DRAFT

Guidance for Development Activities in Redside Dace Protected Habitat

February 2011

Scale: Actual length of Redside Dace depicted is 7 centimetres.

RECOMMENDED CITATION

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These guidelines will be periodically updated as required to reflect more current information. For the most current version of these guidelines, please refer to MNR's website at www.mnr.gov.on.ca.

Cette publication hautement spécialisée Guidance for Development Activities in Redside Dace Protected Habitat *n'est disponible qu'en Anglais en vertu du Règlement 411/97 qui en exempte l'application de la Loi sur les services en français. Pour obtenir de l'aide en français, veuillez communiquer avec Cathy Darevic au (705) 755-5580 au ministère des Richesses naturelles.*

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EXECUTIVE SUMMARY

The Redside Dace (*Clinostomnus elongatus*) is a small colourful cyprinid (minnow family) that lives in small streams in the southern Great Lakes basin, the upper Mississippi drainage and the upper Susquehanna River drainage. In Canada, the Redside Dace is found only in southern Ontario where it most frequently occurs in streams flowing into western Lake Ontario. Based on observed declines and threats to remaining populations the species has been listed as Endangered under Ontario's *Endangered Species Act* (ESA 2007).

Redside Dace populations in Ontario are subject to numerous threats, the most notable being the loss of suitable habitat, which has likely been the major factor contributing to declines. The species is now primarily restricted to the headwaters (i.e., the source and most upstream sections) of many streams where it was once widespread. A large proportion of Redside Dace populations in Ontario are found around the Greater Toronto Area – a region that has been experiencing rapid urban growth over the past 20 years. Urban development has the potential to impact Redside Dace habitat through; 1) increasing the percentage of impervious surfaces, which effects runoff patterns, increases erosion and alters hydrologic regimes and may increase water temperatures; 2) site grading and excavation which may lead to increased sedimentation and erosion of the banks; and 3) loss of habitat, which may occur through loss of riparian vegetation, in-stream habitat features, wetland and groundwater sources.

This document is intended to provide guidance to proponents interested in developing lands in and adjacent to protected habitats of Redside Dace. While each development situation is unique and will need to be assessed on a case by case basis in consultation with the local Ministry of Natural Resources (MNR) district office, these guidelines are intended to assist by providing a description of Redside Dace habitat, the protection provided to the species and their habitat under the ESA, a description of when a permit is required under the ESA and the project review and permitting process, and guidance as to best management practices for development activities to avoid or mitigate impacts on Redside Dace and their habitat.

This document provides an overview of best management practices (BMPs) that have been based upon current requirements, guidelines and existing development practices in Ontario. These BMPs include the following:

1) Comprehensive Planning for Subwatersheds - Planning at a subwatershed level allows for the evaluation and assessment of potential cumulative effects of urbanization on Redside Dace and its habitat. Incorporation of these subwatershed plans, prior to the Secondary Planning stage will inform the planning process and help ensure that consideration is given for Redside Dace upfront, when there is greater flexibility and more opportunities for avoiding or minimizing impacts;

2) Stream Crossings – development activities should attempt to minimize the number of stream crossings, and where required, minimize widths, target straight sections of the stream and areas that have been previously disturbed, minimize activity/footprint within regulated habitat, including spanning the meanderbelt, adherence to timing windows, incorporation of effective erosion and sediment control measures, and design in a manner that promotes fish passage;

3) Construction Site Preparation – Construction activities may result in the removal of vegetative cover and grading of adjacent lands, which, can lead to increased sediment delivery and erosion to the stream and its banks. Site preparation should be completed in a manner that attempts to prevent suspended sediment concentrations from exceeding 25mg/L of background conditions in occupied reaches. In addition, site preparation and construction should follow an approved Erosion and Sediment Control Plans, including minimizing disturbed areas, stabilizing soils through erosion control blankets and revegetation efforts as soon as possible, and using multiple-barrier approach to sedimentation, effective sediment and erosion ponds and sediment traps, where applicable.

4) Stormwater Management – untreated runoff of urban landscapes may impact Redside Dace habitat by altering hydrologic regimes, increasing water temperatures, and conveyance of chemicals and pollutants to watercourses. Stormwater management ponds should attempt to target outflows having water temperatures less than 24C, dissolved oxygen levels above 7 mg/L and having total suspended sediment levels less than 25mg/L above background conditions. Stormwater management should attempt to mimic pre-development hydrologic regimes by incorporating a 'treatment-train' approach and low-impact development designs.

5) Installation of Infrastructure – the placement of infrastructure such as gas pipelines, storm and sanitary sewers, and hydro conduits near streams has the potential to impact Redside Dace habitat. Utilities near streams should be located either over or under streams to avoid potential for impact, and should be constructed in conjunction with new or replacement stream crossings. Methods such as directional drilling, and jack and boring are encouraged when soil conditions are appropriate.

6) Stream realignment and relocation – While stream realignments or relocations are discouraged, in some situations they may be unavoidable. In these situations stream realignments and relocations should be based on an approved subwatershed plan and connect to existing Redside Dace streams, incorporate natural channel design concepts and habitat features consistent with Redside Dace habitat requirements (e.g., overhanging terrestrial vegetation, pool-riffle habitat, water temperatures and dissolved oxygen), and corridors consistent with regulation (e.g., meanderbelt and 30m riparian corridor).

1.0 PURPOSE

To provide guidance to persons interested in developing areas in southern Ontario that have Redside Dace (*Clinostomus elongatus*) habitat. Redside Dace, which is an endangered species, and its habitat are protected under the *Endangered Species Act, 2007 (ESA).* While each development situation, as described below, will need to be assessed on a case by case basis in consultation with the local Ministry of Natural Resources (MNR) district office, these guidelines are intended to assist by providing the following information:

- A description of Redside Dace, where they are located, and the habitat they require
- An explanation of the protection provided to Redside Dace and their habitat under the *ESA*
- A description of when a permit is required under the *ESA*, and the project review and permitting process under the *ESA*
- Best management practices for development activities to avoid or mitigate impacts on Redside Dace and their habitat.

2.0 CONTEXT

2.1 Introduction to the Species and its Habitat

2.1.1 Species Characteristics

The Redside Dace is a small colourful minnow (i.e., a cyprinid), with an average length of 7 cm, reaching a maximum of 12 cm. They are silvery in colour, with red sides and a purple sheen (see photograph on Cover Page). Typically Redside Dace have a life expectancy of 3 to 5 years (MNR 2010a).

Redside Dace have an unusually large mouth for a minnow. They are insectivorous fish (feed on insects) that rely on seeing their prey at the water's surface. Redside Dace spend most of their time in mixed-species schools in pools, at or near a mid-depth position in the water. They are specialized feeders, their primary food consisting of terrestrial (land-based) insects, especially adult flies. Redside Dace leap out of the water to obtain such prey. On occasion, they may also feed on aquatic insects.

Typically, the Redside Dace is sexually mature at two years, but spawning may not occur until its third year. Spawning occurs in late May/early June when water temperature reaches 16 to 18°C. This limited temperature range results in a short spawning period, and while females can produce from 400 to over 1500 eggs, survival to the adult stage is limited (MNR 2010a). These factors and other specialized spawning habits described below, may limit the ability of Redside Dace to rebound from low population levels (MNR 2010a).

2.1.2 Habitat Preferences

In Ontario, Redside Dace generally inhabit slow moving sections of connected streams. They prefer streams that are usually less than 10 metres in width (i.e., 2nd, 3rd and 4th order size streams) that meander through meadows. Redside Dace are most commonly found in stream sections flowing through open meadows with scattered trees and shrubs. These streams are typically partially covered by overhanging vegetation, banks, submerged branches and logs. The overhanging vegetation is important both as a source of cover that shades the water and protects the Redside Dace from predators, and as habitat for the insects that Redside Dace eat.

The stream bottoms generally include gravel and/or sand or other coarse sediment which provides the spawning habitat.

Redside Dace require clear water in order to see their prey, and are sensitive to turbidity (i.e. the cloudiness of the water from particles suspended within it), although they have been found in some streams with moderate turbidity. Redside Dace are a cool water species, preferring temperatures less than 24°C and dissolved oxygen concentrations of at least 7 milligrams per litre (MNR 2010a). Although Redside Dace can leap several centimetres out of the water to catch flying insects, they can not jump over dams or other elevated structures in streams. Collectively these conditions limit the widespread dispersal of the species.

Redside Dace inhabit different sections of the stream, depending on whether they are of the age to breed, and if it is breeding season, as follows:

- Spawning habitat consists of faster flowing “riffles” or gravel bars (deposits of gravel in the stream)
- Non-breeding habitat is most often in the form of headwater streams, brooks or pools

Redside Dace commonly use nests of Creek Chub and/or Common Shiner, and synchronize their spawning with that of these two species. The Creek Chub or Common Shiner likely guard the Redside Dace eggs from predation, and keep the nest free of silt (MNR 2010a).

Existing knowledge of Redside Dace habitat is primarily based on studies conducted during the warm weather seasons. Knowledge of seasonal movements of Redside Dace can be summarized as follows:

- In spring, they move upstream to find suitable spawning habitat
- In late summer young Redside Dace move upstream from the areas where they hatch, along with the Creek Chub or Common Shiner
- Redside Dace often rely on groundwater-fed pools for refuge habitat during warm summer months
- Redside Dace have been observed moving downstream from the habitat they occupy during the summer to overwinter

Headwaters of streams are a key source of the habitat described above that Redside Dace require. It has been estimated that 90 percent of the flow of a river originates from the watershed’s headwaters. Flows from headwaters, which includes groundwater discharge areas and wetlands, also supply important factors to Redside Dace including cool water, food and coarse sediment for spawning habitat.

2.1.3 Range

In Canada, Redside Dace are only found in southern Ontario and the Two Tree River on St. Joseph Island (see Figure 1). Most populations in southern Ontario occur in tributaries in the GTA (i.e. the City of Toronto, and the Regions of the municipalities of Durham, Halton, Peel and York) and the City of Hamilton, flowing into western Lake Ontario from Spencer Creek in the west, to Pringle Creek in the east. Populations are also known to occur in the following areas outside of the GTA:

- The Saugeen River system (Grey and Bruce Counties)
- Gully Creek and an unnamed creek south of Gully Creek (near Bayfield in Huron County)
- Irvine Creek in the Grand River watershed (near Fergus in Wellington County)
- Humber River system (extends in to Simcoe County)

Ontario currently has just under 5% of the global range of Redside Dace. Ontario populations have experienced a continuing decline over the last 50 years. Historically, Redside Dace was found in 24 watersheds in Ontario. In 1987, the species was considered provincially vulnerable and nationally to be of "special concern". In 2000, the species was designated as "threatened" in the province of Ontario based on it being present in approximately 20 locations. In 2009, the species was provincially designated as "endangered" based on its remaining presence in 16 watersheds.

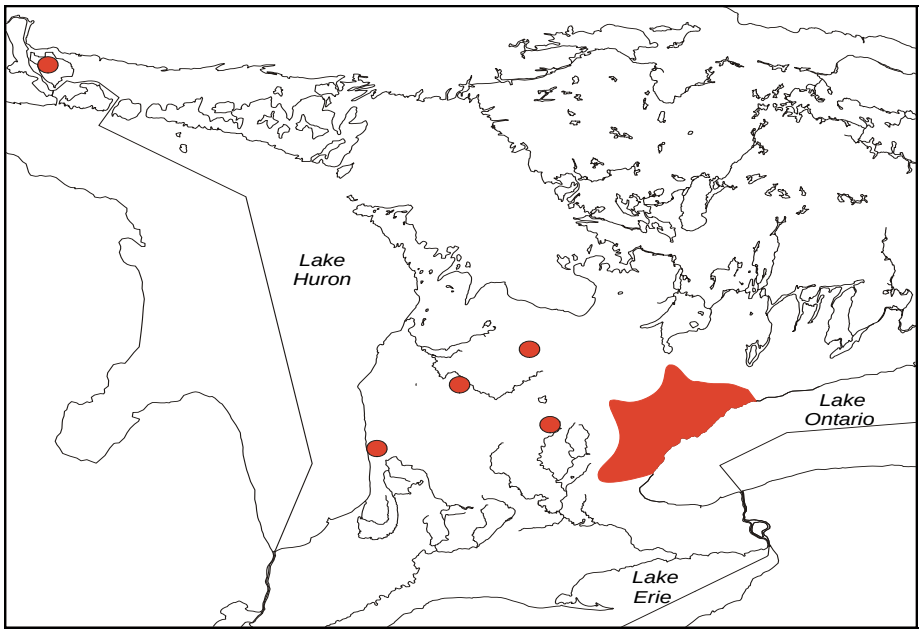

Figure 1. Distribution of Redside Dace (*Clinostomus elongatus*) in Ontario, 2001 (MNR 2010a).

Within these 16 remaining watersheds, Redside Dace populations have been lost from several tributaries flowing into western Lake Ontario and the length of stream occupied by several populations has been reduced. For example, in the Spencer Creek watershed, Redside Dace were found in several locations in a stream stretch of approximately 18 kilometres in the early 1970s. Intensive sampling from 1997 to 2001 at historical sites produced only a single specimen. Reductions in range and abundance have also occurred in other watersheds including the Lynde Creek, Don River, Duffins Creek, Kettleby Creek, Fourteen Mile Creek and Bronte Creek watersheds. Redside Dace currently occupy less than 4% of the total stream length in the GTA.

2.1.4 Urban Development – Threats and Opportunities

Threats to Redside Dace

Redside Dace populations in Ontario are subject to numerous threats that vary across its range. While additional research may be beneficial to fully understand the specific causes and effects for Redside Dace, the loss of suitable habitat is likely the major factor contributing to Redside Dace declines in Ontario (MNR 2010a). The species is now primarily restricted to the headwaters (i.e., the source and most upstream sections) of many streams where it was once

widespread. Figure 2 depicts the occurrence of Redside Dace in the GTA and the level of urbanization from 1969 to 1999.

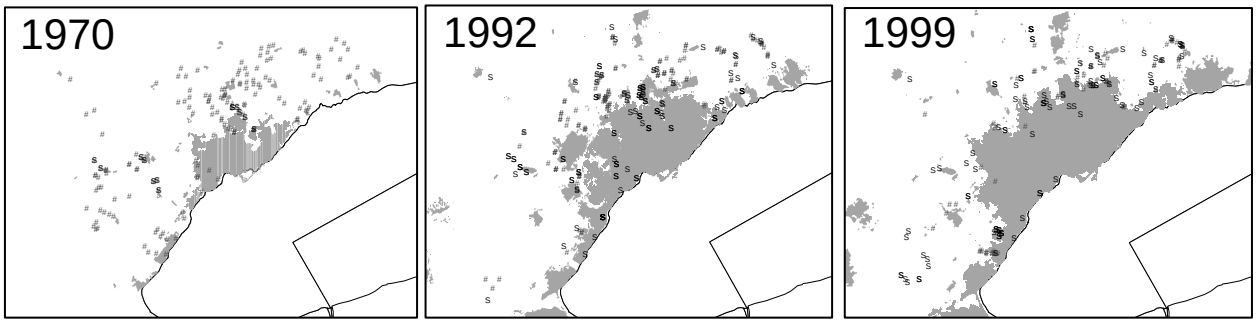

Figure 2. Distribution of Redside Dace in the GTA over time. Degree of urban area at the respective time period shown as grey shading. Closed circles represent sites where Redside Dace were captured; open circles represent sites of former Redside Dace occurrences when sampling occurred, but no Redside Dace were captured. Taken from COSEWIC (2007).

Development can impact Redside Dace habitat through:

1. Increasing the percentage of imperviousness (i.e., impenetrable) surface of the subwatershed which:
    - Reduces the ability of the ground to absorb rainwater resulting in reduced groundwater discharge to streams, which in turn results in reduced stream baseflows and increased water temperature
    - Increases the amount of surface runoff during rain storms (i.e., stormwater) causing streams to become wider and more unstable as erosion of the banks occurs; increased sediment enters the streams as result of the erosion of the banks
    - Increases stream water temperature through the addition of warmed rain water from hot surfaces

2. Site grading and excavation activities which can result in soil erosion which deposits silt (fine sediment) into streams:
    - Silt enters streams and reduces water clarity thereby affecting the ability of Redside Dace to see their prey
    - Excessive silt may result in the loss of habitat by covering up coarse substrate (e.g., gravel) areas required for spawning and filling in pool habitat areas; excessive silt can also suffocate Redside Dace eggs

3. Loss of Habitat:
    - Removal of riparian vegetation impacts the production of terrestrial insects; riparian vegetation is also an important source of cover in the small streams inhabited by Redside Dace
    - Straightening or enclosure of streams eliminates habitat including pools and riffles
    - In-stream barriers and weirs affect Redside Dace access to nursery and spawning areas located further upstream
    - Loss of natural heritage features like wetlands and groundwater discharge areas affects the flow of water and food to downstream reaches of streams, and increases the temperatures of water flowing downstream

The above information has largely been summarized from the Recovery Strategy for Redside Dace (*Clinostomus elongatus*) in Ontario (MNR 2010a).

For further details and references for the above, please refer to this strategy available at: http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/287136.html

Opportunities for Economic Benefits from Protection and Recovery Activities

Redside Dace require the same environmental conditions that can support high local property values: clean water from clear and cool streams. This presents an opportunity for developers and consumers to consider the economic returns that may be realized from Redside Dace protection and recovery.

Economic studies from across North America found that people are willing to pay more to live near clear and clean watercourses. A survey of thousands of residents within the Grand River watershed in the mid-1990s confirmed that residents are willing to pay an average of 9.6% more on their water bill in order to prevent development that would harm water quality enough to threaten fish, waterfowl, songbirds, and other species in marshes and woodlands. Similar results have been found within other watersheds, including in the St. Mary's watershed in Baltimore, Maryland where the effects of urban development have been the most widely studied over time. In this watershed, water quality is only affected by runoff from developed and paved areas, which have increased since a boom in development in the 1990s. During that time, economic analysis has revealed that even small changes in the environmental health of nearby streams can explain significant differences in property values. Each additional milligram of silt that clouds the water depressed the value of an average $200,000 house by approximately $1100, meaning that an additional 10 mg of silt in the water depressed property values by $11,000. Further studies found that even if streams are not located within or next to a subdivision, their beneficial economic effects to property values can be measured within the local area.

Economists have also discovered that developers often have misconceptions regarding consumers' preferences for green spaces. Surveys have shown that consumers are willing to pay a premium for areas of high environmental health. A key finding from research on this issue is that local market research should be used rather than discussions with realtors and experiences from model-house showings, since this information usually reveals consumer preferences for the structural characteristics of the house, and not the natural environment.

Actions to support the recovery of Redside Dace have the added benefit of making streams clearer, calmer, and cooler. Upstream riverbank restoration could reduce the amount of sediment washing into streams, and thereby prevent the sediment from impacting Redside Dace's ability to find food and/or cover spawning habitat. Improvements to water quality have been shown to significantly improve property values. Recovery of Redside Dace could return economic benefits to local property owners in addition to providing them with improved environmental health.

Actions to protect Redside Dace and other species at risk, all contribute to the protection of biodiversity (i.e., the variety of living organisms that occur in an area). Maintaining natural biodiversity, and the interaction among species, is critical in maintaining natural ecosystem functions, many of which provide substantial benefits to society, including:

- Improved air quality
- Stabilization of climate (e.g., removing carbon from the atmosphere)
- Water purification

- Pollination
- Erosion control

Ontario's economy benefits from these functions including through:

- Reduced costs of water treatment
- Natural areas help to protect property from erosion and to store carbon to slow the rate of climate change
- Natural areas also provide places for recreation and renewal. Ecological research has revealed that biologically diverse ecosystems typically provide a greater flow of ecosystem services than non-diverse systems
- Biodiversity acts as insurance against some of the impacts of climatic change, since biologically diverse ecosystems are more resilient to change

These benefits are defined as nature's "ecosystem services." Ecosystem services are nature's benefits to humans that are not traded in the marketplace, so they do not have a market price. These priceless benefits have an economic value which can be revealed by various statistical and survey techniques known as ecosystem valuation. Recent research has revealed tens of billions of dollars in value from these ecosystem services across the Southern Ontario landscape.

The need to retain biodiversity is now recognized as an international priority. The impact of human activity globally, through increased industrialization and urbanization, is causing diversity to be lost at an accelerated rate. The United Nations General Assembly named 2010 as the International Year of Biodiversity to increase awareness of the importance of biodiversity and increase actions aimed at reducing the loss of biodiversity. Ontario has undertaken several actions, including passing the *ESA*, to protect its biodiversity.

2.2 Redside Dace and the *Endangered Species Act*

In Ontario, species that may be at risk are reviewed by a team of experts known as the Committee on the Status of Species at Risk in Ontario (COSSARO). COSSARO is generally made up of people with expertise in certain scientific disciplines or Aboriginal Traditional Knowledge and are appointed by the Lieutenant Governor in Council. Once classified by COSSARO as "at risk", a species is added to the Species at Risk in Ontario (SARO) List.

For further information on COSSARO, please see:
https://www.pas.gov.on.ca/scripts/en/BoardDetails.asp?boardID=141880.

The Redside Dace was originally listed by COSSARO as a threatened species in 2000. Following re-assessment by COSSARO, the status of Redside Dace was changed from threatened to endangered on February 18, 2009 under the *ESA*. A species is classified as "endangered" if it lives in the wild in Ontario but is facing imminent extinction or extirpation. The Redside Dace was classified as endangered based on significant declines in most of the 24 Ontario watersheds where it was historically known to occur along with the ongoing threats to the species.

2.2.1 Species Protection – Section 9 of the ESA

Generally, endangered, threatened and extirpated species on the SARO List are automatically afforded protection under the *ESA*. Section 9 of the *ESA* prohibits harmful actions such as killing, harming, harassment, possession, buying and selling of any of these species. As an endangered species, Section 9 of the *ESA* applies to Redside Dace.

2.2.2 Habitat Protection – Section 10 of the ESA

Section 10 of the *ESA* prohibits the damage or destruction of the habitat of all endangered and threatened species including Redside Dace. Under the *ESA*, "habitat" is defined as either:

- General Habitat (based on the general definition in clause 2(1)(b) of the Act) - an area on which a species depends directly or indirectly to carry on its life processes including life processes such as reproduction, rearing, hibernation, migration or feeding or
- Regulated Habitat (as defined in clause 2(1)(a) of the Act) - the area prescribed for a specific species in a habitat regulation

Only one definition will apply to a species at any given time. Therefore the habitat that is protected for any given species will either be the habitat based on the general definition in the Act or the habitat specifically prescribed for that species in a regulation.

General Habitat

General habitat protection provides immediate habitat protection to a species added to the SARO List as threatened or endangered. This can help allow for the continued persistence of the species until a more precise evaluation of the habitat needs of the species is completed and identified in a species-specific habitat regulation. Once a habitat regulation is in place, the habitat for that species is as described in that regulation.

Habitat protection based on the general definition described above applies to species listed as threatened or endangered and added to the SARO List after June 30, 2008, and to the species that were protected under the previous legislation (which are identified in Schedule 1 of the Act). From the time it was added to the SARO List as endangered in 2009, Redside Dace has received general habitat protection. The general definition of habitat applies until a Redside Dace habitat regulation comes into force.

Regulated Habitat

A habitat regulation prescribes an area as the habitat of the species. This can be done in several ways: by describing boundaries, features of an area, or describing the area in any other manner [S.55 (3)(a)]. The regulated area may be smaller or larger than the area described as general habitat [S.55(3)(c)]. The goal of species-specific habitat regulations is to protect habitat and help ensure the survival and recovery of endangered and threatened species.

The *ESA* requires that proposals for species-specific habitat regulations for newly listed species be published within two years of listing on the SARO List for endangered species, and within three years of listing for threatened species. A habitat regulation proposal for Redside Dace is therefore required by February 18, 2011, two years from the date that it was listed as endangered.

In keeping with these legislative requirements, the MNR has developed a proposed Draft Habitat Regulation for Redside Dace, which has been posted on the Environmental Registry for public comment on February 18, 2011. The Draft Habitat Regulation for Redside Dace can be found at: INSERT LINK ONCE AVAILABLE

2.2.3 Recovery Strategy and Government Response Statement for Redside Dace

In February 2010, the recovery strategy for Redside Dace was finalized. Under the *ESA*, a recovery strategy provides advice to government on what is required to achieve recovery of a species. The recovery strategy outlines the habitat needs and the threats to the survival and recovery of the species. It provides recommendations on the objectives for protection and

recovery, the approaches to achieve those objectives, and the area that should be considered in the development of a habitat regulation.

For further details on the strategy, please see A Recovery Strategy for Redside Dace in Ontario, at: http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/287136.html

Within nine months of approving a recovery strategy, the Act requires the Minister to publish a statement summarizing the government's actions and priorities in response to the recovery strategy.

To review the Redside Dace Ontario Government Response Statement that was published in November, 2010, please see:
http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@species/documents/document/stdprod_069068.pdf

The recovery strategy, government response statement and species and habitat protection are all part of the government's approach to providing for protection and recovery of Redside Dace.

2.3 Other Approvals Required for Development Activities in Redside Dace Habitat

While these guidelines are specific to the requirements under the *ESA*, there are other approvals related to development work conducted in Redside Dace habitat that may be required. In Ontario, federal, provincial and municipal permits and approvals may be required for projects in and around water, where fish habitat may be affected. These include, but are not limited to the following:

Federal:

- *Fisheries Act* (e.g., prohibits harm to fish habitat)
- *Navigable Waters Protection Act*
- *Species at Risk Act* (e.g., fish and migratory birds listed under this Act throughout Canada, and other species at risk listed under this Act on federal lands) Note: Redside Dace is currently listed as Special Concern on Schedule 3 of this Act. As a species of Special Concern it is not afforded legal protection under SARA. In April 2007, COSEWIC assessed Redside Dace as Endangered, and it is currently being considered for listing under SARA.
- *Canadian Environmental Assessment Act (*e.g., federal Environmental Assessment process applies whenever a federal authority has decision making authority on a project)
- *National Energy Board Act*

Provincial:

- *Lakes and Rivers Improvement Act (*e.g., dams*)*
- *Public Lands Act*
- *Crown Forest Sustainability Act*
- *Conservation Authorities Act* (e.g., flood and erosion control, water course alteration)
- *Fish and Wildlife Conservation Act (*e.g., research permits*)*
- *Ontario Water Resources Act* (e.g., stormwater management)
- *Environmental Assessment Act* (e.g., process required for infrastructure projects by the public sector and certain regulated private sector organizations)
- *Pesticides Act*
- *Aggregate Resources Act*
- *Environmental Protection Act*
- *Drainage Act*

- *Safe Drinking Water Act*
- *Nutrient Management Act*
- *Planning Act (*e.g., provincial policy restrictions on development in significant habitat of endangered and threatened species and fish habitat*)*
- Planning legislation/regulations specific to certain geographic areas *(e.g., Oak Ridges Moraine Act, Greenbelt Act,* the *Niagara Escarpment Planning and Development Act)*
- *Green Energy Act*

Municipal:

- Bylaws related to development (e.g., topsoil preservation bylaws*)*

For more details on the permitting and approval roles of agencies that have a regulatory responsibility for the review of proposed development projects in and around water, you can refer to the Fish Habitat Referral Protocol for Ontario at: http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@letsfish/documents/document/264110.pdf

The Ontario and federal governments have established a protocol to streamline the approvals required under a few of the key Acts listed above. An Interim Protocol for the Review of Project Proposals that may Affect Species at Risk in Ontario has been prepared to provide a harmonized approach to the review and approval of projects associated with species at risk under the federal *Fisheries Act* and *Species at Risk Act,* as well as the provincial *ESA.* Under this protocol, the agency with the legislation that affords the greatest protection for the species will be designated as the lead (i.e., federal department such as Fisheries and Oceans Canada or the MNR). The lead will review proposals, and establish criteria that must be met for their legislation. Criteria designed to meet this legislation with the greatest protection, will also address the requirements of the other agency's legislation. For Redside Dace, where permits are required under the *ESA*, MNR is at this time the lead government agency as the *ESA* currently provides Redside Dace with the greatest protection.

It is the responsibility of the proponent planning any activities in Redside Dace habitat to obtain all necessary approvals and permissions (both under the *ESA* and/or any other applicable legislation) prior to the undertaking. Section 3.0 below provides a description of the project review and permitting process under the *ESA*. For more information on Ontario's provincial legislation, please see the E-laws website at: http://www.e-laws.gov.on.ca/index.html. For more information on Canada's federal legislation, please see the Department of Justice Canada's website at: http://laws.justice.gc.ca/en/.

3.0 PROJECT REVIEW/PERMITTING PROCESS

Proponents are advised to discuss project plans with MNR district staff early in the project planning and design phase so that species and habitat protection measures can be considered at the outset and to avoid unanticipated delays. Redside Dace within Ontario are predominantly found in the GTA, within MNR's Aurora district. For MNR district contact information please see the References Section.

Each proposal will be considered on a case-by-case basis to determine whether or not a permit is required, with consideration for the broader subwatershed context. A permit is required for any activities that cannot avoid outcomes that are prohibited by the *ESA*, including those that are likely to kill, harm or harass Redside Dace, or damage or destroy its habitat. The Minister may decide to issue a permit, provided that the appropriate tests can be met (those for an

Overall Benefit permit are outlined in Phase 3 below). In some cases, it may be possible to avoid activities prohibited by the *ESA*, for example, by:

- Conducting activities at a different time of year (e.g., installing culverts in areas upstream of occupied reaches when these creeks are dry)
- Avoiding specific areas (e.g., moving upstream from occupied reaches to install a bridge)
- Using different techniques, such as directional drilling to install new infrastructure (e.g. pipelines, see Section 4.2.4 Best Management Practices: Installation of New Infrastructure).

Permits may also be required for activities occurring outside of Redside Dace habitat that have the potential to indirectly adversely affect the species' habitat. For example, construction, repair or redirection of storm water drains occurring outside of Redside Dace habitat that results in stormwater effluent flowing into protected habitat would likely require a permit.

There are four different types of permits that can be sought under Section 17 of the *ESA*. The permit type varies depending on the purpose of the activity:

ESA Permit Name	Title	Description
A	Human Health or Safety Permit	For activities necessary for the protection of human health or safety (e.g., repairing a failing pedestrian bridge that is at risk of collapsing, therefore posing a risk to human health and safety)
B	Protection or Recovery Permit	For activities that help protect or recover a species at risk (e.g., undertaking a stream restoration and enhancement project designed to improve overall riparian and aquatic habitat conditions within a portion of an occupied reach)
C	**Overall Benefit Permit**	**For activities where the main purpose is not protection or recovery, but an overall benefit* for the species will be achieved within a reasonable time while minimizing adverse impacts** (e.g., road widening activities that have the potential to adversely effect Redside Dace habitat) ***** Overall benefit is more than 'no net loss' or an exchange of 'like for like' (see Figure 4).
D	Significant Social or Economic Benefit to Ontario Permit	For activities where the main purpose is not protection or recovery, but significant social or economic benefit to Ontario is provided (i.e., for limited circumstances and requires Cabinet approval)

Proponents are responsible for obtaining the appropriate permits prior to beginning the project. MNR district staff can support proponents in each step of the process as described below by:

- Confirming if Redside Dace and/or their habitat occur at or in the vicinity of the proposed site
- Providing advice on how to avoid harming or harassing Redside Dace and damaging or destroying its habitat
- Helping to determine whether specific activities will require authorizations under the

ESA and other approval authorities
- Assisting proponents in the development of a permit proposal, including the development of mitigation and overall benefit plans, by providing species at risk expertise and applying knowledge of local habitat conditions

Examples of development activities that may require an Overall Benefit Permit under the *ESA* for Redside Dace include (but are not limited to):

- Site preparation (e.g. removing vegetation and/or topsoil, grading land, constructing, using and/or maintaining utilities, roads and septic systems)
- Stormwater management
- Removing or altering groundwater
- Activities relating to the construction and maintenance of water crossings (bridges, culverts), stream diversions and ponds
- Relocation of streams
- Road widening

3.1 The Project Review and Permitting Process

The project review and permitting approval process involves six phases:

Phase 1: Gathering information

Phase 2: Assessing the need for a permit

Phase 3: Permit assessment and content development

Phase 4: Consultation and permit drafting

Phase 5: Final permit and approval process

Phase 6: Implementing permit

The following section focuses on the project review process for Overall Benefit Permits because they are typically the most appropriate authorization for development projects. In some cases, other permits (e.g., Protection or Recovery Permits) may be required as a precursor to development projects. For further information on other permit types, please consult with your local MNR district office. A summary of the Overall Benefit Permit review and approval process is outlined in Figure 3.

The project review process is iterative and involves ongoing dialogue with the proponent, the MNR district office, affected stakeholders and other approval agencies. Each project review phase is described in more detail below and the roles and responsibilities of the MNR and proponents are summarized in the Project Review Summary (Section 3.4).

Phase 1: **Gathering Information**

Proponents are requested to discuss their proposed project with local MNR district staff and to provide the following documentation to support the determination about whether an *ESA* permit is required:

- Proponent name and contact information
- Land ownership (i.e. private, provincial, federal)
- Project overview (i.e. a brief description of your project or activity)
- Project details, including purpose, location, duration, timing and methodology
- How it was determined that Redside Dace or its habitat was present
- List of other species found on or near the site
- List of other permits/approvals required

General Project Review Process

Project Review Process for Overall Benefit Permits

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Gathering Information	**Assessing the need for a permit**	**Permit assessment and content development**	**Consultation and permit drafting**	**Final permit and approval process**	**Implementing permit**
Proponent gathers information about the project Are Redside Dace or its habitat present?	*Proponent works with MNR* Will species or its habitat be impacted? Can activities be modified to avoid adverse effects? Confirm a permit is required	Consider alternatives Design mitigation measures to minimize adverse effects Develop actions to result in overall benefit *Draft Permit* Consider MNR's EA obligations	Complete consultation, if needed Consider comments Revise plan and finalize draft permit conditions	Seek final approvals Proponent notified of decision Post Decision Notice on ER	Proponent undertakes project under conditions of permit

Figure 3. Overview of the Overall Benefit Permit Process. (EA: Environmental Assessment, ER: Environmental Registry)

Phase 2: Assessing the Need for a Permit

During the second phase of the project review process, the MNR screens projects by considering a series of questions to determine the potential for adverse effect on Redside Dace or its habitat. Answers to the following questions will determine if a permit is required:

a) Do Redside Dace occur within the given stream reach? Is Redside Dace habitat present?
b) Are any phases of the proposed project likely to harm, harass, or kill individual Redside Dace? (Section 9 of the *ESA*)
c) Will the proposed project damage or destroy Redside Dace habitat? (Section 10 of the *ESA*)
d) Can the proposed project be modified to avoid all adverse effects on Redside Dace or its habitat? For example, could it be moved outside of Redside Dace habitat?

The first priority of the project review process is to determine whether it is possible to avoid activities prohibited by the *ESA* (i.e., avoid adverse effects on Redside Dace and its habitat) thereby eliminating the need for a permit under the *ESA*. MNR district staff will work with the proponent and provide advice about:

1. whether the project is unlikely to affect the species or its habitat and therefore not require a permit

2. whether and how the project can be modified to avoid all impacts (e.g., the project will not require a permit provided certain techniques are used, the work is conducted at a specific time of the year, and the work occurs in specified locations)
3. whether the project will require a permit to remain compliant with the *ESA*

Broad scale Redside Dace location information is available through the NHIC Biodiversity Explorer website: https://www.biodiversityexplorer.mnr.gov.on.ca/nhicWEB/mainSubmit.do and within recent Fisheries Management Plans. More detailed information regarding watershed range of the species is available through local district offices.

Case Studies: Modifying a Project to Avoid Impacts to Redside Dace

Project 1: Installing a new watermain by digging an open-cut trench through existing occupied Redside Dace habitat.

Potential impacts: By digging a trench through the stream, the instream and riparian habitats would be disturbed. The impacts of an open-cut trench may include: i) altering the bed and banks of the stream (e.g. impacting spawning or feeding habitat); ii) removing potential food supply to the fish (i.e., Redside Dace feed on insects that live on the vegetation on the banks); iii) removal of bank vegetation/cover may result in increases in water temperature; iv) Construction of trenches may result in sediment entering the stream which may impact the water quality and clarity; and v) has the potential to directly harm Redside Dace during construction and/or fish removal/salvage activities.

How can the project be modified to avoid impact: Changing the method of installing the watermain so as not to enter the Redside Dace habitat will reduce the potential for adverse impacts. This can be done by conducting directional drilling that occurs beyond the 30 m of the riparian habitat of the stream and goes underneath the stream. Geotechnical studies are required to ensure that the location or drilling will not have indirect impacts on the stream such as draining its groundwater, and to ensure that this method is viable for that particular site (i.e., some sites contain subsurface conditions which would mean that directional drilling is unlikely to succeed such as large boulders). This should be discussed with your local MNR District Office.

Project 2: Installing a culvert in an area upstream of an occupied reach of Redside Dace.

Potential impacts: Installing a closed bottom culvert would require instream work which could impact the flow and function of the water to the occupied stream of the Redside Dace downstream.

How can the project be modified to avoid impact: Change the time of year for this project to July/August when this portion of the creek is generally dry so there would be no impact to the flow and function of the stream. Subwatershed studies for the area will usually document these conditions. In the event that the creek is flowing at this time, another alternative would be to use methods that pump or divert the water around the installation site to ensure that the stream flow is maintained.

The project proceeds to Phase 3 of the project review and permitting process, if it is determined that it is not feasible to avoid contravening the *ESA.*

Phase 3: Overall Benefit Permit Assessment and Content Development

Tests for an Overall Benefit Permit

The legal requirements [*ESA*, clause 17 (2) (c)] for an Overall Benefit Permit include that the Minister must be of the opinion:

- that reasonable alternatives have been considered, including alternatives that would not adversely affect the species, and the best alternative has been adopted
- that reasonable steps to minimize adverse effects on individual members of the species are required by conditions of the permit
- that an overall benefit to the species will be achieved within a reasonable time through requirements imposed by conditions of the permit

Overall benefit is more than 'no net loss' or an exchange of 'like for like' (Figure 4). Actions deemed to provide an overall benefit to Redside Dace will typically be measurable (e.g., an appropriate length of the inhabited stream channel restored), outcome-oriented (i.e., focused on achieving a specific, predetermined goal) and linked to addressing threats identified for the species.

Overall benefit may include (but may not be limited to) the following changes relative to the initial condition of the species and/or habitat:

- An increase in the number of individuals of the species above the current level
- An increase in the extent of the species (e.g., increased proportion of the species' range occupied)
- Improved condition of existing populations
- An increase in the protection, quality and extent of a species' habitat
- Beneficial activities (such as reducing threats, monitoring project effectiveness, research, education and outreach) that alone do not result in any of the above benefits may contribute to an overall benefit plan for the species

To consider issuing an Overall Benefit Permit, MNR needs proponents to provide supporting documentation that:

- Describes in detail the proposed approach to achieve an overall benefit
- Describes the activities to be carried out to minimize adverse effects (i.e., mitigation measures)
- Demonstrates the consideration of a range of reasonable alternatives, including:
  - The rationale for selecting the preferred alternative as being the best alternative
  - The consideration of alternatives that avoid impacting the species (e.g., Can the activity be moved to a different location?)
  - The evaluation of alternatives that minimize the potential adverse effects. These evaluations may be part of the project's Environmental Assessment, provided that each alternative is considered from a perspective focused on its potential effects on Redside Dace

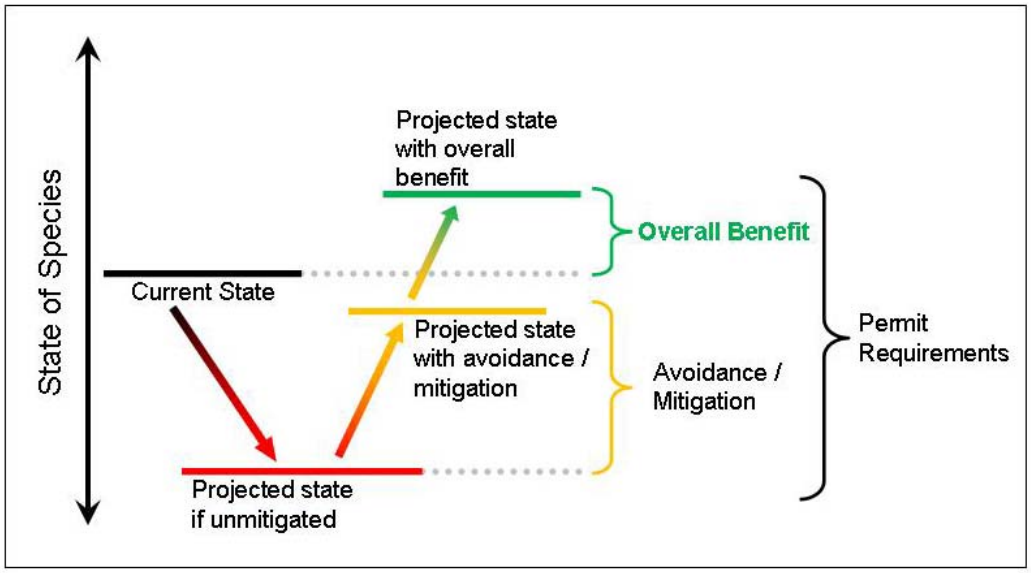

Figure 4. A visualization of what constitutes an overall benefit. Overall benefit is more than 'no net loss' or an exchange of 'like for like'. The gap between the projected state and the current state is dynamic and its location will vary according to how effectively the adverse effects can be mitigated, which in turn modifies what actions are necessary to achieve an overall benefit for the species.

Examples of project components that may be modified to **minimize adverse effects** include:

- Changes to the location of the proposed project (e.g., move the location of a bridge so that it is outside of the occupied reach of Redside Dace)
- Changes to project design (e.g., phasing grading of sites which assist in ensuring that sediment and erosion control is in place during construction; for further information on this and other Best Management Practices see Section 4.0 Best Management Practices below)

Examples of potential **overall benefit actions** for Redside Dace may include:

- Retrofitting of existing storm ponds and/or effluents to improve water quality
- Improving and/or securing habitat within the reach/subwatershed
- Decommissioning of artificial ponds connected to occupied streams to improve fish passage and/or water quality (e.g., temperature)
- Removing artificial barriers from streams to improve up/downstream fish movement
- Planting riparian vegetation to reduce bank erosion and create shaded stream conditions and insect habitat

In reviewing the documentation submitted, MNR considers the following:

- The location of the proposed project in relation to the Redside Dace habitat regulation. This information should be accompanied by a detailed description of the information source (e.g., MNR Redside Dace maps).
- Whether and how the tests for an Overall Benefit Permit are being met
- The degree of uncertainty and risk in the actions proposed to provide an overall benefit
- The proposed overall benefit relative to the magnitude and impact of the project
- The government's response statement to the Redside Dace recovery strategy which describes actions that the government and partners will take to protect Redside Dace

(as per the requirement to consider this statement prior to issuing a permit as described in ESA, subsection 17(3)). For the Redside Dace Ontario Government Response Statement please see: http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@species/documents/document/stdprod_069068.pdf

This information will be used by MNR to work with the proponent to begin compiling a draft Overall Benefit Permit. Opportunities to achieve an overall benefit to the species may be limited within particular stream reaches and sub-watersheds. In these cases, it may be necessary to consider the opportunities for providing an overall benefit to Redside Dace in habitats in other adjacent sub-watersheds (MNR district staff can provide assistance in this regard).

Phase 4 Consultation and Permit Drafting

The consultation and permit drafting phase involves ongoing dialogue between the MNR and the proponent. Following discussions between MNR and the proponent, MNR will assess other consultation activities that may be necessary (e.g., with the public, stakeholders, Aboriginal communities, local communities) depending on the particular situation. For example, a more consultation may be identified as an obligation under the Resource Stewardship and Facility Development Class Environmental Assessment. It is anticipated that proponents would be actively involved in these consultations, should they be necessary. Further information is provided in "A Class Environmental Assessment for MNR Resource Stewardship and Facility Development Projects" available on the Ministry of Natural Resources website at: http://www.mnr.gov.on.ca/en/Business/LUEPS/Publication/245473.html , including details regarding consultation requirements (i.e., Appendix 3).

MNR considers the comments received during the consultation process and revises the proposal as required (e.g., in response to significant new information). Each draft permit will undergo a legal review.

Phase 5: Final Approval Process

During this phase of the project review, MNR staff submit the draft permit and supporting documentation to the Minister for a final decision regarding the issuance of a permit. The proponent is notified of the decision outcome by MNR district staff and the decision is made publicly available through the posting of a Decision Notice on the Environmental Registry.

Phase 6: Implementing Permit

If approved, the permit holder must adhere to the permit conditions to remain in compliance with the *ESA*, including, but not limited to, adherence to all aspects of Overall Benefit details, mitigation strategies and any other prescriptions (e.g., monitoring) or required documentation (e.g., photographs).

Case Study: Overall Benefit

Project: Road widening, including the removal of an existing 40 m steel pipe culvert in a reach of a stream occupied by Redside Dace and replacement with a new structure.

Alternatives: Design alternatives include: i) open span bridge; ii) new closed-bottom, corrugated steel pipe culvert (CSP); or iii) an open bottom culvert. These three options were considered, documented and presented for evaluation; however, technical constraints limit the potential for completely avoiding an adverse effect on Redside Dace regardless of the alternative chosen. It is geotechnically not feasible to build a bridge that arches above the unconfined (not defined) valley given the sandy soils and high groundwater in the area. A closed-bottom CSP culvert would require additional channel length (20m) to accommodate the road widening thereby covering existing habitat and may further limit fish passage. An open-bottom culvert can be incorporated that matches the existing culvert length and will not limit fish passage as would the CSP culvert. Therefore, the option of an open bottom culvert was chosen.

Adverse Effects: The construction of the preferred alternative (open-bottom culvert) will still result in some adverse impacts to Redside Dace habitat, including the temporary disturbance and damage of some habitat via construction activities to remove the existing culvert. In addition, there is the potential to harm or harass the species through de-watering of the construction area and fish salvage activities.

Mitigation:

- Flows are diverted around the construction area using dam-pump operations; a fish rescue plan is put in place within the construction area to remove and relocate the fish downstream.
- Insertion of a new open bottom culvert that spans the channel will restore the natural flow of the stream including that of potential groundwater inputs
- Retaining walls are used (compared to traditional embankment areas) to support the road which eliminated the need to lengthen the culvert over a further 20 m of the stream (i.e., the new culvert is the same length as the culvert being replaced)
- Work within the stream to remove the existing culvert is conducted within the construction timing window recommended for Redside Dace (i.e. July 1 to September 15th so as to avoid the spawning season and to stabilize the stream corridor before winter)
- Effective sediment and erosion control is in place to prevent sediment from entering the stream
- Maintain style of existing rural road for road expansion that has no curbs or drains to prevent stormwater runoff from the road into the stream

Overall Benefit: The incorporation of an open-bottom culvert will restore overall stream function, as the existing culvert was impairing natural channel processes including sediment transport and groundwater flow into the channel and limiting fish passage. In addition to the open-bottom culvert, Overall Benefit included the removal of an existing barrier (i.e., small dam) to Redside Dace movement located upstream of project site. Removal of the barrier upstream provided access to 1.5 km of good quality habitat located upstream. The increase in the extent of the species' habitat is expected to be sufficient to support an increase in the local population.

3.2 Timelines for Seeking a Permit

Once permit conditions are determined, the process is generally completed within six months; however complex situations may take longer. Each project proposal will be unique. The duration of the project review process will depend on the project complexities, scale, proposed timing of development activities and the sensitivity of Redside Dace and its habitat to these activities. Examples of factors that may affect the timing the project review process include:

- The amount of time required to obtain preliminary information from proponents
- Timing considerations associated with gathering additional information, if needed
- Determining the probability and magnitude of potential impacts
- The complexity of discussions regarding mitigation and overall benefit plans
- Results of *Environmental Assessment Act* screening that outlines the consultation requirements necessary (i.e., the higher the category that a project screens to, the more consultation is needed)
- Drafting of the permit
- The feedback received from posting to the Environmental Registry

3.3 Checklist: Summary of What is Required for the Project Review Process

The type of information required by MNR to discuss your project will depend on the type of permit being sought. The information provided below refers to the information that the proponent is to provide to MNR (Phases 1-3) for acquisition of an Overall Benefit Permit.

Phases 1 and 2: Gathering Information and Assessing the Need for a Permit

- ☐ Proponent information (contact information and primary contact)
- ☐ Land ownership (i.e. private – including landowner name, provincial, federal)
- ☐ Project details, including the purpose of the activity, project location(s), duration of the project, timing and methodology (i.e. how each phase of a multiple phase project will be carried out). The specific nature of these documents will vary based on the proposed undertaking.
- ☐ A detailed description of the source for Redside Dace and habitat information (e.g. MNR maps or advice given by MNR to the proponent about whether the stream reach is occupied by Redside Dace)
- ☐ A list of other species found on or near the site
- ☐ An explanation of possible impacts on a protected species or habitat throughout the entire project
- ☐ A list of other permits/approvals required

Phase 3: Permit Assessment and Content Development

- ☐ An analysis of a range of reasonable alternatives (including those that avoid adverse effects on Redside Dace)
- ☐ The rationale for the best alternative selected
- ☐ Recommended steps to minimize adverse effects (i.e. a mitigation plan)
- ☐ Proposed approach to achieve overall benefit to the species (i.e. an overall benefit plan)
- ☐ Permit proposal
- ☐ Consideration of Environmental Assessment obligations, approvals required by other legislation and consultation (if applicable)

3.4 Project Review Summary

Roles and Responsibilities – the Ministry of Natural Resources

The MNR will:

- Work with the proponent at the earliest possible stages of the land use planning process
- Determine whether Redside Dace or its habitat are known to occur on site
- Evaluate whether additional information is needed about the presence of Redside Dace or its habitat
- Assess proposals on a case-by-case basis with consideration of the broader subwatershed
- Consider the Government Response Statement for Redside Dace when evaluating mitigation and overall benefit actions described in the permit proposal
- Draft the legal terms of the permit
- Consider comments provided during the consultation process (if applicable) and revise permit as required
- Make a final decision whether to approve the permit and notify the proponent
- If approved, issue the permit
- Post decision notice on the Environmental Registry

Roles and Responsibilities – Proponents

In general, proponents are responsible for:

- Ensuring they follow all relevant laws in addition to the *ESA*.
- Consulting with MNR and other approval agencies as early in the process as possible to learn what permits may be needed and to aid in the coordination of these approvals
- Consulting with the local district MNR office about the location of the proposed project in relation to stream reaches occupied by Redside Dace. This could include conducting surveys only if MNR determines that insufficient data is available for the site and there is reason to believe that Redside Dace may be in the area
    - NOTE: a protection and recovery permit may be needed.

If a species at risk or protected habitat is likely to be impacted by the proposed activities and the proponent wishes to pursue an Overall Benefit permit to obtain authorization for the activity, the proponent will need to:

- Provide detailed information about the proposed activity and demonstrate that the appropriate species information has been considered (e.g., species presence and/or habitat features)
- Provide specific project information including:
    - Proponent name and contact information
    - Land ownership (i.e. private, provincial, federal)
    - Project overview (i.e. a brief description of your project or activity)
    - Project details, including purpose, location, duration, timing and methodology
    - How it was determined that Redside Dace or its habitat was present
    - List of other species found on or near the site
    - List of other permits/approvals required
    - Analysis of a range of reasonable alternatives, including alternatives that would not adversely affect Redside Dace
    - Rationale for best alternative selected
    - Recommended steps to minimize adverse effects
    - Proposed approach to achieve overall benefit to the species
- Develop a detailed plan for how to achieve an overall benefit for the species with support from MNR and provide the supporting documentation

4.0 BEST MANAGEMENT PRACTICES

The following Best Management Practices (BMPs) have been developed to provide guidance to development activities and have been based upon current requirements, guidelines and existing development practices in Ontario. For each BMP, links to current guidelines or other key reference documents are provided. In the Project Review and Permitting section (Section 3.0), MNR district offices will be reviewing applications for consistency with the following BMPs.

4.1 Planning Development Activities: Comprehensive Planning for Subwatersheds

As described above, Redside Dace inhabit and move through subwatersheds of larger river systems. Through planning at a subwatershed level, the entire areas that Redside Dace inhabit can be fully evaluated and assessed for potential cumulative effects of urbanization on this species. Utilizing these subwatershed plans to inform the planning process will help ensure that consideration is given for Redside Dace upfront, when there is greater flexibility and more opportunities for avoiding or minimizing impacts (e.g., moving or redesigning projects and ensuring that projects timing conforms with the recommended construction timing window). Examining the impact of multiple potential projects on this comprehensive scale upfront can save time and money for all involved. The following BMPs are therefore recommended for planning:

- Municipalities should ensure that subwatershed plans that include consideration for Redside Dace are developed early on in the planning process, and prior to any decisions being made that could impact their habitat. These subwatershed plans should therefore be completed prior to the Secondary Planning stage, so that Redside Dace requirements are fully incorporated into planning for areas (e.g., secondary, subdivision and site plans) and appropriate direction is provided for all development.

The development of subwatershed plans are generally led by the local Conservation Authority or municipality, with input and advice from the MNR and other planning agencies. By developing this clear direction early on in the planning process, municipalities will ensure that all developers within areas are provided with consistent direction that may streamline their approvals, and that several requirements of the Provincial Policy Statement (PPS) are met, including those pertaining to Redside Dace as follows:

2.1 Natural Heritage …

- *2.1.3. Development and site alteration shall not be permitted in:*
  a) significant habitat of endangered species and threatened species (as defined in the PPS and approved by MNR)
- *2.1.5. Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements….*

2.2.1 Planning authorities shall protect, improve or restore the quality and quantity of water by:

c) Identifying surface water features, ground water features, hydrologic functions and natural heritage features and areas which are necessary for the ecological and hydrological integrity of the watershed….

g) ensuring stormwater management practices minimize stormwater volumes and contaminant loads, and maintain or increase the extent of vegetative and pervious surfaces.

For a complete copy of the Provincial Policy Statement 2005, see the Ministry of Municipal Affairs and Housing's website at: http://www.mah.gov.on.ca/Page215.aspx

For technical guidance on implementing the natural heritage policies of the PPS including the relationship of the PPS to the *ESA*, please see the second edition of the Natural Heritage Reference Manual, available on MNR's website at: http://www.mnr.gov.on.ca/en/Business/LUEPS/Publication/249081.html

Subwatershed plans are typically divided into three phases within the planning process:

Phase 1 - Characterization

- Characterize the existing subwatershed area in terms of the natural heritage features and linkages including the following that pertain to Redside Dace:
  - Natural cover and impervious or impenetrable cover
  - Groundwater discharge and recharge zones
  - Vegetative cover (i.e., riparian habitat)

- Wetlands and headwater stream network
- Fisheries
- Current water balance or water budget (i.e., the way in which precipitation falling in an area is dispersed among evaporation, transpiration from plants into the air, infiltration and runoff) and water quality

Phase 2 - Analysis

- Set the vision, goals and objectives for priorities that may include natural heritage, water management and land management planning goals (e.g., protect and enhance the environment, community involvement)
- Set targets for water infiltration, stormwater management, fish community and natural heritage features (e.g., targets for water infiltration and stormwater management for the selected storm ranges, maximum percentage of impervious/impenetrable cover, maximum temperature increases based on needs of the fish, maximum total suspended solids, preservation and/or increase of wetlands to support Redside Dace, realignment of streams, etc.)
- Forecast possible development scenarios and implications to water balance and water quality. Subwatershed based impact analyses are closely tied with understanding the cumulative effects of predicted land use changes.
- Make adjustments to planned land uses to achieve targets for water infiltration, stormwater management, etc.

Phase 3 – Implementation

- Subwatershed plans when implemented:
  - Recommend a Natural Heritage System
  - Provide recommendations for impact mitigation and adaptive management
  - Provide policy direction to the planning process (i.e., secondary, subdivision and site plans)
  - Provide comprehensive monitoring program recommendations

The following checklist identifies content that subwatershed plans should identify to protect Redside Dace.

Subwatershed plans should identify the following items to protect Redside Dace:

- ☐ The protected habitats of Redside Dace (i.e., habitat as outlined above in the Redside Dace habitat regulation)
- ☐ The water management targets that need to be achieved in order to protect and rehabilitate the local subwatershed population including for example:
    - o Stormwater management targets designed to help mitigate the impacts of development (i.e., impervious cover) on water balance
    - o Recommended stream temperatures
    - o Recommended water quality parameters (e.g., concentration of total suspended solids)
- ☐ Approaches to meeting targets, goals and objectives including for example:
    - o Designating areas and low impact development approaches for stormwater management
    - o Minimizing the number of stream crossings (i.e., bridges, culverts, etc.) and directing the location and design of these crossings
    - o Identification of trail locations (i.e., proximity and impact on streams)
    - o Identification of wetland and stream restoration areas
    - o Direction for Erosion and Sediment Control Plans/Environmental Control Plans and the development of related bylaws (e.g., Topsoil bylaws to regulate/prohibit the removal of topsoil)
    - o Location and design of infrastructure (e.g., watermains, pipelines, etc.)
    - o Enhancement opportunities via the removal or mitigation of existing impacts on Redside Dace (e.g., barriers, online ponds, etc.)

See Section 4.2 Best Management Practices for specific sediment, temperature, water balance, water quality targets for Redside Dace, as well as preferred construction practices.

Subwatershed planning, and the development of water related targets to be considered before official plan documents are formulated, have been recommended as a BMP since the early 1990s. This was documented by the Ministries of Environment, Energy and Natural Resources in the Subwatershed Planning document which is available on MNR's website at: http://www.mnr.gov.on.ca/en/Business/Water/Publication/MNR_E002320P.html

The value of subwatershed planning and the need to consider the cumulative effects of stormwater management is described in the Ministry of Environment's Stormwater Management Planning and Design Manual, 2003 which is available at: http://www.ene.gov.on.ca/envision/gp/4329eindex.htm

For further information on subwatershed planning consult with your local conservation authority or municipality. Some conservation authorities, including Credit Valley Conservation, have subwatershed plans posted on their website. For a list of conservation authorities, please see Conservation Ontario's website: http://www.conservation-ontario.on.ca/

For a list of municipalities and information on the municipal planning process, please see the Ministry of Municipal Affairs and Housing website at: http://www.mah.gov.on.ca/Page1591.aspx

4.2. Conducting Development Activities

This section contains the BMPs for the following development activities:

- Stream Crossings
- Erosion and Sediment Control During Construction
- Stormwater Management
- Installation of New Infrastructure
- Stream Realignments and Relocations

This list of BMPs is not intended to be an exhaustive list, but rather to cover the major construction activities that most commonly have an impact on Redside Dace and their habitat. Development of urban areas will typically involve all of these activities, while development in rural areas will typically only involve select activities including stream crossings and installation of infrastructure. These BMPs have been developed using habitat conditions that Redside Dace requires as described in the Context section, including water temperature and water clarity. The degree to which habitat conditions can be maintained will determine the relative impact on Redside Dace and their habitat. The BMPs listed for each activity are intended to act as suggested methods or techniques that can be implemented to protect habitat conditions for Redside Dace.

By following these suggested BMPs, the permitting process may become more streamlined as less discussion about possible construction methods and their impacts will be required with MNR staff. If there are other methods available for meeting these conditions, proponents are encouraged to discuss them with their local MNR district office early on in the process. In some cases, adherence to the suggested BMPs will preclude the need for a permit, whereas, in other situations, the BMPs will further assist in avoidance/mitigation activities.

As described in the Project Review and Permitting Process (Section 3.0), MNR will provide advice on whether or not a permit is required based on the specifics of proposed projects. If a permit is required, the avoidance/mitigation and overall benefit activities will be determined and documented in a permit issued under the *ESA.*

4.2.1 Stream Crossings (i.e., Bridges, Culverts, etc.)

Roads constructed across or adjacent to streams can have significant impacts on the overall health of the stream and Redside Dace habitat. For example, the removal of riparian vegetation and the discharge of sediment into streams during construction can impact Redside Dace habitat by covering up important spawning areas, filling in pools and reducing the ability of the species to find food. Bridges and culverts can have varying impacts on the habitat of Redside Dace, depending on their location, design, size and placement in the streams, and method of construction. For example, some designs may restrict flows, prevent light penetration, and/or limit fish passage. The following BMPs are therefore suggested for stream crossings to assist in minimizing the impacts on Redside Dace habitat.

For all direct Redside Dace habitat, crossings should be designed to avoid/mitigate impacts by adhering to the following:

- The proposed road networks for new crossings should be designed to minimize the number of stream crossings (e.g., stream crossings should generally be limited to 1 per kilometre of stream).

- The location of new stream crossings should be chosen to:
  - Minimize the width of the crossings
  - Cross over straight sections of the stream where there is less likelihood for bank erosion
  - Cross at areas that have already been disturbed and avoid initiating disturbances in new areas of the stream

- Construction methods used should attempt to minimize the amount of activity in protected habitat (i.e., including the stream meander belt and riparian habitat) and incorporate the following, to maintain the natural flow and functions of streams:
  - For new/replacement crossings in confined valleys (i.e., defined valleys), stream crossings should be bridges that span the valley with any piers required placed outside of the meander belt of the stream (Figure 5). Bridges should be high enough to maintain light penetration to the stream.
  - For new/replacement crossings in unconfined valleys (i.e., undefined valleys), stream crossings should be open bottom culverts designed to span the meander belt of the stream. The length of the culvert should be minimized by using retaining walls vs longer culverts to minimize disruption to riparian habitat.
  - For extension of existing structures, the footprint of the structure should be minimized by using retaining walls to minimize disruption to riparian habitat. Replacement of the existing structure should be considered as an alternative through the planning process.
  - Developing a plan for managing the stormwater runoff from road crossings and where possible preventing it from entering the stream. For example, by retaining rural road structures for the crossings, which do not have curbs or drains, stormwater will not be discharged directly into the stream. For further information on stormwater management BMPs, please refer to Section 4.2.3.
  - In addition to the BMPs listed above, any construction activity that must occur in the stream should also incorporate the BMPs outlined for indirect habitats (i.e., upstream areas) below. This includes restoring any temporary disturbances within the riparian habitat (i.e., 30 m on each side of the meander belt) by planting native species.

- For proposed road crossings in all indirect Redside Dace habitat, there is more flexibility in the location and design of the crossings, as the impact on the habitat is lessened. If the form and/or function of these supporting features is maintained, a permit may be avoided. This can be achieved through the following:
  - In-water work should only be conducted during the recommended construction timing window of July 1 to Sept 15. This will ensure that Redside Dace their habitats downstream are protected during the sensitive spawning period, as well as ensuring that the stream has stabilized and the riparian habitat is established before the winter months. Once construction is completed, the riparian habitat must be restored using native materials
  - Construction should be undertaken during periods when the channel is dry or with minimal flow. If undertaken during a period when the channel is dry then the project can avoid the need for the next two best management practices
  - The length of time required for in-water work should be kept to a minimum
  - Watercourses should not be blocked or flows impeded sufficiently to limit fish movement (i.e., pumping or diversion of flows around the work site can be used to avoid blocking flow during construction)
  - Appropriate sediment controls should be in place and measures taken to prevent sediment from exceeding 25 mg/l above background level during construction (see Section 4.2.2 BMPs: Construction Site Preparation)
  - Exposed soil should be graded to a stable angle and revegetated in a manner that prevents erosion
  - Closed-bottom culverts should be installed so that the invert is embedded a minimum of 10% (of the culvert diameter) below the stream bed. This will facilitate fish passage by ensuring that the culvert is not perched during periods of low flow
  - Slopes of culverts should mimic the natural stream bed
  - Materials moved during construction activities should not be stockpiled where they can adversely affect drainage patterns

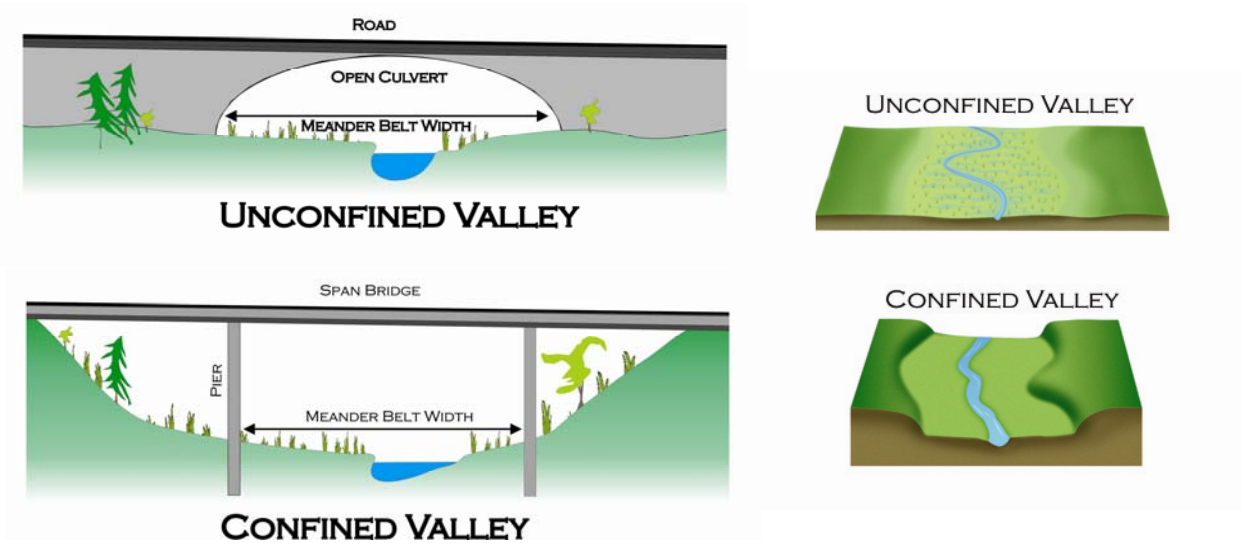

Figure 5. Examples of road crossings with respect to confined and unconfined valleys.

The MNR works closely with local Conservation Authorities on stream crossing proposals. Local Conservation Authorities review stream crossing proposals in order to issue permits under their Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses. Conservation Authorities also generally conduct screening on behalf of the Fisheries and Oceans Canada (DFO) under the federal *Fisheries Act* to determine if projects will have a harmful alteration, disruption or destruction (HADD) of fish habitat. If it is determined that there is a HADD, MNR will also work closely with the DFO (see Section 2.3 for further information on an Interim Protocol established).

For an example of criteria that the Conservation Authorities will be looking for please see Watercourse Crossing Design and Submission Requirements on the Toronto and Region Conservation Authority's website at:

http://www.trca.on.ca/dotAsset/40041.pdf

4.2.2 Construction Site Preparation

While some soil erosion occurs naturally as a result of rain, wind and water dispersing soil, a good vegetative cover can prevent significant soil erosion. The substantial benefits of vegetative cover to control soil erosion are often lost during land development. For example, when trees and plants are removed, natural drainage pathways are altered and stable topsoil aggregates are stripped away as part of the grading process. Studies have shown that suspended solid concentrations in untreated runoff originating from construction sites can be up to 30 times greater than in vegetated residential areas (SWAMP, 2005; TRCA and U of G, 2006; TRCA 2006).

The damaging effects of excess sediment discharges on fish and aquatic life are well documented, and may impact Redside Dace through:

- Impairment to respiratory functions
- Lower tolerance to toxins or disease

- Decreased reproductive success due to siltation of nests and impacts on spawning sites
- Reduced vision, which inhibits their ability to find food
- Sediment accumulation on the banks of the stream may restrict light penetration and impede plant growth, which in turn reduces riparian cover and habitat for their prey (i.e., terrestrial insects)

Redside Dace are a sensitive species that require clean and clear water that allows them to detect their prey in. Studies have shown that anything above 25 mg/L will begin to impact fish, as summarized in Figure 6. The degree of impact increases as the amount and duration of total suspended solids that fish are exposed to increases. As these two factors increase, impacts intensify as follows:

- Minor impacts which result in behavioral changes (e.g., avoiding areas, changes in breathing patterns)
- Moderate impacts which have serious health implications including elevated stress and exposure to bacterial infection
- Major impacts causing destruction to habitat and/or death to fish and their eggs.

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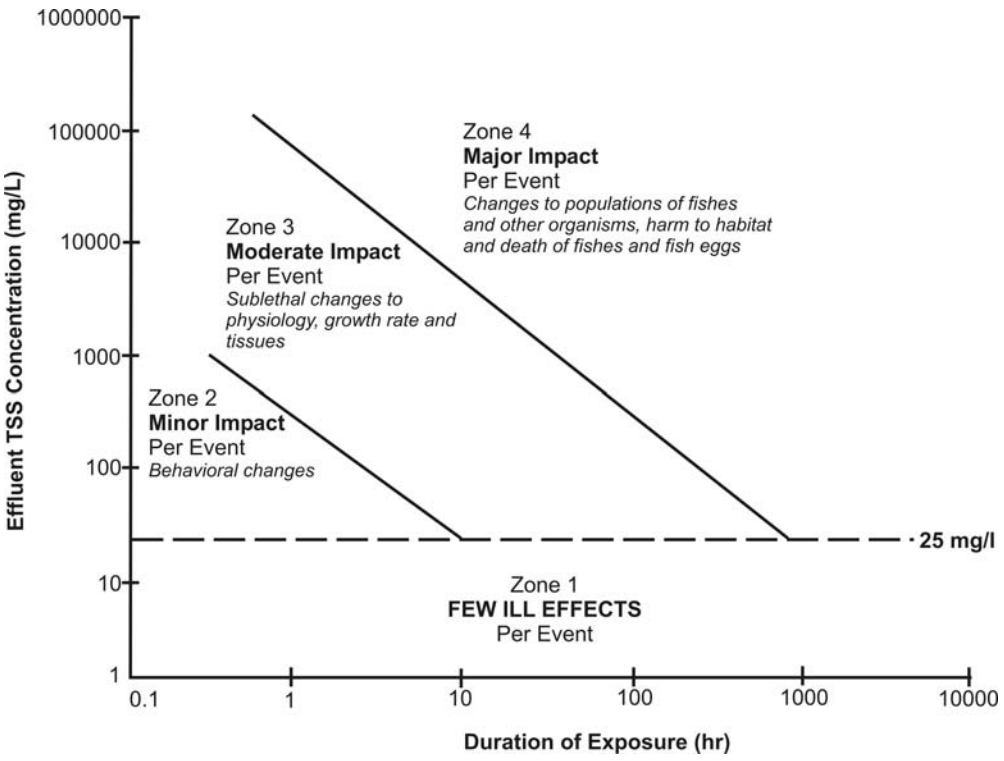


Figure 6: Relationship between sediment concentration and duration of exposure on fish health and habitat (Newcombe 1986)

Construction should therefore be designed with a comprehensive or treatment train approach to preventing and controlling sediment release, from the source and through conveyance to the streams. Adopting a comprehensive approach offers many efficiencies, including avoiding

costly cleanup efforts if the entire train of sediment is not considered. The following controls are suggested BMPs to use during construction to prevent erosion and reduce or eliminate increased sediment flowing into streams.

The discharge of water from urban development construction areas into Redside Dace habitat should not exceed 25 mg/l of total suspended solids (TSS) above the background stream level of total suspended solids in baseflow conditions. This is consistent with the level recommended by the Canadian Aquatic Water Quality Guidelines for the Protection of Aquatic Life for Total Particulate Matter. These guidelines recommend different parameters for high flow conditions and for measuring using Nephelometric Turbidity Units (NTUs) which are listed in Appendix A. Should proponents be able to control sediment and erosion on site without connection to adjacent Redside Dace habitat, they can avoid the need for a permit. If projects are to enter Redside Dace habitat (e.g., by connecting sediment and erosion control ponds to Redside Dace habitat) there is the potential to have significant negative impacts on Redside Dace habitat which would require a permit.

Erosion and Sediment Control Plans are often required by Conservation Authorities for permits under their Regulation for *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses* and screening for federal *Fisheries Act* requirements. Erosion and Sediment Control Plans should be designed to meet the above objectives by incorporating measures such as the following:

- Erosion should be prevented by limiting the size of disturbed areas through such measures as:
  - Phasing grading and infrastructure
  - Minimizing nonessential clearing and grading
  - Retaining existing vegetation
- Erosion should be minimized through measures including:
  - Minimizing the time that any area is exposed to erosion.
  - Any surface left exposed should have the soil stabilized (e.g., erosion control blankets, lockdown netting, seeding, spraying, utilization of methods to roughen the surface)
  - Minimize the slope length and gradient of disturbed areas
  - Store/stockpile soil outside of direct Redside Dace habitat and at least 30 m away from indirect Redside Dace habitat
- Sediment from the construction site should be captured through measures including:
  - A multi-barrier approach to prevent sediment entering the stream
  - Effective sediment and erosion ponds (i.e., appropriate structure, size and type required for site)
  - Methods to trap sediment (i.e., filter berms, sediment traps, vegetation, etc.)
  - Monitor and maintain sediment and erosion controls at all times to ensure they are effective

For further information on sediment and erosion control, consult the following:
Greater Golden Horseshoe Area Conservation Authorities Erosion and Sediment Control Guideline for Urban Construction which can be found at:
http://www.sustainabletechnologies.ca/portal/alias__Rainbow/lang__en-US/tabID__432/DesktopDefault.aspx

For an example of criteria that the Conservation Authorities will be looking for please see Erosion and Sediment Control Design and Submission Requirements on the Toronto and Region Conservation Authority's website at:

http://www.trca.on.ca/dotAsset/40051.pdf

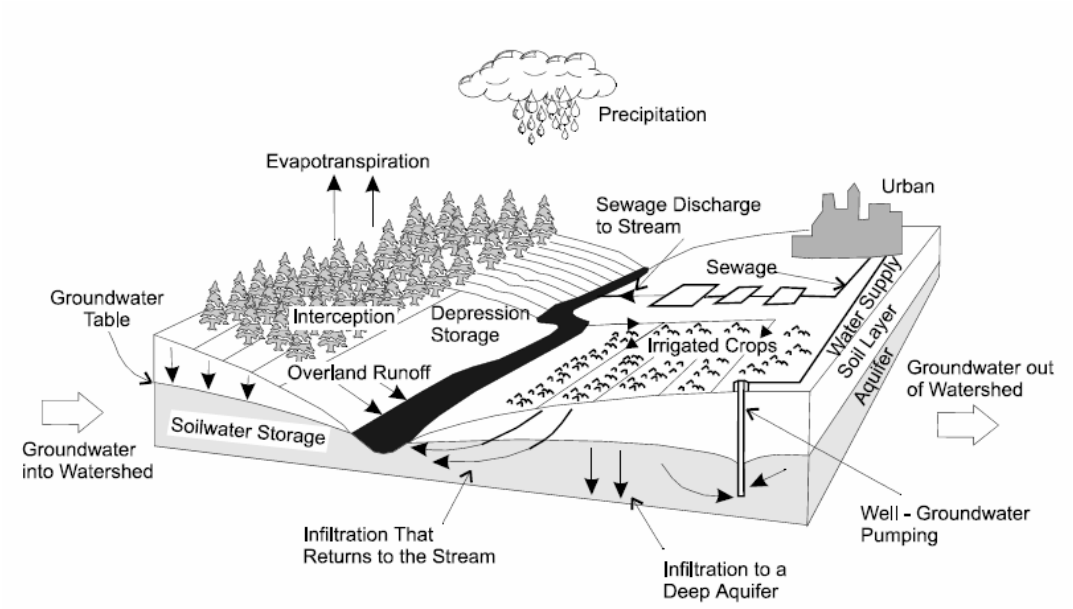
4.2.3 Stormwater Management

As land changes from being used for agriculture purposes to urban uses, farmland is replaced by impervious or impenetrable surfaces (i.e., pavement for roads, buildings, etc.). This can result in increased rainfall entering a stream, as there is less land to absorb the runoff. Rainfall from urban areas is generally referred to as stormwater. In some cases, urbanization has caused a 3 -5 fold increase in the amount of stormwater entering a stream, with a corresponding reduction in infiltration into the ground.

This results in dramatic changes to the habitat that Redside Dace require, including, but not limited to, increasing water temperatures, alteration of natural flow regimes and increased runoff and reduced infiltration. For example, untreated stormwater from pavement is much warmer and often carries pollutants (e.g., oil, chemicals). When deposited into Redside Dace streams, this stormwater can render the water too warm and change the water quality sufficiently to impact their survival. Untreated stormwater can also impact the flow and stability of water levels and have damaging impacts including reducing or eliminating spawning habitat and filling in pools, and altering the riparian habitat as the streams widen and overflow.

Stormwater management has evolved since the mid 1980s and there has been increased emphasis on capturing more rainfall at the source rather than relying on end-of-pipe solutions. Modern stormwater guidelines adopt a comprehensive "treatment train" approach which means that stormwater runoff is treated at source, during conveyance and at the end of the pipe. This comprehensive approach can provide a more effective reduction of runoff and pollutants from stormwater than end-of-pipe facilities alone. It is now recognized that end-of-pipe facilities on their own will not match the characteristics of the distributed infiltration from a natural hydrological cycle, which occurred under pre-development conditions.

The natural hydrological cycle of streams (as illustrated below in Figure 7) includes infiltration to the stream, effects on groundwater, evapotranspiration from nearby vegetation, etc. and can be maintained to the greatest extent possible by maximizing infiltration controls at the source or lot level. Some initial studies conducted by the United States Environmental Protection Agency on sites in Canada and the U.S. have shown that employing such approaches reduces the costs of stormwater management as less land is required to implement end-of-pipe solutions. Other potential benefits identified were enhanced property values and improved quality of life for residents as stormwater management is integrated into amenities in residential areas such as parks and wetlands.



Source : After, M. L. Davis, D. A. Cornwell, **Introduction to Environmental Engineering**, 1991.

Definitions:
Overland runoff – water that travels over the ground surface to a channel
Streamflow – movement of water via channels
Groundwater flow – movement of water through the subsurface
Infiltration – penetration of water through the ground surface
Groundwater recharge – water that reaches saturated zone

Figure 7 - The Hydrological Cycle (taken from CVC/TRCA 2010)

The following represent BMPs for stormwater management.

As described in the previous BMP Section regarding Construction Site Preparation, the discharge of water from urban development stormwater management facilities into Redside Dace habitat should not exceed 25 mg/l of total suspended solids (TSS) above the background stream level of total suspended solids. Should proponents be able to control stormwater without connection to Redside Dace habitat, they can avoid the need for a permit. However a permit would be required if direct connections are made between stormwater management ponds and Redside Dace habitats due to the potential for negative impacts (e.g., sediment release, increased water temperatures).

Discharge temperatures for stormwater management facilities connected to Redside Dace streams should be below 24°C and have dissolved oxygen concentrations of at least seven milligrams per litre. These thresholds represent the maximum (temperature) and preferred (oxygen) conditions for Redside Dace (MNR 2010a).

Post development water balance (i.e., the hydrological cycle of the water including the flow and levels of surface and ground water) should match predevelopment water balance in order to protect the natural hydrological functions of Redside Dace streams. Therefore, there should be no storm run-off from rainfall events in the range of 5 – 15mm (however, this may depend on the recommendations set forth in the subwatershed plan and on soil permeability).

To maximize the absorption of nutrients and other contaminants and prevent them from entering streams, stormwater management facilities adjacent to Redside Dace habitat should be designed as hybrid extended detention wetlands/wet ponds. These facilities are more effective than traditional ponds at removing pollutants harmful to Redside Dace including nitrates, phosphorous and copper.

The above objectives can be achieved by utilizing a low impact development strategy for stormwater management that treats stormwater as close to the source as possible and focuses on runoff prevention. This includes such measures as:

- Site design strategies to minimize runoff which involves:
  - conserving natural features that absorb rainfall (e.g., wetlands, stream buffers, forested areas, permeable soil, etc.)
  - locating and designing buildings/infrastructure to reduce impact (e.g., clustering development in less sensitive areas, reducing footprints of buildings and roadways)
- Evaporation and infiltration practices (e.g., using native vegetation/trees, green roofs, soak aways pits, infiltration trenches, permeable pavement)
- Rainwater harvesting (e.g., rain barrels, cisterns)
- Runoff conveyance (e.g., perforated pipe systems or grass channels which treat and infiltrate runoff as it is being transported)
- Runoff storage (e.g., woodland restoration, constructed wetlands which capture and then release water as evaporation into the air)

Several of these low impact development measures may be required, which will vary depending on site specific factors including the soil, geology and groundwater level. These measures will reduce the amount of effort required to implement effective end-of-the-pipe solutions.

Municipalities routinely review stormwater management plans, often with the assistance of Conservation Authorities. The Ministry of Environment issues Certificate of Approvals and permits to take water for stormwater management facilities under the *Ontario Water Resources Act*.

For further information on Low Impact Design and Stormwater Management, consult the following:

Low Impact Development Stormwater Management Planning and Design Guide by the Credit Valley and Toronto Region Conservation Authorities.
http://www.sustainabletechnologies.ca/Portals/_Rainbow/Documents/LID%20SWM%20Guide%20-%20v1.0_2010_1_no%20appendices.pdf

Ministry of Environment's Stormwater Planning and Design Manual at:
http://www.ene.gov.on.ca/envision/gp/4329eindex.htm

4.2.4 Installation of New Infrastructure (e.g., pipelines, watermains, sewers, hydro conduits, etc.)

The placement of infrastructure such as gas pipelines, storm and sanitary sewers, and hydro conduits near streams has the potential to impact Redside Dace habitat. For example, open cut installations which excavate trenches into the stream bed often impact habitat by discharging sediment into the stream and disrupting the riparian habitat along the stream banks. Other technologies are available that allow for the installation of the infrastructure that avoid or minimize impacts to the stream or stream corridor. These methods are now commonly used by utility companies and developers. The following are BMPs for the installation of new infrastructure:

Utilities near streams should be located either over or under streams to avoid impact to Redside Dace habitat. By implementing these BMPs and avoiding impact to Redside Dace stream corridors, proponents can avoid the need for a permit.

Utilities should be planned to be built in conjunction with new or replacement road crossings as part of the planning process. When utilities need to be added after road crossings have been built or replaced or installed in areas outside of right-of-ways, they should be:

- Installed below the streams using trenchless techniques such as directional drilling and jack and boring (i.e., tunneling). Site-based geotechnical studies are required to support the techniques, to ensure that the location for drilling will not have indirect impacts on the stream such as draining its groundwater, and to ensure that the method is viable for that particular site (i.e., some sites have subsurface conditions, such as large boulders, which could mean that directional drilling has a high risk of failure or frac-out). These projects should be discussed with your local MNR district office. MNR works closely with the local Conservation Authority on these proposals. Generally, emergency frac-out response and contingency plans will be required by Conservation Authorities to obtain a permit under their Regulation of *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*. These plans are also required by the Fisheries and Oceans Canada to comply with the *Fisheries Act* as outlined in their High-Pressure Directional Drilling Operational Statement available at: http://www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/provinces-territories-territoires/nt/os-eo09-eng.htm.
- Placed underneath existing road crossings (i.e., attached underneath the existing bridge) and above the streams, presuming the owner of the structure provides consent.

4.2.5 Stream Realignments and Relocations

Historically, some Redside Dace streams, like sections of Highland Creek in Toronto, were straightened into concrete lined channels, engineered storm channels or enclosed in large pipes through urbanization. In other areas, the improvement of land for agricultural purposes resulted in the straightening of streams into agricultural ditches or drains. As our understanding of stream functions has improved, the management of streams has shifted to maintaining natural channels to maintain the natural flow and functions of streams, thereby minimizing the impact on fish species including Redside Dace.

As planning for urban development is undertaken, there are opportunities to improve and increase Redside Dace habitat by:

- realigning previously straightened streams to restore their natural forms and functions
- relocating degraded streams to locations that are better linked to supporting features such as wetlands and areas of groundwater discharge

The following BMPs for stream realignments and relocations have been taken from the Adaptive Management of Stream Corridors in Ontario guide produced by MNR and many partners.

The relocation or realignment of degraded stream reaches should be based on an approved subwatershed plan as described earlier in these guidelines.

The design and function of the new streams should be based on the planning and design processes outlined in the Adaptive Management of Stream Corridors in Ontario document and the habitat requirements of Redside Dace, which includes:

- Connection to adjacent occupied Redside Dace reaches

- Stream conditions that Redside Dace require including:
  - Stream corridors consistent with the Redside Dace habitat regulation (i.e., meander belt plus 30 metres of appropriate riparian habitat)
  - Channel design to emulate the natural meandering of the stream required for Redside Dace
  - Habitat that the Redside Dace require (e.g., overhanging vegetation, pool and riffle habitat, etc.)

  MNR is available for providing advice on these conditions which are outlined in the Recovery Strategy for Redside Dace in Ontario.

- Water quality and quantity targets appropriate for Redside Dace as described in these guidelines including:
  - Maintenance of natural flow and function of streams including water balance (i.e., the hydrological cycle of the water including groundwater, surface water, etc.)
  - Sediment that does not exceed 25 mg/l of total suspended solids over the background stream level during construction. Once construction is completed the creek should be stabilized to minimize erosion and ensure sediment is not being released into the stream.

MNR works closely with local Conservation Authorities on stream realignments/relocations. Local Conservation Authorities review these in order to issue permits under their Regulation of *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*. Conservation Authorities also generally conduct screening on behalf of the Fisheries and Oceans Canada (DFO) under the federal *Fisheries Act* to determine if projects will have a harmful alteration, disruption or destruction (HADD) of fish habitat. If it is determined that there is a HADD, MNR will also work closely with the DFO (see Section 2.3 for further information on an Interim Protocol established).

For further information on natural channel design, consult the Adaptive Management of Stream Corridors in Ontario available at:
http://www.conservation-ontario.on.ca/resources/reports/index.html

Complex Case Study for a Proposed Plan of Subdivision

Project: Proposed plan of a 100 acre subdivision adjacent to existing Redside Dace occupied stream, with 950 low density residential homes, roads and underground utilities including sanitary and storm sewers, water main, hydro and communications. The storm sewer system is to be connected to a stormwater pipe that is proposed to discharge into a Redside Dace stream. A 60 m stream crossing is proposed for a 4 lane arterial road across an unconfined valley with a meander belt width of 12m. Location of proposed road passes through former pasture area. Subwatershed plan was completed in advance of subdivision; no contributing habitat features are adjacent to the stream corridor.

Potential impacts: Loss of riparian vegetation, topsoil removal and grading of land adjacent to stream. Possible harm to the species with release of sediment into the watercourse from grading activities. Loss of riparian habitat through construction of connecting stormwater headwall and connecting discharge channel through the stream corridor into creek. Increased storm runoff from impervious surfaces potentially damaging spawning and pool habitats and water quality. Loss of riparian habitat through the construction of the road and installation of utilities.

Mitigation: In discussions between the municipality and the proponent, the proposed plan of subdivision was amended to exclude individual lots and site grading from regulated habitat per recommendations of the subwatershed plan. Road crossing and stormwater discharge could not be relocated or re-designed to avoid potential impact to habitat and species. Proponent consults with MNR regarding *ESA* requirements and it was determined that mitigation was not sufficient to avoid impacts and an Overall Benefit permit would be required.

Comprehensive preventative sediment and erosion control plan in place for tablelands to avoid discharge into Redside Dace habitat (e.g., grading and infrastructure installation phased over several months with disturbed areas being graded flat and stabilized with hydroseed, sediment control fences and sediment control pond in place, conveyance channels lined with sod and catch basins covered with filter fabric to filter sediment, regular inspections and maintenance of measures).

Application of recommended stormwater management strategies and targets from subwatershed plan to match, as close as possible, to pre-development seasonal water balance:
- lot level infiltration from rooftop runoff designed to achieve infiltration/attenuation of first 8mm of storm runoff
- conveyance controls designed to achieve infiltration/attentuation of first 5 mm of storm runoff from roads and sidewalks
- end-of- pipe extended detention wetland designed to accommodate quality and quantity control for 25mm storm events with 72 hour detention per the recommendations of the subwatershed plan
- sub-surface cooling trench used at outlet of stormwater wetland to mitigate anticipated 3.5°C increase in temperature of storm runoff
- conveyance channel discharges to valley floor without direct connection to stream; conveyance channel stabilized with erosion blanket, seed, native shrubs and trees
- level spreader used to spread storm flows across a wide area of meadow floodplain
- 5 year monitoring program proposed for stormwater practices to evaluate and report effectiveness

Geotechnical studies completed for proposed crossing of stream which find that trenchless techniques are technically feasible with minimal risk of failure; studies used to support Directional Drilling for installation of the watermain perpendicular to the stream corridor to avoid impact. Jack and bore techniques used to install the sanitary sewer perpendicular to the stream corridor to avoid impact.

Minimizing Impact:
Road crossing of unconfined stream valley could not be avoided. Impacts to stream corridor minimized by:
- use of prefabricated open bottom culvert for 12m meander belt of stream
- retaining wall system used to minimize footprint of road crossing through stream corridor
- stormwater from road crossing conveyed to extended detention wetland storm pond

Overall Benefit:
Plan devised for residual loss of 0.36 ha of riparian habitat as a result of eliminating riparian habitat with road crossing. Proponent includes proposed 600m long livestock fencing project for rural site located upstream of occupied habitat. Overall benefit expected from the improved water quality for the occupied reach.

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For a list of MNR District Offices please see MNR's website at: http://www.mnr.gov.on.ca/en/ContactUs/2ColumnSubPage/STEL02_179002.html

APPENDIX A

Excerpt from the Canadian Water Quality Guidelines for the Protection of Aquatic Life

Table 1. Water quality guidelines for total particulate matter for the protection of aquatic life (Caux et al. 1997).

Aquatic life — Freshwater, estuarine, and marine	Guideline value
Suspended sediments	
clear flow	Maximum increase of 25 mg·L^{-1} from background levels for any short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg·L^{-1} from background levels for longer term exposures (e.g., inputs lasting between 24 h and 30 d).
high flow	Maximum increase of 25 mg·L^{-1} from background levels at any time when background levels are between 25 and 250 mg·L^{-1}. Should not increase more than 10% of background levels when background is >250 mg·L^{-1}.
Turbidity	
clear flow	Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from background levels for a longer term exposure (e.g., 30-d period).
high flow or turbid waters	Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when background is >80 NTUs.
Deposited bedload sediment	Insufficient information to derive guideline.
Streambed substrate[*]	
fine sediments	The quantity in streambed substrates should not exceed 10% <2 mm, 19% <3 mm, and 25% <6.35 mm.
geometric mean diameter	Geometric mean diameter should not exceed 12 mm.
Fredle number	Fredle number should not exceed 5 mm.
intergravel dissolved oxygen	Minimum of 6.5 mg·L^{-1}.

[*] Guideline values apply to actual and potential spawning sites.

Canadian Environmental Quality Guidelines
Canadian Council of Ministers of the Environment, 1999, updated 2002