
		Riparian Cover Upstream: 4.89% = 0.24
		Impervious Cover Upstream: 3.8% = 4.05
		Quality of Habitat Score: 3.1
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	---	

BAROSH12

Metric	Score	Summary of Findings
Quality of Biotic Life	4.1	**Downstream Community: IBI Score = 72** (OD01). Site dominated by Brown Trout with some Rainbow Trout, Mottled Sculpin, Creek Chub and Fathead Minnows present. **Upstream Fish Community: IBI Score = 93** (SOD4). Site dominated by Brown Trout with some Sculpin. Note, this site is located above the next barrier. No sites have been completed upstream of this site before the next barrier.
Extent of Barrier	3.0	The barrier is thought to be a seasonal barrier depending on flows and water level. There is a 0.6m drop into a pool with a depth of 0.3m.
Quantity of Habitat	0.1	This barrier restricts 0.7km of upstream habitat
Quality of Habitat	3.6	**Water Temperature**: Cold- 4.81. Both upstream (TLOA19, 4.88) and downstream (TLOA27, 4.73) were found to be Coldwater.
		Riparian Cover Upstream: 48.74% = 2.44
		Impervious Cover Upstream: 6.20% = 3.45
		Quality of Habitat Score: 3.6
Other considerations for removal	No	There does not appear to be any biological consequences for removal.
Total Score	**10.8**	

BAROSH13

Metric	Score	Summary of Findings
Quality of Biotic Life	4.1	**Downstream Community: IBI Score =** 72 (OD01). Site dominated by Brown Trout with some Rainbow Trout, Mottled Sculpin, Creek Chub and Fathead Minnows present. Note this site is located downstream of BAROSH11 (Russo Dam). No sites are located between the two barriers. **Upstream Fish Community: IBI Score =** 93 (SOD4). Site dominated by Brown Trout with some Sculpin.
Extent of Barrier	3.0	This barrier is believed to be passable by Salmonids during periods of high flow/water level. The barrier has a total drop of 1.5m.
Quantity of Habitat	0.4	This barrier restricts 4.4km of upstream habitat
Quality of Habitat	3.8	**Water Temperature**: Cold- 4.88. The downstream site (TLOA19) was found to be coldwater. There are no sites above this location.
		Riparian Cover Upstream: 61.90% = 3.05
		Impervious Cover Upstream: 6.33% = 3.42
		Quality of Habitat Score: 3.8
Other considerations for removal	No	There are no major biological consequences to barrier removal. It is unknown the purpose of this barrier and if there are any conflicts with landowners interests.
Total Score	**11.3**	

BAROSH14

Metric	Score	Summary of Findings
Quality of Biotic Life	4.8	**Downstream Community: IBI Score =** 93 (SOD4) Site dominated by Brown Trout with some Sculpin. **Upstream Fish Community: IBI Score =** 99 (OD05). Site dominated by Brook Trout with some Sculpin species. Upstream of the barrier, Rainbow Trout and Brook Trout were captured in 2000. Note this site is located above the next barrier. No sites have been completed upstream of this site before the next barrier.
Extent of Barrier	5.0	This is a barrier to all fish at all times of the year.
Quantity of Habitat	1.3	This barrier restricts 12.6km of upstream habitat
Quality of Habitat	3.8	**Water Temperature**: Cold- 4.88 (TLOA19)
		Riparian Cover Upstream: 62.21% = 3.11
		Impervious Cover Upstream: 6.06% = 3.49
		Quality of Habitat Score: 3.8
Other considerations for removal	Yes	Removal of this barrier would open up the Brook Trout to competition with the downstream populations of Brown Trout. This would have potential to affect the long-term sustainability of this Brook Trout population.
Total Score	**14.9**	

BAROSH15

Metric	Score	Summary of Findings
Quality of Biotic Life	4.8	**Downstream Community: IBI Score = 93** (SOD4) Site dominated by Brown Trout with some Sculpin. **Upstream Fish Community: IBI Score = 99** (OD05) Site dominated by Brook Trout with some Sculpin species. Upstream of the ponds a couple Rainbow Trout were found but are likely escapies from the pond. No Rainbow Trout have been caught in these waters since 2000 sampling. This area is dominated by Brook Trout.
Extent of Barrier	5.0	Considered un-passable to salmonids. Underground culverts screened to prevent the escape of stocked Rainbow Trout. Rock-lined spillways are a barrier for Brook Trout.
Quantity of Habitat	1.5	This barrier restricts 14.9 km of upstream habitat
Quality of Habitat	3.9	**Water Temperature**: Cold- 4.96 (TLOA19 – 2007)
		Riparian Cover Upstream: 66.14% = 3.31
		Impervious Cover Upstream: 6.06% = 3.49
		Quality of Habitat Score: 3.9
Other considerations for removal	Yes	Removal of this barrier would open up the Brook Trout to competition with the downstream populations of Brown Trout. This would have potential to affect the long-term sustainability of this Brook Trout population.
Total Score	**15.2**	

BAROSH16

Metric	Score	Summary of Findings
Quality of Biotic Life	4.2	**Downstream Community: IBI Score =** 68 (OADG). The site, located approximately 2.5km downstream is dominated by Brown Trout with some Rainbow Trout, Blacknose Dace, Longnose Dace and Mottled Sculpin present. **Upstream Fish Community: IBI Score =** 100 (SOC1). The site is dominated by Brook Trout with Sculpin present. No sites are located between the two barriers.
Extent of Barrier	5.0	The earthen berm contains concrete reinforced steel culvert outfalls and is believed to be a barrier to all migratory fish at all times of the year. The pond is approximately 4.8 m higher than the creek level.
Quantity of Habitat	2.0	This barrier restricts 19.8km of upstream habitat
Quality of Habitat	3.4	**Water Temperature**: Cold- 4.90, 4.48 (TLOA21, TLOA22). Average: 4.69
		Riparian Cover Upstream: 22.04% = 1.10
		Impervious Cover Upstream: 2.17% = 4.46
		Quality of Habitat Score: 3.4
Other considerations for removal	Yes	Removal of this barrier would open up the Brook Trout to competition with the downstream populations of Brown Trout. This would have potential to affect the long-term sustainability of this Brook Trout population.
Total Score	**14.6**	

BAROSH17

Metric	Score	Summary of Findings
Quality of Biotic Life	4.2	**Downstream Community: IBI Score =** 68 (OADG). The site, located approximately 2.7km downstream is dominated by Brown Trout with some Rainbow Trout, Blacknose Dace, Longnose Dace and Mottled Sculpin present. Note this site is located on the downstream side of BAROSH015 (Hamer Pond). No sites lie between the two barriers. **Upstream Fish Community: IBI Score =** 100 (SOC1). The site is dominated by Brook Trout with Sculpin present.
Extent of Barrier	---	Unknown
Quantity of Habitat	1.7	This barrier restricts 17.3km of upstream habitat
Quality of Habitat	3.5	**Water Temperature**: Cold- 5.00, 4.97 (TLOA21, TLOA22 – 2007). Average: 4.99
		Riparian Cover Upstream: 21.59% = 1.08
		Impervious Cover Upstream: 2.17 % = 4.46
		Quality of Habitat Score: 3.51
Other considerations for removal	Yes	Removal of this barrier would open up the Brook Trout to competition with the downstream populations of Brown Trout. This would have potential to affect the long-term sustainability of this Brook Trout population.
Total Score	---	

BAROSH18

Metric	Score	Summary of Findings
Quality of Biotic Life	0.3	**Downstream Community: IBI Score =** 11 (SOC2). The site, located immediately downstream of the barrier is dominated by Blacknose Dace, with some Brook Trout present. **Upstream Fish Community: IBI Score =** 0 (SOC3, OC03, OC04, OC06). Sites dominated by very tolerant species. Blacknose Dace, Creek Chub and Fathead Minnows are the primary species.
Extent of Barrier	5.0	The 1.8 m high concrete and stop-log structure is a barrier to all migratory fish at all times of the year.
Quantity of Habitat	1.8	This barrier restricts 18.2km of upstream habitat
Quality of Habitat	3.3	**Water Temperature**: Cold- 4.90, 4.48 (TLOA21, TLOA22). Average: 4.69
		Riparian Cover Upstream: 12.11% = 0.61
		Impervious Cover Upstream: 1.87 % = 4.53
		Quality of Habitat Score: 3.3
Other considerations for removal	No	Removal of this barrier would potentially give the downstream Brook Trout more access to habitat upstream. There are no known other considerations for removal.
Total Score	**10.4**	

BAROSH19

Metric	Score	Summary of Findings
Quality of Biotic Life	0.2	**Downstream Community: IBI Score =** 4 (OC02). The site, located 1.4km downstream of the barrier is dominated by native species; Blacknose Dace, with some Creek Chub and Mottled Sculpin present. Only tolerant species, aside from the Sculpin, were identified. **Upstream Fish Community: IBI Score =** No site upstream of barrier
Extent of Barrier	---	Unknown
Quantity of Habitat	1.0	This barrier restricts 10.1km of upstream habitat
Quality of Habitat	2.8	**Water Temperature**: Cold- 4.90, 4.48 (TLOA21, TLOA22). Average: 4.69
		Riparian Cover Upstream: 0% = 0
		Impervious Cover Upstream: 4.7% = 3.83
		Quality of Habitat Score: 2.8
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	---	

BAROSH020

Metric	Score	Summary of Findings
Quality of Biotic Life	1.9	**Downstream Community: IBI Score =** 26 (OA10). This site has a high diversity with a mix of species. Longnose Dace and Johnny Darter are the most numerous. Rainbow Trout and Mottled Sculpin are the most sensitive and are present in good numbers. Smallmouth Bass are also present at this location, especially in the early spring. **Upstream Fish Community: IBI Score =** 48 (OA11). This site has a fish community very similar to OA10. Longnose Dace, Johnny Darter, Rainbow Trout, Mottled Sculpin, and White Sucker are the most common species found. No records of Smallmouth Bass have been made here.
Extent of Barrier	3.0	The barrier is thought to be a barrier to non-jumping fish but not Salmonids. It is thought that Smallmouth Bass have a difficult time passing this locating in the spring.
Quantity of Habitat	4.7	This barrier restricts 46.5km of upstream habitat
Quality of Habitat	2.6	**Water Temperature**: Cool- 3.44. The temperature logger is located immediately downstream and was found to be cool water (TLOA03).
		Riparian Cover Upstream: 36.07% = 1.80
		Impervious Cover Upstream: 10.34 % = 2.42
		Quality of Habitat Score: 2.6
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. It is thought this would help pass Smallmouth Bass easier as well as making it less of an obstacle for Salmonids.
Total Score	**12.2**	

13 Appendix 3 - Black/Farewell/Harmony Creek Watershed

BARBHF01

Metric	Score	Summary of Findings
Quality of Biotic Life	0.3	**Downstream Community: IBI Score =** 4 (FAS1) the site is dominated by native tolerant species (White Sucker, Brook Stickleback and Fathead Minnow) with some moderately tolerant species present (Bluntnose Minnow, Spotfin Shiner, Johnny Darter and Rock Bass). **Upstream Fish Community: IBI Score =** 9 (HYS2) This site has a mix of species including White Sucker, Blacknose Dace, Longnose Dace, Johnny and Rainbow Darter, and one Rainbow Trout YOY has been caught here.
Extent of Barrier	3.0	Series of concrete box culverts with the up-stream end of the barrier consisting of a 0.75 m drop into a plunge pool. The downstream end consists of a raised concrete barrier. This barrier may cause flooding and captures debris while preventing upstream migration for non-jumping fish at all times of the year. The other two culverts include several drop structures, which range in height from 0.25 m to 0.5 m.
Quantity of Habitat	0.5	This barrier restricts 5.1 km of upstream habitat
Quality of Habitat	1.7	**Water Temperature**: Cool- 3.3. Both TLHA02 (3.45, US) and TLHA01 (3.15, DS) have been found to be coolwater.
		Riparian Cover Upstream: 34.11% = 1.71
		Impervious Cover Upstream: 27.4% = 0.00
		Quality of Habitat Score: 1.7
Other considerations for removal	Yes	Further investigation to see if the barrier limits Round Goby and Sea Lamprey access to the watershed is recommended before undergoing any removal efforts. If so, the positives of this barrier may outweigh the negatives.
Total Score	**5.5**	

BARBHF02

Metric	Score	Summary of Findings
Quality of Biotic Life		**Downstream Community: IBI Score =** 9 (HYS2) A decline in Blacknose Dace numbers in 2013 contributed to a higher score in combination with the addition a few new species (Rainbow Darter and Johnny Darter). **Upstream Fish Community: IBI Score =** 5 (H101) this site has historically been heavily dominated by Dace, largely Blacknose Dace, but showed new species (Johnny Darter, Rainbow Darter, Rainbow Trout) making an appearance in 20 bo l sco Sunfis o fou 3 fo time at this location.
Extent of rrier		His ically, a concr berm e dow eam d tha rese a season arrier. tes from field sheet indi barrier i ne are as found.
Quantity o abi		This barr estrict 9 km o ostream l itat ne arrie
Quality of bitat		**Wa er Te eratur** ool- 3.9 57 (T 07, A08) vera 3.74
		Riparian Cover Upstream: 29.61% = 1.48
		Impervious Cover Upstream: 26.2 % = 0.00
		Quality of Habitat Score: 1.74
Other considerations for removal		There are no known biological consequences for removal of this barrier.
Total Score		

BARBHF03

Metric	Score	Summary of Findings
Quality of Biotic Life	0.2	**Downstream Community: IBI Score = 5 (H101)** this site has historically been heavily dominated by Dace, largely Blacknose Dace, but showed new species (Johnny Darter, Rainbow Darter, Rainbow Trout) making an appearance in 2013 and boosting the IBI score. Green Sunfish were also found in 2013 for the first time at this location. **Upstream Fish Community: IBI Score = 0/3 (H102, H401)** previous to 2013, both sites were essential exclusively Blacknose Dace. Rainbow Trout, White Sucker, and Creek Chub were found in higher numbers during 2013 sampling.
Extent of Barrier	3.0	Concrete box culvert with a drop of 0.5 m and a concrete lined plunge pool, which was thought to be a barrier for all fish during all times of the year. With monitoring data showing young of year Rainbow Trout upstream, it would appear that some of the Rainbow Trout are able to pass this barrier.
Quantity of Habitat	1.2	This barrier restricts 12 km of upstream habitat
Quality of Habitat	2.3	**Water Temperature**: Cool- 3.95, 4.09, 3.82 (TLHA09, TLHA10, TLHA11). Average: 3.95
		Riparian Cover Upstream: 26.54% = 1.33
		Impervious Cover Upstream: 13.24 % = 1.69
		Quality of Habitat Score: 2.3
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**6.7**	

BARBHF04

Metric	Score	Summary of Findings
Quality of Biotic Life	0.2	**Downstream Community: IBI Score =** 2 (H501) This site is located 0.2 km downstream and dominated by tolerant native Blacknose Dace and Fathead Minnow populations, with White Sucker, Bluntnose Minnow, Longnose Dace and Pumpkinseed also present. **Upstream Fish Community: IBI Score =** 5 (H502) This site is dominated by tolerant species but did have a Rainbow Trout YOY during 2013 sampling. It was one of only two fish caught at that site.
Extent of Barrier	3.0	Concrete box culvert with a drop of 0.5 m and a rocky plunge pool. This barrier was previously thought to be impassible to all fish but a Rainbow Trout YOY was found upstream of it meaning some fish must be able to pass it.
Quantity of Habitat	0.1	This barrier restricts 0.4 km of upstream habitat
Quality of Habitat	2.1	**Water Temperature**: Cool- 4.44. (TLHA25)
		Riparian Cover Upstream: 34.08% = 1.7
		Impervious Cover Upstream: 19.32 % = 0.17
		Quality of Habitat Score: 2.1
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**5.4**	

BARBHF05

Metric	Score	Summary of Findings
Quality of Biotic Life	0.2	**Downstream Community: IBI Score =** 2 (H501). This site is located 0.2 km downstream and dominated by tolerant native Blacknose Dace and Fathead Minnow populations, with White Sucker, Bluntnose Minnow, Longnose Dace and Pumpkinseed also present. **Upstream Fish Community: IBI Score =** 5 (H502). This site is dominated by tolerant species but did have a Rainbow Trout YOY during 2013 sampling. It was one of only two fish caught at that site.
Extent of Barrier	3.0	Raised corrugated steel culvert with a 0.5 m drop. This barrier was previously thought to be impassible to all fish but a Rainbow Trout YOY was found upstream of it meaning some fish must be able to pass it.
Quantity of Habitat	2.4	This barrier restricts 23.5 km of upstream habitat
Quality of Habitat	2.1	**Water Temperature**: Cool- 4.44 (TLHA25)
		Riparian Cover Upstream: 34.42% = 1.72
		Impervious Cover Upstream: 19.32 % = 0.17
		Quality of Habitat Score: 2.1
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**7.7**	

BARBHF06

Metric	Score	Summary of Findings
Quality of Biotic Life	2.7	**Downstream Community: IBI Score = 46 (FA03)** This site is located approximately 2 km downstream and is dominated by Rainbow Trout and Longnose Dace, with Blacknose Dace, Bluntnose Minnow, Creek Chub, Mottled Sculpin and Johnny Darter all present as well. **Upstream Fish Community: IBI Score = 60 (BL01)** This site is located 0.5 km upstream and is dominated by Rainbow Trout with several other species present being Blacknose and Longnose Dace, White Sucker, Creek Chub, Mottled Sculpin, Pumpkinseed, and Johnny Darter.
Extent of Barrier	3.0	Constructed of concrete for erosion control. 10 metres in width, 8 metres in length and a 0.6 m drop into a 2 m plunge pool. This barrier is passable to migratory fish.
Quantity of Habitat	4.2	This barrier restricts 42.4 km of upstream habitat
Quality of Habitat	3.4	**Water Temperature**: Cool- 3.34, 4.46, 4.08 (TLFA01, TLFA03, TLFA04). Average: 3.96
		Riparian Cover Upstream: 47.11% = 2.36
		Impervious Cover Upstream: 4.81 % = 3.80
		Quality of Habitat Score: 3.4
Other considerations for removal	Yes	The barrier currently limits Round Goby and Sea Lamprey access to the watershed. The positives of this barrier may outweigh the negatives.
Total Score	**13.3**	

BARBHF07

Metric	Score	Summary of Findings
Quality of Biotic Life	1.1	**Downstream Community: IBI Score =** 13/17 (BLUC, BLO4). These sites have high diversity with Johnny Darter and Creek Chub being the most common. Other notables are Rainbow Trout, Mottled Sculpin, Blacknose Dace, and Pumpkinseed. **Upstream Fish Community:** IBI Score = 27 (BLS1). This site is very similar to BLUC and BL04 with essentially the same fish community.
Extent of Barrier	3.0	This barrier was originally designed for agricultural water retention. The dam was damaged in 1980's but never repaired. What is left has formed a 2 meter plunge pool. The pond is a seasonal barrier to migratory fish.
Quantity of Habitat	0.1	This barrier only restricts 0.5 km of upstream habitat but if the barrier upstream of it is removed the importance of removing this barrier will be of greater significance.
Quality of Habitat	2.1	**Water Temperature**: Cool- 4.04 (TLBA09)
		Riparian Cover Upstream: 45.47% = 2.27
		Impervious Cover Upstream: 2.77 % = 0.05
		Quality of Habitat Score: 2.1
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**6.3**	

BARBHF08

Metric	Score	Summary of Findings
Quality of Biotic Life		**Downstream Community: IBI Score =** 14/27 (BLDN, BLS1). These sites have high diversity with Johnny Darter and Creek Chub being the most common. Other notables are Rainbow Trout, Mottled Sculpin, Blacknose Dace, and Pumpkinseed. **Upstream Fish Community: IBI Score =** 12/28 (BLUN, BLO5). These sites have moderate diversity with Blacknose Dace, Pumpkinseed, Common Shiner and Mottled Sculpin being the most dominate. Rainbow Trout are also present.
Extent of Barrier		Concrete structure with a 0.75 meter inclined fall which may be impassable to migratory fish du w riods is in i nd ho stru uently blow or fill with se ent cre g erosi nd bitat cern
Quantity Hab t		Th rier restri 31.5 k f upstrea hab
Quality Hab t		**Water perat** : Cool- 4 (TLBA0
		ver U ream:
		Impervious Cover Upstream: 2.49% = 4.38
		Quality of Habitat Score:
Other considerations for removal		There are no known biological consequences for removal of this barrier.
Total Score		

BARBHF09

Metric	Score	Summary of Findings
Quality of Biotic Life	0.2	**Downstream Community: IBI Score =** 3 (BLS3). This site is dominated by tolerant or moderately tolerant species, such as, Blacknose Dace, Fathead Minnow, Creek Chub, Pumpkinseed, and Johnny Darter. **Upstream Fish Community: IBI Score =** 4 (BL06). This site is dominated by Blacknose Dace, Johnny Darter and Creek Chub.
Extent of Barrier	---	Unknown
Quantity of Habitat	0.3	This barrier restricts 3.05 km of upstream habitat
Quality of Habitat	3.1	**Water Temperature**: Cool- 4.08 (TLBA05)
		Riparian Cover Upstream: 9.87 = 0.50
		Impervious Cover Upstream: 1.67% = 4.58
		Quality of Habitat Score: 3.1
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	---	

BARBHF10

Metric	Score	Summary of Findings
Quality of Biotic Life	0.1	**Downstream Community: IBI Score =** 4 (BL06). This site is dominated by Blacknose Dace, Johnny Darter and Creek Chub. **Upstream Fish Community: IBI Score =** 1 (BL07). This site is dominated by Blacknose Dace and Creek Chub, with Johnny Darter, White Sucker, Common Shiner and Green Sunfish also present.
Extent of Barrier	3.0	Historically, a concrete barrier with wooden stop logs creating a rise of approximately 1.25 meters and an approximately 1 meter deep concrete plunge pool. The dam was a barrier to migratory fish during all times of the year. It is currantly managed with all stop logs removed as the structure is in poor condition. It likely is still a barrier to non-jumping fish.
Quantity of Habitat	1.3	This barrier restricts 13.3 km of upstream habitat
Quality of Habitat	3.5	**Water Temperature**: Cool- 4.08 (TLBA05)
		Riparian Cover Upstream: 36.72% = 1.84
		Impervious Cover Upstream: 1.72% = 4.57
		Quality of Habitat Score: 3.5
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**7.9**	

BARBHF11

Metric	Score	Summary of Findings
Quality of Biotic Life	4.1	**Downstream Community: IBI Score =** 74 (FAS2). The site is dominated by Brown Trout and Rainbow Trout with Blacknose Dace and Mottled Sculpin also present. **Upstream Fish Community: IBI Score =** 91 (FA08). This site has three species consistently caught: Rainbow Trout, Brown Trout, and Mottled Sculpin
Extent of Barrier	3.0	Corrugated steel culvert perched approximately 0.3 meters above the creek on the downstream end of Taunton Road and includes a deep and long plunge pool. Passable to jumping salmonids during periods of high flow but a barrier to all migratory fish during low flow periods.
Quantity of Habitat	4.3	This barrier restricts 43 km of upstream habitat
Quality of Habitat	3.8	**Water Temperature**: Cold- 5.00 (TLFA06)
		Riparian Cover Upstream: 38.41% = 1.92
		Impervious Cover Upstream: 2.47% = 4.38
		Quality of Habitat Score: 3.8
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**15.2**	

BARBHF12

Metric	Score	Summary of Findings
Quality of Biotic Life	0.3	**Downstream Community: IBI Score =** 5 (H403). Blacknose Dace, Creek Chub and Rainbow Trout have been caught at this site. **Upstream Fish Community: IBI Score =** N/A (H404). No fish caught at this site.
Extent of Barrier	1.0	Constructed of steel and is in ill repair. The stream channel has breached the berm to the east of the structure and the majority of the flow bypasses the barrier. This barrier causes pooling in the upstream end which has led to a braided and unstable creek. The weir is not a complete barrier for migratory fish and may not be a barrier for non-jumping fish in most flow conditions.
Quantity of Habitat	0.8	This barrier restricts 7.7 km of upstream habitat
Quality of Habitat	3.0	**Water Temperature**: Cool- 4.03 (TLHA05)
		Riparian Cover Upstream: 8.67% = 0.43
		Impervious Cover Upstream: 2.48% = 4.38
		Quality of Habitat Score: 3.0
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**5.1**	

BARBHF13

Metric	Score	Summary of Findings
Quality of Biotic Life	0.3	**Downstream Community: IBI Score =** 5 (H403). Blacknose Dace, Creek Chub and Rainbow Trout have been caught at this site. **Upstream Fish Community: IBI Score =** N/A (H404). No fish caught at this site.
Extent of Barrier	3.0	Rainbow Trout have been observed upstream of the barrier. It is assumed that they are passing by themselves even though through observations it doesn't look passible. It is possible people are helping them pass as there is regular traffic down to this section of creek from the neighbouring subdivision. It would not be possible for non-jumping fish to pass this barrier.
Quantity of Habitat	1.3	This barrier restricts 12.5 km of upstream habitat
Quality of Habitat	2.5	**Water Temperature**: Cool- 4.03 (TLHA05)
		Riparian Cover Upstream: 19.76% = 0.99
		Impervious Cover Upstream: 9.69% = 2.58
		Quality of Habitat Score: 2.5
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**7.1**	

BARBHF14

Metric	Score	Summary of Findings
Quality of Biotic Life	0.2	**Downstream Community: IBI Score =** 4 (H402; 2002). Blacknose Dace and Creek Chub make up the majority with Rainbow Trout, Fathead Minnow and Pumpkinseed in low numbers. **Upstream Fish Community: IBI Score =** 4 (H403). Blacknose Dace, Creek Chub and Rainbow Trout have been caught at this site.
Extent of Barrier	3.0	This culvert is a barrier to non-jumping fish at all times of the year. Based on fisheries sampling upstream, it appears Rainbow Trout are able to pass. It is likely a difficult barrier even for jumping fish.
Quantity of Habitat	0.1	This barrier restricts 0.65km of upstream habitat
Quality of Habitat	2.4	**Water Temperature**: Cool- 4.03, 4.11 (TLHA05, TLHA26). Average: 4.07
		Riparian Cover Upstream: 16.63% = 0.83
		Impervious Cover Upstream: 10.8% = 2.30
		Quality of Habitat Score: 2.4
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**6.7**	

BARBHF15

Metric	Score	Summary of Findings
Quality of Biotic Life	0.2	**Downstream Community: IBI Score =** 2 (H301). This site is dominated by the highly tolerant Blacknose Dace and Creek Chub, but Rainbow Trout are present in decent numbers as well as Longnose Dace and White Sucker. Goldfish can often be found here in low numbers. **Upstream Fish Community: IBI Score =** 6 (H302). Blacknose Dace and Creek Chub are again the most common species, but increasing numbers of Rainbow Trout are positive. Rainbow Darter was found here for the first time in 2013 sampling.
Extent of Barrier	1.0	Previous to 2004, the barrier was a series of gabion basket weirs which each displayed a 0.5 meter drop for a total of 2 meters in elevation. The barrier was mitigated in 2004 by the City of Oshawa and the Region of Durham by creating a series of armourstone drops. It now passes migratory fish but does not pass non-jumping fish.
Quantity of Habitat	0.1	This barrier restricts 0.8 km of upstream habitat
Quality of Habitat	2.5	**Water Temperature**: Cool- 3.77 (TLHA16)
		Riparian Cover Upstream: 22.69% = 1.13
		Impervious Cover Upstream: 10.24% = 2.44
		Quality of Habitat Score: 2.5
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**3.8**	

PARTIALLY RESTORED

BARBHF16

Metric	Score	Summary of Findings
Quality of Biotic Life	0.1	**Downstream Community: IBI Score =** 4 (H201). The site, located 1 km downstream, is dominated by Blacknose Dace, White Sucker and Creek Chub with Rainbow Trout, Fathead Minnow and Longnose Dace populations also present. **Upstream Fish Community: IBI Score =** N/A/0 (H202/H203). No fish captured after two years of sampling at H202. H203 has two species, Blacknose Dace and Creek Chub.
Extent of Barrier	5.0	Lies within an 83 meter long constructed channel lined with rip rap rock filled gabion baskets on the either side of the creek. Built in the 1970's for flood control, the first structure displays a 1.75 meter drop, which acts as a year round barrier to migratory fish. The entire channel displays a total drop of 11.25 meters over 9 weirs.
Quantity of Habitat	0.5	This barrier restricts 4.6km of upstream habitat
Quality of Habitat	1.7	**Water Temperature**: Cool- 4.09 (TLHA21).
		Riparian Cover Upstream: 19.68% = 0.98
		Impervious Cover Upstream: 69.7% = 0.00
		Quality of Habitat Score: 1.7
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. Removal of this barrier would likely allow Rainbow Trout to access this portion of the creek.
Total Score	**7.3**	

BARBHF17

Metric	Score	Summary of Findings
Quality of Biotic Life	0.0	**Downstream Community: IBI Score =** 0 (H103). This site is located immediately downstream has almost no biomass present with only small populations of Blacknose Dace and Creek Chub present **Upstream Fish Community: IBI Score =** N/A. There are no sites located upstream of the barrier
Extent of Barrier	5.0	Composed of concrete inside a gabion basket. A drop of 0.5 meters would not normally pose a barrier but the concrete apron of this structure prevents the formation of a plunge pool needed by migratory fish.
Quantity of Habitat	0.1	This barrier restricts 0.7 km of upstream habitat
Quality of Habitat	1.7	**Water Temperature**: Cool- 4.19 (TLHA14)
		Riparian Cover Upstream: 17.32% = 0.87
		Impervious Cover Upstream: 62.6% = 0.00
		Quality of Habitat Score: 1.7
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**6.8**	

BARBHF18

Metric	Score	Summary of Findings
Quality of Biotic Life	0.0	**Downstream Community: IBI Score =** 0 (H103). This site is located immediately downstream has almost no biomass present with only small populations of Blacknose Dace and Creek Chub present **Upstream Fish Community: IBI Score =** N/A. There are no sites located upstream of the barrier
Extent of Barrier	5.0	The barrier is constructed of concrete filled gabion baskets. There is a 1.5 meter drop, which acts as a barrier to migratory fish during all times of the year.
Quantity of Habitat	0.1	This barrier restricts 0.1 km of upstream habitat
Quality of Habitat	1.7	**Water Temperature**: Cool- 4.19 (TLHA14)
		Riparian Cover Upstream: 19.79% = 0.99
		Impervious Cover Upstream: 55.1 % = 0.00
		Quality of Habitat Score: 1.7
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**6.8**	

BARBHF19

Metric	Score	Summary of Findings
Quality of Biotic Life	0.0	**Downstream Community: IBI Score =** 0 (FAS6). The site, located 2.5 km downstream had only small populations of White Sucker and Blacknose Dace present during a 2008 catch. Supplemental sampling was directly downstream of the barrier in which Blacknose Dace, Creek Chub, and Northern Redbelly Dace were found. Consultants and the landowner has indicated Rainbow Trout has been observed at this location. **Upstream Fish Community: IBI Score =** N/A. There is no upstream site for this barrier.
Extent of Barrier	1.0	This barrier had work completed on it to try and make passable for jumping fish. Non-jumping fish cannot pass this barrier.
Quantity of Habitat	0.2	This barrier restricts 2 km of upstream habitat
Quality of Habitat	3.4	**Water Temperature**: Cool- 4.05 (TLFA09)
		Riparian Cover Upstream: 32.28% = 1.62
		Impervious Cover Upstream: 2.05% = 4.49
		Quality of Habitat Score: 3.4
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**4.6**	

PARTIALLY RESTORED

BARBHF20

Metric	Score	Summary of Findings
Quality of Biotic Life	0.2	**Downstream Community: IBI Score =** 6 (H302). This site is dominated by tolerant species, notable Blacknose Dace, but did have Rainbow Trout during the last two sampling events. **Upstream Fish Community: IBI Score =** 2 (H303). Blacknose Dace, Creek Chub, and Fathead Minnow make up the majority of this fish population. One Rainbow Trout was found during the last sampling event.
Extent of Barrier	3.0	This barrier is passable as seen through spawning surveys. Although the barrier looks through observations as very difficult to pass, several Rainbow Trout were found upstream of the barrier. There is the possibility the fish are being helped by people as there is a large community nearby with well-travelled walking paths to the creek.
Quantity of Habitat	2.5	This barrier restricts 25.4km of upstream habitat
Quality of Habitat	2.4	**Water Temperature**: Cool- 3.71 (TLHA03)
		Riparian Cover Upstream: 21.43% = 1.07
		Impervious Cover Upstream: 10.24 = 2.3
		Quality of Habitat Score: 2.4
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**8.1**	

14 Appendix 4 - Bowmanville/Soper Creek Watershed

BARBOW01

Metric	Score	Summary of Findings
Quality of Biotic Life	2.5	**Downstream Community: IBI Score = 4/28 (BB15/BB10)** Tolerant species dominate at the closest site (BB15) with mostly Blacknose Dace and Creek Chub and the occassional Brown Trout. At BB10, DS, conditions improve and tolerant species are present in high numbers but sensitive species are also common in strong numbers. **Upstream Fish Community: IBI Score = 85 (BB17)** This site has been one of the strongest Brook Trout spots within CLOCA.
Extent of Barrier	5.0	Berm and top draw sluiceway present from original dam structure, and the berm and pond are currently used for recreational purposes. Impassable to anadromous fish species.
Quantity of Habitat	2.7	This barrier restricts 26.76km of upstream habitat
Quality of Habitat	4.1	**Water Temperature**: Cold- 4.97 (TLBOW20)
		Riparian Cover Upstream: 50.94% = 2.55
		Impervious Cover Upstream: 1.27% = 4.68
		Quality of Habitat Score: 4.1
Other considerations for removal	Yes	There could be severe consequences to the long-term sustainability of Brook Trout in this area if the barrier was removed. Further analysis is needed.
Total Score	**14.3**	

BARBOW02

Metric	Score	Summary of Findings
Quality of Biotic Life	3.1	**Downstream Community: IBI Score =** 80 (BA11). This site is dominated by Rainbow Trout and Mottled Sculpin with various other species present. **Upstream Fish Community: IBI Score =** 42 (BB02). Fish species include a large number of Brown Trout and Sculpin with a mix of tolerant species as well. Upstream location Brook Trout are found.
Extent of Barrier	5.0	Original dam structure and mill removed and replaced with an impassable structure designed to protect native salmonid species upstream. The dam is two-tiered and includes many concrete structures which prevent fish passage and break up flow.
Quantity of Habitat	5.0	This barrier restricts 102.58km of upstream habitat
Quality of Habitat	4.1	**Water Temperature**: Cold- 4.91 (TLBOW24)
		Riparian Cover Upstream: 58.72% = 2.94
		Impervious Cover Upstream: 1.98% = 4.51
		Quality of Habitat Score: 4.1
Other considerations for removal	Yes	Brook Trout present upstream of barrier. Upstream sensitive species including Brown Trout and Brook Trout are protected by this structure from non-native anadromous species downstream. Removal of this barrier will eliminate this protection. Also, because of this protection this area of Bowmanville Creek became a candidate for Atlantic Salmon introduction in the 1990s.
Total Score	**17.2**	

BARBOW03

Metric	Score	Summary of Findings
Quality of Biotic Life	4.8	**Downstream Community: IBI Score = 95 (BC06)** Brook Trout, Brown Trout, Rainbow Trout and Sculpin are found at this site. **Upstream Fish Community: IBI Score = Not Available.** Rainbow Trout were spotted above the two barriers.
Extent of Barrier	3.0	Three online ponds exist make up this barrier. Little is known about the area, but migratory salmonids are believed to be able to pass.
Quantity of Habitat	0.3	This barrier restricts 2.6km of upstream habitat
Quality of Habitat	4.4	**Water Temperature:** Cold- 5.00 (TLBOW11)
		Riparian Cover Upstream: 68.14% = 3.41
		Impervious Cover Upstream: 1.27 = 4.68
		Quality of Habitat Score: 4.4
Other considerations for removal	No	Since Rainbow Trout are already able to pass this barrier, it is thought all species would benefit from the ability to migrate further with the removal of this barrier.
Total Score	**12.5**	

BARBOW04

Metric	Score	Summary of Findings
Quality of Biotic Life	3.0	**Downstream Community: IBI Score =** 65 (BD02) Chinook and Coho Salmon as well as Rainbow and Brown Trout have all been sited downstream of the structure. **Upstream Fish Community: IBI Score =** 53 (BD03). Present species include Brook Trout, Blacknose Dace and Brook Stickleback.
Extent of Barrier	5.0	Mill is currently used as a saw mill and apple cider press. Structure is impassable to anadromous fishes.
Quantity of Habitat	2.0	This barrier restricts 19.78km of upstream habitat
Quality of Habitat	4.1	**Water Temperature**: Cool- 4.10 (TLBOW29)
		Riparian Cover Upstream: 71.79% = 3.59
		Impervious Cover Upstream: 2.2% = 4.45
		Quality of Habitat Score: 4.1
Other considerations for removal	Yes	There could be severe consequences to the long-term sustainability of Brook Trout in this area if the barrier was removed. Further analysis is needed.
Total Score	**14.1**	

BARBOW05

Metric	Score	Summary of Findings
Quality of Biotic Life	4.4	**Downstream Community: IBI Score =** 76 (BD05) This site has both Brook Trout and Blacknose Dace, the first being the most dominant. **Upstream Fish Community: IBI Score =** 99 (BD04) This site has Brook Trout and Sculpin in strong numbers.
Extent of Barrier	5.0	The pond outlet is a top-draw standpipe and prevents fish passage.
Quantity of Habitat	1.1	This barrier restricts 11.40km of upstream habitat
Quality of Habitat	4.5	**Water Temperature**: Cold- 4.86 (TLBOW27)
		Riparian Cover Upstream: 83.32% = 4.17
		Impervious Cover Upstream: 2.71% = 4.32
		Quality of Habitat Score: 4.45
Other considerations for removal	No	Since Brook Trout are the only salmonid species present both upstream and downstream of this barrier, there are no known biological consequences for removal. If the barrier downstream gets removed (BARBOW04), this barrier will play a more important role in protection of the current Brook Trout population upstream. This pond is currently used as a recreational pond for the residential owners.
Total Score	**15.0**	

BARBOW06

Metric	Score	Summary of Findings
Quality of Biotic Life	4.4	**Downstream Community: IBI Score =** 76 (BD05) This site has both Brook Trout and Blacknose Dace, the first being the most dominant. **Upstream Fish Community: IBI Score =** 99 (BD04) This site has Brook Trout and Sculpin in strong numbers.
Extent of Barrier	5.0	Pond displays two top-draw sluices that create two channels which join several meters downstream.
Quantity of Habitat	0.2	This barrier restricts 2.41km of upstream habitat
Quality of Habitat	4.6	**Water Temperature**: Cold- 4.92 (TLBOW28)
		Riparian Cover Upstream: 90.95% = 4.55
		Impervious Cover Upstream: 2.71% = 4.32
		Quality of Habitat Score: 4.6
Other considerations for removal	No	Since Brook Trout are the only salmonid species present both upstream and downstream of this barrier, there are no known biological consequences for removal. If the barrier downstream gets removed (BARBOW04), this barrier will play a more important role in protection of the current Brook Trout population upstream. This pond is currently used as a recreational pond for the residential owners.
Total Score	**14.2**	

BARBOW07

Metric	Score	Summary of Findings
Quality of Biotic Life	2.7	**Downstream Community: IBI Score =** 40 (BA03). Four species are present at this site. Rainbow Trout, White Sucker, Longnose Dace, and Mottled Sculpin. Brown Trout have been observed upstream and downstream of this location. **Upstream Fish Community: IBI Score =** 66 (BA04). High diversity is found at this site. Rainbow Trout, Longnose Dace, and Brown Trout are the most common.
Extent of Barrier	1.0	This weir is passable by jumping fish in both the spring and fall but does slow down their progress. They can often be viewed resting both upstream and downstream of the barrier. This barrier is not passable by non-jumping fish.
Quantity of Habitat	5.0	This barrier restricts 157.7km of upstream habitat
Quality of Habitat	3.5	**Water Temperature**: Cool- 3.76 (TLBOW37)
		Riparian Cover Upstream: 52.73% = 2.64
		Impervious Cover Upstream: 3.13% = 4.22
		Quality of Habitat Score: 3.5
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. It may act as a second barrier to Sea Lamprey which are able to pass the barrier downstream.
Total Score	**12.2**	

BARBOW08

Metric	Score	Summary of Findings
Quality of Biotic Life	1.7	**Downstream Community: IBI Score =** 20 (BA01). This site has high diversity with some sensitive species, Rainbow Trout, Mottled Sculpin as well as common tolerant species (Blacknose Dace, Longnose Dace, Common Shiner, Round Goby, etc.). **Upstream Fish Community: IBI Score =** 48 (BWDJ). This site has high species diversity with the dominant species being Rainbow Trout most years, and Longnose Dace others. Chinook Salmon and Brown Trout are also found here along with many others.
Extent of Barrier	3.0	A fishway was incorporated into the dam structure in 1988 to allow migratory salmonid passage but prevent the spread of migrating Sea Lamprey. It is believed that Smallmouth Bass are not able to pass this barrier. The barrier was updated in 2013 with an improved fishway to allow fish to move upstream easier.
Quantity of Habitat	0.4	This barrier restricts 3.68 km of upstream habitat
Quality of Habitat	3.6	**Water Temperature**: Cool- 3.97 (TLBOW04)
		Riparian Cover Upstream: 52.57% = 2.63
		Impervious Cover Upstream: 3.85 = 4.04
		Quality of Habitat Score: 3.6
Other considerations for removal	Yes	The barrier is designed to prevent Sea Lamprey and other species (e.g. Round Goby) from accessing upstream. Jumping fish are able to pass through the fishway. Sea Lamprey have been identified as being upstream therefore they are passing this barrier somehow (possible while still attached to jumping fish). Removal would allow non-native species to access another 9.68km of habitat but would be beneficial for decreasing temperature and restoring some sediment transport.
Total Score	**8.7**	

PARTIALLY RESTORED

BARBOW09

Metric	Score	Summary of Findings
Quality of Biotic Life	4.4	**Downstream Community: IBI Score** = 91 (SC01). **Upstream Fish Community: IBI Score =** 86 (SC02). Both of the sites listed above are very similar with Brown and Rainbow Trout being the most common. Coho Salmon have been found downstream but not upstream.
Extent of Barrier	3.0	Provides only minimal fish passage during spring flooding events. Impassable to most fish species the rest of the year.
Quantity of Habitat	2.9	This barrier restricts 28.51km of upstream habitat
Quality of Habitat	4.0	**Water Temperature**: Cold- 4.98 (TLSOP21)
		Riparian Cover Upstream: 56.19% = 2.81
		Impervious Cover Upstream: 2.90% = 4.28
		Quality of Habitat Score: 4.0
Other considerations for removal	No	Brook Trout are found farther upstream, but since Rainbow Trout are already passing this barrier, there are no known biological consequences for removal.
Total Score	**14.3**	

BARBOW10

Metric	Score	Summary of Findings
Quality of Biotic Life	0.1	**Downstream Community: IBI Score =** 1 (SB22) This site is all tolerant species with Blacknose Dace being the most common. Fathead Minnow, Creek Chub, and Northern Redbelly Dace also present. **Upstream Fish Community: IBI Score =** Not Available
Extent of Barrier	5.0	Pond includes a top-draw standpipe outflow. Limited flow and catchment basin limits its use as a migration route.
Quantity of Habitat	0.2	This barrier restricts 2.36km of upstream habitat
Quality of Habitat	3.5	**Water Temperature**: Coolwater = 3.50 (TLSOP13)
		Riparian Cover Upstream: 39.29% = 1.96
		Impervious Cover Upstream: 0.38% = 4.91
		Quality of Habitat Score: 3.5
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**8.8**	

BARBOW11

Metric	Score	Summary of Findings
Quality of Biotic Life	0.3	**Downstream Community: IBI Score =** 10 (SB22) **Upstream Fish Community: IBI Score =** 0 (SB15) Both sites have a similar fish community with low diversity and all common tolerant species.
Extent of Barrier	5.0	Pond is often drained for irrigation purposes, and is found to offer no migration routes for fish species.
Quantity of Habitat	0.4	This barrier restricts 4.03km of upstream habitat
Quality of Habitat	3.6	**Water Temperature**: Cold- 4.30 (TLSOP12)
		Riparian Cover Upstream: 46.10% = 2.30
		Impervious Cover Upstream: 2.68% = 4.33
		Quality of Habitat Score: 3.6
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**9.3**	

BARBOW12

Metric	Score	Summary of Findings
Quality of Biotic Life	---	**Downstream Community: IBI Score =** N/A (SBS07). This site was a no-catch **Upstream Fish Community: IBI Score =** No site located upstream
Extent of Barrier	5.0	Pond includes a top-draw standpipe with a perched culvert on the downstream side. Impassable to forage fish species.
Quantity of Habitat	0.4	This barrier restricts 4.4km of upstream habitat
Quality of Habitat	3.2	**Water Temperature**: Cold- 4.30 (TLSOP12)
		Riparian Cover Upstream: 24.62% = 1.23
		Impervious Cover Upstream: 3.67% = 4.08
		Quality of Habitat Score: 3.2
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. It would likely be a benefit to baseflow to have this barrier removed as this section of creek can go dry during a hot summer.
Total Score	---	

BARBOW13

Metric	Score	Summary of Findings
Quality of Biotic Life	0.3	**Downstream Community: IBI Score =** 5 (SB08). This site consists of similar numbers of Pumpkinseed and Blacknose Dace as well as one Brook Stickleback. **Upstream Fish Community: IBI Score =** N/A (SBS07). This site was a no-catch.
Extent of Barrier	5.0	Pond includes a top-draw outlet. Impassable to forage fish species.
Quantity of Habitat	0.4	This barrier restricts 4.37km of upstream habitat
Quality of Habitat	3.1	**Water Temperature**: Cool- 3.94 (TLSOP07)
		Riparian Cover Upstream: 22.57% = 1.13
		Impervious Cover Upstream: 3.67% = 4.08
		Quality of Habitat Score: 3.1
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. It would likely be a benefit to baseflow to have this barrier removed as this section of creek can go dry during a hot summer.
Total Score	**8.8**	

BARBOW14

Metric	Score	Summary of Findings
Quality of Biotic Life	2.1	**Downstream Community: IBI Score =** 63 (SB09). This site has high diversity with a mix of sensitive and tolerant species. Rainbow Trout is the most numerous species. **Upstream Fish Community: IBI Score =** 21 (SB07) Rainbow Trout have been increasing their numbers at this site. They were the most numerous species during the last sampling event. Prior to this, Blacknose Dace was the most numerous.
Extent of Barrier	1.0	Barrier was modified to allow jumping fish to pass and possibly non jumping fish in certain flow conditions.
Quantity of Habitat	1.8	This barrier restricts 17.7km of upstream habitat
Quality of Habitat	3.7	**Water Temperature**: Cold- 4.68 (TLSOP01)
		Riparian Cover Upstream: 40.60% = 2.03
		Impervious Cover Upstream: 2.37% = 4.41
		Quality of Habitat Score: 3.7
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**8.6**	

PARTIALLY RESTORED

BARBOW15

Metric	Score	Summary of Findings
Quality of Biotic Life	2.6	**Downstream Community: IBI Score =** 25(SB02). This site has high diversity with many of the species being tolerant. Some salmonids are present as well as Sculpin. **Upstream Fish Community: IBI Score =** 79 (SB19). This site is dominated by salmonids with some sculpin present.
Extent of Barrier	1.0	This is a barrier to all non-jumping fish. It does slow down progress of jumping fish as they are often seen holding in pools both upstream and downstream of the barrier, but almost all migratory fish are able to pass. There has not been evidence of Smallmouth Bass attempting to pass this barrier in the spring.
Quantity of Habitat	5.0	This barrier restricts 119km of upstream habitat
Quality of Habitat	3.6	**Water Temperature**: Cool- 4.32 (TLSOP03)
		Riparian Cover Upstream: 49.74% = 2.49
		Impervious Cover Upstream: 3.47% = 4.1
		Quality of Habitat Score: 3.6
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**12.2**	

BARBOW16

Metric	Score	Summary of Findings
Quality of Biotic Life	2.6	**Downstream Community: IBI Score =** 17 (BA12). Rainbow Trout, Brown Trout, and several tolerant minnow species present here. **Upstream Fish Community: IBI Score =** Supplemental sites upstream of barrier have documented several tolerant minnow species and Rainbow Trout.
Extent of Barrier	3.0	This is a barrier to all non-jumping fish. Rainbow Trout have been documented passing in the spring but there have been no records of fall migratory fish passing this barrier.
Quantity of Habitat	0.6	This barrier restricts 6.0km of upstream habitat
Quality of Habitat	2.9	**Water Temperature**: Cool- 3.95 (TLBOW07)
		Riparian Cover Upstream: 38.01% = 1.90
		Impervious Cover Upstream: 8.03% = 2.98
		Quality of Habitat Score: 2.9
Other considerations for removal	No	There are no known biological consequences for removal of this barrier.
Total Score	**9.1**	

BARBOW17

Metric	Score	Summary of Findings
Quality of Biotic Life		
Extent of Barr		
Quantity of Ha t		
Quality of Hab		
Other considerations for removal		
Total Score		

15.0 Appendix 5 - Small Watersheds

BARSMW01

Metric	Score	Summary of Findings
Quality of Biotic Life	0.0	**Downstream Community: IBI Score =** 0 (CWS01). High catch rate at this site but all species are tolerant. **Upstream Fish Community: IBI Score =** 0 (CW04). No catch.
Extent of Barrier	3.0	It is thought that this barrier is passable for jumping fish only.
Quantity of Habitat	0.6	This barrier restricts 5.5km of upstream habitat
Quality of Habitat	1.5	**Water Temperature**: Cool- 3.18 (TLCW03)
		Riparian Cover Upstream: 28.70% = 1.43
		Impervious cover upstream: 42.12% = 0.00
		Quality of Habitat Score: 1.5
Other considerations for removal	No	There are no known biological consequences for removal of this barrier
Total Score	**5.1**	

BARSMW02

Metric	Score	Summary of Findings
Quality of Biotic Life	0.0	**Downstream Community: IBI Score =** 0 (WS01). Low quality habitat with tolerant fish community. **Upstream Fish Community:** No sites upstream.
Extent of Barrier	---	Unknown
Quantity of Habitat	0.1	This barrier restricts 1.2km of upstream habitat
Quality of Habitat	1.6	**Water Temperature**: Cool- 2.84 (TLCW02)
		Riparian Cover Upstream: 39.24% = 1.96
		Impervious Cover Upstream: 44.67% = 0.00
		Quality of Habitat Score: 1.60
Other considerations for removal	No	There are no known biological consequences for removal of this barrier
Total Score	---	

BARSMW03

Metric	Score	Summary of Findings
Quality of Biotic Life	0.2	**Downstream Community: IBI Score =** 2 (TYDC). Rainbow Trout have been observed at this location. The site is dominated by tolerant species, mostly Blacknose Dace, Creek Chub and Pumpkinseed. **Upstream Fish Community: =** 6 (TYDD). Rainbow Trout have been found at this site and farther upstream. Johnny Darter, White Sucker, and Longnose Dace are also present.
Extent of Barrier	3.0	Rainbow Trout have been found to be able to pass, although it is difficult at best for them. No Chinook Salmon YOY have been found upstream. It is a barrier to all non-jumping fish.
Quantity of Habitat	2.0	This barrier restricts 20.2km of upstream habitat
Quality of Habitat	3.0	**Water Temperature**: Cool- 4.22 (TLTY01)
		Riparian Cover Upstream: 31.87% = 1.59
		Impervious cover upstream: 7.84% = 3.04
		Quality of Habitat Score: 3.0
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. Tooley Creek currently is not known to be used for Sea Lamprey Spawning.
Total Score	**8.2**	

BARSMW04

Metric	Score	Summary of Findings
Quality of Biotic Life	0.0	**Downstream Community: IBI Score** Not Available [MTDAR21]. **Upstream Fish Community:** Not Available [MTDAR25]. If these sites have not dried up, pockets of tolerant species (Blacknose Dace and Fathead Minnow) can be found here.
Extent of Barrier	5.0	This barrier is a berm structure and is not passable to fish.
Quantity of Habitat	0.3	This barrier restricts 2.73km of upstream habitat.
Quality of Habitat	3.4	**Water Temperature**: Cool- 4.76 (TLDN02)
		Riparian Cover Upstream: 27.70% = 1.38
		Impervious cover upstream: 4.0% = 4.00
		Quality of Habitat Score: 3.4
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. There would likely be benefits to the baseflow if this barrier and irrigation uses were removed.
Total Score	**8.7**	

BARSMW05

Metric	Score	Summary of Findings
Quality of Biotic Life	0.0	**Downstream Community: IBI Score** Not Available [MTDAR21]. **Upstream Fish Community:** Not Available [MTDAR25]. If these sites have not dried up, pockets of tolerant species (Blacknose Dace and Fathead Minnow) can be found here.
Extent of Barrier	---	Unknown
Quantity of Habitat	0.1	This barrier restricts 500m of upstream habitat
Quality of Habitat	3.4	**Water Temperature**: Cool- 4.76 (TLDN02)
		Riparian Cover Upstream: 26.29% = 1.31
		Impervious Cover Upstream: 4.0% = 4.00
		Quality of Habitat Score: 3.4
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. There would likely be benefits to the baseflow if this barrier and irrigation uses were removed.
Total Score	---	

BARSMW06

Metric	Score	Summary of Findings
Quality of Biotic Life	0.0	**Downstream Community: IBI Score =** Not available (MTDAR19). **Upstream Fish Community:** No sites upstream If these sites have not dried up, pockets of tolerant species (Blacknose Dace and Fathead Minnow) can be found here.
Extent of Barrier	---	Unknown
Quantity of Habitat	0.2	This barrier restricts 1.7km of upstream habitat
Quality of Habitat	2.6	**Water Temperature**: Cool- 3.12 (TLDN01)
		Riparian Cover Upstream: 14.83% = 0.74
		Impervious Cover Upstream: 4.0% = 4.00
		Quality of Habitat Score: 2.6
Other considerations for removal	No	There are no known biological consequences for removal of this barrier. There would likely be benefits to the baseflow if this barrier and irrigation uses were removed.
Total Score	---	