

Action Plan for the Misty Lake Sticklebacks (*Gasterosteus aculeatus*) in Canada

Misty Lake Lentic Stickleback
Misty Lake Lotic Stickleback



2020

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For copies of the action plan, or for additional information on species at risk, including Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, recovery strategies, and other related recovery documents, please visit the [Species At Risk Public Registry](#).

Cover illustration: Photographs of Misty Lake Lentic Stickleback and Misty Lake Lotic Stickleback (*Gasterosteus aculeatus*) from the lake (lentic form; top photo) and from the inlet stream (lotic form; bottom photo). Photos by Renaud Kaueffer, with the help of Maryse Boisjoly and Shahin Muttalib.

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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 effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of action plans for species listed as extirpated, endangered, or threatened for which recovery has been deemed feasible. They are also required to report on progress five years after the publication of the final document on the Species at Risk Public Registry.

The Minister of Fisheries and Oceans is the competent minister under SARA for the Misty Lake Sticklebacks and has prepared this action plan to implement the recovery strategy, as per section 47 of SARA. In preparing this action plan, the competent minister has considered, as per section 38 of SARA, the commitment of the Government of Canada to conserving biological diversity and to the principle that, if there are threats of serious or irreversible damage to the listed species, cost-effective measures to prevent the reduction or loss of the species should not be postponed for a lack of full scientific certainty. To the extent possible, this action plan has been prepared in cooperation with the Province of British Columbia as per section 48(1) of SARA.

As stated in the preamble to SARA, success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions and actions set out in this action plan and will not be achieved by Fisheries and Oceans Canada 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 this action plan for the benefit of the Misty Lake Sticklebacks and Canadian society as a whole.

Under SARA, an action plan provides the detailed recovery planning that supports the strategic direction set out in the recovery strategy for the species. The plan outlines recovery measures to be taken by Fisheries and Oceans Canada and other jurisdictions and/or organizations to help achieve the population and distribution objectives identified in the recovery strategy. Implementation of this action plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

Acknowledgments

This action plan was prepared by Ahdia Hassan (Fisheries and Oceans Canada [DFO]), with contributions from Sean MacConnachie (DFO) and Martin Nantel (DFO). Participants of the Action Planning Workshop (Appendix B) contributed valuable information and ideas toward the development of this action plan.

Executive summary

The Misty Lake Lentic Stickleback (*Gasterosteus aculeatus*) and the Misty Lake Lotic Stickleback (*Gasterosteus aculeatus*) (Misty Lake Sticklebacks) were listed as Endangered under the *Species at Risk Act* (SARA) in 2010¹. This action plan is part of a series of documents regarding the Misty Lake Sticklebacks, including the COSEWIC Status Report (COSEWIC 2006), the recovery potential assessment (DFO 2010), the critical habitat identification report (Hatfield 2009), and the recovery strategy (DFO 2018), that should be taken into consideration together.

The Misty Lake Sticklebacks occur only within the Misty Lake watershed, on northern Vancouver Island, British Columbia. The Misty Lake Sticklebacks are comprised of an inlet population (lotic form), a lake-dwelling population (lentic form), and an outlet population that is considered part of the lentic form. The two forms are parapatric, meaning their ranges do not significantly overlap but are immediately adjacent to each other; they occur together in a narrow contact zone. Parapatric lake-stream stickleback species pairs are rare and are of considerable scientific interest and value due to their recent and unique evolutionary history.

This action plan outlines measures that provide the best chance of achieving the population and distribution objectives for the species, including the measures to be taken to address the threats and monitor the recovery of the species. The population and distribution objectives for the Misty Lake Sticklebacks identified in the recovery strategy are:

- *maintain, or where possible increase, abundance of each population (inlet, lake, outlet) relative to the 2016 observed population sizes*
- *maintain the current spatial distribution of each population (inlet, lake, outlet) and maintain the two distinct forms by preventing an increase in hybridization that could lead to the collapse of the species pair into a hybrid swarm*

Section 1.2 outlines the measures to be taken under the following broad strategies:

1. *determine the current distribution of key aquatic exotic, invasive or introduced species on Vancouver Island*
2. *develop and implement a Total Prevention Plan for aquatic invasive species*
3. *address information gaps that inhibit conservation of the Misty Lake Sticklebacks and their critical habitat*
4. *increase scientific understanding of the Misty Lake Sticklebacks through additional investigation into their natural history and threats to their persistence*
5. *continue to develop sound protocols for scientific investigations*
6. *manage and protect the habitat of the Misty Lake Sticklebacks*
7. *increase understanding of population trends and make linkages to threats*
8. *continue to develop and implement a long term monitoring program to assess population response to management activities and/or threats*

¹ In Schedule 1 of SARA, the species pair is listed as “Misty Lake Lentic Threespine Stickleback (*Gasterosteus aculeatus*)” and “Misty Lake Lotic Threespine Stickleback (*Gasterosteus aculeatus*)”. In this document, the common names “Misty Lake Lentic Stickleback” and “Misty Lake Lotic Stickleback” are used throughout to maintain consistency with the recovery strategy (DFO 2018).

9. develop and implement educational outreach materials to foster awareness of the species and encourage active local involvement in stewardship and habitat protection

For the Misty Lake Sticklebacks, critical habitat was identified to the extent possible, using the best available information, in section 7 of the recovery strategy. Under SARA, critical habitat must be legally protected from destruction within 180 days of being identified in a final recovery strategy or action plan and included in the Species at Risk Public Registry. For the Misty Lake Sticklebacks' critical habitats identified in the 2008 recovery strategy (DFO 2018), legal protection was accomplished on October 12, 2018 through two SARA Critical Habitat Orders made under subsections 58(4) and (5), which invoked the prohibition in subsection 58(1) against the destruction of the identified critical habitat.

An evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation is provided in section 3.

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1. Recovery actions

1.1 Context and scope of the action plan

The Misty Lake Lentic Stickleback (*Gasterosteus aculeatus*) and the Misty Lake Lotic Stickleback (*Gasterosteus aculeatus*) (Misty Lake Sticklebacks) were listed as Endangered under the *Species at Risk Act* (SARA) in 2010². This action plan is part of a series of documents regarding the Misty Lake Sticklebacks, including the COSEWIC Status Report (COSEWIC 2006), the recovery potential assessment ([DFO 2010](#)), the critical habitat identification report (Hatfield 2009), and the recovery strategy (DFO 2018), that should be taken into consideration together. Under SARA, an action plan provides the detailed recovery planning that supports the strategic direction set out in a recovery strategy for the species. A recovery strategy also provides background information on the species and its threats and critical habitat information.

The Misty Lake Sticklebacks occur only within the Misty Lake watershed, on northern Vancouver Island, British Columbia. The Misty Lake Sticklebacks are composed of an inlet population (lotic form), a lake-dwelling population (lentic form), and an outlet population that is considered part of the lentic form.³ Fish of the lentic form have shallower (that is streamlined) bodies, larger caudal fins and smaller pelvic girdles that are advantageous for sustained swimming in the pelagic habitat of the lake, compared with the lotic fish whose morphology confers increased maneuverability in structurally complex stream environments (Hendry et al. 2011). The two forms are parapatric, meaning their ranges do not significantly overlap but are immediately adjacent to each other; they occur together in a narrow contact zone. Parapatric stickleback species pairs are rare and are of considerable scientific interest and value due to their recent and unique evolutionary history.

Threats to Misty Lake Sticklebacks include: the introduction and establishment of aquatic invasive species that may predate upon, or compete with, the Misty Lake Sticklebacks or degrade habitat quality; point and non-point source water pollution from contaminants such as hydrocarbons or pesticides, and increased sediment loads and degradation of water quality from land use activities in the watershed; habitat loss or degradation from non-conforming use of the Misty Lake Ecological Reserve, riparian vegetation removal, and water extraction; changes in precipitation, water flow, temperature, and ice cover due to climate change⁴; and disturbance or harm from excessive removal of individuals for scientific research (DFO 2018).

The recovery strategy defines population and distribution objectives for the Misty Lake Sticklebacks as:

1. *to maintain, or where possible increase, abundance relative to the 2016 observed population sizes of each population (inlet, lake, outlet). The 2016 abundances are thought to be near historical levels and self-sustaining; and*
2. *to maintain the current spatial distribution of each population (inlet, lake, outlet) and maintain the two distinct forms by preventing an increase in hybridization that could lead to the collapse of the species pair into a hybrid swarm.*

² Refer to footnote 1.

³ Refer to footnote 2.

⁴ Addressing this threat is beyond the scope of the recovery strategy and action plan.

Under section 47 of SARA, the competent minister must prepare one or more action plans based on the recovery strategy. Therefore, action planning for species at risk recovery is an iterative process. The Implementation Schedule in this action plan may be modified in the future depending on the progression towards recovery.

1.2 Measures to be taken and implementation schedule

Success in the recovery of this species is dependent on the actions of many different jurisdictions; it requires the commitment and cooperation of the constituencies that will be involved in implementing the directions and measures set out in this action plan.

This action plan provides a description of the measures that provide the best chance of achieving the population and distribution objectives for the Misty Lake Sticklebacks, including measures to be taken to address threats to the species and monitor its recovery, to guide not only activities to be undertaken by Fisheries and Oceans Canada, but those for which other jurisdictions, organizations and individuals have a role to play. As new information becomes available, these measures and the priority of these measures may change. Fisheries and Oceans Canada strongly encourages all Canadians to participate in the conservation of the Misty Lake Sticklebacks through undertaking measures outlined in this action plan.

Table 1 identifies the measures to be undertaken by Fisheries and Oceans Canada to support the recovery of the Misty Lake Sticklebacks.

Table 2 identifies the measures to be undertaken collaboratively between Fisheries and Oceans Canada and its partners, other agencies, organizations or individuals. Implementation of these measures will be dependent on a collaborative approach, in which Fisheries and Oceans Canada is a partner in recovery efforts, but cannot implement the measures alone.

As all Canadians are invited to join in supporting and implementing this action plan, table 3 identifies the remaining measures that represent opportunities for other jurisdictions, organizations or individuals to lead for the recovery of the species. If your organization is interested in participating in one of these measures, please contact the Species at Risk Pacific Region office at sara@pac.dfo-mpo.gc.ca.

Implementation of this action plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

Broad strategies

Broad strategy 1: determine the current distribution of key aquatic exotic, invasive or introduced species on Vancouver Island

Broad strategy 2: develop and implement a Total Prevention Plan for aquatic invasive species

Broad strategy 3: address information gaps that inhibit conservation of the Misty Lake Sticklebacks and their critical habitat

Broad strategy 4: increase scientific understanding of the Misty Lake Sticklebacks through additional investigation into their natural history and threats to their persistence

Broad strategy 5: continue to develop sound protocols for scientific investigations

Broad strategy 6: manage and protect the habitat of the Misty Lake Sticklebacks

Broad strategy 7: increase understanding of population trends and make linkages to threats

Broad strategy 8: continue to develop and implement a long term monitoring program to assess population response to management activities and/or threats

Broad strategy 9: develop and implement educational outreach materials to foster awareness of the species and encourage active local involvement in stewardship and habitat protection

Table 1. Measures to be undertaken by Fisheries and Oceans Canada

#	Recovery measures	Broad strategy	Priority ⁵	Threats addressed	Timeline
1	Develop a monitoring plan for the Misty Lake Sticklebacks to measure progress achieved towards the population and distribution objectives. Monitoring efforts may include: <ul style="list-style-type: none"> trends in abundance of the Misty Lake Stickleback populations trends in hybridization rates trends in habitat quantity and quality 	7, 8	High	All	2019 to 2022
2	Continue to refine allowable harm estimates for Misty Lake Sticklebacks as new information on population structure and abundance is made available.	5	Medium	Disturbance or harm	2020 to 2023
3	Update scientific protocols (for example, collection and handling guidelines) for Misty Lake Sticklebacks. Set boundaries for experimental work and collection activities in an effort to reduce harm to the species.	5	Medium	Disturbance or harm	2021 to 2024

⁵ Priority” reflects the degree to which the measure contributes directly to the recovery of the species or is an essential precursor to a measure that contributes to the recovery of the species:

- "high" priority measures are considered likely to have an immediate and/or direct influence on the recovery of the species
- "medium" priority measures are important but considered to have an indirect or less immediate influence on the recovery of the species
- "low" priority measures are considered important contributions to the knowledge base about the species and mitigation of threats

Table 2. Measures to be undertaken collaboratively between Fisheries and Oceans Canada and its partners

#	Recovery measures	Broad strategy	Priority ⁶	Threats addressed	Timeline ⁷	Partner(s)
4	<p>Develop and implement initiatives to prevent aquatic invasive species from entering and becoming established in the Misty Lake watershed.</p> <p>Such initiatives may include:</p> <ul style="list-style-type: none"> • develop a comprehensive list of native, non-native, and cryptogenic⁸ species that occur within the Misty Lake watershed. This baseline information will serve as a benchmark for future invasive species monitoring; • risk analysis of intentional and unintentional pathways of introduction for aquatic invasive species; and • assess likelihood of introduction, establishment, and impact for a variety of aquatic invasive species <p>Implement a system of monitoring and communication for early detection and rapid response in the event that high-risk invasive species are detected within the Misty Lake system.</p>	1, 2	High	Aquatic invasive species	Medium-term	Academia, local or provincial government, industry, stewardship groups
5	Determine the normal variance of water quality parameters in the Misty Lake system with the objective of developing a quantitative range of values for various Critical Habitat attributes (for example, temperature, turbidity, algal growth, pH, dissolved oxygen, water velocity, etc).	3, 4	Medium	Water pollution; habitat loss or degradation; climate change	Short-term	Academia, local or provincial government, industry

⁶ Refer to footnote 5.⁷ Short-term = 2019 to 2023, medium-term = 2024 to 2028, long-term = beyond 2028.⁸ A species whose origins are unknown; the species may be either a native species or an introduced species, but clear evidence for either origin is absent.

#	Recovery measures	Broad strategy	Priority ⁶	Threats addressed	Timeline ⁷	Partner(s)
6	Assess risk of point-source pollution and risk of invasive species introduction from nearby highway rest stop, and consider appropriate mitigation options (for example, add educational signage along highway, modify slope of rest stop away from lake, decommission rest area, and/or reduce footprint of rest area).	6	High	Aquatic invasive species; water pollution	Short-term	Local or provincial government, stewardship groups
7	Promote further discussion and research on successful forest harvest strategies around small streams.	6	Low	Habitat loss or degradation	Medium-term	Provincial government, industry
8	Implement the monitoring plan for Misty Lake Sticklebacks.	7, 8	High	All	Medium-term	Academia, provincial government, stewardship groups

Table 3. Measures that represent opportunities for other jurisdictions, organizations or individuals to lead

#	Recovery measures	Broad strategy	Priority ⁹	Threats addressed	Suggested other jurisdictions or organizations
9	Develop and implement initiatives to prevent aquatic invasive species from entering the Misty Lake watershed. For example: <ul style="list-style-type: none"> • increase public knowledge about aquatic invasive species and their impacts • increase public participation in aquatic invasive species prevention, control, and monitoring efforts 	1, 2	High	Aquatic invasive species	Potentially stewardship groups, recreational users, local or provincial governments, industry, schools, other agencies, groups, or individuals
10	Participate in a group that supports the conservation and protection of the Misty Lake Sticklebacks, and undertake watershed-based stewardship initiatives that increase awareness and protection of the species.	9	Medium	All	Potentially stewardship groups, recreational users, local or provincial governments, industry, schools, other agencies, groups, or individuals
11	Develop educational material about the general biology of the species pair, their biodiversity value, threats to their persistence, and to provide information about the Misty Lake Ecological Reserve. Examples of educational materials include web-based and hard-copy material for use in public schools and regional interpretive centres nearest to the species' range.	9	Medium	All	Potentially stewardship groups, recreational users, local or provincial governments, industry, schools, other agencies, groups, or individuals

⁹ Refer to footnote 5.

2. Critical habitat

2.1 Identification of the species' critical habitat

2.1.1 General description of the species' critical habitat

Critical habitat is defined in SARA as “...*the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in a recovery strategy or in an action plan for the species.*” [s. 2(1)]

Also, SARA defines habitat for aquatic species as “... *spawning grounds and nursery, rearing, food supply, migration and any other areas on which aquatic species depend directly or indirectly in order to carry out their life processes, or areas where aquatic species formerly occurred and have the potential to be reintroduced.*” [s. 2(1)]

Critical habitat for the Misty Lake Sticklebacks is identified to the extent possible in section 7.1 of the recovery strategy (DFO 2018). The recovery strategy also contains details about the identified critical habitat including geographic location and biophysical functions, features and attributes. The recovery strategy contains a schedule of studies outlining the research required to identify additional critical habitat if necessary, and to acquire more detail about the critical habitat identified, in order to achieve the species' population and distribution objectives.

2.2 Activities likely to result in the destruction of critical habitat

Examples of activities likely to result in destruction of critical habitat may be found in section 7.3 of the recovery strategy.

2.3 Measures to protect critical habitat

Under SARA, critical habitat must be legally protected from destruction within 180 days of being identified in a final recovery strategy or action plan and included in the Species at Risk Public Registry. For the Misty Lake Sticklebacks' critical habitats identified in the 2008 recovery strategy (DFO 2018), legal protection was accomplished on October 12, 2018 through two SARA Critical Habitat Orders made under subsections 58(4) and (5), which invoked the prohibition in subsection 58(1) against the destruction of the identified critical habitat.

3. Evaluation of socio-economic costs and of benefits

SARA requires that an action plan include an evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation (SARA 49(1)(e) 2002). This evaluation addresses only the incremental socio-economic costs of implementing this action plan from a national perspective as well as the social and environmental benefits that would occur if the action plan were implemented in its entirety, recognizing that not all aspects of its implementation are under the jurisdiction of the federal government. It does not address cumulative costs of species recovery in general nor does it attempt a cost-benefit analysis. Its intent is to inform the public and to guide decision making on implementation of the action plan by partners.

The protection and recovery of species at risk can result in both benefits and costs. SARA's preamble recognizes that "*wildlife, in all its forms, has value in and of itself and is valued by Canadians for aesthetic, cultural, spiritual, recreational, educational, historical, economic, medical, ecological and scientific reasons*" (SARA, S.C. 2002, c. 29). Self-sustaining and healthy ecosystems with their various elements in place, including species at risk, contribute positively to the livelihoods and the quality of life of all Canadians. A review of the literature confirms that Canadians value the preservation and conservation of species in and of themselves. Actions taken to preserve a species, such as habitat protection and restoration, are also valued. In addition, the more an action contributes to the recovery of a species, the higher the value the public places on such actions (Loomis and White 1996; DFO 2008). Furthermore, the conservation of species at risk is an important component of the Government of Canada's commitment to conserving biological diversity under the *International Convention on Biological Diversity*. The Government of Canada has also made a commitment to protect and recover species at risk through the [Accord for the Protection of Species at Risk](#). The specific costs and benefits associated with this action plan are described below.

3.1 Socio-economic costs of implementing this action plan

The implementation schedule separates recovery measures into three tables. Table 1 includes measures to be undertaken by Fisheries and Oceans Canada with the full costs borne by the Government of Canada. Table 2 includes measures to be undertaken collaboratively between Fisheries and Oceans Canada and partners; the costs of these measures would be borne jointly by government and partners. The measures in table 3 provide opportunities for other jurisdictions, organizations and individuals to support the recovery of Misty Lake Sticklebacks; these costs would be borne primarily by parties other than the Government of Canada. Government of Canada costs would come from existing allocations.

The majority of the measures in table 1 and 2 of the action plan are research and monitoring activities. Research is focused on gathering information on water quality for critical habitat identification, use, risk assessment for aquatic invasive species and point-source pollution, and to assess the impacts of land use on habitat. Monitoring actions will indicate progress towards meeting population and distribution objectives and are to be undertaken on an ongoing basis. The majority of the actions are one-time, low direct and in-kind cost activities, scheduled to be conducted in the medium-term (that is over the next 6 to 10 years). The costs associated with the actions in table 3, are unknown, but likely very low cost based on similar actions for other species. Table 3 activities mainly focus on engagement and raising awareness. Additionally, some stewardship activities to prevent aquatic invasive species from entering the Misty Lake watershed are identified which could be undertaken on a voluntary basis by groups as opportunities arise. These measures are anticipated on an ongoing basis starting in the short-term for the duration of the action plan. Most of the direct and in-kind costs, while likely low, would be borne by parties other than the Government of Canada.

Overall, the direct annual costs of all the measures in the action plan (tables 1, 2 and 3) are likely low (that is <\$50,000/year) for Fisheries and Oceans Canada and partners. Some additional in-kind costs are likely for partners, organizations and individuals for measures in tables 2 and 3. Indirect costs are not anticipated. The majority of the actions are one-time actions, with some Fisheries and Oceans Canada and voluntary actions continuing on an ongoing basis. The costs will be distributed over time, with majority of the costs borne in the medium term.

3.2 Benefits of implementing this action plan

The impacts of the recovery measures in this plan on Misty Lake Sticklebacks are unknown but likely positive. As indicated above, Canadians value species for a number of reasons, including non-market benefits (that is existence, bequest and option values).¹⁰ Activities that positively affect the recovery of species, for which there are non-market benefits, may result in positive benefits to Canadians. The recent and unique evolutionary history of the Misty Lake Stickleback species pair has been of considerable scientific interest. Recovery will preserve this research value and could provide insights that benefit other species.

The recovery measures may also provide broader benefits to other species and to the ecosystem. For example, monitoring and research activities to address data and knowledge gaps for Misty Lake Sticklebacks may provide information via opportunistic observations on other species or habitat conditions. Specifically, water use in these systems is a high concern for salmonids as well as Misty Lake Stickleback, while measures to prevent aquatic invasive species can have ecosystem-wide impacts.

4. Measuring progress

The performance indicators presented in the associated recovery strategy provide a way to define and measure progress toward achieving the population and distribution objectives.

Reporting on *implementation* of the action plan (under s. 55 of SARA) will be achieved by assessing progress towards implementing the broad strategies.

Reporting on the ecological and socio-economic impacts of the action plan (under s. 55 of SARA) will be achieved by assessing the results of monitoring the recovery of the species and its long term viability, and by assessing the implementation of the action plan.

5. References

- COSEWIC. 2006. COSEWIC assessment and status report on the Misty Lake Sticklebacks *Gasterosteus* sp. (Misty Lake lentic Stickleback and Misty Lake lotic Stickleback) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 27 pp.
- DFO (Fisheries and Oceans Canada). 2008. Estimation of the Economic Benefits of Marine Mammal Recovery in the St. Lawrence Estuary. Policy and Economics Regional Branch, Quebec 2008.
- DFO (Fisheries and Oceans Canada). 2010. Recovery Potential Assessment for the Misty Lake stickleback (*Gasterosteus* spp.) pair. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/058.

¹⁰ Non-market benefits include bequest values (the value placed on conservation for future generations), existence values (the value people place on the existence of a species) and option values (the amount someone is willing to pay to keep open the option of future use of the species).

- DFO (Fisheries and Oceans Canada). 2018. Recovery Strategy for the Misty Lake Sticklebacks (*Gasterosteus aculeatus*) in Canada. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa. iv + 41pp.
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- Loomis, J.B. & White, D.S (1996). Economic Benefits of Rare and Endangered Species: Summary and Meta-analysis. *Ecological Economics*, 18: 197-206.

Appendix A: effects on the environment and other species

In accordance with the [Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals](#) (2010), SARA recovery planning documents incorporate strategic environmental assessment (SEA) considerations throughout the document. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or achievement of any of the [Federal Sustainable Development Strategy](#)'s goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the action plan itself, but are also summarized below in this statement.

By promoting the recovery of Misty Lake Sticklebacks, this action plan will benefit the environment, thereby contributing to FSDS Goal 4 (Conserving and Restoring Ecosystems, Wildlife and Habitat, and Protecting Canadians). Specifically, it will help to attain the associated Target 4.1 which is to have populations of federally listed species at risk exhibit trends that are consistent with recovery strategies and management plans. In addition, it could help to meet the target associated with 4.6, whereby pathways of invasive alien species introductions are identified, and risk-based intervention or management plans are in place for priority pathways and species.

The recovery measures identified in this action plan address threats such as: the introduction and establishment of aquatic invasive species; point and non-point source water pollution from contaminants such as hydrocarbons or pesticides, and increased sediment loads and degradation of water quality from land use activities in the watershed; habitat loss or degradation from non-conforming use of the Misty Lake Ecological Reserve, riparian vegetation removal, and water extraction; and excessive removal of individuals for scientific research. By addressing these threats, the recovery measures will contribute to the overall ecosystem health, which may provide benefits to other species that coexist in the Misty Lake watersheds, including Coastal Cutthroat Trout (*Oncorhynchus clarkii clarkii*), Coho Salmon (*O. kisutch*), Dolly Varden (*Salvelinus malma*), and Prickly Sculpin (*Cottus asper*), as well as ecological services to Canadians living in the area. No adverse effects on other species are anticipated as the result of the implementation of this action plan.

More specifically, within the distribution of Misty Lake Sticklebacks, it is unlikely that the recovery measures recommended within this document will negatively impact other fish or wildlife species. The recovery measures will help to address threats to Misty Lake Sticklebacks and their habitat, which will also benefit other native species. Recovery efforts are unlikely to affect species outside of the current range of Misty Lake Sticklebacks as the distribution of the species is limited and introduction into new areas is not a recommended recovery action.

Appendix B: record of cooperation and consultation

Action plans are to be prepared in cooperation and consultation with other jurisdictions, organizations, affected parties and others as outlined in SARA section 48. Fisheries and Oceans Canada hosted an Action Planning Workshop in Nanaimo, British Columbia on the afternoon of January 17th, 2017 to seek input on the development of this action plan. WebEx and a teleconference line were made available to those unable to attend in person. Information on participation is included below.

Organizations represented
1. British Columbia's Ministry of Environment
2. Western Forest Products
3. McGill University
4. Fisheries and Oceans Canada

Workshop participants identified knowledge gaps and provided input on potential recovery measures addressing key threats. Discussions focused on the importance of: aquatic invasive species prevention; reducing the likelihood of point source pollution and aquatic invasive species introduction from the nearby highway and rest stop; assessing the impact of current land use practices on Misty Lake Stickleback's habitat; communicating the Endangered status and the species to local residents; and, the general need for further research to inform knowledge gaps.

In June 2017 the draft action plan was circulated to Indigenous organizations, local, regional and provincial governments, environmental non-governmental organizations, and industry representatives for a 30-day external review. Comments resulted in minor revisions.

Additional Indigenous, stakeholder, and public input was sought through the publication of the proposed document on the Species at Risk Public Registry for a 60-day public comment period. No feedback was received.