

Okanagan Local Government Boards and Councils

April 25, 2019

Re: Reducing conflict between native mussel protection and invasive milfoil control in the Okanagan

Dear Mayors, Chairs, Councillors and Directors,

Since the 1970s, the Okanagan Basin Water Board has run a program to remove invasive Eurasian watermilfoil from the five large lakes in the Okanagan (Okanagan, Kalamalka Wood, Skaha and Osoyoos). Most public beaches throughout the valley are free of invasive weeds due to this program. However, recent changes in provincial and federal regulations are increasingly affecting our most effective treatment method, rototilling in the winter. Rototilling de-roots milfoil from the lake bottom, reducing stem densities by 80-97% in a single treatment. Rototilling is now prohibited in several areas under provincial regulations.

This recent rototilling prohibition is due to federal and provincial government staff efforts to protect a species of freshwater mussel known as the Rocky Mountain Ridged Mussel (RMRM). These mussels range from southern California, East to Nevada and throughout the Pacific Northwest, but in Canada they are limited to the Okanagan Basin, which represents only 5% of their total population range. Prior to 2003 there had been only 14 occurrences of the RMRM recorded in the Okanagan, and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) recommended that they be listed as “Endangered” under the Species at Risk Act (SARA). However, more recent surveys have found healthy populations with successful reproduction rates in several areas throughout the valley. One study in 2015 counted more than 5,500 RMRM in just nine surveyed sites, and estimated the total population at those sites to be more than 13,000. COSEWIC has not re-assessed their recommendation since 2010, and has not accounted for this new information. Further, November 2011 was the last time that Canada’s Department of Fisheries and Oceans conducted public consultations on the recommendation to list RMRM as endangered under SARA.

Milfoil rototilling is now prohibited in any areas where RMRM are found based on an assumption that this weed control method could cause harm to RMRM. However, there is evidence to suggest that allowing milfoil to grow will create conditions which are unsuitable for RMRM, while also creating poor water quality, poor habitat for other species, as well as social and economic harm.

The OBWB has sent a detailed letter (enclosed) to the Minister of Fisheries and Oceans Canada, and to the B.C. Minister of Forests, Lands, Natural Resource Operations and Rural Development asking them to grant an authorization under the federal Fisheries Act for the milfoil control program to continue. We strongly believe that a more evidence-based and balanced approach is needed before prohibiting milfoil de-rooting and allowing this invasive weed to thrive in our lakes. We have also provided a detailed response to the recommendation to list RMRM as endangered under SARA, asking for a new round of consultations, and for COSEWIC to re-assess their recommendation based on current information. That response is included in the letter at appendix C.

We request that your local government consider providing a letter of support for our request to the ministers, authorizing the OBWB milfoil de-rooting program to continue.

We have provided extensive information in the letter to the ministers including:

- Decision sought
- History
- Concerns
- Effects of invasive Eurasian watermilfoil (Appendix A): Environmental, Social and Economic
- Methods of Milfoil Control (Appendix B)
- Comments Regarding Canada Gazette, Part 1, Volume 153, Number 12: Order Amending Schedule 1 to the Species at Risk Act.

We hope this information will address any questions or concerns you have about this issue and allow you to support us as we continue to battle this harmful invasive species in our local waters.

Sincerely,



Anna Warwick Sears, Executive Director
Okanagan Basin Water Board

Hon. Jonathan Wilkinson
Minister of Fisheries and Oceans Canada
min@dfo-mpo.gc.ca

Hon. Doug Donaldson
Minister of Forests, Lands, Natural Resource Operations and Rural Development
FLNR.Minister@gov.bc.ca

April 24, 2019

Re: Reducing conflict between native mussel protection and invasive milfoil control in the Okanagan

Dear Minister Wilkinson and Minister Donaldson,

The Okanagan Basin Water Board (OBWB) is a local government agency in B.C. established through provincial legislation in 1970, with a mandate to provide leadership on valley-wide water issues. One part of OBWB's legislated mandate is to "participate in and undertake an aquatic weed control program under a cost-sharing agreement with the province." We are writing to make you aware of a conflict that is developing between the requirement to protect a species of freshwater mussel (Rocky Mountain Ridged Mussel, RMRM), and the need to control the growth of invasive Eurasian watermilfoil (milfoil) for ecological, social and economic reasons (Appendix A). While we strongly support the protection of native species and their natural habitats, we believe that a more evidence-based and balanced approach is needed in this particular case.

While RMRM are currently listed as 'at-risk' under the Species at Risk Act (SARA), they are now being considered for up-listing to 'endangered' which would greatly increase regulatory requirements for the milfoil control program. We have submitted feedback under the Canada Gazette process for this SARA listing proposal and have included it as Appendix C.

Decision sought:

- We request that the milfoil control program of the OBWB be formally authorized, on a permanent basis, under the terms of the Fisheries Act, Aquatic Invasive Species Regulations, Section 19 (2) (a) (iii) and (b) by either the Minister of Fisheries and Oceans, or the Minister of FLNRORD. Specifically, that the Minister may take measures

to control any aquatic species in a particular region or body of water frequented by fish where the aquatic species is not indigenous and may harm fish, fish habitat or the use of fish (harm as noted in Appendices A and C).

Should the proposed up-listing of RMRM as endangered under SARA be approved, the following is an alternative to authorization under the Fisheries Act:

- We request that the Minister issue a long-term permit authorized under SARA, Section 73 (1) and (2) (c) allowing OBWB to engage in milfoil control activities in which “affecting the species is incidental to the carrying out of the activity.”

If neither of these authorizations are granted:

- We ask that Fisheries and Oceans Canada and the BC Ministry of FLNRORD conduct a literature review and further field research into the effect of uncontrolled invasive milfoil on RMRM and other native species, prior to prohibiting the ongoing beneficial and locally-funded program to de-root milfoil;
- We ask that the ministries allocate sufficient funding to complete surveys to establish the extent of RMRM habitat (a requirement if up-listing under SARA occurs), and to determine the total estimated population in Okanagan large lakes. It is likely that surveys of this type will also have a number of periphery benefits such as detecting other freshwater mussel species and informing other regulatory decision-making;

and:

- **Until further research is conducted and an evidence-based decision can be made, we ask to continue to conduct milfoil de-rooting in areas which have historically been treated using this method; and**
- **We ask that milfoil de-rooting in the Okanagan by the OBWB be allowed to continue in high public-use areas regardless of future recordings of RMRM, ensuring that prohibitions do not continue to expand in future years.**

History:

The OBWB has been controlling milfoil in the Okanagan's major lakes for more than four decades, with a current budget of \$825,000 – entirely funded by local property taxes. The program was developed by the B.C. Ministry of Environment following more than 17 years of experiments into control methods including chemicals, bottom-barriers, biological control and several methods of mechanical treatment (Appendix B).

Ultimately, de-rooting the invasive weed using barge-mounted rototillers was found to be the most effective method of control (after aquatic herbicides), achieving an 80-97% reduction in

stem densities in water depths up to 3.5 meters.¹ Our operations are conducted using best practices incorporating all known environmental concerns and regulated species work windows, and are permitted through both provincial and federal ministries.² This program targets only invasive Eurasian watermilfoil during winter months when the plant is dormant and cannot spread.

Our annual treatment areas represent a small fraction of the lakeshore, focusing on public beaches and boating areas. Untreated areas can experience dense growth of the invasive weed, degrading the beaches for swimming and recreation. Further, untreated weed beds become mucky and anoxic with decaying milfoil.

Despite the demonstrated beneficial effects and best practices of the milfoil control program, concerns about a native freshwater mussel, (Rocky Mountain Ridged mussel, RMRM) have prompted ministry staff at both levels of government to issue increasing restrictions on the de-rooting method of milfoil control. These restrictions are based on an assumption that milfoil de-rooting has a negative effect on RMRM in the local area of milfoil control, but does not consider the negative effects of the milfoil itself on RMRM, other species, or their habitat.³

In 2010, a fisheries officer at DFO gave instructions that de-rooting could no longer be used at any site where RMRM were present, although we have been de-rooting in these locations for decades.⁴ In 2013, more mussels had been recorded at more historical de-rooting sites, and the prohibition expanded.⁵ In January 2018, the Thompson-Okanagan Ecosystem Section at the B.C. Ministry of FLNRORD released “Guidance for Freshwater Mussels in the Okanagan” which has the effect of formally prohibiting milfoil control (both de-rooting and harvesting⁶) in any area where RMRM are present, and the prohibited areas were again expanded due to new mussel recordings in historical treatment sites. These restrictions now extend to major sections of four large lakes, in areas of high public use and ecological value (Appendix A).⁷

Concerns:

We feel that the decision from both federal fisheries officers and provincial habitat officers is based on limited evidence, and does not achieve a balance between the need to protect RMRM and the need to consider the other ecological, social and economic concerns that will arise from limiting milfoil control. Serious questions remain.

1. Studies from other areas show that invasive milfoil displaces beneficial native macrophyte communities⁸, changes aquatic food webs⁹, substrate conditions and oxygen availability¹⁰ (Appendix A). It is unknown if sensitive RMRM would prefer, or could even survive in areas of untreated invasive milfoil infestation.¹¹ By removing

milfoil through de-rooting, we may help preserve more natural habitat for RMRM and other species. More research in this area is needed

2. Invasive milfoil has been shown to negatively effect many other native species of plants and aquatic animals, including salmonids and other fish (Appendix A). In extreme cases of milfoil infestation, there have been recordings of direct fish mortality from the anoxic conditions created in those areas.¹² Preventing milfoil de-rooting for RMRM is an example of one-species management, without consideration of the potential negative effects to other species.
3. Areas which have already been subject to de-rooting for several decades still show evidence of live RMRM and successful juvenile recruitment (reproduction) at the periphery of the treatment area. Any damage to individual RMRM in these limited de-rooting areas would have occurred long ago, and it is unlikely that the method of milfoil control is having a negative population-level effect on the species, given the limited total shoreline area where de-rooting occurs. More research in this area is needed.
4. A provincially-commissioned report in 1991 found that termination of the program would lead to a projected economic decline of \$85 million in annual tourism revenue, \$360 million in lost property value and over 1,700 job losses in the Okanagan alone. The study also found the further loss of \$40 million in provincial tourism revenues, \$3 million in lost provincial tax revenue and a further 800 job losses province-wide. It is likely that the numbers today are much higher given the dramatic population, economic and tourism growth in the valley in the last 28 years. We recommend that the province conduct another study to determine the current socio-economic benefits of the milfoil control program to inform decision makers of the effects of their decision to slowly erode this important program.

We have also expanded on these concerns in our feedback to the proposed changes to SARA in Appendix C.

Some B.C. provincial staff have asserted that milfoil in the Okanagan can be controlled through summer harvesting, which we conduct in limited areas where rototilling is already restricted, or where underwater infrastructure makes rototilling unfeasible. This short-term method does not have the same beneficial effects on water quality and habitat, does not prevent anoxic conditions at the lake bottom, and because it occurs during the plant's growing season, also spreads fragments which can lead to increased infestations in other areas.¹³

Harvesting is less effective than de-rooting as the plant grows back to the surface within four to six weeks of treatment, and the root systems are allowed to spread and densify. Harvesting also creates an increased danger to public safety through increased weed growth in swimming areas, as the machines enter swimming areas during beach-use, and operate in peak boating season. Harvesting is also less cost-effective and requires more equipment and on-shore infrastructure to collect and transfer the weeds to land for disposal. Finally, the harvesting season is only two months long; too short a window to treat the extensive areas of milfoil infestation in five major lakes. Harvesting is not an alternative to de-rooting for milfoil control, it is a less-effective aesthetic-only method which has limited benefit to aquatic health, and given the size of the infested treatment areas, is cost-prohibitive.

Summary:

Current management decisions being made by ministry staff under the B.C. Water Sustainability Act, the Fisheries Act and potentially the Species at Risk Act are not sufficiently informed by available evidence, and do not take a balanced approach to natural resource management. These decisions have the potential to return some areas of Okanagan lakes to the aquatic conditions of the 1970's with uncontrolled milfoil growth promoting poor water quality and toxic algae blooms, anoxic lake-bottom conditions, increased nutrient release into the water, and unusable swimming areas. There is little evidence that the restriction of milfoil de-rooting will have a positive effect on the overall RMRM population, and there is some evidence to suggest these restrictions may actually cause negative effects in their habitat. Further, RMRM are primarily known to reside in healthy populations in streams such as the Okanagan River, which are not infested by milfoil, and not subject to milfoil control.

As a water management agency, the OBWB provides leadership and funding to improve water quality, protect source waters, conserve water, prevent new invasive species and manage those that are here. Even as a small regional agency we have provided more than \$90 million over our history to support these efforts. In cooperation with federal, provincial, and local governments and First Nations, the programs of the OBWB over the last 50 years, including the control of invasive milfoil, have likely had a significantly positive effect on the RMRM species and its habitat. Provincial studies show that the species is thriving in several locations, including through healthy juvenile recruitment, and in parts of our system which were heavily modified in the last several decades, demonstrating their resilience.

We ask you to consider the potential harm that could be done to the Okanagan aquatic ecosystem, economy and way of life if milfoil treatment is curtailed. We are happy to continue working with ministry staff at all levels of government and to continue to provide leadership on valley-wide water issues.

Sincerely,



Anna Warwick Sears, Executive Director
Okanagan Basin Water Board

CC:

- Okanagan MPs: Mel Arnold, Stephen Fuhr, Dan Albas, Richard Cannings;
- MLAs: Eric Foster, Norm Letnick, Steve Thomson, Ben Stewart, Dan Ashton, Linda Larson, Jackie Tegart, Greg Kylo
- Chiefs Executive Council, Okanagan Nation Alliance;
- Regional District Chairs for North Okanagan, Central Okanagan, and Okanagan-Similkameen;
- Okanagan Municipalities;
- Okanagan Chambers of Commerce
- Thompson Okanagan Tourism Association
- FLNRORD Thompson Okanagan Region, Ecosystems Section Head

References

- ¹ Newroth, Peter R. and Roger J. Soar, "Eurasian Watermilfoil Management Using Newly Developed Technologies." *Lake and Reservoir Management*, Vol 2, Issue 1, 1986, pp. 252-257. <https://www.tandfonline.com/doi/abs/10.1080/07438148609354638>
- ² Letter from Ministry of FLNRO, 12 July, 2013. File: R8-7520
- ³ RMRM have been found on the periphery of milfoil beds and rototilling areas, but due to the conditions created in the milfoil bed, surveyors have been unable to enter the beds. Sloey, David et al., 1996 found that "the edges of the milfoil bed (either shallow or pelagic or both) contained higher biomass, density and taxa richness than the center of the bed." (abstract) This correlates with a finding that RMRM would be healthier at the margins of a milfoil bed, but not necessarily able to live within the bed.
- Sloey, David., Terry Schenck and Richard Narf, "Distribution of Aquatic Invertebrates within a Dense Bed of Eurasian Milfoil (*Myriophyllum spicatum* L.)." *Journal of Freshwater Ecology*, Vol 12, Issue 2, 1997, pp. 303-313.
<https://www.tandfonline.com/doi/abs/10.1080/02705060.1997.9663537>
- ⁴ Email correspondence DFO, 08 November 2010.
- ⁵ Letter from Ministry of FLNRO, 29 November, 2012. File: R8-7222
- ⁶ Recent changes (January 2018) to the Okanagan Large Lakes Foreshore Protocol upgraded milfoil harvesting to a "high-risk" activity, requiring extra mitigation measures than were previously required when it was designated as a "low-risk" activity, including through the new Guidance for Freshwater Mussels, also published in January 2018.
- ⁷ Mussel Habitat Zones Okanagan Region:
<https://catalogue.data.gov.bc.ca/dataset/mussel-habitat-zones-okanagan-region>
- ⁸ Ring, R.A., N.N. Winchester and I.V. MacRae. "Myriophyllum spicatum L., Eurasian Water Milfoil (Haloragaceae)." *Biological Control Programmes in Canada, 1981-2000*, edited by P.G. Mason and J.T. Huber, CABI Publishing, 2002, pp. 402-407.
<https://books.google.ca/books?hl=en&lr=&id=tDHWhOEhTckC&oi=fnd&pg=PA402&dq=milfoil+and+anoxic&ots=b6jZsJiqqd&sig=mGPMJgTxkVSwuDNpH3JmUm-pqXU#v=onepage&q&f=false>
- Madsen, J.D., C.F. Hartleb, and C.W. Boylen. "Photosynthetic characteristics of *Myriophyllum spicatum* and six submersed aquatic macrophyte species native to Lake George, New York." *Freshwater Biology*, Vol. 26, Issue 2, 1991, pp. 233-240. Found that the canopy of invasive milfoil reduces light transmissivity into the water column, preventing other native plants from growing.

⁹ Wilson, Sarah J. and Anthony Ricciardi. "Epiphytic macroinvertebrate communities in watermilfoil (*Myriophyllum spicatum*) and native milfoils *Myriophyllum sibiricum* and *Myriophyllum alterniflorum* in Eastern North America." *Canadian Journal of Fisheries and Aquatic Sciences*, Vol 66, Issue 1, 2009, pp. 18-30. Found that invasive milfoil supports different macroinvertebrate communities compared to native aquatic macrophytes and "the replacement of native milfoils by *M. spicatum* (Eurasian water milfoil) may have indirect effects on aquatic food webs." (Abstract)

<https://www.nrcresearchpress.com/doi/10.1139/F08-187#.XK-Go5hKjcs>

¹⁰ Frodge, Jonathan et al., "Mortality of Largemouth Bass (*Micropterus salmoides*) and Steelhead Trout (*Onorhynchus mykiss*) in Densely Vegetated Littoral Areas Tested Using in situ Bioassay." *Lake and Reservoir Management*, Vol 11, Issue 4, 1995, pp. 343-358.

<https://www.tandfonline.com/doi/abs/10.1080/07438149509354216>

Zavinski, Erik, "Lake Group Responds to Burtis Bay fish kill." *Observer*. November 17, 2018.

<http://www.observertoday.com/news/page-one/2018/11/lake-groups-respond-to-burtis-bay-fish-kill/>

¹¹ Burlakova, Lyubov E., and Alexander Y. Karatayev., "The Effects of Invasive Macrophytes and water level fluctuations on unionids in Texas impoundments." *Hydrobiologia*, Vol 586, Issue 1, 2007, 291-302. "In two ponds, horizontal distribution of unionids was limited by dense beds of invasive and noxious macrophytes (mainly Eurasian watermilfoil *Myriophyllum spicatum* and American lotus *Nelumbo lutea*): mussel densities were significantly lower in these macrophyte beds ($P < 0.001$)." (Abstract).

<https://link.springer.com/article/10.1007/s10750-007-0699-1>

¹² Frodge, Jonathan et al., demonstrated that anoxic conditions caused by dense aquatic macrophytes led to significant fish mortalities (steelhead trout and largemouth bass) and found that "at high densities aquatic macrophytes can have significant detrimental localized effects on fish." (abstract) See note 10 for Citation.

¹³ Newroth, Peter R., "British Columbia Aquatic Plant Management Program." *Journal of Aquatic Plant Management*, Vol 17, 1974, pp. 12-19. Continued use of the harvester did not provide lasting control, and since it tended to encourage further spread of Eurasian watermilfoil, reviews of other mechanical removal options were continued." 17.

<http://www.apms.org/japm/vol17/v17p12.pdf>

Appendix A: Effects of invasive Eurasian watermilfoil

Economic Effects:

According to Fisheries and Oceans Canada: “Eurasian Water Milfoil grows and spreads rapidly while invading replacing native plants. It negatively impacts fish and wildlife populations as well as human activities such as swimming, boating, waterskiing, fishing and tourism in affected areas. This plant also has been known to impede flood control, water conservation and drainage and irrigation works. Milfoil populations can be very dense making it very costly to control.” <http://www.dfo-mpo.gc.ca/species-especies/profiles-profils/eurasianwatermilfoil-myriophylleenepi-eng.html>

The current annual budget of the OBWB Milfoil Control Program is \$825,000.

In 1991, the BC Ministry of Environment released an independent report: *Evaluation of the Socio-Economic Benefits of the Okanagan Valley Eurasian Water Milfoil Control Program*. The report found that terminating the milfoil control program would lead to an economic decline of:

- \$85 million in tourism revenues;
- Employment in tourism of 1,700 positions;
- Real estate values of \$360 million (3.8% of net taxable values of Okanagan properties); and a further projected decline (outside the Okanagan) of:
- \$40 million in BC Tourism Revenues;
- Employment in tourism of 800 positions in BC;
- \$3 million in tax revenues;

Further, the report found that “increasing emphasis should continue to be placed on de-rooting rather than harvesting as a means to control Eurasian water milfoil.”

A 2014 study in King County, Washington found “that milfoil has a significant negative effect on property sales price (\$94,385 USD lower price), corresponding to a 19% decline in mean property values.” Olden J.D., and M. Tamayo. (2014) “Incentivizing the Public to Support Invasive Species Management: Eurasian Milfoil Reduces Lakefront Property Values.” *PLoS ONE* 9(10): e110458. <https://doi.org/10.1371/journal.pone.0110458>

Environmental Effects:

“From an ecosystem standpoint, the most important consequences of macrophyte decay are release of dissolved substances, deoxygenation and sediment accretion.” Carpenter, Stephen R. and David M. Lodge, “Effects of Submersed Macrophytes on Ecosystem

Processes." *Aquatic Botany*, Vol 26, 1986, 341-370.

<https://www.sciencedirect.com/science/article/pii/0304377086900318>

Water flow effects One experiment on the effects of aquatic macrophytes on water flow, showed that invasive milfoil beds decreased water flux through the littoral zone by 36%. (Ibid 344)

Increase in organic sediments In streams, "macrophyte stands act as a sieve retaining coarse particulate detritus" and terrestrial organic material "is retained in macrophyte beds and decomposed to a much greater extent than in unvegetated reaches of streams. In lakes, macrophytes contribute refractory organic matter directly to sediments..." (Ibid, 344)

Changes in free-water dissolved oxygen levels Dense macrophyte stands create significant oxygen changes in the water column, reducing available dissolved oxygen near the lake substrate, and increasing it at the surface. "Oxygen flux in a dense *Myriophyllum spicatum* stand was about twice as great as that of an adjacent harvested plot." (Ibid 345)

Nutrient release into the water column The literature review from Carpenter and Lodge (1986) found that submersed macrophyte stands act as translocators of dissolved organic carbon and phosphorus, by absorbing it from the substrate through the plant, and releasing it back into the water during decomposition. (349)

Social Effects:

Invasive milfoil infests many public beaches and boating areas throughout North America. In the Okanagan, approximately 58 linear kilometers of shoreline covering approximately 6km² have been historically treated for milfoil using either winter de-rooting or summer harvesting methods or both. This represents 13.9% of the total shoreline area of major Okanagan Lakes.

The following public beaches in the Okanagan are infested with milfoil and historically subject to milfoil control (* Areas are now partially or wholly prohibited for milfoil de-rooting due to RMRM occurrences.):

Kin Beach – Vernon *

Paddlewheel Park Beach – Vernon *

Kalamalka Beach – Coldstream

Beasley Park – Lake Country

Reiswig Regional Park – Lake Country

Tugboat Bay – Kelowna

Hot Sands Beach/City Park – Kelowna
Strathcona Park – Kelowna
Kinsmen Park – Kelowna
Boyce-Gyro Beach – Kelowna
Rotary Beach Park – Kelowna
Pritchard Park – West Kelowna
Gellatly Bay Park – West Kelowna
Willow Beach – West Kelowna
Okanagan Lake Provincial Park North
Okanagan Lake Provincial Park South
Crescent Beach – Summerland *
Gordon Beggs Rotary Beach – Summerland *
Rotary Park Beach – Penticton
Skaha Lake Park – Penticton *
Lions Park – OK Falls *
Christie Memorial Provincial Park – Skaha Lake *
Lions Park – Osoyoos
Veterans Memorial Park – Osoyoos
Legion Beach Park – Osoyoos
Gyro Park – Osoyoos
Goodman Park – Osoyoos
Haynes Point Provincial Park *
Osoyoos Lake Regional Park

Yacht Clubs and Marinas infested with or directly affected by milfoil and subject to historical milfoil control include:

Vernon Yacht Club *
Turtle Bay Marina
Kelowna Yacht Club
El Dorado Marina
Kelowna Sailing Club
West Kelowna Yacht Club
Summerland Yacht Club *
Penticton Yacht Club
Skaha Lake Marina *
Osoyoos Boat Launch and Marina

As well as public beaches, yacht clubs and marinas, extensive lakefront business and resort areas are also treated each year for invasive milfoil. Several of these areas are also now restricted due to RMRM occurrences.

Uncontrolled invasive milfoil represents a severe threat to the economy and local way of life in the Okanagan. In 2018, nearly 80% of all visitors to Kelowna participated in beach, park and water related activities with 10% reporting that it was the primary reason for their visit.

Uncontrolled milfoil also represents an increased risk to public safety as well as beach water quality and drinking water quality. As recently as 2017, Okanagan media covered a story of a man swimming in an uncontrolled milfoil bed who described getting tangled in milfoil off of Kelowna's City Park. <https://www.pentictonwesternnews.com/news/adversity-for-lake-milfoil-harvest/> In nearby lakes in northwestern states, several drownings have been attributed to swimmers becoming caught in dense milfoil beds. Further, reduction in water quality due to milfoil increases the occurrence of swimmers itch, and promotes toxic algae blooms, which can cause a hazard to both humans, pets and wildlife.

Appendix B: Methods of Milfoil Control

There are two methods of milfoil control used in the Okanagan Basin, summer harvesting and winter rototilling. Both methods have been historically used since the 1970s in Okanagan Lakes, and were developed by the B.C. Ministry of Environment during more than 17 years of control experiments. Each machine operator has a GPS-linked tablet on board with maps showing all environmental work windows, habitat and species concerns. All information relating to federal and provincial environmental permitting is updated annually by a Qualified Environmental Professional. All milfoil control work is GPS tracked and a report is also submitted to the province annually.

Summer harvesting uses specially designed machines to cut invasive milfoil approximately 5 feet below the water's surface, and to transport the cut weeds to land. Once on shore, a truck collects the weeds for disposal. This control method only occurs during the peak milfoil growth season in July and August when the milfoil reaches the water's surface. Since milfoil grows up to 5 cm per day, a harvested milfoil bed could be back at the surface of the water in 30 days after treatment. Milfoil starts growing at water temperatures as low as 15 degrees Celsius, which occurs in Okanagan Lakes from May to October. Since mature milfoil plants naturally spread through fragmentation, the process of cutting the weeds also leads to viable plant fragments floating freely in the water to potentially establish new plants. Although the harvester collects most of the weeds, other stray fragments can create piles on beaches, get caught in boating equipment and interfere with other recreational activities.

Harvesting is not an effective method for milfoil control and is only used as an aesthetic treatment in areas of high public value where rototilling is not feasible. Harvesting also presents increased public safety risks as the machines must operate in public swimming areas during peak summer beach use. July and August are also the busiest time for boating and all water-related recreation activities in the Okanagan, creating increased workplace hazards for machine operators.

Winter rototilling occurs between October and May while milfoil is dormant and plant fragments cannot spread. The machine tills the top few inches of the lake substrate in areas where high milfoil growth were previously mapped, and where plant fragments are still visible. Root fragments float to the surface of the water and wash ashore where they decompose. The root fragments are also a food source for waterfowl which can often be seen following the machine. One year of de-rooting can lead to reduced plant density of 80-97%, while ongoing de-rooting in the same area can locally eliminate plant growth for a few years. However, once de-rooting stops, the area will become re-infested. De-rooting milfoil can also lead to a resurgence of native aquatic plants which are beneficial to the ecosystem, although the exact

mechanism for this is unknown. Milfoil is known to outcompete native plants by reducing available light for photosynthesis, and these plants have different root structures, which may not be as effectively removed from the substrate through rototilling.

De-rooting only occurs in mapped milfoil beds, accounting for all known fisheries work windows, including fish, amphibians, waterfowl, and sensitive plant areas.

Milfoil control can also occur through the use of physical, biological and chemical methods which were studied during the development of the OBWB milfoil control program. Bottom barriers are used in some places, and can be effective for a short period. However, bottom barriers have a number of environmental drawbacks and are not as effective as de-rooting. Bottom barriers create a permanent change in the substrate, limiting access to fish spawning beds and preventing all plant growth, reducing the occurrence of native aquatic plants.

Biological control includes the mass rearing of native aquatic insects such as weevils. The weevils prefer milfoil to other food sources, and also provide a food source for other species. However, in order to reduce overall milfoil density, huge numbers of weevils are needed which makes the mass-rearing process difficult and cost prohibitive. Weevils quickly consume a milfoil bed, which then eliminates the food source, killing the weevils and allowing the plants to re-grow.

Selective chemical treatment is the most effective method of milfoil control and is used extensively in the United States, including in the southern portion of the Okanagan Basin. Chemical treatment can lead to longer-term milfoil control while having limited effects on the aquatic ecosystem. Newer products have been developed since this method was last used in the 1980's in the Canadian Okanagan Basin, but they are not currently approved for use in Canada. Costs of chemical treatment are lower than the cost of rototilling and do not disturb the lake bottom. However, this method means releasing substances into drinking water while the plant has foliage in the summer months during peak beach-use. Chemical treatment does not have the same social licence as de-rooting and it is not likely a publicly acceptable alternative.

Appendix C: Comments Regarding Canada Gazette, Part 1, Volume 153, Number 12: Order Amending Schedule 1 to the Species at Risk Act

Julie Stewart, Director
Species at Risk Program
Fisheries and Oceans Canada
200 Kent Street
Ottawa, Ontario K1A 0E6

April 17, 2019

Re: Comments Regarding Canada Gazette, Part 1, Volume 153, Number 12: Order Amending Schedule 1 to the Species at Risk Act

Dear Director Stewart,

The Okanagan Basin Water Board (OBWB) is a local government agency in B.C. established through provincial legislation in 1970, with a mandate to provide leadership on valley-wide water issues. While we strongly support the protection of native species and their natural habitats, we believe that new evidence should be considered prior to the decision to up-list the Rocky Mountain Ridged Mussel (RMRM) from at-risk to endangered. To that end, we submit these comments to the subject Canada Gazette Order Amending Schedule 1 of the Species at Risk Act, regarding the recommended up-listing RMRM from “at-risk” to “endangered.”

Because of the limited time given to respond to the Canada Gazette publication, and the limited opportunity for communities to become informed and engaged, Okanagan elected officials will be directing additional correspondence directly to the Minister.

The listing considerations provided in the Canada Gazette are based on old information and in some cases, reach false conclusions. There is significant new scientific information to suggest that this species does not meet the definition of endangered under SARA, and that this new information has not been considered by COSEWIC. The Regulatory Impact Analysis Statement (RIAS) also significantly understates the social, economic and ecological impacts of regulations to protect RMRM should they be listed as endangered under the Order.

We strongly believe that the Minister should recommend to the Governor in Council that the matter be referred back to COSEWIC for further information and consideration. Specifically, that COSEWIC should consider new information about the species, published in 2015, and all

federal, provincial and academic surveys done on the RMRM since the last COSEWIC report in 2010, and that COSEWIC make a new recommendation based on this information.

This new information was also not available prior to the last round of (very limited) public, Indigenous and stakeholder consultations held in 2011. Since those consultations were held, there has been significant advancement in the understanding of Indigenous rights, changes in government at both the federal and provincial level, significant restoration activities in RMRM habitat areas, and an enhanced understanding of the issues and trade-offs among the stakeholders. **New consultations should be held to better inform the advice given to the minister.**

The Annex 1 – Description of species being added or reclassified to Schedule 1 of the Species at Risk Act section on RMRM asserts that “there may be some costs associated with reclassifying these species as endangered, due to the application of the SARA prohibitions; costs are not currently quantifiable, but are expected to be low.”

This conclusion is false and limited. There are significant extra direct and indirect costs associated with this decision which have been quantified in the past, and could be re-examined in detail given current information. There will be immediate and significant social and economic impacts related to a loss of the ability to control invasive Eurasian watermilfoil which have not been considered. We have outlined this information below.

Further, we believe it is appropriate for the Minister to consider the other factors given in this letter while preparing listing advice for the Minister of Environment.

We have organized our comments with specific reference to each of the considerations as outlined on page 5 of the Canada Gazette. Specifically: “In preparing listing advice to the Minister of Environment in relation to each aquatic species, the Minister of Fisheries and Oceans considers the following, as appropriate:

- The purposes of SARA;
- The species status assessment by COSEWIC;
- Other available information regarding the status and threats to the species;
- The *Fisheries and Oceans Canada Species at Risk Act Listing Policy for “Do Not List” Advice*;
- The results of consultations with the public, provinces and territories, appropriate Indigenous groups and organizations and wildlife management boards and with any other person or organization that the competent minister considers appropriate; and
- The socio-economic (costs and benefits) and biological impacts.

- The purposes of SARA

Page 3: The “Background” section outlines “the purposes of SARA, which are to prevent wildlife from becoming extinct or extirpated from Canada...” SARA defines an endangered species as “a wildlife species that is facing imminent extirpation or extinction.”

Comment: A 2015 study conducted by Post-Doctoral Fellow, Dr. Jon Mageroy, on behalf of the University of British Columbia and in partnership with the Province of B.C., found “Overall the investigation into RMRM juvenile recruitment in the Okanagan shows that juveniles have been recruited fairly recently at all the locations we surveyed, which indicates that the mussel population is not under immediate threat to be extirpated from the system.” (Mageroy P.4)

Further, between 1906 and 2002, only 14 records of RMRM exist from the entire range in Canada, leading to an initial precautionary COSEWIC listing of them as “at-risk”. However, Mageroy reported that snorkel surveys, limited to 3 meters in depth at only nine sites throughout the Okanagan directly recorded more than 5,500 RMRM individuals, and estimated the population at those nine sites to be over 13,300 individuals, and found healthy, recent juvenile recruitment in at least half of those surveyed sites. Mageroy also acknowledged that mussel surveys had to include excavations at the site as “juveniles are found buried in the substrate,” making them difficult to locate and identify. Still, the study found “mussels as young as two or three years old at a majority of the locations surveyed, and mussels seven years or younger at all locations.” (Mageroy P.3)

The precautionary principle defined on page 6 of the Gazette reads: “where there are threats of serious or irreversible damage to a wildlife species, cost-effective measures to prevent the reduction or loss of the species should not be postponed for a lack of full scientific certainty.” However, the initial COSEWIC assessment of RMRM as an at-risk species was only based on information available in 2003, while the latest assessment informing this Canada Gazette is only as recent as 2010. In the Mageroy study alone, the recorded population of the RMRM species in the Okanagan region increased by more than 390 times. That is, for every one Rocky Mountain Ridged Mussel recorded between 1906 and 2002, over 392 RMRM were found in just one study in just nine locations in 2013 and reported in 2015. Still, this information does not seem to have been assessed by COSEWIC, and does not seem to inform the recommendation to up-list this species to endangered.

Also since 2010, the B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development have conducted more surveys, identified more RMRM locations, and should provide this information to COSEWIC for further assessment.

- **The species status assessment by COSEWIC and The Fisheries and Oceans Canada Species at Risk Act Listing Policy for “Do Not List” Advice**

The Fisheries and Oceans Canada Species at Risk Act Listing Policy and Directive for “Do Not List” Advice, 6.2.3. provides DFO with policy direction to provide “Do Not List” advice to the Minister to provide an option “to ‘refer back’ (to COSEWIC) when there is significant, credible information that:

- Was not available to, or not considered by, COSEWIC at the time of the assessment, and
- Could lead to a change in the conclusion that COSEWIC reached regarding the status of the species.”

Comment: In addition to the information on RMRM population numbers and healthy juvenile recruitment, Mageroy also examined and identified some of the host-fish species which are used by RMRM. The 2010 COSEWIC report indicated that “host species in Canada are unknown.” (COSEWIC RMRM, 2010, v.) This is another indication that the species status assessment by COSEWIC is outdated. Similarly, recent work by Snook (2018) identified more of the substrate types that provide habitat for RMRM species, another unanswered question given in the 2010 COSEWIC report.

Based on the Mageroy and Snook studies alone, there is “significant, credible information that was not available to COSEWIC and could lead to a change in the conclusion that COSEWIC reached regarding the status of the species.” It is likely that the Province of B.C. has further new information that was not previously available and should be considered.

- **Other available information regarding the status and threats to the species**

Significant assumptions have been made about this species and their decline in the Okanagan based on a lack of scientific knowledge. In the 2010 COSEWIC RMRM report Technical Summary, out of 21 factors used to determine demographic, extent and occupancy information, 11 were listed as “unknown,” 4 factors were listed as “possibly, likely or unlikely” and only 6 factors including geographic range were listed with certainty or from direct observation. Several of the unknown factors have now been studied in more detail and would provide for a more evidence-based assessment by COSEWIC.

The 2010 COSEWIC RMRM report also listed the following threats:

1. Introduction and establishment of the Zebra Mussel and/or Quagga Mussel in the Okanagan River basin.

Comment: Since 2010, the Province of B.C. in coordination with other northwestern jurisdictions has taken steps to prevent the introduction of invasive mussels. While these invasive species still represent the most serious threat, new prevention activities likely reduce the threat, and are another factor that has changed since 2010.

2. Ongoing foreshore/riparian development affecting quality/quantity of habitat especially on lake shorelines.

Comment: While we agree that foreshore/riparian development continues to be a threat to RMRM and aquatic habitat health in general, the regulations associated with the up-listing of SARA do not provide any additional protection for the species.

Further, habitat in the RMRM Extent of Occupancy area is generally improving from the conditions which likely led to any decline in the species in the past. Water quality in many of the main lakes of the Okanagan Basin has seen significant improvement since the 1960's, through reduced nutrient loading. Riverine environments in the Okanagan are also increasingly being protected and restored, and fish passage for potential host-fish species is being put in place around previously impassable barriers which may have prevented the species from moving in a natural way.

3. Regular rototilling of Eurasian Watermilfoil beds.

Comment: The assumption was made in both the 2010 COSEWIC RMRM report and the *Annex 1 – Description of species being added or reclassified to Schedule 1 of the Species at Risk Act section on RMRM*. However, there has never been any consideration of the effect of the invasive milfoil itself on the habitat of the RMRM. Introduced in the 1960's, invasive Eurasian water milfoil has significant effects on the substrate habitat conditions in many areas of the Okanagan. While RMRM individuals have been identified on the fringes of milfoil rototilling beds, there is no evidence that they can survive within dense milfoil beds that are left uncontrolled.

Limiting factors for RMRM survival in dense milfoil beds include lack of water flow, low dissolved oxygen conditions, nutrient loading into the water column, and lower water temperatures. Each of these factors is explained by Snook (2018) in her discussion of RMRM critical habitat identification. **It is possible that failure to control invasive milfoil will lead to a decrease in RMRM population and lower habitat quality.**

4. Channelization and water regulation in the Okanagan River.

Comment: Snook (2018) showed that RMRM density is noticeably higher in locations along channelized sections, while being “nearly absent from natural sections of Okanagan River.” Since river channelization only occurred in the Okanagan in the 1950’s, the population of RMRM that colonizes these sections has demonstrated successful juvenile recruitment since that time. This is another example of a conclusion drawn in 2010 by COSEWIC which should be reconsidered based on new information.

- The results of consultations with the public, provinces and territories, appropriate Indigenous groups and organizations and wildlife management boards and with any other person or organization that the competent minister considers appropriate

Annex 1 – Description of species being added or reclassified to Schedule 1 of the Species at Risk Act section on RMRM describes “several opportunities for consultation” that were provided over two months from October 2011 - November 2011, and only 17 responses were received. Of note, the report includes that “a face-to-face meeting (...) took place between DFO management and the Okanagan Basin Water Board to discuss specific aspects of the reclassification of the species.”

The report states: “Opposition was mainly due to fear of anticipated increases in the management costs of Eurasian Water Milfoil (an invasive aquatic plant), where rototilling is used to eliminate the plant. However, management costs are not likely to change significantly as a result of the listing of this mussel. Typically, the same areas are treated each year and the mussel is unlikely to be present in areas where rototilling has already occurred.”

Comment: RMRM mussels have been found adjacent to areas where milfoil rototilling has taken place for more than 30 years. Recent provincial restrictions have already significantly increased management costs, while reducing the effectiveness of invasive milfoil control. Further, the recent description of RMRM “critical habitat” by Snook for DFO means that restrictions could be placed on any areas of potential RMRM habitat within 80 meters of shore from the high-water mark, while provincial restrictions place a 100 meter buffer for each individual RMRM. These requirements could lead to an 800 square meter exclusion zone for milfoil control work around each new RMRM individual discovered in the future, even where the new recording is directly adjacent to the boundary of a historical rototilling bed. This would lead to significantly increased direct costs to the management program, contrary to the conclusion reached in the report.

These restrictions will have a very direct, immediate and significant impact on the local environment, economy, culture, and public enjoyment of the beaches as they are degraded by invasive milfoil.

The report also states: “For new areas that would require rototilling to eliminate the invasive plant, an environmental assessment would be required under the legislative requirements of the *Fisheries Act*, which has administrative, information and mitigation requirements similar to those required for species listed under SARA. Therefore, incremental costs for Milfoil control attributable to reclassifying the species to endangered under SARA would be negligible.”

Comment: The Fisheries Act relies on the listing of a species under SARA as extirpated, endangered or threatened to be in effect. Thus, the up-listing of RMRM would bring about significant new legislative requirements under the Fisheries Act – ONLY in relation to the SARA. Under the current listing as at-risk, the Fisheries Act requires the avoidance of “serious harm” to RMRM, whereas the up-listing to endangered would require the avoidance of “impacts” to RMRM – a significantly lower bar with significantly increased costs.

Further, the Benefits and Costs Analysis for RMRM on page 19 of the Gazette indicates that “there will not be any incremental costs to businesses as the majority of development that could harm the species would require a *Fisheries Act* review.”

Comment: This analysis is flawed as it only accounts for direct costs associated with the administration of the SARA regulations should the up-listing of RMRM be accepted. As outlined in the next section, there will be significant indirect costs associated with both the new requirements of the SARA permitting process, and the potential loss of milfoil control in newly identified critical habitat areas.

- **The socio-economic (costs and benefits) and biological impacts**

The listing of RMRM as an endangered species under SARA could trigger significant added burdens to proponents of any change in aquatic environments in the Okanagan without offering significant and meaningful additional protections for the survival and recovery of the species. Most significantly, increasing restrictions on milfoil control will have measurable biological effects on other species, a direct negative socio-economic effect, as well as potential negative effects on RMRM themselves (as outlined above).

1. The perimeters of areas that have already been subject to de-rooting for several decades still show evidence of live RMRM and successful juvenile recruitment (reproduction). Any damage to individual RMRM in these limited de-rooting areas would have occurred long ago, are incidental to the activity, and it is unlikely that the

method of milfoil control is having a negative population-level effect on the species, given the limited total shoreline area where de-rooting occurs. More research in this area is needed.

2. A provincially-commissioned report in 1991 found that termination of the milfoil control program would lead to a projected economic decline of \$85 million in annual tourism revenue, \$360 million in lost property value and over 1,700 job losses in the Okanagan alone. The study also found the further loss of \$40 million in provincial tourism revenues, \$3 million in lost provincial tax revenue and a further 800 job losses province-wide. It is likely that the numbers today are much higher given the dramatic population, economic and tourism growth in the valley in the last 28 years. **This report was not taken into consideration in the RIAS.**

- **Reasonable alternatives, feasible measures to minimize impact, and jeopardizing the survival or recovery of the species**

Should the order to up-list RMRM be approved, the following would apply:

“In order to authorize an activity that would otherwise be prohibited under SARA, the Minister of Fisheries and Oceans must be of the opinion that **one** of the following conditions is met:

- the activity is scientific research relating to the conservation of the species and is conducted by qualified persons
- the activity benefits the species or is required to enhance its chance of survival in the wild
- or affecting the species is incidental to carrying out the activity (i.e. is not the purpose of the activity)

As well, the Minister must be of the opinion that **all three** of the following conditions are met:

1. all reasonable alternatives to the activity that would reduce the impact on the species have been considered and the best solution has been adopted
2. all feasible measures will be taken to minimize the impact of the activity on the species or its critical habitat or the residences of its individuals
3. and the activity will not jeopardize the survival or recovery of the species”

Reasonable alternative:

Some B.C. provincial staff have asserted that milfoil in the Okanagan can be controlled through summer harvesting, which we conduct in limited areas where rototilling is already restricted, or where underwater infrastructure makes rototilling unfeasible. This short-term method does not have the same beneficial effects on water quality and habitat, does not prevent anoxic conditions at the lake bottom, and because it occurs during the plant's growing season, also spreads fragments which can lead to increased infestations in other areas.

Harvesting is less effective than de-rooting as the plant grows back to the surface within four to six weeks of treatment, and the root systems are allowed to spread and densify. Harvesting also creates an increased danger to public safety through increased weed growth in swimming areas, as the machines enter swimming areas during beach-use, and operate in peak boating season. Harvesting is also less cost-effective and requires more equipment and on-shore infrastructure to collect and transfer the weeds to land for disposal. Finally, the harvesting season is only two months long; too short a window to treat the extensive areas of milfoil infestation in five major lakes. Harvesting is not a reasonable alternative to de-rooting for milfoil control, it is a less-effective aesthetic-only method which has limited benefit to aquatic health, and given the size of the infested treatment areas, is cost-prohibitive.

The only known effective alternative to milfoil rototilling is the **use of aquatic herbicides** which is not socially acceptable for use in source drinking waters, and is not authorized for use in Canada.

Feasible Measures to Minimize Impact

Current policy in both provincial regulations and through SARA suggest that relocation of mussels out of a proposed work area is a feasible measure to reduce species impact. However, relocation of RMRM has been shown to also be detrimental and in many cases, difficult to conduct, and prohibitively expensive in larger areas. Through an experiment in 2013, 50 RMRM relocated to a control site were surveyed four months after relocation. Only 21 live mussels were recorded at that site, suggesting less than 50% survival of RMRM at four months after relocation. Based on the cost of relocation and the limited change of RMRM survival, it is not a feasible measure to minimize impact to individuals, and is also not likely to have a population-level effect.

Jeopardizing the survival or recovery of the species

COSWEIC acknowledges that only 5% of RMRM global habitat is in Canada, and is limited to the Okanagan Basin. Because juvenile RMRM are carried on host fish, the greater threat to the survival of the species is likely the prevention of fish passage through hydroelectric dams, and water control structures causing habitat fragmentation. Most of these structures in the broader Okanagan/Columbia basin exist in the United States, outside the control of SARA. In the Okanagan Basin, river channelization, water pollution and invasive milfoil introduction all occurred in a period between 1950 and 1975. While foreshore and riparian development continue to be a problem for RMRM and other species, the greatest threat likely occurred during that time period of rapid negative habitat change.

Since 1970, RMRM have successfully re-established in dense numbers in the channelized sections of the Okanagan River, have demonstrated successful juvenile recruitment in lake and river environments, and have enjoyed the benefit of significantly improved water quality, reduced nutrient loading, enhanced fish passage and increasing legal protection. Further, there is no evidence that RMRM prefer the same habitat as invasive milfoil, or that they can even survive in dense milfoil beds. Although rototilling for milfoil control may have negative effects for individual RMRM, the harm would be incidental to the carrying out of the activity, and may even provide broader benefits for the population based on enhanced habitat for other species, including potential host fish. The limited scope of milfoil rototilling (a small fraction of the lake shores) is also unlikely to have population-level effects to RMRM.

Conclusion

With the current information available based on locally-controllable processes, it is as likely that RMRM is in a recovery stage compared to the 1950-70's as it is that they are in decline in the Canadian Okanagan region. However, COSEWIC and other sources assert that global populations of freshwater mussels are in decline. The broader global conditions such as climate change and related increases in extreme events, effects on habitat conditions and other processes that could negatively affect freshwater mussel populations will not be addressed through the proposed changes in SARA.

We strongly believe that the Minister should recommend to the Governor in Council that the matter be referred back to COSEWIC for review of newly available information. We also strongly support the re-assessment of the RIAS, as the current version is based on old information, false conclusions and assumptions, despite other information being available. Finally, we believe new consultations should be held to better inform the advice given to the Minister.

In addition to these comments to the Canada Gazette process, we will be providing a letter directly to the Minister of Fisheries and Oceans and our local Members of Parliament to make them aware of our concerns. We will also be requesting feedback to the Minister from local governments, First Nations and local stakeholders to ensure that any decision is based on full and recent consultations, rather than a limited Regulatory Impact Analysis Statement informed by information from 2010 and very limited consultations from 2011.

We would be happy to engage further with your office on this issue which affects the Okanagan region, economy, ecosystem and Okanagan communities.

Sincerely,



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