

# Report on the Progress of Recovery Strategy Implementation for the Carmine Shiner (*Notropis percobromus*) in Canada for the Period 2014 to 2020

## Carmine Shiner



2022

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## Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#) agreed to establish complementary legislation and programs that provide for the protection of species at risk throughout Canada. Under section 46 of the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the competent minister is responsible for reporting on the implementation of the recovery strategy for a species at risk, and on the progress towards meeting its objectives within 5 years of the date when the final recovery strategy was placed on the Species at Risk Public Registry, and in every subsequent 5-year period until its objectives have been achieved or the species' recovery is no longer feasible.

Reporting on the progress of recovery strategy implementation requires reporting on the collective efforts of the competent minister, provincial and territorial governments, and all other parties involved in conducting activities that contribute to the species' recovery. Recovery strategies identify broad strategies and approaches that will provide the best chance of recovering species at risk. Some of the identified strategies and approaches are sequential to the progress or completion of others and not all may be undertaken or show significant progress during the timeframe of a report on the progress of recovery strategy implementation (progress report).

The Minister of Fisheries and Oceans is the competent minister under SARA for the Carmine Shiner and has prepared this progress report.

As stated in the preamble to SARA, success in the recovery of species at risk depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in the recovery strategy and will not be achieved by Fisheries and Oceans Canada (DFO) or any other jurisdiction alone. The cost of conserving species at risk is shared amongst different constituencies. All Canadians are invited to join in supporting and implementing the recovery strategy for the Carmine Shiner for the benefit of the species and Canadian society as a whole.

## Acknowledgments

This progress report was prepared by Jennifer Diment (DFO) and Christine Lacho (DFO). To the extent possible, this progress report has been prepared with input from the Carmine Shiner Recovery Team. DFO would like also to express its appreciations to all individuals and organizations who have contributed to the recovery of the Carmine Shiner.

## Executive summary

The Carmine Shiner (*Notropis percobromus*) was listed as threatened under the Species at Risk Act (SARA) in 2003. The “[Recovery Strategy for the Carmine Shiner \(\*Notropis percobromus\*\) in Canada](#)” (DFO 2008) was finalized and published on the Species at Risk Public Registry in 2008. The [recovery strategy](#) was revised and republished in 2013 to include critical habitat (DFO 2013a). In 2020, the status of Carmine Shiner was changed to endangered under SARA.

The main threats identified for the Carmine Shiner include: overexploitation, species introductions, habitat loss and degradation, and pollution.

The recovery objectives for the Carmine Shiner are to maintain Carmine Shiner populations at their current abundance and within their present distribution within the Whitemouth, Birch, and Winnipeg river systems.

During the time period reported by this progress report, progress has been made in the following areas:

- surveying and environmental DNA (eDNA) sampling to clarify the distribution of Carmine Shiner
- habitat modeling work to determine potential critical habitat of the species
- identification of potential environmental limiting factors (temperature and oxygen concentration)
- development of a standardized field sampling method to monitor the distribution and relative abundance of the species
- education and outreach for the species, including working with stakeholders to increase local awareness and in the development of outreach materials

Taken together, these activities indicate that progress is being made toward the goal of maintaining Carmine Shiner populations in Canada; however, there are still a number of areas where further information is required. Consistent sampling of populations is necessary to develop reliable population and distribution trends. Significant gaps in the knowledge of the biology of the species still exist, particularly related to spawning requirements. Uncertainty remains related to the tolerance of the species to potentially limiting environmental factors, such as extremes of water turbidity and flow.

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## 1 Introduction

In 2008, the "Recovery Strategy for the Carmine Shiner (*Notropis percobromus*) in Canada" ([DFO 2008](#)) was finalized and published on the Species at Risk Public Registry. In 2013, revisions were made to the original recovery strategy and it was republished as the "Recovery Strategy for the Carmine Shiner (*Notropis percobromus*) in Canada" ([DFO 2013a](#)) (henceforth called the recovery strategy). This progress report outlines the progress made towards meeting the objectives listed in the recovery strategy ([DFO 2013a](#)) for the Carmine Shiner from 2014 to 2020 and should be considered as one in a series of documents for this species that should be taken into consideration together; including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status reports ([COSEWIC 2001](#); [COSEWIC 2006](#); [COSEWIC 2018](#)), the science advisory report from the recovery potential assessment (RPA) ([DFO 2013b](#)), a recovery strategy ([DFO 2008](#); [DFO 2013a](#)), an action plan ([DFO 2018](#)), and the previous 5-year progress report ([DFO 2015](#)).

Section 2 of the progress report provides references to, or reproduces, key information on the threats to the species, population and distribution objectives for achieving its recovery, approaches to meeting the objectives, and performance indicators to measure the progress of recovery. For more details, readers should refer back to the recovery strategy. Section 3 reports the progress of activities identified in the recovery strategy, to support achieving the population and distribution objectives. Section 4 provides a concluding summary of the progress toward achieving the objectives.

## 2 Background

### 2.1 COSEWIC assessment summary and threats to the species and its critical habitat

The listing of the Carmine Shiner under SARA in 2003 led to the development and publication of the "Recovery Strategy for the Carmine Shiner (*Notropis percobromus*) in Canada" in 2008 ([DFO 2008](#)). In 2013, revisions were made to the original recovery strategy and it was republished on the Species at Risk Public Registry as the "Recovery Strategy for the Carmine Shiner (*Notropis percobromus*) in Canada" ([DFO 2013a](#)). The 2013 recovery strategy is consistent with the information provided in the COSEWIC status reports ([COSEWIC 2001](#); [COSEWIC 2006](#)) and the COSEWIC summary information is included in section 1 of the recovery strategy. The listing and development of the recovery strategy were further informed by the "Recovery Potential Assessment of Carmine Shiner (*Notropis percobromus*) in Canada" ([DFO 2013b](#)).

In 2006, COSEWIC re-examined and confirmed the status of the Carmine Shiner as threatened ([COSEWIC 2006](#)). In 2018, COSEWIC re-examined and changed the status of the Carmine Shiner from threatened to endangered ([COSEWIC 2018](#)). Subsequently, the SARA status of the Carmine Shiner was changed to endangered in 2020.

**Assessment summary – April 2018****Common name**

Carmine Shiner

**Scientific name***Notropis percobromus***Status**

Endangered

**Reason for designation**

The range of this small, colourful minnow is restricted to Manitoba. Although there is limited information on population trends since the last assessment, projected declines over the next 10 years related to the threat of habitat loss and pollution will put the species at risk of extinction in Canada.

**Occurrence**

Manitoba

**COSEWIC Status history**

Designated Special Concern in April 1994. Status re-examined and designated threatened in November 2001 and in April 2006. Status re-examined and designated endangered in April 2018. Last assessment based on an updated status report.

The “Recovery Strategy for the Carmine Shiner (*Notropis percobromus*) in Canada” ([DFO 2013a](#)) identifies the threats to survival and recovery of the Carmine Shiner and threats to its critical habitat.

Section 4 of the recovery strategy provides information on the threats to the species’ survival and recovery. These threats include: overexploitation, species introductions, habitat loss and degradation, and pollution.

Critical habitat for the Carmine Shiner has been identified, to the extent possible, in section 7 of the recovery strategy ([DFO 2013a](#)). The recovery strategy also provides examples of activities that are likely to result in destruction to critical habitat (that is, threats to critical habitat). The list of activities provided in table 9 of the recovery strategy is neither exhaustive nor exclusive, and the inclusion of activities has been guided by the relevant threats to habitat described in the recovery strategy. For more details on the activities likely to result in the destruction of critical habitat, consult the recovery strategy ([DFO 2013a](#)).

Threats to Carmine Shiner critical habitat include: habitat loss and degradation, pollution, and landscape activities and changes.

## 2.2 Recovery

This section summarizes the information, found in the recovery strategy ([DFO 2013a](#)), on the population and distribution objectives that are necessary for the recovery of the Carmine Shiner. Section 5 of the recovery strategy identified the following recovery objectives necessary for the recovery of the species:

- i. maintain Carmine Shiner populations at their current abundance and within their present distribution within the Whitemouth, Birch, and Winnipeg river systems
- ii. identify and protect critical habitat of the Carmine Shiner
- iii. identify potential threats to the Carmine Shiner from human activities and ecological processes, and develop plans to avoid, eliminate, or mitigate these threats

The recovery strategy did not include performance indicators. The progress towards achieving population and distribution objectives will be informed by the progression made under the approaches and studies in section 3.1 and 3.2 below.

### **3 Progress towards recovery**

The recovery strategy for the Carmine Shiner ([DFO 2013a](#)) divides the recovery effort into 3 broad strategies: 1) research and monitoring, 2) management and regulatory actions, and 3) public education and outreach. Progress in carrying out these broad strategies is reported in section 3.1. Section 3.2 reports on the activities identified in the schedule of studies to identify critical habitat. Section 3.3 reports on the progress on the recovery objectives and other commitments (for example, action plan and critical habitat order) identified in the recovery strategy and information obtained through implementing the recovery strategy.

### 3.1 Activities supporting recovery

Table 1 provides information on the implementation of activities undertaken to address the approaches and broad strategies identified in the recovery planning table of the recovery strategy.

**Table 1. Details of activities supporting the recovery of the Carmine Shiner from 2014 to 2020.**

Activity	Broad strategy and approach	Descriptions and results	Recovery objectives	Participants <sup>1</sup>
Sampling to determine distribution of Carmine Shiner	1) Research and monitoring	<p>Sampling has been conducted using many different methods including:</p> <ul style="list-style-type: none"> <li>- historical records from prior to 2000</li> <li>- boat electrofishing from 2001 to 2005</li> <li>- seine netting from 2006 to 2016</li> <li>- environmental DNA (eDNA) from 2014 to 2016</li> </ul> <p>The extent of occurrence is estimated at 2,122 square kilometres for known collection sites and the discrete and continuous index of area of occupancy are 160 square kilometres and 312 square kilometres, respectively.</p> <p>The area of occupancy is large enough to support the minimum viable population necessary for an extinction risk of 3% in 100 years (<a href="#">Carr et al. 2015</a>; <a href="#">COSEWIC 2018</a>)</p>	Maintain population at the current abundance	<b>Fisheries and Oceans Canada (DFO)</b> , Global Institute for Water Security, Interdisciplinary Center for Marine and Environmental Research, Manitoba Natural Resources and Northern Development (MNRND), University of Manitoba (UM)

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<sup>1</sup> Lead participant(s) is/are listed on top and in bold; other participants are listed alphabetically. Not all activities have specific participants identified.

Activity	Broad strategy and approach	Descriptions and results	Recovery objectives	Participants <sup>1</sup>
Identification of limiting factors: temperature and oxygen concentration	1) Research and monitoring	<p>Studies (<a href="#">Pandit et al. 2017</a>; <a href="#">McNaughton et al. 2019</a>) have been completed on thermal preferences and standard metabolic rate using models. Summer temperatures (maximum, mean, July temperature) and temperature seasonality have been found to determine and predict Carmine Shiner distribution in North America. Due to the current temperature trends and projections from climate change, it is predicted that the species distribution might be driven northward, although suitable habitat in this portion of the species range may be inaccessible due to dispersal limitations.</p> <p>Data suggests that Carmine Shiner prefer water temperatures between 18°C and 29°C depending on life stage. Recorded summer temperatures in the Birch River are 26°C which suggests that currently Carmine Shiner are not under thermal stress; however, it is predicted that the air temperature in Canada will rise 1°C to 3°C by 2050, suggesting thermal stress may be a limiting factor in the near future for Carmine Shiner. Using a standard metabolic rate model, it was determined that at higher temperatures, Carmine Shiner have greater metabolic requirements. Metabolism increases between 1.5 and 3.0 fold for every 10°C temperature increase. This means that fish would have higher energy maintenance costs as metabolic activities would accelerate and energy for growth and reproduction would decrease.</p>	Identify potential threats	<b>Concordia University</b> , DFO, MNRND, University of Alberta, University of Wyoming

Activity	Broad strategy and approach	Descriptions and results	Recovery objectives	Participants <sup>1</sup>
Monitoring of population trends	1) Research and monitoring	<p>Data collected in 2011 created a baseline to determine changes to Carmine Shiner relative abundance and distribution trends (<a href="#">COSEWIC 2018</a>).</p> <p>The eDNA data collected from 2014 to 2016 add to this baseline data as all the Carmine Shiner eDNA detected were within the known range of Carmine Shiner in Manitoba (Birch and Whitemouth Rivers, Pinawa Channel downstream of the Pinawa Dam), with 1 polymerase chain reaction replicate detected in Peterson Creek which would extend the known distribution range approximately 300 m downstream if confirmed (M. Docker, unpublished data).</p> <p>A technical data report was written for a standardized field sampling method for monitoring the distribution and relative abundance of Carmine Shiner in Canada (<a href="#">McNaughton et al. 2020</a>).</p>	Maintain population at the current abundance	DFO, UM

Activity	Broad strategy and approach	Descriptions and results	Recovery objectives	Participants <sup>1</sup>
Protection of Carmine Shiner habitat	2) Management and regulatory actions	<p>The Manitoba Habitat Heritage Corporation (MHHC) Habitat Stewardship Program continues to protect 199 acres of riparian area along the Birch River and has restored 70 acres of upland through three conservation easements. The habitat within these easements has remained in good condition (<a href="#">MHHC project summary</a>).</p> <p>MHHC partnered with the Rural Municipality (RM) of Reynolds to mitigate a water quality issue in the Medika drain, a tributary to the Birch River. This project successfully resolved erosion and water quality concerns through bank stabilization, resulting in increased quality of spawning habitat and reduced sedimentation.</p> <p>Manitoba Water Stewardship and Biodiversity, Wildlife and Fisheries Branch integrated protection of riparian habitat in 2013 within the provincial forest management plan for the area that includes the Birch and Whitemouth river watershed.</p>	Maintain population at the current abundance, identify and protect critical habitat, identify potential threats	<b>MNRND, MHHC,</b> Environment and Climate Change Canada, DFO
Protection of Carmine Shiner Habitat	2) Management and regulatory actions	On September 7, 2018, a <a href="#">critical habitat order</a> was made by the Minister of Fisheries and Oceans and published in <i>Canada Gazette, Part II</i> , to ensure that the critical habitat of the Carmine Shiner is legally protected under SARA.	Identify and protect critical habitat, identify potential threats	<b>DFO</b>
Development of action plan	2) Management and regulatory actions	On August 10, 2018, an action plan ( <a href="#">DFO 2018</a> ) was published on the SARA Public Registry to address the activities towards meeting the objectives listed in the recovery strategy, and includes an implementation schedule with recovery measures.	Identify and protect critical habitat, identify potential threats	<b>DFO</b>

Activity	Broad strategy and approach	Descriptions and results	Recovery objectives	Participants <sup>1</sup>
Re-examination of species status	2) Management and regulatory actions	<p>In 2018, Committee on the Status of Endangered Wildlife (COSEWIC) re-examined and reclassified the status of the Carmine Shiner to endangered (<a href="#">COSEWIC 2018</a>). In 2020 the Carmine Shiner was legally listed as an endangered species under the <i>Species at Risk Act</i> (SARA).</p>		<b>COSEWIC</b> , DFO
Improvement of public awareness of Carmine Shiner	3) Public education and outreach	<p>On March 26, 2018, DFO attended the Informational Meeting of Council RM of Whitemouth for Farmers and Landowners in Elma, Manitoba (MB) and presented on important habitat and Projects Near Water.</p> <p>In June 2018, DFO collaborated with the RM of Whitemouth, MB to incorporate information on the Species at Risk Program, the Carmine Shiner, and Projects Near Water into their <a href="#">webpage</a>.</p> <p>In 2018, signage was designed for public awareness in collaboration with the Recovery Team. The Species at Risk Program is working with a contractor to produce and install the signs at 10 locations within the known distribution of Carmine Shiner in Manitoba.</p>	Maintain population at the current abundance, identify and protect critical habitat, identify potential threats	DFO, MNRND, RM of Whitemouth

Activity	Broad strategy and approach	Descriptions and results	Recovery objectives	Participants <sup>1</sup>
Encouragement of stakeholder involvement in Carmine Shiner recovery actions	3) Public education and outreach	<p>In January 2020, the distribution of Carmine Shiner from eDNA mapping was presented at the 80th Midwest Fish and Wildlife Conference in Springfield Illinois.</p> <p>MHHC has a <a href="#">Landowner Guide for Species at Risk</a> that indicates Beneficial Management Practices (BMPs) for landowners to follow with the assistance of Partners of Manitoba Agriculture to ensure protection of Species at Risk and their habitat. Carmine Shiner is referenced in this manual under Habitat Restoration, Habitat Enhancement, and Habitat Assessment sections.</p> <p>MHHC also has a <a href="#">fact sheet</a> for Carmine Shiner including a list of BMPs and a description of the benefits for producers enrolling in the Environmental Farm Plan for both the producer and species.</p>		MHHC, Minnesota Department of Natural Resources, UM

### 3.2 Activities supporting the identification of critical habitat

Table 2 provides information on the implementation of the studies outlined in the schedule of studies to identify critical habitat found in the recovery strategy. Each study has been assigned 1 of 4 statuses:

1. completed: the study has been carried out and concluded
2. in progress: the planned study is underway and has not concluded
3. not started: the study has been planned but has yet to start
4. cancelled: the planned study will not be started or completed

**Table 2. Status and details of the implementation of the schedule of studies outlined in the recovery strategy for the Carmine Shiner.**

Study	Timeline	Status	Descriptions and results	Participants <sup>2</sup>
Description of habitat use by life stage	2011 to 2015	Completed	Field surveys to collect fish and habitat data were conducted from June to October 2011 in the Birch River. More fish were caught in the downstream portion of the study area. Carmine Shiner tended to use less silt and more sand habitat than would be expected, based on availability. Gravel, cobble, and boulder habitat use was similar to availability. Habitat used by the mature and immature fish did not vary significantly. Data were analyzed and used in part for a research paper published in 2015 ( <a href="#">Carr et al. 2015</a> ) and 2 Canadian Science Advisory Secretariat documents ( <a href="#">Watkinson and Sawatzky 2013</a> ; <a href="#">DFO 2013b</a> ).	<b>Fisheries and Oceans Canada (DFO)</b> , Global Institute for Water Security, Interdisciplinary Center for Marine and Environmental Research, Manitoba Natural Resources and Northern Development

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<sup>2</sup> Lead participant(s) is/are listed on top and in bold; other participants are listed alphabetically.

<b>Study</b>	<b>Timeline</b>	<b>Status</b>	<b>Descriptions and results</b>	<b>Participants<sup>2</sup></b>
Identification and inventory of Carmine Shiner habitat in the Birch River	2011 to 2018	Completed	<p>In April 2011, the Birch River was surveyed with acoustic sonar equipment from its confluence with the Boggy River, downstream to its confluence with the Whitemouth River, in order to collect data on depth and substrate type. Data were analyzed and used in part for a research paper published in 2015 (<a href="#">Carr et al. 2015</a>).</p> <p>At 2 locations in the Birch River and 1 location in the Boggy River, a complete year of hourly water temperature data was collected from April 2011 to April 2012. At 3 locations in the Birch River, 2 weeks of hourly oxygen data were collected in September 2012. These data were used to help determine temperature ranges used in the experiments for <a href="#">McNaughton et al. 2019</a>.</p>	<b>DFO</b> , Concordia University (CU), University of Alberta (UA), University of Manitoba (UM), University of Wyoming (UW)

<b>Study</b>	<b>Timeline</b>	<b>Status</b>	<b>Descriptions and results</b>	<b>Participants<sup>2</sup></b>
Refining of critical habitat identification	2015 to present	In progress	Population viability analysis has been conducted using temperature and standard metabolic rate models. A species distribution model was determined to predict the range shifts in Carmine Shiner due to climate change based on thermal impacts ( <a href="#">Pandit et al. 2017</a> ). Another study determined the standard metabolic rates of Carmine Shiner to predict metabolic responses under different thermal conditions. This study was conducted on fish caught in the Birch River and transported back to the Fisheries and Oceans Freshwater Institute fish holding facility ( <a href="#">McNaughton et al. 2019</a> ). In 2011, catch per unit effort was calculated to determine abundance and site density in the Birch River at different times throughout the year, and these data assisted in the technical data report “Standardized Field Sampling Method for Monitoring the Distribution and Relative Abundance of the Carmine Shiner ( <i>Notropis percobromus</i> ) in Canada” ( <a href="#">McNaughton et al. 2020</a> ). In 2015 and 2016, field studies using environmental DNA (eDNA) were conducted on the La Salle River, Seine River, Hazel Creek, Brokenhead River, Bird River, Peterson Creek, Pinawa Channel, and Winnipeg River in an attempt to confirm the known range of Carmine Shiner and to determine if range extension is possible using different sampling techniques. Data analysis and a peer-reviewed publication is currently ongoing.	CU, DFO, UA, UM, UW

### **3.3 Summary of progress towards recovery**

#### **3.3.1 Status of recovery objectives**

Implementation of the recovery objectives have been assessed as follows:

1. Maintain Carmine Shiner populations at their current abundance and within their present distribution within the Whitemouth, Birch and Winnipeg River systems.

No known instances of population or habitat decline have occurred and there is no information to suggest that the population has declined. Traditional and eDNA sampling have helped confirm the extent of the distribution and will aid in determining future changes to distribution and abundance.

2. Identify and protect critical habitat of the Carmine Shiner.

Critical habitat was identified in the 2013 recovery strategy and a critical habitat order was finalized in 2015. Through conservation easements and best management practices, forest management plans, and restoration and enhancement activities, critical habitat and riparian habitat in the Birch and Whitemouth River watershed continue to be protected.

3. Identify potential threats to the Carmine Shiner from human activities and ecological processes, and develop plans to avoid, eliminate, or mitigate these threats.

Potential threats to the Carmine Shiner remain static. Public awareness and stakeholder engagement is critical in mitigating threats to critical habitat. Understanding thermal preferences will help to mitigate threats of climate change and determine if steps need to be taken to ensure that fish have access to habitat within their thermal requirements.

The Carmine Shiner Species at Risk Recovery Team continues to monitor the Carmine Shiner Recovery Strategy and Action Plan and will update them when warranted by new information.

#### **3.3.2 Completion of action plan**

The action plan for the Carmine Shiner was published in 2018 ([DFO 2018](#)). It is a document that outlines what needs to be done to achieve the population and distribution objectives for the Carmine Shiner. It includes an implementation schedule for recovery measures in the following categories: research and monitoring; management and regulatory actions; and education and outreach.

#### **3.3.3 Critical habitat identification and protection**

Critical habitat was identified, to the extent possible, in the recovery strategy for the Carmine Shiner ([DFO 2013a](#)). Critical habitat was defined as all aquatic habitats in identified portions of the Whitemouth and Birch rivers characterized by fast-flowing water, generally less than 3 metres deep, sand, gravel, cobble, or boulder substrate, and in or near riffles.

A critical habitat order was published in the Canada Gazette, Part II on September 7, 2018.

### 3.3.4 Recovery feasibility

The goal of the 2013 recovery strategy “to maintain self-sustaining populations of the Carmine Shiner by reducing or eliminating potential threats to the species and its habitats” remains valid. There is no evidence that the distribution, abundance, or habitat has declined in the Whitemouth, Birch, and Winnipeg river systems. The projected declines that resulted in a change in status relate to the threat of habitat loss and pollution over the next 10 years. Future revisions to the recovery approaches and action plan may be warranted and recovery goals and objectives may be revised to include more specific goals as further information, particularly population trends, becomes available; however, the overall goal of maintaining a self-sustaining population should remain the same.

## 4 Concluding statement

Over the last 6 years, through the implementation of the activities identified in the recovery strategy, progress has been made in recovering the Carmine Shiner. During this time period, progress has been made in:

- surveying and environmental DNA (eDNA) sampling to clarify the distribution of Carmine Shiner
- habitat modeling work to determine potential critical habitat of the species
- identification of potential environmental limiting factors (temperature and oxygen concentration)
- development of a standardized field sampling method to monitor the distribution and relative abundance of the species
- education and outreach for the species, including working with stakeholders to increase local awareness and in the development of outreach materials

There may be research opportunities for determining potential suitable habitat and existing access to suitable habitat north of the current distribution, to gain an understanding of potential distribution shifts as climate change continues to affect water temperature to maintain thermal requirements for Carmine Shiner. An additional recommendation is to consider assisted migration of Carmine Shiner. Assisted migration may be required as potential barriers may limit the ability for fish to move into thermally suitable habitat. Locations could be determined using species distribution modeling which has been successful in previous attempts of managed recolonization ([Pandit et al. 2017](#)).

DFO remains committed to recovering the Carmine Shiner. The work started and completed to date has built a strong foundation for continued research and management of this species over the next reporting period. Progress made to date would not have been achieved without the contribution from DFO’s partners. DFO is looking forward to continuing this successful collaboration and welcomes the participation of additional partners.

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