Dalhousie University- Environmental Science

Barriers to Fish Passage in Nova Scotia

The Evolution of Water Control Barriers in Nova Scotia's Watershed

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DALHOUSIE UNIVERSITY

Inspiring Minds

Abstract

Loss of connectivity throughout river systems is one of the most serious effects dams impose on migrating fish species. I examine the extent and dates of aquatic habitat loss due to dam construction in two key salmon regions in Nova Scotia: Inner Bay of Fundy (IBoF) and the Southern Uplands (SU). This work is possible due to the recent progress in the water control structure inventory for the province of Nova Scotia (NSWCD) by Nova Scotia Environment. Findings indicate that 586 dams have been documented in the NSWCD inventory for the entire province. The most common main purpose of dams built throughout Nova Scotia is for hydropower production (21%) and only 14% of dams in the database contain associated fish passage technology. Findings indicate that the SU is impacted by 279 dams, resulting in an upstream habitat loss of 3,008 km of stream length, equivalent to 9.28% of the total stream length within the SU. The most extensive amount of loss occurred from 1920-1930. The IBoF was found to have 131 dams resulting in an upstream habitat loss of 1, 299 km of stream length, equivalent to 7.1% of total stream length. The most extensive amount of upstream habitat loss occurred from 1930-1940. I also examined if given what I have learned about the locations and dates of dam installations, are existent fish population data sufficient to assess the impacts of dams on the IBoF and SU Atlantic salmon populations in Nova Scotia? Results indicate that dams have caused a widespread upstream loss of freshwater habitat in Nova Scotia howeverfish population data do not exist to examine the direct impact of dam construction on the IBoF and SU Atlantic salmon populations in Nova Scotia. Because of the large extent of rivers behind dams, this research suggests that dam construction may havecontributed to the decrease of Atlantic salmon populations or may be currently inhibiting recovery of salmon stocks in Nova Scotia.

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1.0 Introduction

1.1 Overview

Habitat fragmentation is an important causal agent in species decline (Allan et al. 1997). The development of water control barriers such as dams, have altered freshwater habitats and have had a profound effect on aquatic organisms around the world (Schilt 2006). For example, an estimated 80% of the total discharges of large rivers in North America are impacted by dams (Bednarek 2001). Dams are valuable as they provide inexpensive and efficient power generation, flood control, recreational activities, water supply, irrigation, and navigation (Bednarek 2001). However, with over 36,000 major dams and hundreds of thousands of smaller ones implemented on river systems around the world, they can also have significant negative impacts on hydrological resources and aquatic ecosystems (Wells 1999).

Impacts of dams on freshwater ecosystems have been intensely studied and are well documented. Dams impact freshwater ecosystems by altering the natural hydrology of river systems. Examples of these impacts include; alteration of flow regimes, changing of water temperatures upstream and downstream, disrupting sediment transport, modifying nutrient loads, and fragmenting the continuity of river systems (Bednarek 2001; Saunders et al. 2002). The complex interactions and flow regimes within freshwater ecosystems play a profound role in the distribution, abundance, and diversity of the organisms which reside there (Bunn & Arthington 2002).

Alterations of natural freshwater hydrological systems, through the use of damscan create substantial impacts upon aquatic organisms. For example, dams placed in freshwater ecosystems create the potential of restricting or eliminating the movement of fish upstream and isolating upstream populations (Hoffman & Dunham 2007). Movement among fish species plays an essential role for acquiring the resources necessary in order to complete their life cycles (Hoffman & Dunham 2007).

Some fish species are known to have complex life cycles in which they need to migrate for; spawning, overwintering, feeding, and seeking refuge (Meixler et al. 2009). Consequences of barriers include reducing the ability of fish to migrate upstream to critical habitats, extirpation of species from upstream populations, fragmenting or isolating upstream populations, increasing vulnerability to negative impacts of habitat disturbances, increasing the loss of genetic diversity at the population level and creating new habitats preferred by non-native species (Hoffman & Dunham 2007). Decreasing stream network connectivity is a significant threat which has caused freshwater species, especially diadromous fish in North America, to be listed as either endangered, vulnerable, or extinct (Saunders 2002).

The Atlantic salmon (*Salmo salar)* Inner Bay of Fundy population (IBoF) and the Atlantic salmon Southern Upland population (SU) in Nova Scotia are endangered species potentially threatened by dams (DFO 2010; Gibson 2010). In order to aid in the recovery of these species, connectivity should be maintained in river systems, allowing critical habitat to be accessible. Installing a barrier without providing adequate fish passage will result in the permanent loss of access to upstream habitat.

Until 2011, limited knowledge existed regarding general information on dams along river systems within Nova Scotia such as; where the dams are located, what parts of Nova Scotia are most affected by dams, how many dams are there in Nova Scotia, when were they constructed, how many dams contain fish passage technology, and how much critical upstream habitat has been lost. This knowledge is critical as recovery efforts in a greater number of rivers are becoming increasingly important for long term fish population self-sustainability.

1.2 Research Problem

My research questions are:

1) "To what extent has aquatic habitat been lost due to artificial water control barriers,
2) when did this aquatic habitat loss occur, and
3) if given what I have learned about the locations and dates of dam installations, are existent fish population data sufficient to assess the impacts of dams on the IBoF and

SU Atlantic salmon populations in Nova Scotia?

There are three related hypotheses:

1) the construction of dams has led to a reduction of 1/3 of the habitat for fish species in Nova Scotia,
2) the largest aquatic habitat loss occurred between 1920 to 1930, and
3) existent data regarding fish populations will not be sufficient to assess the impacts of dams on the IBoF and SU Atlantic salmon populations in Nova Scotia.

To achieve the goal of exploring the impacts of dams on fish habitat and to address these research questions, there are three related objectives. The primary objective of this research is to determine the spatial distribution of dams throughout Nova Scotia. The second objective is to calculate the extent of aquatic habitat loss upstream due to dam construction inthe SU and IBoF regions from 1800-2010. The third objective is to examine patterns between any observed SU and IBoF Atlantic salmon population declines and dam construction.

It is my goal that this research will be able to help fill in essential information gaps pertaining to dams in freshwater ecosystems and contribute to the body of knowledge that exists regarding endangered aquatic species and their freshwater habitats in Nova Scotia.

1.3 Scope

Examining the extent of aquatic habitat loss upstream due to dams and when it occurred will be limited to the SU region and the IBoF region of Nova Scotia, mainly due to time constraints and because these two regions contain endangered Atlantic salmon populations that depend on freshwater habitats which may be threatened by dam construction (DFO 2010; Gibson 2010). Artificial water control barriers will also be limited to solely examining dams, due to available database. Upstream river or stream length from each dam that is considered inaccessible to fish (no fish passage technology) is deemed as upstream habitat loss for the purpose of this study. Examining habitat suitability upstream from each dam site is beyond the scope of this research, therefore, results are preliminary and conservative.

2.0 Literature Review

Freshwater ecosystems have received less attention and support in conservation efforts compared to adjacent terrestrial or marine ecosystems, despite the fact that freshwater ecosystems contain a large extent of the world’s global biodiversity and are exposed to higher pressures and threats from human impacts (Hermoso et al. 2011).

Habitat fragmentation is one of the most serious ecological concerns imposed on riverine environments (Raeymaekers et al. 2009). The cumulative construction of dams worldwide continues to increase and has led to extensive fragmentation of river systems (Lucas et al. 2009). Decreased connectivity can prevent or disrupt natural patterns of migration and dispersal between critical habitats especially for diadromous fish species that depend on access between different habitats in order to complete their life cycle (Lucas et al. 2009). Loss of connectivity can result in reduced fitness of organisms and in worst case scenarios can result in population extinction (Blanchet et al. 2010; Lucas et al. 2009).

The principal objective of this literature review is to provide the reader with context of where current literature stands with regards to the research proposed. This section will examine the extent of changes to the hydrological regime which dams impose on riverine systems and the connection of these physical attributes to aquatic habitats and associated biological communities. This review will also examine the connection between dam construction and upstream habitat loss for diadromous species such as, the endangered Inner Bay of Fundy Atlantic salmon population and the Southern Uplands Atlantic salmon population in Nova Scotia, as well as the necessity of this study in addressing information gaps regarding freshwater habitat loss in Nova Scotia due to dam installations.

Literature was located using apriori and aposteriori methods, by searching academic journal databases using various combinations of the phrases "effects of dams on hydrology" and "effects of dams on fish populations and habitats". Cited works in relevant articles were also examined for other relevant articles. Literature was limited to using relevant articles from 1980-2011.

Grey literatureregarding endangered Atlantic salmon populations were found on provincial and federal websites using a snowball method. Only the most recent documents concerning status, habitats, population abundance and distribution, and threats for Atlantic salmon were incorporated.

2.1 Changes to the Hydrological Regime and Physical Habitat of Riverine Systems Imposed by Dams

The alteration of a rivers hydrological regime, due to dam installations, threatens the ecological integrity and sustainability of riverine systems. The physical characteristics, operating rules, and general climatic setting of a dam determines the extent of changes imposed to the hydrological regime (Graf 2006; Burke et al. 2008). A considerable amount of research exists in regards to the hydro-ecological impacts of dams, both upstream and downstream however, an exhaustive review of the literature is beyond the scope of this project.

This section of the literature review will focus on common themes which have appeared through various case studies and model-based research pertaining to the hydro-ecological effects of dams. Common themes include changes to flow, temperature, sediment transport, and connectivity in the unregulated upstream and regulated downstream portions of dams.

2.1.1 Flow Regulation

Flow regimes are fundamental in determining the physical characteristics of a rivers habitat. Spatial and temporal variations in frequency, magnitude, and duration of flows, regulates the shape and size of channels, distribution of riffle and pool habitats, the stability of substrate, and the temperature of riverine systems (Bunn & Arthington 2002; Bednarek 2001). Biological communities are dependant on specific habitat requirements, therefore, alteration of the natural flow regime indirectly affects the distribution and abundance of biodiversity within the river system. Dams physically block the river, store excess water, and release water according to human needs, resulting in altering the natural flow regime of the river, both upstream and downstream (Bednarek 2001).

Studies of altered flow regime downstream due to dams have concluded that; 1) dams reduce flood peaks, 2) dams alter low flow patterns, and 3) dams alter the timing of peak flows (Graf 2006). For example, a study conducted across the Connecticut River watershed in the United States concluded that peak flows declined by 32%, in rivers impacted by dams (Graf 2006). Magilligan and Nislow (2005) also assessed hydrological changes at twenty-one different dam sites across the United States and found that on average the 2-year flow decreased by 60% after dam installation. The greater the deviation in magnitude and frequency of the flow regime from pre disturbance conditions, the greater the expected shift in species composition (Magilligan & Nislow 2005).

2.1.2 Conversion to Lentic Water Bodies and Temperature Changes

The creation of a reservoir through damming turns upstream free flowing rivers (lotic) into slow moving lake like water bodies (lentic). A study on the Colorado River found that dam installations converted one quarter of the river to lentic habitat, which resulted in the loss of fish who are naturally adapted to turbid riverine habitats (Bunn & Arthington 2002). The newly created lentic habitat also accompanied the success of invasive species which have contributed to the extirpation of native fish species in the Colorado River (Bunn & Arthington 2002).

The creation of lake like habitats upstream from dams also alters the natural temperature of the river (Bednarek 2001). For migrating cold water fish such as salmon, warm water temperatures act as thermal barriers to movement (Bednarek 2001). Fish species therefore may be forced to find alternate routes which can lead to decreasing their chance of reaching appropriate spawning grounds (Lucas et al. 2009)

Warmer temperatures upstream of dams can favour invasive fish species populations. For example, the damming of the Peticodiac River in New Brunswick resulted in an increased abundance of non-native species, such as; small mouth bass, due to warm water temperatures facilitating high successful reproduction rates of the species (Locke et al. 2003)

Temperature changes can also occur downstream of dams, if large amounts of water from the stratified reservoir upstream is released. The release can cause cold water with low levels of dissolved oxygen to move downstream (Bednarek 2001; Bunn & Arthington 2002). Oxygen-poor cold water downstream can influence spawning behaviour of some fish species (Bunn &Arthington 2002). For example, cold water releases downstream of dams have been found to delay spawning of some fish species by up to thirty days (Bunn & Arthington 2002).

2.1.3 Altered Sediment Transport

Changes to the natural flow regime can also alter the transportation of sediment which changes the natural physical structure of aquatic habitats. Sediment transport is a key factor in developing a rivers natural structural habitat. Altering sediment transport through dam construction generally causes stream bed deposition upstream of the dam site (Magilligan & Nislow 2005). Reducing suspended sediment and bed load transport also results in increased erosion downstream (Magilligan & Nislow 2005).

Increased erosion downstream of damscan result in a loss of critical habitat used by some fish species for spawning, refuge, and migration. For example, downstream sediment related effects include the loss of riffle pool sequences, collapse of banks, and loss of riparian habitat, which are considered to be critical habitat for the successful completion of some fish specieslife cycles (Lucas et al. 2009).

It is evident through these examples that dams can make profound changes to freshwater habitat and may therefore, indirectly lead to the decline of aquatic species. The following section of the literature review will examine the effects of dam installations experienced by fish species only, with focus on the Inner Bay of Fundy and Southern Uplands Atlantic salmon populations. The focus of dam related impacts on fish species will be limited to examining the impact of lostconnectivity throughout river systems.

2.2 Connectivity

Connectivity is an important component of all aspects in a functioning river. Connectivity is defined as the spatial continuity of a habitat type (Cote et al. 2008). In freshwater ecosystems connectivity can be used to measure and describe longitudinal river network connectivity (Cote et al. 2008). Longitudinal connectivity refers to connections between upstream and downstream sections of a river network (Cote et al. 2008).

Loss of connectivity throughout the river system is one of the most serious effects that dams impose on migrating fish species (Schick & Lindley 2007; Lucas et al. 2009; Blanchet et al. 2010). It is widely referred to as the "barrier effect" (Morita & Yamamoto 2002). The barrier effect is defined as the prevention of migration throughout the freshwater ecosystem (Morita &Yamamoto 2002). The terms migration and movement are used inter-changeably within this review. For the purpose of this review, migration and movement will be used as defined by the Department of Ocean and Fisheries as, the spatial and temporal movement between spawning, feeding, and refuge habitats in response to genetic or environmental stimuli.

Aquatic fish species are impacted by dams as upstream habitats become inaccessible and populations can become isolated or extirpated due to impassibility of dam structure (Blanchet et al. 2010; Lucas et al. 2009). Lack of accessibility or poor connectivity between habitats can potentially lead to population decline as populations that are physically and genetically isolated upstream suffer from decreasing population sizes and inbreeding,this further increases the risk of extinction (Blanchet et al. 2010; Lucas et al. 2009; Raeymaekers et al. 2009).

Riverine ecosystems are considered to be dynamic landscapes, therefore, movement, habitat patchiness, and life stage dependent shifts in critical habitat interact with one another and influence fish populations across the broader ecosystem (Poplar-Jeffers et al. 2009). Movement therefore is an important determinant of how fish species are distributed across the ecosystem and is related to their persistence within the system.

Examples of consequences of dam installations on fish species include, but are not limited to (Hoffman & Dunham 2007): 1) reduction or elimination of the ability for fish to reach upstream habitats; 2) extirpation of populations from upstream habitats; 3) fragmentation and isolation of upstream populations; 4) increased vulnerability to environmental change; 5) prevention of recolonization of disturbed upstream habitats;and 6) population-level genetic impacts. Impediments to migration caused by dams is exceptionally problematic for diadromous fish species as they must make migrations between marine and freshwater habitats in order to complete their life cycle (Cote et al. 2009).

Studies have shown that some declines of diadromous fish species have been attributed to the loss of connectivity from dam construction. For example, addition of large water storage dams to rivers in California's Central Valley resulted in a dramatic decline in the distribution and abundance of spring-run Chinook salmon due to blocked access to spawning habitat (Schick & Lindley 2007). It has also been found thatin the Peticodiac River in New Brunswick, poor upstream passage for migrating fish species was the dominant reason for the decline and eventual extirpation in diadromous stocks (Locke et al. 2003). Another example is the extensive network of dams constructed in the Colombia River Basin, which blocked access to critical spawning habitats for Chinook salmon (Bunn & Arthington 2002). More than 75% of the spawning and rearing habitats that existed prior to dam installations are now eliminated within the Basin (Bunn & Arthington 2002). Decreasing connectivity amongst river systems is potentially a significant threat which may be inhibiting the recovery of endangered fish species in Nova Scotia.

2.3 Atlantic salmon in Nova Scotia

Two endangered Atlantic salmon (*Salmo salar)* populations found in Nova Scotia will be examined within this literature review: 1) Atlantic salmon Inner Bay of Fundy population (IBoF) and 2) Atlantic salmon Southern Uplands populations (SU).

2.3.1 Habitat Range

The IBoF population is an anadromous fish species endemic to the northern temperate hemisphere (DFO 2010). The entire population exists within Eastern Canada, in rivers draining into the Inner Bay of Fundy beginning at Mispec River in New Brunswick to the Pereaux River in Nova Scotia (DFO 2010). The IBoF Atlantic salmon are known to possess distinct genetic traits which are associated with unique and complex life history characteristics (DFO 2010).

The SU population resides throughout the Southern Upland region of Nova Scotia, including all rivers along the Eastern Shore and south-western portion of the province that drain into the Atlantic Ocean (Gibson et al. 2010).

2.3.2 Status

Presently, both the IBoF and the SU populations of Atlantic salmon are at critically low levels and are listed as endangered (COSEWIC 2006; SARA 2011). The SU Atlantic salmon population has been designated as endangered by COSEWIC(Committee on the Status of Endangered Wildlife in Canada) in 2010 (SARA 2011). The IBoF population has been listed as endangered under both COSEWIC and the Species at Risk Act (SARA) since 2001 (COSEWIC 2006).

2.3.3 Threats

The SU and IBoF Atlantic salmon populations suffer from various anthropogenic and natural threats within the marine and freshwater environment. Examples of threats identified in the 2010 recovery strategy report for the IBoF and the review of information for the SU population by the Department of Fisheries and Oceans in 2010include; marine survival, acidification of freshwater, over fishing, and barriers to fish passage (DFO 2010; Gibson et al 2010). The scope of this review is limited to examining barriers to fish passage.

It has been recognized that habitat in spawning rivers of both the SU and IBoF Atlantic salmon populations are threatened by human activities such as; agriculture, urbanization, road building, dam construction, and poor forestry practices (DFO 2010). Decreased smolt production due to habitat degradation has been observed, however, overall impacts on the IBoF and the SU from freshwater habitat degradation has not been quantified (DFO 2010).

Hydroelectric power is known to impact more than 30% of the salmon populations in the Southern Uplands and barriers are known to exist on at least 25 major rivers around the Bay of Fundy (DFO 2010; Gibson et al. 2010). However, overall impact of barriers and consequences of lost connectivity throughout the river system within the SU and IBoF remains largely unknown and is therefore of concern especially within the Southern Uplands as freshwater production is depressed due to acidified freshwater within the region (Gibson et al. 2010). It is acknowledged that barriers alter habitat and change the hydrology of rivers which has no known positive effects on salmon populations, therefore, spawner loss could be substantial and persistence of salmon populations within these regions could be threatened (DFO 2010; Gibson et al. 2010).

The quality and quantity of freshwater habitat will become increasingly important, as it must be able to support increased returns of adult salmon and provide adequate accessible habitat for spawning if recovery progresses (DFO 2010; Gibson et al. 2010). It is evident that barriers to fish passage in fresh water habitats must be identified and prioritized for mitigation in order to ensure that freshwater habitats will not pose a limiting factor for potential recovery of these populations.

2.4 Identification of Literature Gaps

A review of the relevant literature indicates that there is scientific consensus regarding the disruption of ecological integrity caused by dam installations. However, literature pertaining to the recovery of both Atlantic salmon populations reveals extensive gaps in baseline information pertaining to characteristics of barriers to fish passage in Nova Scotia such as; locations of dams across Nova Scotia, what parts of Nova Scotia are most affected by dams, how many dams are there in Nova Scotia, when were they constructed, how many dams contain fish passage technology, and how much critical upstream habitat has been lost.

The IBoF recovery strategy implies that freshwater habitat is currently not limiting the reproductive success and persistence of the IBoF Atlantic salmon population (DFO 2010). However, this remains inconclusive due to lack of research aimed at identifying and evaluating habitat loss due to dam construction and the necessary mitigation measures for addressing it. I have not found any literature pertaining to examining connectivity within freshwater habitats in the SU or the IBoF regions in Nova Scotia, nor to the extent of upstream habitat which is deemed inaccessible to Atlantic salmon populations due to dams. The recovery strategy for IBoF Atlantic salmon acknowledged various knowledge gaps regarding barriers in freshwater habitats (Table 2.0) (DFO 2010).

Table 2.0. List of high priority research and monitoring recommendations developed by the Department of Fisheries and Oceans regarding the recovery strategy of the IBoF Atlantic salmon population. Modified from DFO 2010.

Knowledge Gaps Regarding Barriers in Freshwater Habitats	
Barriers	Collect information on barriers
Barriers	Quantifying restoration potential of various barrier removal and fish passage improvement scenarios and the methodology and technology that would be most effective
Barriers	Develop meta population viability analysis modelling to investigate expected increases in productive capacity and population persistence that would result from removing particular barriers
Barriers	Research impact of barriers on the loss in productivity in adjacent estuarine and coastal habitats and potential impact of those losses on salmon production.

3.0 Methods

3.1 Study Design

Geographic Information System (GIS) (ESRI 2010) was used to integrate existing databases to investigate the; 1) extent of aquatic habitat loss due to dams and 2) occurrence of aquatic habitat loss due to dams.

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3.2 Sources of Data

The objectives of this research are achievable through recent progress of databases which have been made available. The Nova Scotia Water Control Structure Database (NSWCD) was sourced from Nova Scotia Environment, along with associated metadata (NSE 2010) (Appendix A). The NSWCD is considered an ongoing project within Nova Scotia Environment (NSE 2010). The NSWCD was initialized for legal and engineering purposes in regards to maintenance and status of dams across Nova Scotia (NSE 2010).

The NSWCD contains 586 total dam locations. 473 dam locations have assigned coordinates. Only dams with coordinates were used throughout this study. 229 of 473 dam locations do not possess dates of construction. Only dam locations with known dates of construction wereused to temporally analyze length of stream loss overtime within the SU and IBoF regions.

There are several sources of error in the NSWCD. The majority of errors arise primarily from the data collection process. The NSWCD database has been collected over a number of years and has been the responsibility of a variety of people within Nova Scotia Department of Environment. As a result, a variety of data collection techniques was employed. For example some dam locations were verified using Global Positioning Systems (GPS), while others were located using hard copies of maps.

Various errors can occur when using GPS units such as, interference of satellite signals. Employing different data collection techniques compromise the consistency and accuracy of the data.

Stream networkfor the SU region was derived from The Nova Scotia Hydrographic Network (NSHN). Stream network for the IBoF was derived from the Digital Elevation Model (DEM). Both databases for stream networksare from the Nova Scotia Topographic Database created by Service Nova Scotia Municipal Relations in2009. Total stream length for the SU region derived from the NSHN is 32,414 kilometers and from the DEM in the IBoF region is 18,242 kilometers.Calculations for the total stream length used for these two regions excludes lake dimensions. The DEM was used instead of the NSHN to derive the stream network within the IBoF as it resulted in a better resolution, therefore, direction of flow was more accurate. The Nova Scotia Watershed Assessment Project (HSRG2011) provided data for primary watershed and lake boundaries.

Population data for Atlantic salmonin Nova Scotia is limited. Recreational fisheries data does exist however forboth Atlantic salmon populations. Recreational fisheries data is subjected to numerous uncertainties and biases such as unknown or unreported effort or falsified catches.

Recreational fisheries data pertaining to several rivers within the SU and IBoF regions were chosen for the purpose of this research as they provide the longest historic indicator of population trends (Gibson et al. 2010; Gibson et al. 2003). Recreational fisheries data for IBoF and SU Atlantic salmon populations were obtained from the Department of Fisheries and Oceans Canada (Gibson et al. 2010; Gibson et al. 2003). Recreational catch and effort data for the SU population exists from 1983-2007 and from 1954-2002 for the IBoFpopulation.In 2007, a majority of rivers in the SU region were closed and in 2001 IBoF fisheries were closed.

Catch and effort data from the annual recreational salmon fishery for the SU and IBoF regions were collected using a license-stub return program since 1983 (DFO 2010). After the close of the fishing season, stubs are collected from anglers during autumn and winter (DFO 2010). Preliminary estimates of the season's catch and effort are provided the following spring, and estimates are finalized during the next year (DFO 2010).Effort is denoted as rod days which indicates the number of days during which an angler fished for part or all of that day (DFO 2010). Catch is considered to be the number of fish caught (DFO 2010).

3.3 Focus Area

The IBoFand SU regions in Nova Scotia were chosen as the study site for fourreasons (Figure 3.0). First, Nova Scotia is the scale used in available databases and it is the scale for which important new information exists for the NSWCD. Second, both the IBoF and SU Atlantic salmon populations are endangered within Nova Scotia andfreshwater habitat may be inhibiting their recovery.Third, there is limited knowledge regarding the prevalence of dams and the potential for salmonid habitat loss within these two regions in Nova Scotia. Fourth, 410 of the 473 dams that contain coordinates are located within the SU or IBoF regions.

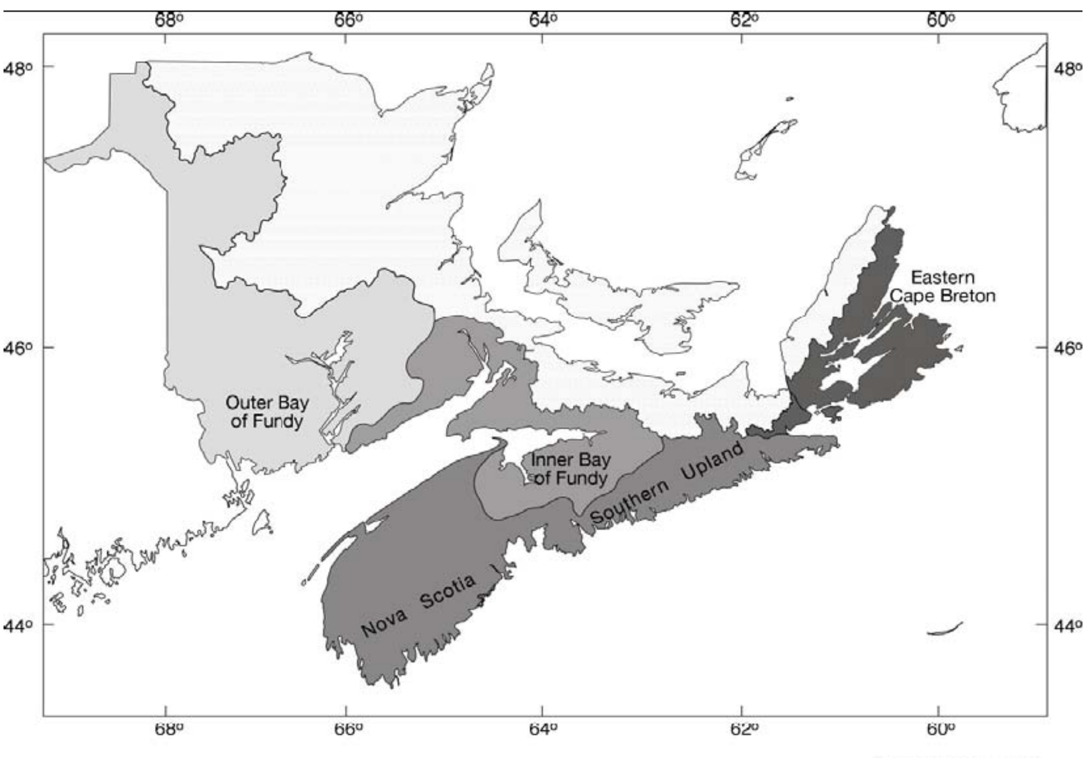

Figure 3.0. Map of Nova Scotia indicating the location of the Atlantic salmon Southern Uplands populations and the Atlantic salmon Inner Bay of Fundy population.Gibson 2010.

The SU region includes all rivers along the eastern shore and the south-western portion of the province that drains into the Atlantic Ocean. The IBoF region includes all rivers draining into the Inner Bay of Fundy beginning at Mispec River in New Brunswick to the Pereaux River in Nova Scotia (DFO 2010).

3.4 Instrumentation and Validity

GIS was used to analyze extent and occurrence of habitat loss. GIS is a valuable tool for examining interactions, patterns, and trends in watersheds, this has been used in a broad array of recent studies. For example, Fukushima et al. 2007 used GIS to quantify fragmented aquatic habitats, which lead to identifying affected fish species and providing spatially explicit predictions of the areas of greatest impact. GIS analysis has also been previously used to calculate the extent of habitat loss due to impoundments, this led to identifying restoration priorities (Poplar-Jeffers et al. 2009).

3.5Procedure

The NSWCD was imported into a geographic information system according to primary function class of the structure, resulting in the creation of a new geo-database. Primary function class defines the primary reason for the structures existence. The categories of the newly created layers can be found in Table 3.0. The newly created layers were then overlaid onto the NSHN layer for the SU region and over the DEM for the IBoF region. A layer displaying primary watershed boundaries of Nova Scotia and a layer illustrating boundaries of lakes in Nova Scotia were then overlaid onto the existing layers.

Table 3.0. Description of newly created layers into a geo-database from the NSWCD, based on primary function class of structure.

Layer number in geo-database	Primary Function Class
Layer 1	Aboiteaux/ Flood reduction structure
Layer 2	Decommissioned
Layer 3	Fish ladder
Layer 4	Mine tailings management
Layer 5	Navigation aid
Layer 6	Water impoundment/Storage

A snap model was created in order to improve accuracy and create consistency amongst the NSWCD and the NSHN and DEM layers. The snap model was able to move the location of dams to the nearest point on the associated river or stream(Horne 2011). The densify command in ArcGIS toolbox was first used inthe model. The densify tool allows vertices to be created within the river/stream line file. This allowed the water control structure point files to join to the line file. The multiple ring buffer tool was then used in the model. This tool creates a new feature class of buffer features using a set of buffer distances. In this model the buffer distance was chosen to be fifty meters around the original location of the dam. Each ring represents increments of five meters. Creating the multiple buffer ring, allows for determining the accuracy of the dam location to the water line. If the dam's location was greater than fifty meters from the stream/river location, it was deemed inaccurate therefore it was not snapped to the stream/river file and was omitted from the study. The snaptool was then used which allows movement of a point file to the nearest line file. The snap tool moved the location of each dam to the closest vertex on the NSHN and DEM files (Figure 3.1).

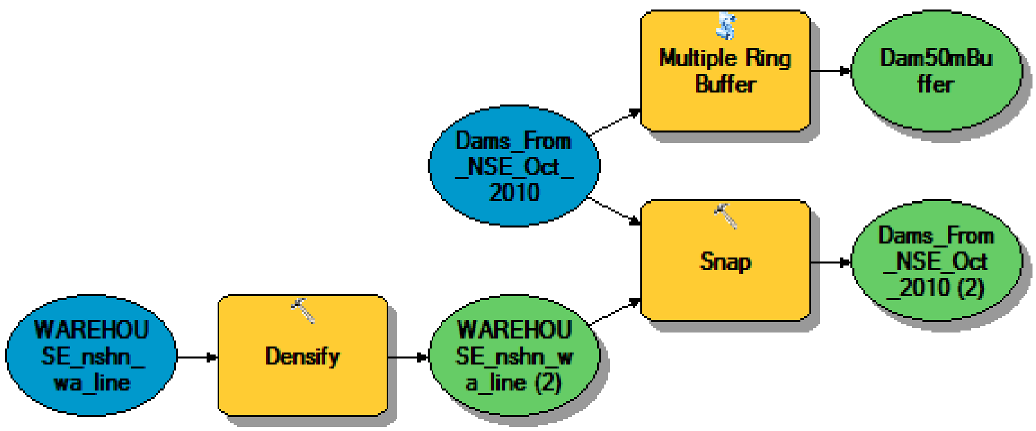

Figure 3.1. Flow chart representing snap model

Network analyst was used in order to calculate upstream river or stream length from each dam site. Network analyst is an extension of ArcGIS that allows conduction of network-based spatial analysis. Network analyst was first used to determine direction of water flow within the NSHN and the DEM. Once flow direction was set, the trace task tool in network analyst was used. This tracing option allows for upstream accumulation to be chosen and calculated from each dam location (Figure 3.2).

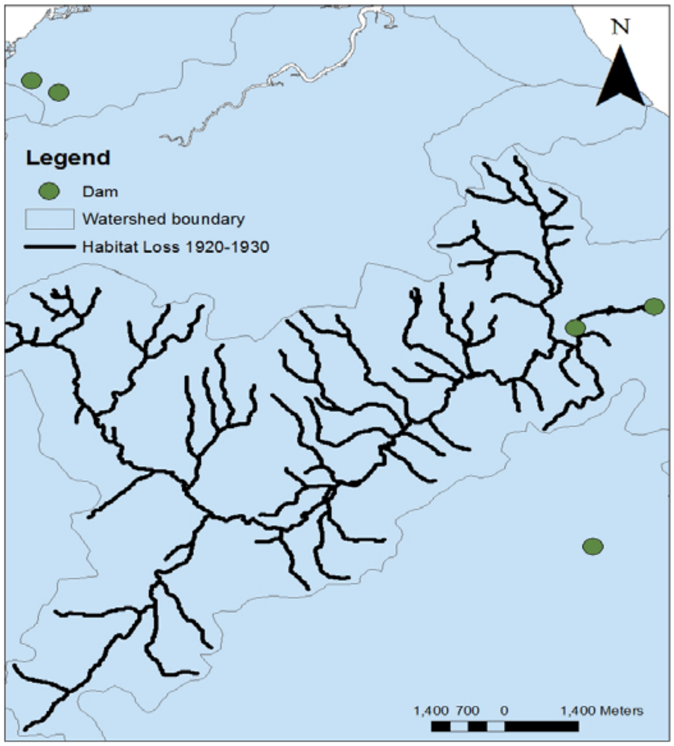

Figure 3.2 Example of method used to calculate upstream length from dam locations.

Calculation of blocked stream length upstream from dam locations in the SU and IBoF is considered conservative, as assumptions were made in order to maintain consistencyand to avoid over representation of aquatic habitat loss in Nova Scotia due to dam construction. Assumptions made are as follows:

1. Fish passages assumed to be in adequate working condition, therefore no upstream loss was calculated
2. If more than one possible accessible route upstream was present at a dam site, no upstream loss was calculated.
3. No habitat loss was calculated at sites where it was indicated that the dam had been breached.
4. Lake dimensions were removed from upstream calculations as only streams and rivers are considered critical habitat for Atlantic salmon in Nova Scotia(Gibson et al 2010).

5. Dams in which year of construction were unavailable were included in total upstream loss but were omitted for temporal analysis.

3.6 Analysis

Once the occurrence and presence of dams and upstream lengthwas mapped in ArcGIS, the extent of aquatic habitat loss and the relationship between aquatic habitat loss and changes in Atlantic salmonpopulations in the SU and IBoF regionof Nova Scotia were determined.

3.6.1 Extent of Aquatic Habitat Loss

The total combined length of stream loss per decade from 1800-2010 was calculated using GIS summary statistics for the SU region and IBoF region. Upstream lengths from dams with no associated year of construction were also summed.

3.6.2 Atlantic SalmonPopulation Data

Catch per unit effort was calculated using recreational fisheries data provided from DFO for the IBoF Atlantic salmon population (1954-2002) and for the SU Atlantic salmon population (1983-2007). Catch per unit effort was calculated as follows:

Equation 1: *Catch per unit effort= Catch + Retained / Effort* (rod days).

Catch per unit effort was summed from all rivers in order to define an overall trend. Indicator rivers and rivers containing a large amount of dams were assessed individually in order to determine if total catch per unit effort is representative of all rivers.

3.6.3 Characteristics of Dams in Nova Scotia

In order to increase general knowledge concerning barriers in freshwater ecosystems in Nova Scotia, the metadata was used to summarize characteristics of dams. Relevant parameters which wereused include: year of construction, primary function of structure,and existence of fish passage.

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3.7 Limitations and Delimitations

Time was the main limitation experienced throughout this project, hindering both the scope and depth of research (Appendix B). In order to ensure that the study wasadequately addressed, within the given time frame, the study focusedspecifically on aquatic habitat loss due to the implementation of dams in SU and IBoF regions. Two Atlantic salmon endangered aquatic species were the focus of this study, however, results from this study may be valuable for research regarding other endangered aquatic species in Nova Scotia. Limitations also exist in light of the willingness and availability of information and databases that can be provided by individuals from the government, concerning Atlantic salmon populations.

4.0 Results

4.1 Characteristics of dams in Nova Scotia

The NSWCD contains a total of 586 dams as of September, 2010.410 of the 473 dams that contain coordinates are within the SU and IBoF regions. A total of 279 dams exist in the SU and 131 in the IBoF. The majority of dams that did not contain associated coordinates (76 of 111) are located within the Cumberland County, Colchester County, and Hants County, which are within the IBoF boundaries and twenty dams are within the SU region. Eleven dams without coordinates are located in Cape Breton.

Evidence shows that a large proportion of dams in the SU are concentrated in the Mersey and Annapolis watersheds. The Gaspereau and St. Croix watersheds within the IBoF also contain a large concentration of dams. Figure 4.0 illustrates the spatial distribution of dams throughout Nova Scotia with coordinates and subsequent stream loss for dams located within the SU and IBoF regions.

Eighty-four of the 586 dams across the province were found to possess fish passage technologies. No information is available on working condition of fish passages. The most common primary function of dams with coordinates built in Nova Scotia is forwater impoundment (78%) which, are primarily used for hydropower production (21%).Other common primary functions of dams include agricultural, water supply, wildlife conservation, aquatic recreational enhancement, and municipal water supply.

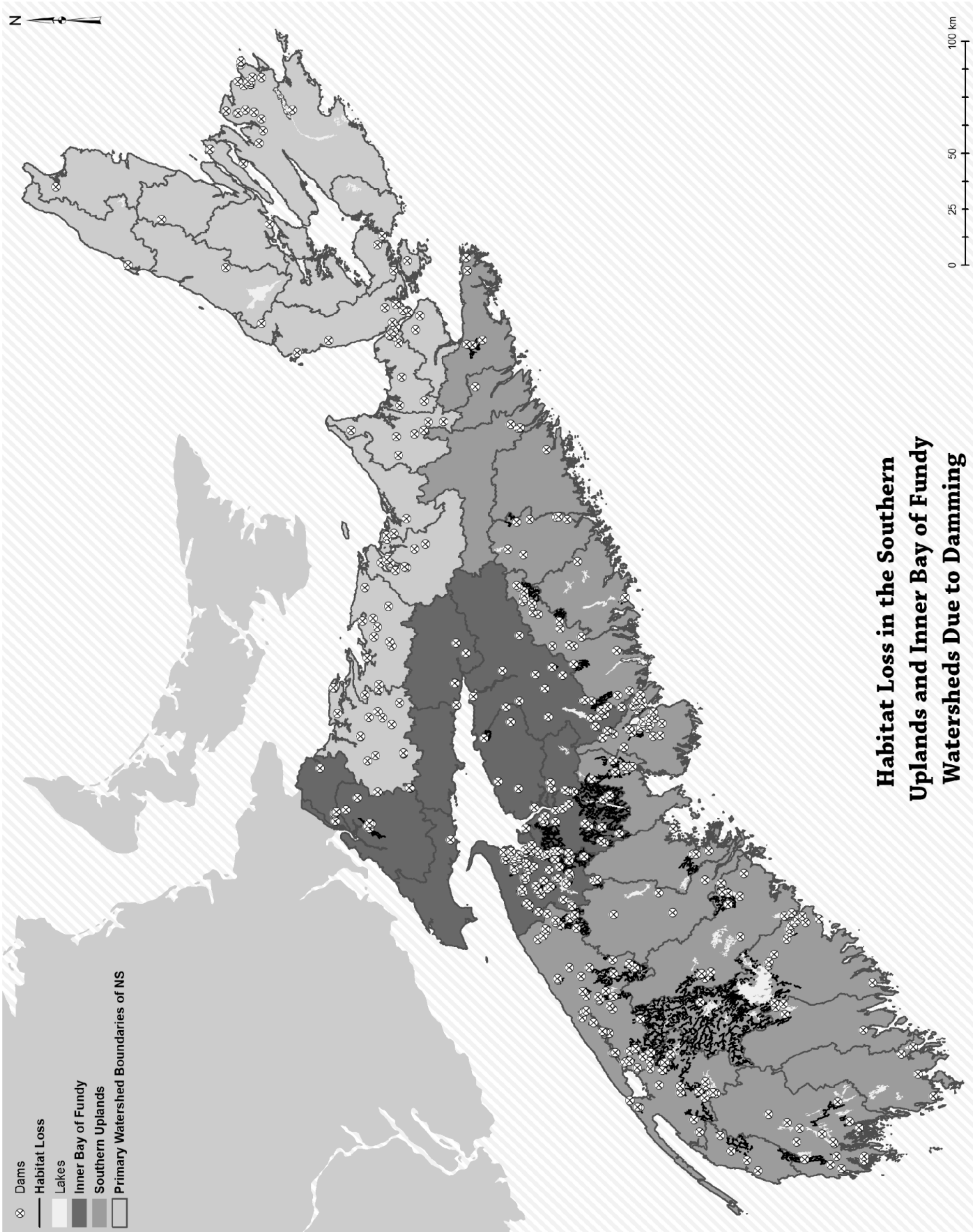

Figure 4.0. Spatial distribution of dams in Nova Scotia and habitat loss in the SU and IBoF watersheds from damming.

4.2 Associated Stream Loss

Total length of accessible streams for potential salmonid habitat in the SU region was found to be32,414 km. Findings indicate that 3,008 km of stream length has beenpotentially lost from 1800-2000,which is equivalent to approximately 9.28% of total stream length of the SU region (Table 4.0). The most extensive loss occurred from 1920-1930, with 47 dams constructed, resulting in a loss of 1, 564 km of stream length. This decade alone accounts for approximately 52% of total loss.

The total length of stream in the Inner Bay of Fundy was found to be 18, 242km. Findings indicate that 1,299 km of stream length has been potentially lost from 1850-2010, which is equivalent to approximately 7.1% of total stream length (Table 4.0). The largest amount of loss occurred from 1930-1940, in which eight dams were constructed, resulting in 585 km of stream length being lost.

Table 4.0. Total length of accessible streams for potential salmonid habitat lost due to dam construction in the SU and IBoF from 1800-2010.

	Number of dams constructed		Length of upstream loss	
Year of Construction	SU	IBoF	SU	IBoF
1800-1810	1	0	32	0
1810-1820	0	0	0	0
1820-1830	0	0	0	0
1830-1840	1	0	4	0
1840-1850	0	0	0	0
1850-1860	3	3	1	0
1860-1870	0	0	0	0
1870-1880	0	0	0	0
1880-1890	0	0	0	0
1890-1900	2	0	2	0
1900-1910	7	1	88	33
1910-1920	0	0	0	0
1920-1930	47	3	1564	290
1930-1940	7	8	19	585
1940-1950	13	7	131	15
1950-1960	19	2	303	2
1960-1970	9	3	39	0
1970-1980	25	6	252	18
1980-1990	43	18	89	43
1990-2000	7	7	46	31
2000-2010	0	5	0	9
Unknown	95	68	438	273
TOTAL	279	131	3008 (9.3%)	1299 (7.1%)
Total Stream Length			32414	18242

4.3Sufficiency of Fish Data

Decreasing trends in recreational fisheries catch and effort data is evident from 1983-2007 for the SU Atlantic salmon population (Appendix C). Figure 4.2 illustrates the relationship between cumulative habitat loss and catch per unit effort for the SU Atlantic salmon.Total catch per unit effort from 1983-1990 ranges from values of 8-12. From 1990-2000, total catch per unit effort decreases with the exception of a peak in 1996. In 1997 total catch per unit effort continues to decline again to

8.4 and decreases furthermore to 4.79 in 1998. In 2000, total catch per unit effort is reduced to 1.7.

The overall trend in catch per unit effort data within the SU does not represent each river individually. For example different trends were found in the St. Mary's River and the LaHave River which are indexrivers for the SU Atlantic salmon population and are minimally impacted by dam construction. Both of the index rivers exhibit increase overtime in catch per unit effort. The maximum catch per unit effort value for the St. Mary's River is 0.9 in 1996 and the LaHave River maximum catch per unit effort value is 0.6 in 2002 (Appendix C). In contrast, the Mersey River is heavily impacted by dams andexhibits a decreasing trend since 1983. The Mersey maximum value in catch per unit effort occurred in 1999 was 0.2.

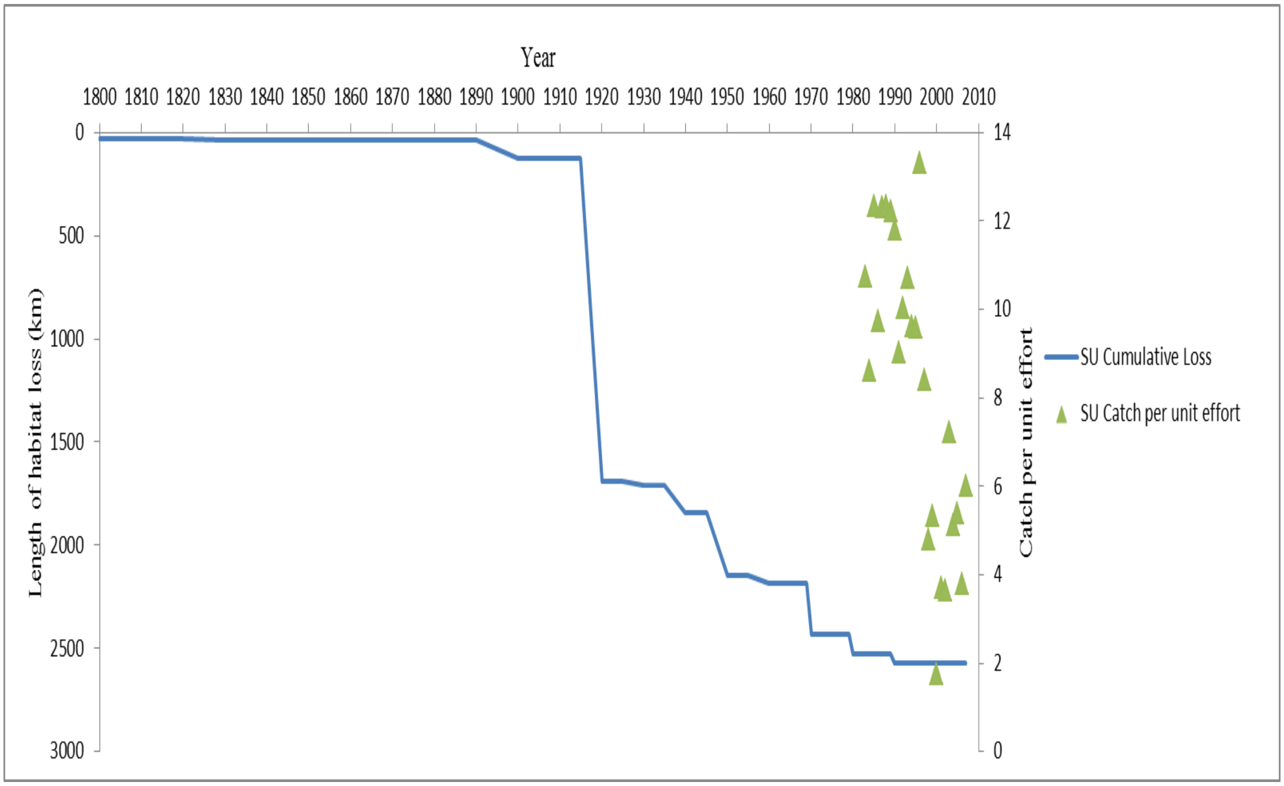

Figure 4.1. Length of cumulative habitat loss (km) from 1800-2000 and total catch per unit effort data for the SU Atlantic salmon populations from 1983-2007.

A declining trend in total catch per unit effort is evident for the IBoFAtlantic salmon population from 1954-2010, based upon recreational fisheries data (Appendix D). Figure 4.2.b shows the relationship between cumulative habitat loss in the IBoF region and catch per unit effort for IBoF Atlantic salmon.No catch or effort was recorded until 1960. Total catch per unit effort from 1960 to 1964 for the IBoF Atlantic salmon population was low with values ranging from 0.006 to 0.08. The early 1960’s trend is evident in some individual rivers such as the Stewiacke River, which is the index river within Nova Scotia for the IBoF Atlantic salmon. This river is not impacted by habitat loss caused by dams. However, rivers which are impacted by dams such as the Gaspereau River possess larger catch per unit effort values for this time period 0.1-0.22 (Appendix D). Some rivers such as the Economy Riverdoes not contain data for this time period. A general peak occurs in the majority of rivers from 1960-1970. Exact time of peak differs within rivers. For example, in the Stewiacke River this occurs in 1965 with a value of approximately 1.5 and in the Gaspereau River this occurs in 1961 with a value of approximately 0.2. A general decreasing trend occurs from 1970-1990overall in the IBoF region. This trend is evident in the Stewiacke River however, within the GaspereauRiver values remain relatively constant overtime until 1990. Values do not exist for any rivers after 1999 as the fishery closed.

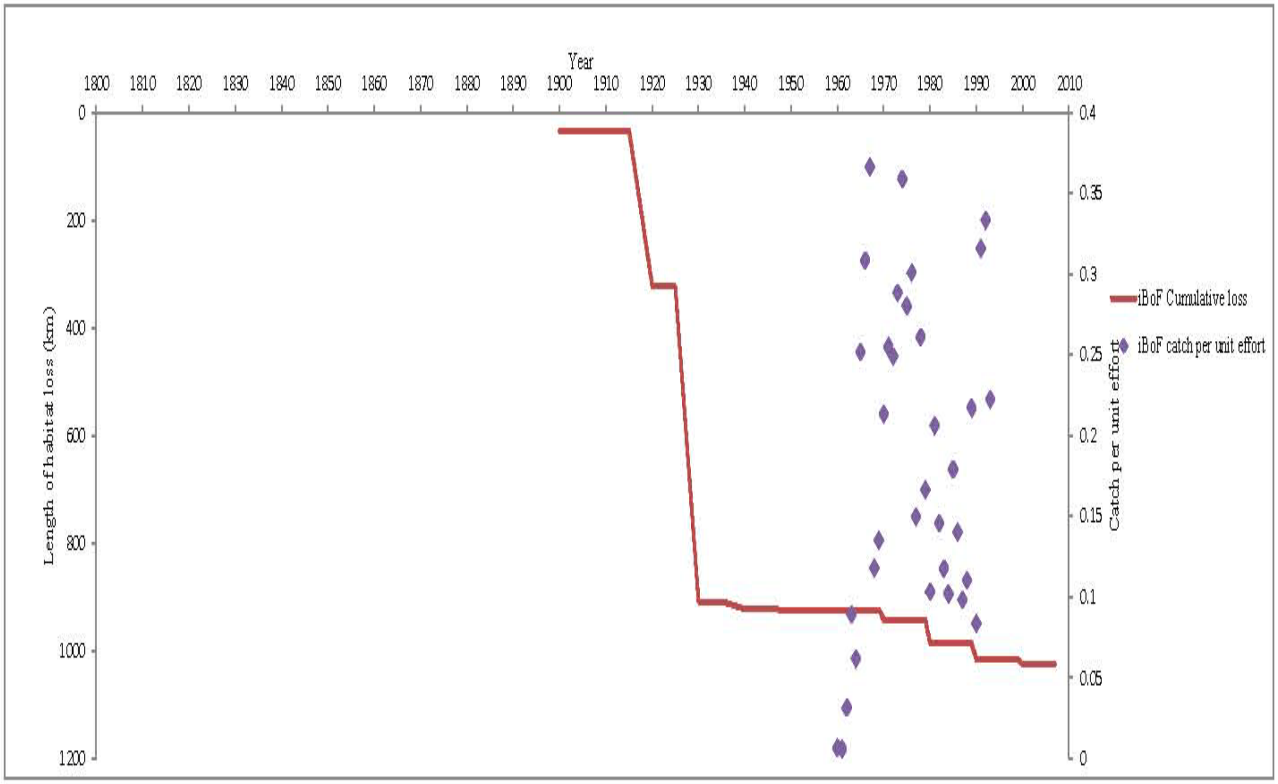

Figure 4.2. Length of cumulative habitat loss (km) from 1850-2010 and total catch per unit effort data for the IBoF Atlantic salmon population from 1954-2010.

4.4Data Limitations

Data limitations exist within the recreational fisheries data for the IBoF and SU Atlantic salmon in Nova Scotia. Data is non-existent prior to 1954 for the IBoF population or prior to 1983 for the SU population. No effort has been documented after year 2000 as fisheries were closed. A total of 54 rivers were monitored within the SU region and 46 rivers within the IBoF region, however, data does not exist every year for each river as rivers were closed to fisheries at various times. Limitations therefore arise when assessing correlation and causation of decline and the current status of Atlantic salmon.

Quality of data is questionable as various biases are associated with recreational fisheries data as described in section 3.2.

5.0 Discussion

5.1 Spatial Occurrence of Dams in Nova Scotia

Results of this research allowed for the identification of the presence and patterns of dam occurrence, purpose, and extent in Nova Scotia, due to the recent development of the NSWCD. The NSWCD is an on-going project, therefore, the total amount of dams across Nova Scotia is yet to be determined. No national inventory of dams for Canada exists (Environment Canada 2008). Development of a dam inventory for each province across Canada such as the NSWCD would greatly benefit management and protection implications regarding freshwater aquatic habitat across Canada

Results of presence and patterns of dam occurrence within the SU and IBoF can be assumed to be underestimated for two reasons;1) the database is incomplete,and 2) only 473 dams contained coordinates, the remaining amount of dams could not be analyzed.

Results of this research illustrating the spatial occurrence of dams throughout Nova Scotia could be used to target rivers or watersheds containing extensive dam construction for restoration via implementation of fish passage or dam removal. For example, results clearly indicate that the Southern

Uplands region is highly impacted by dam construction, especially in the Mersey River and the Annapolis River. Intense dam construction in these rivers may be resulting in subjecting negative impacts on already depressed Atlantic salmon populations, therefore, these regions should be targeted for the rehabilitation of river connectivity.

5.2 Implications for Endangered Salmon Populations

Correlation between salmon population data and cumulative habitat loss overtime within the SU and IBoF regions remain inconclusive as catch and effort data only extends into the 1950s and therefore cannot capture the effect of the 1920-1940 extensive dam construction and subsequent habitat loss. However, evidence shows that dams have impacted an extensive amount of freshwater habitat in Nova Scotia which should not be considered negligible.

Currently, freshwater habitat is not considered to be limiting the recovery of both the endangered SU and IBoF salmon populations (Gibson 2010; DFO 2010).However, results of this study suggest that the loss of connectivity amongstcritical habitatsin freshwater ecosystems may be a limiting factor in Atlantic salmon recovery as a large extent of upstream habitat is potentially inaccessible to salmon. Research has shown that inaccessibility to upstream habitats has led to extirpation of species and may lead to eventual extinction (Cote et al. 2009; Schick & Lindley 2007).

Therefore, loss of spatial connectivity throughout freshwater habitats should be acknowledged as a serious threat to the recovery for salmon populations, especially within the SU region as freshwater habitat is already depressed.

5.3Indicator Rivers

Results show that indicator rivers which are used to analyze population abundances, distributions, and trends (St. Mary's River, LaHave River, and the Stewiacke River) for both the SU and IBoF Atlantic salmon populations are minimally impacted by dams or not at all. Results also indicate thatcatch per unit effortinindicatorrivers vary considerably from rivers which are heavily impacted by dams such as the Mersey Riverand the Gaspereau River.Therefore, indicator rivers are not representative of all rivers within the region.

Due to the misrepresentation of the rivers within both regions, current indicator rivers may be providing inaccurate results regardingAtlantic salmon population dynamics throughout the ecosystem, which could lead to ill-informed management decisions and restoration action.Rivers which are impacted from dam construction should be assessed similarly as current indicator rivers are which includes being regularly electro-fished. Implementing monitoring of rivers impacted by dams may gain insight intoif there are any outstanding differences insalmon population dynamicsin rivers which are impacted by dams and those that are not and to would aid in developing a better representation of all the rivers within the region. This information may lead to improved management and conservation policies regarding endangered Atlantic salmon populations.

5.4 Restoration Implications

The recent progress of the NSWCD has led to valuable findings regarding the extent and occurrence of dam construction and associated habitat loss within Nova Scotia. This study shows irrefutably that habitat loss due to dam construction within Nova Scotia is not negligible, therefore, an opportunity exist throughout the SU and IBoF regions to restore connectivity in endangered Atlantic salmon freshwater habitat.

Various research has concluded that the loss in spatial connectivity amongst riverine systems has been a primary determinant in the extirpation and extinction of fish species, therefore, restoring connectivity amongst riverine system should be of high priority for restoration opportunities (Locke et al. 2003;Bunn & Arthington 2002; Schick & Lindley 2007).

As the NSWCD has led to identifying barriers to fish passage in freshwater habitats and subsequent habitat loss in the SU and IBoF, areas can be prioritized for mitigation in order to ensure that freshwater habitat will not pose a limiting factor for the potential recovery of Atlantic salmon populations.Restoration efforts should be focused on improving salmon migrationthroughout freshwater habitats which may result in re-colonization of previously disturbed upstream habitats.

Decreasing trends in recreational fisheries catch and effort data and decline in recruitment is wide ranging despite closures of fisheries are is considered to be due to low marine survival and acidification of freshwater habitats (Marshall et al. 2005; DFO 2009). Acidification, especially in the SU has been intensely studied and it is well documented that acid rain has substantially reduced the capacity of rivers to contain salmon populations (DFO 2009). For example, twenty rivers have lost 90% of their past known Atlantic salmon populations and thirty rivers contain populations classified as threatened (Figure 5.0) (ASF 2011). Acid rain has also killed fish populations within fourteen rivers throughout the SU (ASF 2011). Loss of connectivity amongst habitats overtime due to dam construction may have increased vulnerability of fish species to acidified waters.

It has been estimated that extirpations of Atlantic salmon populations are likely to occur in 85% of rivers within the SU alone in the near future due expected ecological regime shifts in temperatures, predators, and chemical impacts (Marshall et al. 2005). As of 2000, approximately 50% of salmon populations have already been extirpated from rivers within the SU and the numbers of vulnerable populations are increasing (Marshall et al. 2005). Therefore, it is evident that the magnitude of cumulative effects throughout freshwater habitats is potentially inhibiting the recovery of Atlantic salmon.

An opportunity also exists to correlate findingsfrom this researchwith established acid rain data in order to prioritize areas of restoration highly impacted by multiple stressors which may significantly help in rehabilitating sustainable populations. For example, results from this study have shown that the Mersey, Meteghan, and the Sissiboo/Bear watersheds within the SU areheavily impacted by dam construction. Past research has concluded that these watershedsare also impacted by acidification of freshwater, therefore they should be prioritized for restoration via dam removal, fish way implementation, and liming.

Restoring areas highly affected by multiple stressors could lead to successfully increasing quality and quantity of freshwater habitat available to Atlantic salmon. Restoration efforts focusing on areas impacted by multiple stressors would likely be effective in promoting recovery of endangered species populations.

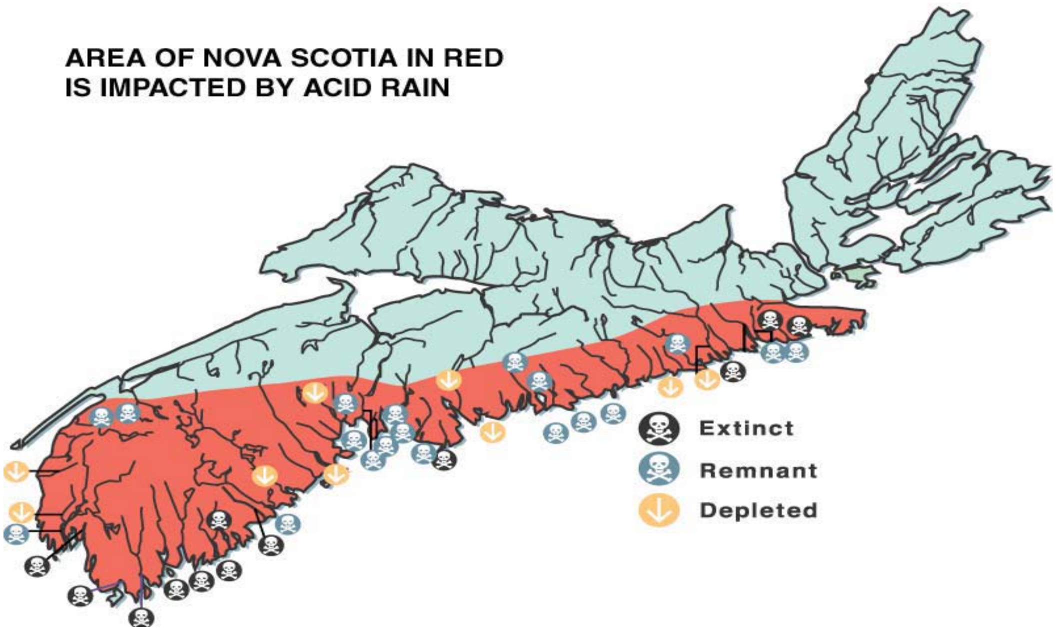

Figure 5.0. Areas of acidified freshwater within Nova Scotia and subsequent consequences for Atlantic salmon populations. ASF 2011.

5.5 Implication of Assumptions and Limitations

As previously mentioned various assumptions and limitations were made and placed upon the research in order to maintain consistency, accuracy, and in order to avoid portraying an unrealistic representation of habitat loss in Nova Scotia due to dams. Implications of the assumptions and limitations produced conservative results (Section 3.5). Amount of dams and subsequent habitat loss in Nova Scotia can therefore be estimated to be of a larger degree than what is portrayed throughout this research. However, this research does result in a justifiable representation using current available information for the province and can be considered as a baseline study for future research regarding loss of connectivity due to dam construction within the SU and IBoF regions of Nova Scotia.

5.6Conclusions and Future Work

The recent progress of the NSWCD has led to valuable findings regarding the extent and occurrence of dam construction and associated habitat loss within Nova Scotia. Results indicate that dams have caused a widespread upstream loss of freshwater habitat in Nova Scotia however fish population data do not exist to examine the direct impact of dam construction on the IBoF and SU Atlantic salmon populations in Nova Scotia. Because of the large extent of rivers behind dams, this research suggests that dam construction and subsequent lost connectivity amongst river systems may have contributed to the decrease of Atlantic salmon populations or may be currently inhibiting recovery of salmon stocks in Nova Scotia. This study shows irrefutably that habitat loss due to dam construction within Nova Scotia is not negligible, therefore, restoration actions should be taken to re-establish connectivity amongst river systems in order to ensure that the quality and quantity of freshwater habitat does not limit recovery of endangered Atlantic salmon populations in Nova Scotia.

The estimated habitat loss within the SU and IBoF regions is conservative for a variety of reasons (Section 3.5), it is therefore likely that the degree of actual habitat loss is much larger than the results presented in this study. Due to the conservative results of this study there is a need for further investigation regarding “worst case scenario” of habitat loss from dams within Nova Scotia and the subsequent implications for endangered species populations, as it may be a contributing factor inhibiting recovery of such populations. The extent of freshwater habitat which has transformed from lotic water-bodies to lentic water-bodies due to dam construction could also be analyzed as this has important implications for native and non-native species within freshwater ecosystems.

A tangible outcome of this research is a map indicating locations of dams in Nova Scotia and associated habitat loss from dams within the SU and IBoF. The model used throughout this research could be replicated for the remaining portion of the province allowing for areas of extensive habitat loss from dams to be identified and thus potentially improve conserving and re-establishing biodiversity within riverine systems throughout Nova Scotia.

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8.0 Appendices

Appendix A

Attached as a pdf document.

Appendix B

Table B.1. Gantt chart, timeline for thesis.

Objectives and Tasks	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Thesis Proposal							
Calculate extent of aquatic habitat loss							
Spatial comparisons between habitat loss and endangered species							
Temporal examination of patterns between fish population declines and dam construction							
Results							
Discussion							
Draft Thesis Due							
Final Thesis Due							
Prepare for presentation/poster							
Thesis Fair and HQE							
Maintain records of inaccuracies in databases							

Appendix C

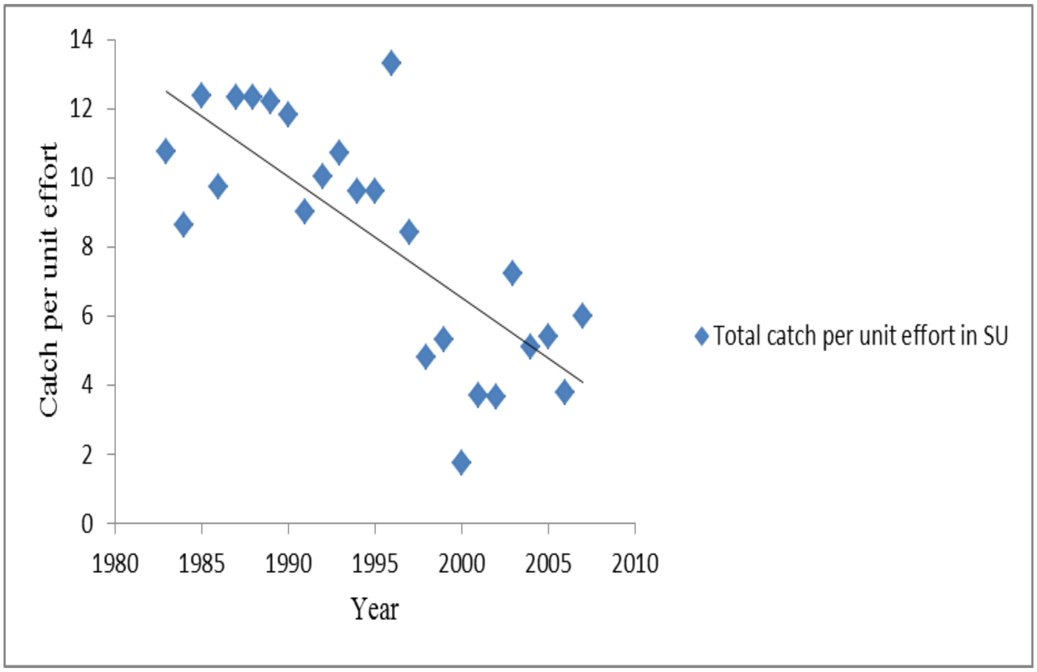

Figure C.1. Total catch per unit effort of rivers in the SU region from 1983-2007.

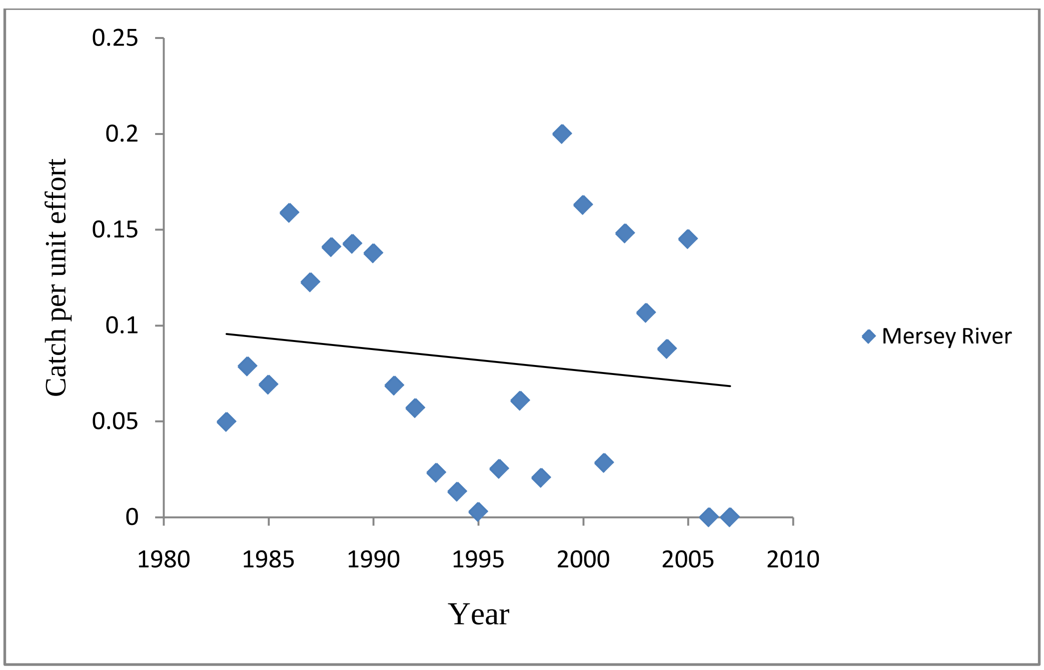

Figure C.2. Catch per unit effort in the Mersey River from 19983-2007.

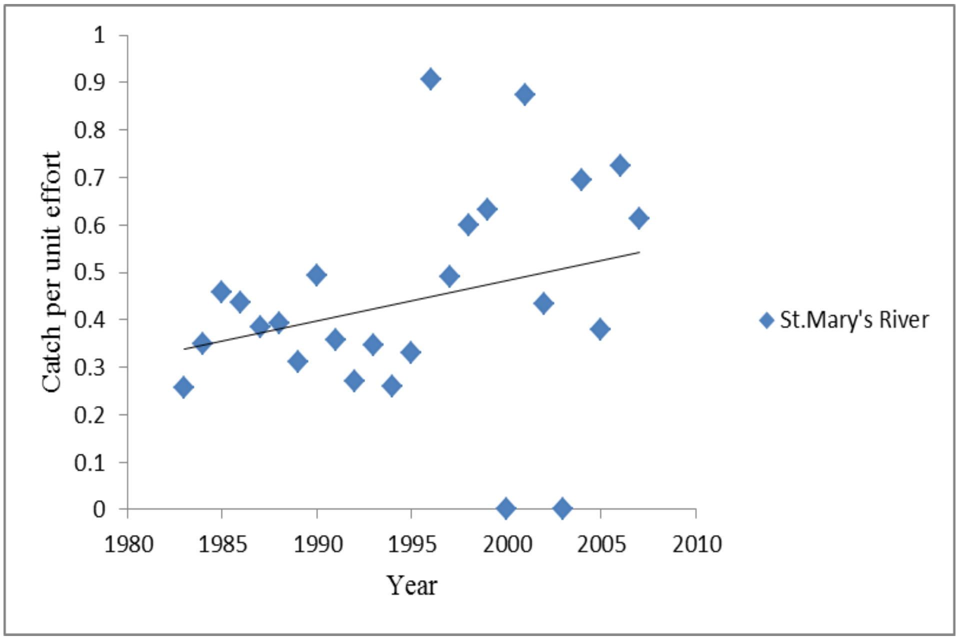

Figure C.3. Catch per unit effort in the St. Mary’s Rivers from 1983-2007.

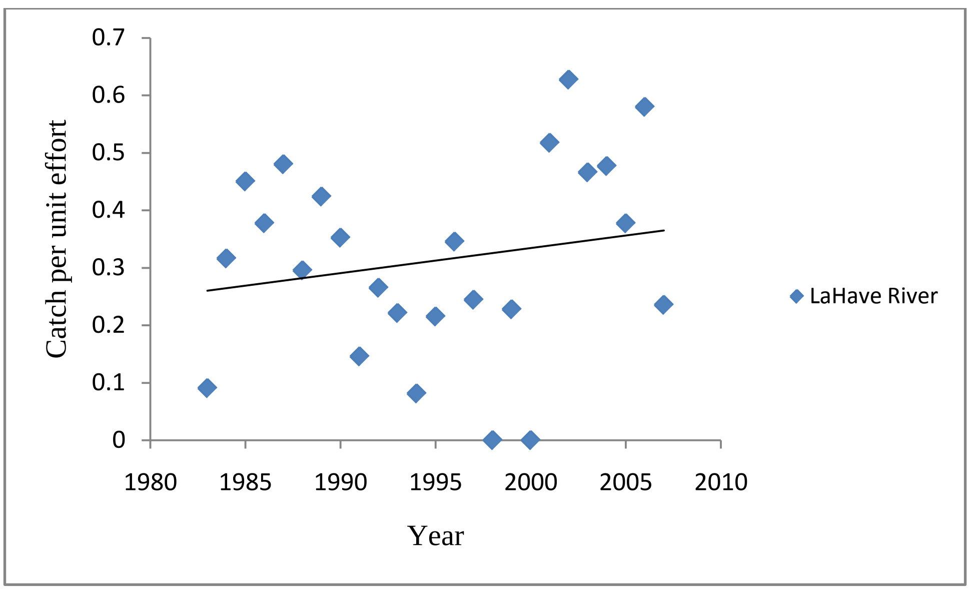

Figure C.4. Catch per unit effort in the LaHave River from 1983-2007.

Appendix D

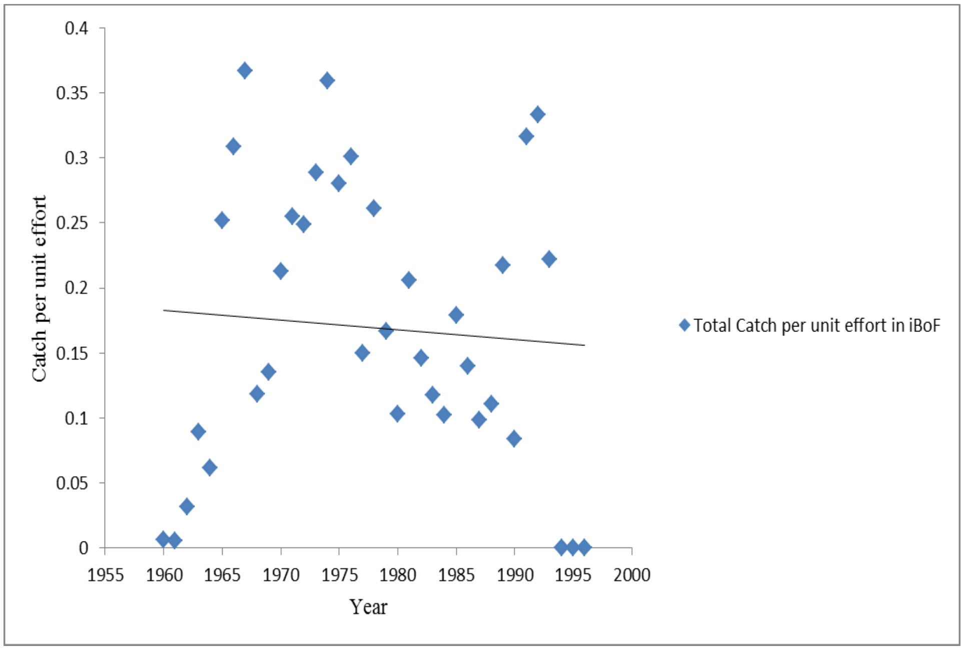

Figure D.1. Total catch per unit effort of all rivers in the IBoF region from 1960-1999.

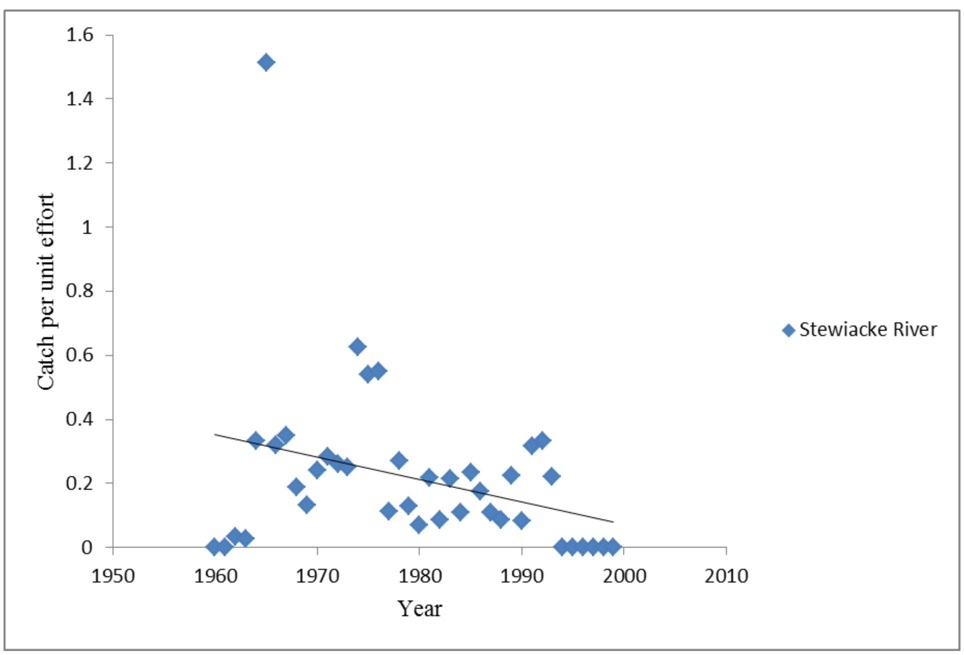

Figure D.2. Catch per unit effort in the Stewiacke River from 1960-1999.

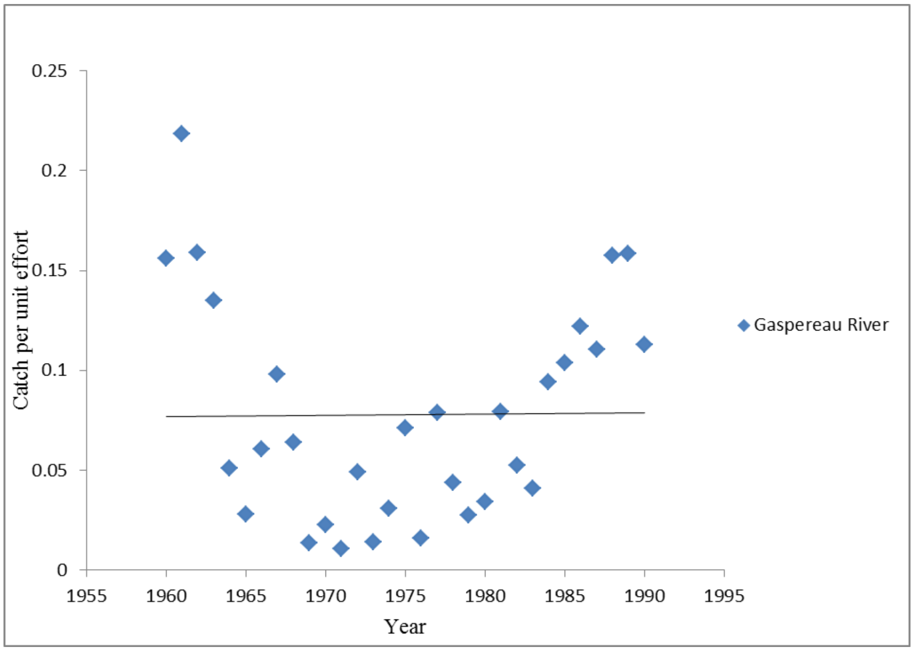

Figure D.3. Catch per unit effort in the Gaspereau River from 1960-1999.

Table A.1. Summary of Water Structure Characteristics From the Nova Scotia Water Control Structure Database

Dam ID Number	Year Constructed	Name of Structure	County	Easting	Northing	UTMGZ	Primary function of dam	Main purpose of dam	Fish Passage
1	Late 1980's	Bayers Brook Diversion Dam	Halifax	447791	4942420	20T	Water impoundment/storage	Water supply - municipal	FALSE
2	1894	Chain Lake Dam	Halifax	449381	4943011	20T	Water impoundment/storage	Water supply - municipal	FALSE
3	1988	Susie Lake Control Structure	Halifax	446257	4943568	20T	Aboiteau or other flood reduction structure	N/A	FALSE
4	1987	Volvo West Retention Pond Structure	Halifax	447497	4943163	20T	Aboiteau or other flood reduction structure	N/A	FALSE
5	1848	Long Lake Provincial Park Dam	Halifax	450662	4940427	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
6		Paper Mill Lake Dam	Halifax	445822	4951475	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
7	circa 1990	Springfield Lake Dam	Halifax	441956	4962804	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
8		Soldier Lake Dam	Halifax	454203	4963129	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
9		Lamont Lake Pumping Station	Halifax	458740	4948310	20T	Water impoundment/storage	Water supply - municipal	FALSE
10	circa 1987	Russell Lake Control Structure	Halifax	458666	4946139	20T	Aboiteau or other flood reduction structure	N/A	FALSE
11		Sullivans Pond Flood Control Structure	Halifax	455349	4946630	20T	Aboiteau or other flood reduction structure	N/A	FALSE
12		Shubenacadie Canal Lock 1 at Lake Banook	Halifax	455408	4946975	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
13		Albro Lake Control Structure	Halifax	454276	4948204	20T	Aboiteau or other flood reduction structure	N/A	FALSE
14		Miller Lake Power Dam	Halifax	452459	4961791	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
15	circa 1928	Kearney Lake Dam	Halifax	444349	4950414	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
16	1920s	Pockwock Lake Dam	Halifax	432029	4958495	20T	Water impoundment/storage	Water supply - municipal	FALSE
17		Spruce Hill Lake Dam	Halifax	448373	4937293	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
18		Dares Lake Water Control	Lunenburg	391500	4917146	20T	Water impoundment/storage	Water supply - municipal	FALSE
19	1974	East Lake Storage Dam	Halifax	460973	4956413	20T	Water impoundment/storage	Water supply - municipal	FALSE
20	prior to 1949	Lake Major Dam	Halifax	462966	4951440	20T	Water impoundment/storage	Water supply - municipal	TRUE
21	Late 70's	Grand Lake Water Control	Halifax	486933	4972091	20T	Aboiteau or other flood reduction structure	N/A	TRUE
22	1970's	Beaver Lake Water Control	Halifax	483376	4977410	20T	Aboiteau or other flood reduction structure	N/A	TRUE
23	1970's	Big Shaw Lake Water Control	Halifax	490720	4981154	20T	Aboiteau or other flood reduction structure	N/A	TRUE
24	1970's	Little River Lake Water Control	Halifax	494007	4981445	20T	Aboiteau or other flood reduction structure	N/A	FALSE
25	1970's`	Fraser Lake Water Control	Halifax	500842	4993031	20T	Aboiteau or other flood reduction structure	N/A	FALSE
26	1970's	Jennings Lake Water Control	Halifax	502113	4993425	20T	Aboiteau or other flood reduction structure	N/A	FALSE
27	1970's	Sherlock Brook Water Control	Halifax	504206	4996183	20T	Aboiteau or other flood reduction structure	N/A	FALSE
28	1970's	Mill Lake Upper Musquodobit Water Control	Halifax	507508	4996789	20T	Aboiteau or other flood reduction structure	N/A	FALSE
29	1970's	Upper Mill Lake Water Control	Halifax	509409	4999149	20T	Aboiteau or other flood reduction structure	N/A	FALSE
30	1970's	Cox Flowage Water Control	Halifax	510013	4999923	20T	Aboiteau or other flood reduction structure	N/A	TRUE
31	mid 1980's	Davis Lake Dam	Colchester	487608	4998701	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
32	1984	Stillwater Brook	Halifax	483001	4975482	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
33	1983	Wallace Brook	Halifax	483023	4984591	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
34	1980	Higgins Brook	Halifax	497170	4990725	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
35	1977	St Andrews River	Colchester	470277	4991805	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
36	Aug. 1st/1989	DU 6537 Dagger Brook	Antigonish	590488	5050233	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
37	1975	Brierly Brook Flood Control Dam	Antigonish	576372	5051711	20T	Aboiteau or other flood reduction structure	N/A	TRUE
38	1978	James River Water Supply Dam	Antigonish	568130	5050975	20T	Water impoundment/storage	Water supply - municipal	FALSE
39	mid 1980's	Dry Lake Dam	Halifax	497830	4993029	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
40	1986	MacElmon's Pond Dam	Colchester	466427	5026493	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
41	1992	Lepper Brook Dam	Colchester	479687	5021807	20T	Water impoundment/storage	Water supply - municipal	FALSE
42		Forbes Lake Dam	Pictou	528473	5039209	20T	Water impoundment/storage	Water supply - municipal	FALSE
43	1921	Mill Lake St Margarets Bay	Halifax	429159	4950024	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
44	1920's	Little Indian Lake Control Structure	Halifax	428609	4951090	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
45	1921	Coon Pond Dam	Halifax	429074	4952295	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
46	1927	Sandy Lake Dam	Halifax	427967	4952687	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
47	1921	Wright Lake Dam	Halifax	429221	4953670	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
48	1922	Big Indian Lake Dam (NSPI)	Halifax	426751	4957377	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
49	1922	Main Dam - Five Mile Lake	Halifax	423472	4967597	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
50		Williams Lake Dam	Halifax	453410	4941018	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
51	early 80's	DU 6284 Milford Station Project	Hants	463926	4987846	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
52		South Gays River	Halifax	469987	4980075	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
53	1970's	Dollar Lake Water Control	Halifax	474852	4975332	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
54	1940	Lower St. Croix	Hants	418537	4979151	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
55	1938	St. Croix Intake/Trash Rack	Hants	418145	4978078	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
56	1933	Parsons Dam	Hants	418034	4977223	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
57	1938	Upper St. Croix/Salmon Hole Dam	Hants	417974	4975325	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
58	Early 1900's	Fall Brook Reservoir Dam	Hants	412437	4977520	20T	Water impoundment/storage	Water supply - municipal	FALSE
59	1990	Coldbrook Fish Hatchery Dam	Kings	373951	4990797	20T	Water impoundment/storage	Water supply - aquacultural	FALSE
60		Lake George Weir	Kings	366715	4976152	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	TRUE
61		McGee Lake Reservoir Dam	Kings	375678	4985377	20T	Water impoundment/storage	Water supply - municipal	FALSE
62			Kings	387501	4999466	20T	Water impoundment/storage	Water supply - agricultural	FALSE
63	late 1980s	Jordan Dam	Kings	384293	4995210	20T	Water impoundment/storage	Water supply - agricultural	FALSE
64	2001/2002	Dykeviews Lakeville Dam	Kings	373080	4997016	20T	Water impoundment/storage	Water supply - agricultural	FALSE
65		DU 6475 Little Dyke	Colchester	456667	5025879	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
66	1978	DU 6254	Kings	384001	5000970	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
67	1990's		Kings	390455	4996368	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
68	1987	Tupper Lake Control Structure	Kings	374520	4986560	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
70			Kings	363381	4986748	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
71		South River Lake Storage Dam	Kings	362859	4974888	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
72		Randall Lake Storage Dam	Kings	357019	4974144	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
73	1800's	Burnt Dam flowage	Kings	361287	4976968	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
74		Factorydale Power Dam	Kings	359498	4983129	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
75	1982	DU 6252 Armstrong Meadow Dam and Fishway Project	Kings	363116	4958186	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
76	late 70's-early 80's	Chisholm Dam	Kings	371939	4989357	20T	Water impoundment/storage	Water supply - agricultural	FALSE
77	1940	Aylesford Lake Dam	Kings	369586	4979873	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
78	1935	Lanes Mills Dam	Kings	379189	4982863	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
79	1936-7	Trout River Pond Dam	Kings	380984	4976955	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
80		Dean Chapter Lake Dam	Hants	388995	4970911	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
81	1942	Salmontail Lake Dam	Kings	378345	4966717	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
82	1942	Hatchard's Dam	Lunenburg	378602	4965017	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
83	mid 1940's	Harmony Main Dam	Queens	335933	4920914	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
84	1994-95	Morgan Falls Power station	Lunenburg	363926	4932712	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
85	1973	Conrod Lake dam	Halifax	480932	4956793	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	TRUE
87	1950's	White Rock Canal Intake	Kings	391272	4990830	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
88	1926	White Rock Dam	Kings	389891	4990090	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
89	1930	Hell's Gate Dam	Kings	389523	4987803	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
90	1942	Lumsden Dam	Kings	389928	4986814	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
91	1940-41	Hollow Bridge Canal Intake	Kings	391360	4983817	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
92	1941	Black River Lake Dam	Kings	391277	4981470	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
93	1948	Methals Dam	Kings	387078	4977286	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
94		Black River Sawmill Dam	Kings	391412	4982105	20T	Water impoundment/storage	Non consumptive - fire protection	FALSE
95		Forks Dam	Kings	390617	4977537	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
96		Little River Lake Dam	Kings	384265	4981444	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
97		Hell's Gate Canal Intake	Kings	388995	4988503	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
98	1938	Card Lake Main Dam	Lunenburg	399381	4955821	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
99	2004	Zwicker Lake Dam	Hants	402246	4963194	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	TRUE
100	1942	South Canoe Lake Dam	Lunenburg	395148	4961978	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
101	1928	Falls Lake Dam	Hants	402330	4968836	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
102	1974	Hebbville Dam	Lunenburg	376697	4912076	20T	Water impoundment/storage	Water supply - municipal	FALSE
103	1929	Nickerson Pond Storage Dam	Queens	363790	4881409	20T	Water impoundment/storage	Water supply - industrial	FALSE
104	1982	Liverpool Water Supply Dam	Queens	359557	4875498	20T	Water impoundment/storage	Water supply - municipal	FALSE
105	1929	Cowie Falls Development	Queens	358202	4881700	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
106	1929	Deep Brook Development Powerhouse	Queens	356594	4882395	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
107	1929	Lower Great Brook Development	Queens	352050	4883563	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
108	1929	Big Falls Development	Queens	345208	4889023	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
109	1929	Lower Lake Falls Development Powerhouse	Queens	341880	4891299	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
110	1929	Upper Lake Falls Development	Queens	340201	4891339	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
112	1980's	DU 6589 Pine Grove Project	Queens	360815	4878883	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
113		Eddy Road Marsh	Cumberland	404687	5078029	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
114		DU 6181 Amherst Marsh	Cumberland	408076	5078405	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
115	1971	Sherbrooke Water Supply Dam	Guysborough	580359	4999463	20T	Water impoundment/storage	Water supply - municipal	TRUE
116		Sherbrooke Village Sawmill Dam #2	Guysborough	580404	4998498	20T	Water impoundment/storage	Non consumptive - historical	FALSE
117	circa 1960	Goose Harbour Lake Dam	Guysborough	624109	5043501	20T	Water impoundment/storage	Water supply - industrial	TRUE
118		Melford Lake Dam	Guysborough	630363	5041623	20T	Water impoundment/storage	Water supply - industrial	FALSE
119	1979	Clement St. Retention Pond	Halifax	456868	4945775	20T	Aboiteau or other flood reduction structure	N/A	FALSE
120	April, 1985	Mulgrave Recreation Centre Dam	Guysborough	625510	5051914	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
121	circa 1988	Mulgrave Water Supply Dam	Guysborough	623494	5052820	20T	Water impoundment/storage	Water supply - municipal	FALSE
122	1983	Forest Hills Storm Water Control Dam	Halifax	461237	4946705	20T	Aboiteau or other flood reduction structure	N/A	FALSE
123		Big Indian Lake Dam (Halifax Water)	Halifax	443036	4938095	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
124	mid 1800s	Shubenacadie Canal Lock 2	Halifax	456195	4949714	20T	Navigation aid	Non consumptive - historical	FALSE
125	mid 1800s	Shubenacadie Canal Lock 3	Halifax	456077	4949982	20T	Water impoundment/storage	Non consumptive - historical	FALSE
126	mid 1800s	Shubenacadie Canal Lock 4 (Fletcher Lock)	Halifax	451545	4964008	20T	Navigation aid	Non consumptive - historical	TRUE
127	mid 1800s	Shubenacadie Canal Lock 5 (Wellington Lock)	Halifax	450703	4968023	20T	Navigation aid	Non consumptive - historical	TRUE
129	1857	Shubenacadie Canal Portobello Inclined Plane	Halifax	455443	4954752	20T	Navigation aid	Non consumptive - historical	TRUE
130	1950s	Otter Lake Dam	Halifax	442627	4941149	20T	Decommissioned	Water supply - domestic	FALSE
131		Lacewood Drive Storm Water Detention Pond	Halifax	448337	4945760	20T	Aboiteau or other flood reduction structure	N/A	FALSE
132		Indian Garden Farm Cranberry Bog	Lunenburg	377133	4911974	20T	Water impoundment/storage	Water supply - agricultural	FALSE
133	1970s	Weagle Road Dam	Lunenburg	376859	4911499	20T	Water impoundment/storage	Water supply - municipal	FALSE
134			Lunenburg	389954	4924098	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
135			Lunenburg	401258	4932615	20T			FALSE
136	circa 1972	White Point Estates	Queens	361050	4869796	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
137		Petite Riviere Dam	Lunenburg	381415	4902059	20T	Decommissioned	Water supply - industrial	TRUE
138	1967-68	Landrie Lake Dam	Richmond	632730	5048821	20T	Water impoundment/storage	Water supply - industrial	FALSE
139	1967-68	Little River Reservoir Dam	Richmond	635537	5051898	20T	Water impoundment/storage	Water supply - industrial	FALSE
140	1967-68	MacIntyre Lake Dam	Inverness	633898	5056625	20T	Water impoundment/storage	Water supply - industrial	FALSE
141		Grant Lake Dam	Guysborough	621042	5052367	20T	Water impoundment/storage	Water supply - industrial	FALSE
142		Embree Pond	Inverness	627552	5053388	20T	Water impoundment/storage	Non consumptive - landscape feature	FALSE
143		Summers Lake Dam	Guysborough	618161	5050961	20T	Water impoundment/storage	Water supply - industrial	TRUE
144	1920s	Fraser's Mills Hatchery Dam	Antigonish	582944	5038056	20T	Water impoundment/storage	Water supply - aquacultural	TRUE
145	2006	Stellarton Water Intake	Pictou	526359	5043960	20T	Water impoundment/storage	Water supply - municipal	TRUE
146	1983	Carl Sheffer Dam	Annapolis	323883	4920946	20T	Water impoundment/storage	Non consumptive - fire protection	FALSE
147	Unknown	Martyn's Mill Dam	Annapolis	339289	4977218	20T	Decommissioned	Non consumptive - fire protection	FALSE
148	Unknown	Bangor Mill	Digby	253299	4900662	20T	Water impoundment/storage	Water supply - industrial	FALSE
149	Unknown	Clementsport Community Park Dam	Annapolis	294587	4947940	20T	Decommissioned	Non consumptive - aquatic recreation enhancement	TRUE
150	1983	Lighthouse Road Fire Pond Dam	Digby	280099	4951195	20T	Water impoundment/storage	Non consumptive - fire protection	FALSE
151	1987	Freeman Heritage Mill Dam	Queens	353088	4903587	20T	Decommissioned	Non consumptive - historical	TRUE

152	1978	Barrington Woolen Mill Dam	Shelburne	291756	4827113	20T	Water impoundment/storage	Non consumptive - historical	TRUE
153	1982	Harmony Lake Dam and Fishway	Queens	334608	4918781	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	TRUE
154	1984	Lakeview Mill Pond Dam	Queens	337352	4916308	20T	Water impoundment/storage	Non consumptive - fire protection	FALSE
155		McGowan Lake Wing Dam	Queens	336639	4920140	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
156			Lunenburg	390048	4922551	20T			FALSE
157			Lunenburg	390059	4922562	20T			FALSE
158	1954	Indian Falls Fishway	Lunenburg	372638	4938821	20T	Fish ladder (not part of dam)	N/A	TRUE
159	1993	Greenwood Lake Dam	Shelburne	304040	4829108	20T	Water impoundment/storage	Water supply - industrial	TRUE
160	1993	Forchu River Dam (Hebron or Hall Dam)	Yarmouth	251299	4864806	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
161	1971	DU6111 Chebogue River Meadows	Yarmouth	255005	4862111	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
162	before 1928	Milton Lake Dam	Yarmouth	249628	4860100	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	TRUE
163	1987	DU6559 Melbourne Marsh Water Control Structure	Yarmouth	253142	4850323	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
164	1987	DU6561 Comeau Hill Marsh	Yarmouth	254962	4850323	20T	Decommissioned	N/A	FALSE
165	1989	DU6547 Goose Bay Marsh	Yarmouth	267929	4852448	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
166	1986	DU6508 Wall's Brook Dam	Shelburne	332509	4846657	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
167	1980	DU6228 Silver River Marsh	Yarmouth	273812	4891426	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
168	prior to 1900	Chocolate Lake Dam	Halifax	450828	4942942	20T	Decommissioned	Non consumptive - aquatic recreation enhancement	FALSE
169	Early 1900s	Minamkeak Lake Dam	Lunenburg	372549	4908652	20T	Water impoundment/storage	Water supply - municipal	FALSE
170	early 1900s	Leipsigate Lake Dam	Lunenburg	373208	4911380	20T	Water impoundment/storage	Water supply - municipal	FALSE
171	circa 1900	Croft Dam	Lunenburg	371212	4903779	20T	Water impoundment/storage	Water supply - municipal	FALSE
172	1927	Halfway River Front Dam	Hants	405636	4988616	20T	Water impoundment/storage	Water supply - industrial	FALSE
173	~1962	Back Dam	Hants	404129	4988139	20T	Water impoundment/storage	Water supply - industrial	FALSE
176	1984	Annapolis Tidal Generation Station	Annapolis	301196	4958657	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
177	1982	Neives Lake (Paradise Hydro System)	Annapolis	322240	4959768	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
178			Annapolis	310000	4960000	20T	Aboiteau or other flood reduction structure	N/A	FALSE
181	1957	Ridge Dam (Bear River Hydro System)	Annapolis	296866	4936323	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
182	1952	Gulch Lake - Sam Harris Dam (Bear River Hydro System)	Annapolis	293472	4937157	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
183	1951-1952	Lake Mulgrave Dam (Bear River Hydro System)	Annapolis	300044	4933630	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
185	1968	Lequille Main Dam (Lequille Hydro System)	Annapolis	302171	4951239	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
186		Dargie Lake Dam (Lequille Hydro System)	Annapolis	316393	4946603	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
187		Curl Hole Dam (Nictaux Hydro System)	Annapolis	338992	4947695	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
188	1955	McGill Dam (Nictaux Hydro System)	Annapolis	341237	4951527	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
189	1956	Scragg Dam (Nictaux Hydro System)	Annapolis	342807	4958595	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
192	1985	Sissiboo Grand Lake Dam	Digby	281112	4919007	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
193	1930s	Big Uniacke Lake Dam	Digby	284073	4921545	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
194	Prior to 1958	Big Tom Wallace Lake Dam	Digby	283526	4929371	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
195	1947	Donahue Lake Diversion Dam	Guysborough	619639	5014772	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
196	1923	Ten Mile Lake Main Dam	Halifax	523674	4997052	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
197	1929	Jordan Lake Main Dam	Shelburne	318615	4884415	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
198	1980	South Lake	Victoria				Water impoundment/storage	water supply - hydroelectric	FALSE
199		Wreck Cove Brook	Victoria				Water impoundment/storage	water supply - hydroelectric	FALSE
200			Hants			20T			FALSE
202		Peck Dam	Digby						FALSE
203	1930s	Port Hood Mines Reservoir	Inverness	614073	5094479	20T	Decommissioned	Non consumptive - fire protection	FALSE
204	1997	Bailey's Pond Dam	Cape Breton	743754	5118656	21T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
205	1970s	Porters Dam	Kings	372952	4997728	20T	Water impoundment/storage	Water supply - agricultural	FALSE
206		Shag Harbour Pond Dam	Shelburne	281990	4820488	20T	Decommissioned	N/A	TRUE
208		Duck Pond Brook	Yarmouth						FALSE
209		River Phillip Tributary	Cumberland			20T			FALSE
210		Baird Brook	Cumberland			20T			FALSE
212		Mattatall Lake Tributary	Colchester	463400	5059200	20T			FALSE
213	1985	McGee Brook Dam	Kings	351866	4990753	20T	Water impoundment/storage	Water supply - agricultural	FALSE
214		South River	Kings	358242	4981158	20T	Water impoundment/storage	Water supply - aquacultural	FALSE
215	1985	Middle River Tributary	Pictou	518308	5048277	20T	Decommissioned	N/A	FALSE
218		Tupper Brook	Kings	375993	4991689	20T	Water impoundment/storage	Water supply - industrial	TRUE
219		Gooseneck Lake Tributary	Guysborough	598734	5017730	20T	Mine tailings management	N/A	FALSE
221		Rankin Brook	Inverness						FALSE
223		Ski Wentworth Dam	Cumberland	457491	5050340	20T	Water impoundment/storage	Water supply - recreation facilities	FALSE
224		McEwan Brook Tributary	Annapolis			20T			FALSE
225		Hoig Brook	Cumberland			20T			FALSE
226		North Aspy River Tributary	Victoria	688000	5198350				FALSE
228	1983	Sixth Lake Dam	Guysborough	581957	5002423	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
230		Beaver Brook Tributary	Colchester			20T			FALSE
231	1900's	Grand Lake Dam - Sydney	Cape Breton	722447	5116792	20T	Water impoundment/storage	Water supply - industrial	TRUE
232		Nappan River Dam	Cumberland	409825	5073424	20T	Water impoundment/storage	Water supply - municipal	TRUE
234			Guysborough	650582	5021070	20T			FALSE
235			Guysborough	656252	5021659	20T			FALSE
236	post 1930, maybe 1960s	Van Tassel Lake Dam	Digby	277069	4947818	20T	Water impoundment/storage	Water supply - municipal	FALSE
238		Waterford Lake Spillway	Cape Breton	721945	5125066	20T	Water impoundment/storage	Water supply - municipal	FALSE
242		Leamington Brook Big Dam	Cumberland	419434	5045652	20T	Decommissioned	Water supply - municipal	FALSE
244	1994-95	"Old" monitoring site Weir	Halifax	458967	4970501	20T	Aboiteau or other flood reduction structure	N/A	FALSE
246			Kings	387308	5004632	20T	Water impoundment/storage	Water supply - agricultural	FALSE
247		Watkins Dam Big Brook	Inverness			20T	Decommissioned	N/A	FALSE
248		Watkins Dam Angus Brook	Inverness	651922	5125195	20T	Water impoundment/storage	Water supply - agricultural	FALSE
250			Cape Breton	722300	5096550		Water impoundment/storage	Water supply - agricultural	FALSE
252			Digby						FALSE
255	1977		Kings	379614	4996751	20T	Water impoundment/storage	Water supply - agricultural	FALSE
256	1986		Kings	378676	4996017	20T	Water impoundment/storage	Water supply - agricultural	FALSE
259			Colchester			20T			FALSE
264	circa 1920s	Lake George Town Dam	Yarmouth	253718	4875785	20T	Water impoundment/storage	Water supply - municipal	FALSE
267	~1995	Clap Dam	Kings	356713	4987659	20T	Water impoundment/storage	Water supply - agricultural	FALSE
268		Millville Bog Reservoir	Kings	356084	4986686	20T	Water impoundment/storage	Water supply - agricultural	FALSE
270			Inverness	627000	5109850	20T			FALSE
273	1972	Prince Mine Dam	Cape Breton	704753	5132093	20T	Water impoundment/storage	Water supply - industrial	FALSE
274	1980's	Schooner Pond Dam	Cape Breton	743978	5118681	21T	Water impoundment/storage	Water supply - industrial	FALSE
276	1900's	Sydney River Dam	Cape Breton	713029	5109128	20T	Water impoundment/storage	Water supply - municipal	TRUE
278	1970's	MacAskill's Brook Dam	Cape Breton	733855	5114399	21T	Water impoundment/storage	Water supply - municipal	TRUE
279	early 1900's	Big Dam Lake	Cape Breton	742567	5118819	21T	Water impoundment/storage	Water supply - industrial	FALSE
280			Cumberland			20T	Water impoundment/storage	Water supply - agricultural	FALSE
281		Surette's Dam ??	Digby	248659	4896041				FALSE
282	1985		Kings	379662	4996250	20T	Water impoundment/storage	Water supply - agricultural	FALSE
283	1989	Cochrane Dam	Hants	419161	4984867	20T	Water impoundment/storage	Water supply - agricultural	FALSE
284			Digby						FALSE
285			Lunenburg			20T			FALSE
286	1944		Annapolis	301356	4942088	20T	Water impoundment/storage	Water supply - municipal	FALSE
287			Yarmouth						FALSE
288			Lunenburg			20T			FALSE
290		Cobequid Hatchery Dam	Cumberland	434927	5048663	20T	Decommissioned	N/A	FALSE
291			Richmond	655023	5047112	20T			FALSE
292		Dykeview Farms Dam	Kings	368070	4995496	20T	Water impoundment/storage	Water supply - agricultural	FALSE
294			Kings	388405	4998875	20T	Water impoundment/storage	Water supply - agricultural	FALSE
295			Kings	389646	4998725	20T	Water impoundment/storage	Water supply - agricultural	FALSE
296	1992	Heightons Dam	Pictou	494194	5066379	20T	Water impoundment/storage	Water supply - agricultural	FALSE
297	1980	DU 6302 Noel Lake Project	Hants	441826	5014080	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
298			Cumberland	464288	5078877	20T	Water impoundment/storage	Water supply - recreation facilities	FALSE
299			Pictou			20T			FALSE
302			Victoria						FALSE
304			Kings	383013	4985858	20T			FALSE
305			Kings	388200	5001375	20T			FALSE
306			Lunenburg	378500	4918780	20T			FALSE
307			Colchester			20T			FALSE
312			Yarmouth	270600	4856500				FALSE
314			Cumberland			20T			FALSE
315			Yarmouth						FALSE
316			Kings	374465	4997560	20T	Water impoundment/storage	Water supply - agricultural	FALSE
317			Cumberland			20T			FALSE
318			Pictou	520155	5058411	20T	Water impoundment/storage	Water supply - agricultural	FALSE
319			Pictou	533178	5052785	20T			FALSE
321			Pictou			20T			FALSE
323	1990		Pictou	518006	5047330	20T	Water impoundment/storage	Water supply - agricultural	FALSE
325			Kings	382885	4994704	20T	Water impoundment/storage	Water supply - agricultural	FALSE
326		Kentville Water Commission	Kings	378302	4988269	20T	Water impoundment/storage	Water supply - municipal	FALSE
328	1984		Kings	385736	4995613	20T	Water impoundment/storage	Water supply - agricultural	FALSE
329			Kings	385917	4995669	20T	Water impoundment/storage	Water supply - agricultural	FALSE
330	1988		Kings	376775	4978459	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
331	1983	Schofield Brook Dam	Kings	387541	4983300	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
332			Yarmouth						FALSE
333			Victoria	671450	5106250				FALSE
334			Kings	386650	5001010	20T			FALSE
336			Colchester			20T			FALSE
337			Cape Breton						FALSE
338		Little Dyke Lake Weir	Colchester	456318	5025708	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
340		Hamilton Brook	Halifax	502737	4997484	20T	Decommissioned	N/A	FALSE
341	1984		Annapolis	326577	4970033	20T	Water impoundment/storage	Non consumptive - fire protection	FALSE
342			Halifax	447100	4965900	20T			FALSE
343			Kings	391101	5002349	20T	Water impoundment/storage	Water supply - agricultural	FALSE
344			Pictou			20T			FALSE
345			Inverness						FALSE
346			Colchester			20T			FALSE
347			Pictou			20T			FALSE
348			Cape Breton	707390	5110946				FALSE
349		Clarence Road Reservoir	Annapolis	319504	4971011	20T	Water impoundment/storage	Water supply - agricultural	FALSE
351			Kings	388771	5004500	20T	Water impoundment/storage	Water supply - agricultural	FALSE
353			Kings	389138	5004514	20T	Water impoundment/storage	Water supply - agricultural	FALSE
355		Merlin Fish Farm Dam	Cumberland	447941	5053786	20T	Water impoundment/storage	Water supply - aquacultural	TRUE
356			Colchester			20T	Water impoundment/storage	Water supply - agricultural	FALSE
358			Victoria	673450	5152830				FALSE
359		Alcorn's Pond	Kings	364317	4990496	20T	Water impoundment/storage	Water supply - domestic	FALSE
360	1985		Annapolis	335460	4972203	20T	Water impoundment/storage	Water supply - agricultural	FALSE

362		Blacks Pond Dam	Cumberland	408826	5078018	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
363	2004	Townsend Pond Control Structure	Colchester	484348	5025981	20T	Water impoundment/storage	Non consumptive - landscape feature	FALSE
364		Falmouth Water Supply Dam	Hants	404475	4983172	20T	Water impoundment/storage	Water supply - municipal	FALSE
365	circa 1986	Hysons Pond Dam	Pictou	516611	5052138	20T	Water impoundment/storage	Non consumptive - landscape feature	FALSE
366			Digby						FALSE
367			Annapolis	320000	4970000	20T			FALSE
369	1986		Kings	360578	4983144	20T	Water impoundment/storage	Water supply - agricultural	FALSE
370			Inverness	653145	5167294				FALSE
373			Lunenburg			20T			FALSE
375		Fraser's Mills Hatchery Storage Dam	Antigonish	583152	5031415	20T	Water impoundment/storage	Water supply - aquacultural	TRUE
379			Yarmouth						TRUE
382		DU 6144	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
383		DU 6246	Annapolis	301051	4957050	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
384	1984	DU 6422 Ryerson Brook Marsh Project	Annapolis	297525	4951341	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
385		DU 6701 Belleisle Marsh Project Segment 1	Annapolis	310588	4962570	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
386		DU 6701 Belleisle Marsh Project Segment 4	Annapolis	310851	4963060	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
387		DU 6780 Troops Marsh Project	Annapolis	314795	4966711	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
388		DU 6582 MACGILLVRAYS MARSH PROJECT	Antigonish	577640	5043949	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
389		DU 6627	Antigonish	592262	5039725	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
390		DU 6214 (AND/OR 6209)	Antigonish	579300	5071200	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
391		DU 6288	Antigonish	603079	5049436	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
392		DU 6287	Antigonish	579340	5039933	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
394	1978	DU 6266 Renwick Brook Project	Cape Breton	733142	5117426	21T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
395	1900's	DU 6236 Homeville Road Project	Cape Breton	736694	5109785	21T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
396		DU 6459	Colchester			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
397		DU 6453 Slade Meadow Project	Colchester			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
398		DU 6469 Sandville Marsh Project	Colchester			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
399		DU 6359	Colchester			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
400		DU 6520	Colchester			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
401		DU 6527	Colchester			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
403		DU 6518/11 Barrachois Project	Colchester			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
404		DU 6560 Willow Church Project	Colchester			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
405		DU 6557 Blockhouse Marsh Project	Colchester			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
406		DU 6565 McMillans Pond Project	Colchester			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
407		DU 6550 Bonnyman Marsh Project	Colchester			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
408		DU 6625	Colchester			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
409			Colchester	487000	5061400	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
410			Colchester	471900	5006100	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
411			Colchester	477700	5064300	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
412		DU 6389 Treed Bog Project	Colchester			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
413		DU 6511 Lake Road Project	Colchester	465800	5059300	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
414		DU 6190	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
415		DU 6473	Cumberland	434000	5060700	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
416		DU 6313 Lower Maccan Meadow Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
417		DU 6486	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
418		DU 6518	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
419		DU 6531 Roadside Marsh Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
420		DU 6518/10 Evans Pond Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
421		DU 6600 Randall's Lake Potholes Project	Cumberland	417800	5059800	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
422		DU 6623 Seaman Marsh Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
423		DU 6635 Maccan Poind Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
425		DU 6656 Hansford Marsh Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
426		DU 6699 Wilmots Pond Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
427		DU 6682 Kaczmareks Pond Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
428		DU 6877 Greenville Station Project	Cumberland	453600	5059800	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
429		DU 6139 Athol Marsh Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
430		DU 6896 Blatch's Pond project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
431		DU 6138	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
432		DU 6300 Kings Mills Site Project	Cumberland	428400	5084700	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
433			Cumberland	450900	5057700	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
434			Cumberland	403800	5063300	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
435			Cumberland	403500	5062500	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
436			Cumberland	402600	5064100	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
437			Cumberland	442400	5067100	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
438		DU 6408 Browns Woodlot Project	Cumberland	452800	5077200	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
439		DU 6152	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
440		DU 6167	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
441		DU 6226 Mahoney Meadow Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
442		DU 6181	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
443		DU 6276	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
444		DU 6290	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
445		DU 6298	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
446		DU 6299	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
447		DU 6301	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
448		DU 6331 Rutledge Brook Marsh Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
449		DU 6181 Amherst Marsh Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
451		DU 6357 Gough Meadow Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
452		DU 6360	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
453		DU 6372	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
454		DU 6327 Malagash Point Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
455		DU 6205	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
456		DU 6402 Wentoworth Meadow Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
457		DU 6421 Conns Mills Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
458		DU 6425 Cove Road Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
459		DU 6620 Linden Marsh Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
460		DU 6737 Sunrise Marsh Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
461		DU 6757 Trenholm Marsh Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
462		DU 6773 Barronsfield Marsh Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
463		DU 6789 Mattatall Meadow Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
464		DU 6777 Mud Creek Pond Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
465		DU 6782 Bacon's Pond Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
466		DU 6793 McIver Marsh Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
467			Cumberland	402600	5064100	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
468		DU 6789	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
469		DU 6806	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
470		DU 6128 John Lusby Marsh Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
471		DU 6815 Eric's Marsh Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
472		DU 6838 Tidal View Marsh	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
473		DU 6841 Eel Creek Marsh Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
474			Cumberland	442700	5067100	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
475			Cumberland	415200	5068500	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
476		DU 6518/7	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
477	1986	DU6201 Guy Mill Pond Restoration Project	Digby	257430	4907460	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
478	1988	DU6605 Lansdowne Meadow Project	Digby	286876	4938630	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
479	1984	DU6393 Hassett Marsh Project	Digby	264315	4912230	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
480	1993	DU6771 Big Tom Wallace Marsh	Digby	286468	4929466	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
481		DU 6505 Akins Meadow Project	Hants	407052	4987585	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
482		DU 6520 Maitland Dyke Marsh Project	Hants	460455	5018613	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
483	1989	DU 6599 Walton River Project	Hants	422547	5008001	20T	Decommissioned	Non consumptive - wildlife conservation	FALSE
484	1991	DU 6671 Zwicker Marsh Project	Hants	421958	4985362	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
485	1990	DU 6665 Cogmagun Marsh Project	Hants	410854	4992397	20T	Decommissioned	Non consumptive - wildlife conservation	FALSE
487		DU 6792 Robinson Meadow Project	Hants	449096	5002533	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
488			Hants	451200	4986200	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
489		DU 6491 Georgefield Marsh Project	Hants	455600	5004600	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
491	1980	DU 6219 Three Mile Brook Project	Hants	419356	4999186	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
493	1985	DU 6501	Kings	384485	4992490	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
494			Annapolis	301500	4957500	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
495			Kings	382784	5000737	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
496	1980	DU 6297 Hutt's Marsh Project	Kings	366932	4994334	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
498		DU 6770 Hoffman's Marsh Project	Kings	387656	4998507	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
499		DU 6743	Kings	386774	5000515	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
500			Kings	390500	4995900	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
501		DU 6739	Lunenburg			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
502			Lunenburg	367600	4908900	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
503		DU 6330 Sartys Dam Project	Lunenburg			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
504		DU 6664 Parkdale Pond Project	Lunenburg			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
505		DU 6707 Lohnes Marsh Project	Lunenburg			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
506		DU 6497	Pictou	530677	5055690	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
507	1986	DU 6518/9 Atwater Pond Project	Pictou	539884	5047322	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
508		DU 6651	Pictou	500752	5055108	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
509		DU 6198	Pictou			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
510		DU 6851	Pictou	495252	5061808	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
511			Pictou	509100	5065300	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
512		DU 6366 White's Pond Project	Pictou	532450	5055972	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
513		DU 6424 Mountain Road Marsh Project	Pictou	491444	5059941	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
517		DU 6614 Meadow Pond Project	Queens	362339	4876911	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
518		DU 6260 Peters Brook Project	Victoria				Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
519		DU 2828	Victoria	698400	5117650		Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
520		DU 6260 Marsh Brook Project	Victoria				Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
521		DU 6269 Big Harbour Meadow Project	Victoria			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
523		DU 6269/1	Victoria				Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
526		Harris Brook	Annapolis	294207	4942404	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
528		DU 6125 Henderson Brook Project	Cumberland			20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
529	1986	DU 6493 Crowley Pond Project	Cumberland	451070	5063707	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
530	1986	DU 6507 King Meadows Project	Hants	458478	4998706	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
531		DU6551 Shoal Lake Dam	Richmond	650533	5052980	20T	Water impoundment/storage	Non consumptive - wildlife conservation	TRUE
532			Annapolis			20T			FALSE
533	1977	Tannery Pond	Kings	390800	4993374	20T	Water impoundment/storage	Water supply - agricultural	FALSE
537		Sherbrooke Village Sawmill Dam #1	Guysborough	580325	4998361	20T	Water impoundment/storage	Non consumptive - historical	FALSE

538	1968		Annapolis	328772	4971463	20T	Water impoundment/storage	Water supply - agricultural	FALSE
542		Point Tupper 2 Ash Retention Pond	Richmond	631874	5046473	20T	Water impoundment/storage	Water supply - industrial	FALSE
544	1924	Seloam Lake Main Dam	Halifax	538394	5000032	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
547		Burnetts Mill Brook	Halifax	505404	4996611	20T	Decommissioned	N/A	FALSE
551	1954	Nictaux Falls Dam (Nictaux Hydro System)	Annapolis	339379	4968616	20T			FALSE
552		Grand Lake Dam (Lequille Hydro System)	Annapolis	303141	4948702	20T			FALSE
553		Lequille Hydropower Development	Annapolis			20T			FALSE
554	1982	Corbett Lake Dam (Paradise Hydro System)	Annapolis	320717	4958722	20T			FALSE
555	1949	Paradise Lake Dam (Paradise Hydro System)	Annapolis	326442	4958243	20T			FALSE
556			Annapolis	326400	4964900	20T			FALSE
557	1950	Saunders Pond Dam (Paradise Hydro System)	Annapolis	324544	4964463	20T			FALSE
558		Dewey Creek Wildlife Management Area	Kings	385546	4998255	20T	Water impoundment/storage	Water supply - agricultural	FALSE
560		Lake Mulgrave Wing Dam #1 (Bear River Hydro System)	Annapolis	299932	4933548	20T			FALSE
561		Lake Mulgrave Wing Dam #2 (Bear River Hydro System)	Annapolis	299479	4933818	20T			FALSE
562		Lake Mulgrave Wing Dam #3 (Bear River Hydro System)	Annapolis	300506	4933787	20T			FALSE
563		Ridge Development Wing Dam (Bear River Hydro System)	Annapolis	297041	4936073	20T			FALSE
564		Roxbury Dam (Paradise Hydro System)	Annapolis	328826	4961450	20T			FALSE
565		Saunders Pond Spillway (Paradise Hydro System)	Annapolis	325077	4964075	20T			FALSE
566			Annapolis	339174	4948377	20T			FALSE
567			Annapolis	339197	4948448	20T			FALSE
568			Annapolis	339218	4948521	20T			FALSE
569			Annapolis	339349	4948753	20T			FALSE
570			Annapolis	339350	4949035	20T			FALSE
571	1920s	Quarry Lake Dam	Halifax	445651	4946886	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
572		Pereaux Aboiteau	Kings	390848	5005481	20T	Aboiteau or other flood reduction structure	N/A	FALSE
573		Canning Aboiteau	Kings	389081	5000698	20T	Aboiteau or other flood reduction structure	N/A	FALSE
574		Canard Aboiteau	Kings	389573	4997989	20T	Aboiteau or other flood reduction structure	N/A	FALSE
575			Annapolis	299652	4945685	20T	Water impoundment/storage	Non consumptive - landscape feature	FALSE
576		Sailing Club Dam	Annapolis	301280	4958007	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
577	1985 or 1993	DU 6270/3	Kings	390336	4996091	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
578		DU 6817 Upper "Hickman" Segment	Kings	391591	4995695	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
579		DU 6817 Middle "Graham" Segment"	Kings	391908	4995625	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
580		DU 6817 Lower "Waugh" Segment	Kings	392081	4995895	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
581		DU 6701 Belleisle Marsh Project Segment 2	Annapolis	310591	4962553	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
582		DU 6701 Belleisle Marsh Project Segment 3	Annapolis	309876	4962004	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
583		Belleisle Aboiteau	Annapolis	310525	4961696	20T	Aboiteau or other flood reduction structure	N/A	FALSE
584	unknown	Big St. Margarets Bay Lake Dam 1	Hants	414398	4962460	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
585	1929	Tusket Falls Main Dam	Yarmouth	261390	4863604	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
586	1929	Carleton Dam	Yarmouth	265015	4868416	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
587	Prior to 1930	Mink Dam	Yarmouth	267511	4878059	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
588	Prior to 1930	Kempt Back Dam	Yarmouth	270164	4883481	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
589	1929	Great Barren Dam	Yarmouth	279435	4861632	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
590	1929	Tusket Falls Powerhouse Dam	Yarmouth	260789	4863094	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
591	circa 1930	Roseway Main Dam	Shelburne	311406	4850533	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
592	1936	Gardners Mills Dam	Yarmouth	261520	4879361	20T			FALSE
593	1960	Weymouth Falls Dam	Digby	265895	4921303	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
594	1960	Sissiboo Falls Dam	Digby	271395	4923673	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
595	1959	Fourth Lake Main Dam	Digby	283379	4916498	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
596	1959	Fourth Lake Wing Dam #1	Digby	286607	4918335	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
597	1959	Fourth Lake Wing Dam #2	Digby	283083	4914093	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
598	1959	Fourth Lake Wing Dam #3	Digby	288407	4918603	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
599	1959	Musquash Dam	Digby	283425	4915243	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
600		Gays River Mine	Halifax	473495	4984667	20T	Mine tailings management	N/A	FALSE
601		Masons Mill Pond Control Structure	Halifax	437673	4953674	20T	Water impoundment/storage	Non consumptive - fire protection	FALSE
603		Sand Lake	Cape Breton	736886	5113707	21T	Water impoundment/storage	Water supply - municipal	FALSE
604	1986	Glace Bay Harbour Dam	Cape Breton	734996	5120021	21T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
605	1900's	City Reservoir	Cape Breton	718328	5109815	20T	Water impoundment/storage	Water supply - municipal	FALSE
606	1900's	Power Lake	Cape Breton	721416	5113025	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
607	1984	Tangier River Lake Dam	Halifax	520676	4973755	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	TRUE
608		Abbecombec Ocean Village 1	Halifax	504365	4953674	20T	Water impoundment/storage	Non consumptive - landscape feature	FALSE
609		Abbecombec Ocean Village 2	Halifax	504555	4953299	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	TRUE
610		Parrsboro Aboiteau	Cumberland	396339	5028381	20T	Aboiteau or other flood reduction structure	N/A	FALSE
611		Harrison Lake	Cumberland	401529	5063345	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
612		Kuhn Marsh Retention Berm	Halifax	458416	4948102	20T	Aboiteau or other flood reduction structure	N/A	FALSE
613	1980	Oathill Lake Control Structure	Halifax	456215	4947087	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
614	1950's	Maynard Lake Control Structure	Halifax	456238	4946355	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
615	1960's	Glenforest Drive Weir	Halifax	449189	4945303	20T	Aboiteau or other flood reduction structure	N/A	FALSE
616	1990	Glenbourne Estates Retention Pond	Halifax	446375	4946995	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
617	1990's	Parkland Dr. Retention Pond	Halifax	446516	4946505	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	TRUE
618		Annapolis Municipal Dam	Annapolis	297368	4942637	20T	Water impoundment/storage	Water supply - municipal	FALSE
619	1988	Upper Clements Park Dam	Annapolis	296692	4953488	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
620		Upper Clements Animal Park 1	Annapolis	296692	4953488	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
621		Upper Clements Animal Park 2	Annapolis	297206	4953279	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
622		Crosskill Lake	Annapolis	317087	4971610	20T	Water impoundment/storage	Water supply - municipal	FALSE
623		Lily Lake Reservoir	Annapolis	333730	4982265	20T	Water impoundment/storage	Water supply - municipal	FALSE
624		Second Lake Reservoir	Annapolis	334405	4982371	20T	Water impoundment/storage	Water supply - municipal	FALSE
625	early 1970's	Trout Lake Weir	Annapolis	336636	4958114	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
626	1923	Governor Lake Main dam	Halifax	526180	5003602	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
628	1924	Anti Dam Reservoir	Halifax	539582	4994407	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
629	1926	Marshall Falls Main Dam	Halifax	540524	4983085	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
630	1923	Malay Falls Main dam	Halifax	540678	4981867	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
631	1936	Ruth Falls Main Dam	Halifax	539532	4978157	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
633	1928	MacDonald Dam and Canal Intake	Hants	403748	4970448	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
634		Amherst Golf Club Pond	Cumberland	408967	5077586	20T	Water impoundment/storage	Water supply - recreation facilities	FALSE
635		Avon River Causeway	Hants	409468	4983187	20T	Aboiteau or other flood reduction structure	N/A	FALSE
636	1998	Angevine Lake Dam	Cumberland	461082	5065396	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	TRUE
637		Second River Dam	Cumberland	435130	5048779	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
638		Park Lake Dam	Cumberland	431557	5064104	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
639		DU 6931 McNeils Pond	Hants	410311	4980093	20T	Water impoundment/storage	Water supply - agricultural	FALSE
640	1948	Tom Lake Spillway	Guysborough	617782	5021436	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
641	1985	Kehoe Brook - Tailings Pond	Cape Breton	720791	5120268	20T	Mine tailings management	N/A	FALSE
642		Kehoe Brook Settling Pond	Cape Breton	721067	5119844	20T	Mine tailings management	N/A	FALSE
643		Sand Lake Brook Dam	Cape Breton	734661	5114371	20T			FALSE
644		Marconi Towers Dam	Cape Breton	735030	5115608	20T	Water impoundment/storage	Water supply - municipal	FALSE
645	1966	Middle River Dam	Pictou	519945	5054237	20T	Water impoundment/storage	Water supply - industrial	TRUE
646		Pictou Causeway	Pictou	521579	5055791	20T	Aboiteau or other flood reduction structure	N/A	FALSE
647	1973	Rory Brook Dam	Inverness	619422	5080936	20T	Water impoundment/storage	Water supply - municipal	FALSE
648	prior to 1930, maybe circa 1900	Budds Brook Reservoir Dam	Digby	276956	4946921	20T	Water impoundment/storage	Water supply - municipal	FALSE
649		Wile Carding Mill Dam	Lunenburg			20T	Water impoundment/storage	Non consumptive - historical	FALSE
650	1989-1990	Don Cox Fishladder	Halifax	443636	4958086	20T	Fish ladder (not part of dam)	N/A	TRUE
651		Muskrat Cove Dam	Kings	379090	4982879	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
652		Gaspereau Lake Dyke, formerly Black Brook Dam	Kings	379334	4982251	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
653		Forest Home Control Structure	Kings	380280	4976830	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
654	1936-37	MacMillan Dam	Kings	381457	4977194	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
655		MacDonald Dam	Hants	403286	4970368	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
656		Wolfville Pond Dam	Kings	391285	4993858	20T	Water impoundment/storage		FALSE
657		Reservoir Park Dams	Kings	394297	4993426	20T	Water impoundment/storage	Non consumptive - aquatic recreation enhancement	FALSE
658		Orchard Ave. Dam	Kings	393790	4993712	20T	Water impoundment/storage	Non consumptive - landscape feature	FALSE
659		Soldier Lake Wing Dam No.1	Halifax	454437	4963607	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
660		Soldier Lake Wing Dam No.2	Halifax	456039	4960758	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
661		Jordan Lake Main Outlet Dam	Queens	321511	4888323	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
662		Jordan Lake Driving Canal Outlet Dam	Queens	323046	4884942	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
663		Jordan Lake Sixth Lake Dam	Queens	323577	4888942	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
664	mid-1800s	St. Peters Canal Locks	Richmond	666071	5057921	20T	Navigation aid	N/A	FALSE
665			Kings	353612	4988400	20T	Water impoundment/storage	Water supply - agricultural	FALSE
666	circa 1830	Barrett's Mill Dam	Halifax	445074	4960183	20T	Water impoundment/storage	Water supply - industrial	FALSE
667	1906	Barrett's Feely Lake Dam	Halifax	445123	4960924	20T	Water impoundment/storage	Water supply - industrial	FALSE
668		North Canoe Lake Weir	Hants	395881	4963546	20T	Decommissioned	N/A	FALSE
669	2005	"New" monitoring site Weir	Halifax	458480	4971112	20T	Aboiteau or other flood reduction structure	N/A	FALSE
670	2000-01	Johnson Brook Weir	Halifax	458334	4967606	20T	Aboiteau or other flood reduction structure	N/A	FALSE
671	1950's	Lakewood Road Dam	Kings	378440	4996330	20T	Decommissioned	N/A	FALSE
672		DU 6121 Avon Project	Kings	401525	4995894	20T	Water impoundment/storage	Non consumptive - wildlife conservation	FALSE
673		Balmoral Grist Mill Dam	Colchester	484826	5054631	20T	Water impoundment/storage	Non consumptive - historical	FALSE
674	2008-09	Waugh River Fish Ladder	Colchester	482898	5053777	20T	Fish ladder (not part of dam)	N/A	TRUE
675	1977	Liscomb River Fish Ladder	Guysborough	570572	4987163	20T	Fish ladder (not part of dam)	N/A	TRUE
676	1969	Morgan Falls Fish Ladder	Lunenburg	363909	4932665	20T	Fish ladder (not part of dam)	N/A	TRUE
677	1949	Grand River Fish Ladder	Richmond	0	0		Fish ladder (not part of dam)	N/A	TRUE
678		Long Lake (Richmond Co) Dam	Richmond	662043	5059982	20T	Water impoundment/storage	Water supply - aquacultural	FALSE
679	1960s	Big St. Margarets Bay Lake Dam 2 (Timber spillway)	Hants	416271	4959896	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
680	1960s	Big St. Margarets Bay Lake Dam 3 (Wing Dam)	Hants	416223	4960333	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
681		The Roll Dam	Queens	359535	4880070	20T	Water impoundment/storage		TRUE
682		Mill Dam	Shelburne	300774	4834237	20T	Water impoundment/storage	Water supply - industrial	TRUE
683		McGowan Lake Powerhouse Intake Canal	Queens	336337	4920216	20T	Water impoundment/storage	water supply - hydroelectric	TRUE
684	1929	Herring Cove Lake Storage Dam	Queens	362310	4884692	20T	Water impoundment/storage	Water supply - industrial	FALSE
685		Leamington Brook Little Dam	Cumberland	419603	5046190	20T	Decommissioned	Water supply - municipal	FALSE
686		Lower Lake Falls Development Spillway	Queens	341256	4891598	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
687		Deep Brook Development Spillway	Queens	355182	4882328	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
688	1947	Donahue Lake Sluiceway	Guysborough	617317	5018949	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
689	1947	Tom Lake Main Dam	Guysborough	617495	5021183	20T	Water impoundment/storage	water supply - hydroelectric	FALSE
690	1990	Aulds Lake Dam	Guysborough	621797	5054609	20T	Water impoundment/storage	Water supply - industrial	FALSE
691		Morrisons Lake Dam	Guysborough	621420	5054522	20T	Water impoundment/storage	Water supply - industrial	FALSE