Gulf Region/Restigouche River strategy for managing angling during periods of warm water

Moncton – May 11, 2026. This document details management actions regarding angling when water in the Restigouche River system reaches levels detrimental to the survival of stressed salmon. It will be applied in the summer of 2019 if and when water temperature thresholds and other environmental conditions are reached. Discussions about warm water situations and management response took place between the DFO, the Province of NB, the Restigouche Watershed Management Council and the Quebec provincial government during high-temperature episodes of 2018, and continued during the spring of 2019. A management strategy was co-developed with stakeholders during the summer of 2019 to mitigate the additional stress to the fish during warm water events. The decision process, thresholds, roles and responsibilities are detailed below. This strategy represents an interim approach for the Gulf Region, that will be refined in the future, based on the data to be collected and the experiences gathered during the past angling seasons.

This protocol does not apply to any Aboriginal food, social and ceremonial fishery agreements.

Science background

In 2012, Fisheries and Oceans Canada Gulf Region Science held a Science Advisory Process with the objectives of addressing questions linked to the physiology and metabolic rates of Atlantic salmon associated with level and duration of stress (warm water) and their probability of survival under such conditions.

The following document was published and is available online:

Breau, C. 2013. Knowledge of fish physiology used to set water temperature thresholds for in-season closures of Atlantic salmon (*Salmo salar*) recreational fisheries. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/163. iii + 24 p.

https://waves-vagues.dfo-mpo.gc.ca/Library/348301.pdf

Information in this section is directly derived from this document; for references and more detailed information, please refer to this document.

Tolerance of Atlantic salmon during high water temperatures

Salmonids (trout, salmon, charr) have generally the lowest thermal tolerance of many fish groups. For Atlantic salmon juveniles, the incipient lethal temperature, defined as the temperature which the fish can tolerate for a long period (usually taken as seven days), is 27.8°C. The ultimate lethal temperature for juveniles, defined as the temperature which the fish cannot tolerate even for short periods of time (usually taken as 10 minutes), is in the range of 30 to 33°C. Thermal sensitivity is size-specific such that adult salmonids prefer lower temperatures and are less tolerant of high temperatures than juveniles. As such, incipient lethal temperature and ultimate lethal temperature of adult Atlantic salmon are expected to be lower than the values for juveniles and therefore; the incipient lethal temperature for adult salmon is likely near 25°C.

Adult Atlantic salmon acclimated to 23°C survived for at least three days and 70% of the fish were able to recover post-exhaustive exercise when held at that acclimation temperature. However, adult Atlantic salmon only survived temperatures of 24 to 27°C for a short time period. Since the adult salmon held above 24°C were not able to recover from the effects of exhaustive exercise and anaerobic metabolism, this infers that these temperatures are above the critical temperature (Tcrit*). Since some of the adult salmon were able to recover from exhaustive exercise at 23°C, this infers that 23°C is very near the level for Tcrit. *Please refer to pages 2 and 3 of Breau (2013) cited above for definitions of Topt and Tcrit.

Temperature-related stress in juvenile Atlantic salmon has been associated with behavioural changes such as abandonment of feeding territories and aggregations at cool-water seeps. Juvenile and adult salmon have been observed aggregating at sources of cool water when the minimum nighttime temperature remained above 20°C for two consecutive nights. Active feeding also ceased under these warm water conditions.

Temperature threshold

Based on laboratory studies of fish obtained in the wild, Tcrit for 2-year old juvenile Atlantic salmon was estimated to be 24°C. Tcrit for adult Atlantic salmon has not been measured but the aerobic capacity and thermal tolerance of adults are lower than in juveniles so Tcrit for adult Atlantic salmon is undoubtedly lower than 24°C. In studies of the recovery rate of adult Atlantic salmon acclimated and subjected to exercise to exhaustion at 18°C, 20°C and 23°C, it was shown that most of the physiological endpoints returned to pre-exhaustion (resting) levels after four hours or more although recovery to resting levels for these endpoints took longer than 4 hours when fish were exercised to exhaustion at 20°C. In these studies, there was a delayed mortality, with 40% of the adult salmon dying when held at 20°C and 23°C. Based on the range observed in other salmonid species, a Tcrit value of less than 24°C could be assumed.

In salmonids, the temperature range differential Tcrit and Topt was estimated to be 6 to 7°C. A proxy for Topt for adult Atlantic salmon could be estimated based on the median water temperature experienced during the migration period of June and July.

The scope for activity of adult Atlantic salmon at temperatures just below 23°C is considered to be very small and anaerobic metabolism is required to sustain activities at temperatures above 23°C. Recovery is more rapid at temperatures close to Topt. Daily fluctuations in temperatures can subject adult Atlantic salmon to temperature stress resulting in the accumulation of anaerobic byproducts. Although potentially exposed to temperatures that exceed 23°C during the day, Atlantic salmon can recover if temperatures overnight decline to values closer to Topt for even short periods of time, for example for four hours. After exercise to exhaustion, at 23°C, fish at rest can survive for days and in some instances are able to recover to resting state after exercise to exhaustion.

Threshold proposals are based on observed changes in behaviour of Atlantic salmon both in the wild and in experiments with measured physiological responses of adult salmon exposed to exercise at high water temperatures. A daily minimum water temperature rather than a maximum temperature (within the thermal tolerance limits of salmon) is proposed to be the appropriate indicator of physiological recovery and survival. Tmin value of 20°C is proposed as the threshold temperature for assessing physiological stress in Atlantic salmon. Here Tmin represents the minimum river temperature during the 24 hour daily cycle.

Restigouche River sections to be managed under this strategy

In 2019, it was proposed by the Restigouche River Science Advisory Committee, that there was a need to implement a warm water protocol strategy focusing on river sections that are believed to be potentially the warmest in the system, based on historical temperature information gathered from 2003 to 2011 with the help of 21 temperature loggers permanently installed permanently across the river system. The sections of river included in the warm water protocol are as follows:

- The main Restigouche River, from below the mouth of the Kedgwick River downstream towards the boundary of tidal waters located at Tide Head, below the confluence of the Restigouche River and the Matapedia River.
- The Upsalquitch River from the Upsalquitch forks downstream to its confluence with the mainstem Restigouche.

Monitoring parameters

During the summer, and more precisely when periods of warm weather coincide with low water conditions, water temperature will be monitored on a daily basis, using real-time temperature loggers installed in the river;

- One real-time temperature logger installed in the Main Restigouche river, Brandy Brook area (installed by GINU) HOBOlink
- Two real-time temperature loggers installed in the Main Restigouche river, in the area below the mouth of Kedgwick river and one at the mouth of the Upsalquitch (By ECCC)
- One real-time temperature logger installed in the Upsalquitch River downstream from the forks will be used as a reference for management actions in the portion of Upsalquitch River described on page 2.

The logger located at Brandy Brook will be used as reference for management actions in the main section of the Restigouche River. This logger is deemed to present the average water temperature in the main section of the Restigouche River. The additional loggers from ECCC are to be used as supplementary information for the final recommendation for any action related to this strategy.

When temperature thresholds for action as defined in this protocol are reached, the following parameters will also be monitored daily: water level, weather forecast and observations of fish behaviour.

Water temperature

Water temperature is the main parameter to monitor during the Atlantic salmon summer angling season. Water temperature will trigger the process to make a decision on the implementation or removal of in-season management measures for Atlantic salmon in the Gulf Region's portion of the Restigouche River system. Secondary parameters will provide supporting information:

Water level

Water levels play a role in the warming and cooling of the water in the system depending on the air temperature, precipitation, and exposure time to day light.

Real-time information for water levels in the Restigouche River system is available from Environment Canada stations located above Rafting Ground (main Restigouche River) https://wateroffice.ec.gc.ca/report/real_time_e.html?stn=01BJ007 and at Upsalquitch (Upsalquitch River) https://wateroffice.ec.gc.ca/report/real_time_e.html?stn=01BE001 .

Weather forecast

The 7-day forecast (long term) for Campbellton NB will be monitored during the weekdays when temperature thresholds are reached. ECCC

Fish behaviour

When water temperature reaches levels detrimental to Atlantic salmon, changes in fish behaviour can be observed. When Tmin stays over 20C, it has been observed in other systems that salmon seek refuge in cold

water areas like mouth of streams or deeper shaded pools. When Tmin stays above 23C, fish showing signs of weakness (i.e. fish unable to resist current, and swimming erratically at the surface) are generally observed in other river systems, as well as sometimes dead fish. DFO and Province of NB enforcement officers, as well as other partners to this interim strategy will be asked for their observations when available, in order to help confirm the management actions planned under the existing temperature thresholds.

Management actions

Management actions will restrict angling activities in the Restigouche River system based on the water temperature triggers, and supported by secondary parameters. The same approach applies for the removal of angling restrictions.

DFO is responsible to monitor the water conditions (water temperatures, levels & weather forecast).

When thresholds are met, DFO is to schedule a call with the stakeholders to discuss potential management actions (closure or opening). Before implementing or removing any of the following management actions, consultations will occur through a conference call between the partners of this protocol: Department of Fisheries and Oceans, Restigouche River Watershed Management Council, the GMRC and the Province of New Brunswick. Ideally, that conference call should take place when the situation evolves towards reaching thresholds, i.e. after one period of 24H over 20C, if the threshold is believed to be reached again in the following 24H period.

The final decision to implement any management action resides with the Department of Fisheries and Oceans.

Criteria for applying restrictions – Main Restigouche River section

Parameters recorded / observed	Information collected	Management action
T_{min} (MT_{min}) for a given day	**MT_{min} < 20ºC**	Maintain access to the river under normal angling rules
T_{min} (MT_{min}) for a given day	**MT_{min} > 20ºC for 2 consecutive periods of 24hrs**	Implement a 'morning angling only' (for all species) restriction for all species (angling to be prohibited after 11 a.m. in the main section of the Restigouche river as defined in page 2.
Water levels	Water levels	
Long term forecast (next 7 days)	Daily temp Night temp Precipitation	
Fish behaviour (anecdotal information)	Fish moving in and out of cold refuges Mortalities observed	
T_{min} (MT_{min}) for a given day	**MT_{min} > 23ºC for 2 consecutive periods of 24hrs**	Implement a closure of angling for all species in the main section of the Restigouche River as defined on page 2, until conditions improve (see reopening criteria)
Water levels	Water levels	
Long term forecast (next 7 days)	Daily temp Night temp Precipitation	
Fish behaviour (anecdotal information)	Fish moving in and out of cold refuges Mortalities observed	
Water temperature	**Tmax ≥ 27ºC**	Implement a closure of angling for all species in the main section of the Restigouche River as defined on page 2 for a minimum duration of 48hrs, until conditions improve (see reopening criteria)
Water levels	Water levels	
Long term forecast (next 7 days)	Daily temp Night temp Precipitation	
Fish behaviour (anecdotal information)	Fish moving in and out of cold refuges Mortalities observed	

Criteria for applying restrictions – Upsalquitch River

Parameters recorded / observed	Information collected	Management action
T_{min} (from the Upsalquitch real-time station)	**T_{min} < 20ºC**	Maintain access to the river under normal angling rules
T_{min} (from the Upsalquitch real-time station)	**T_{min} > 20ºC for 2 consecutive periods of 24hrs**	Implement a 'morning angling only' (for all species) restriction for all species (angling to be prohibited after 11 a.m. in the section of Upsalquitch River described on page 2
Water levels	Water levels	
Long term forecast (next 7 days)	Daily temp Night temp Precipitation	
Fish behaviour (anecdotal information)	Fish moving in and out of cold refuges Mortalities observed	
T_{min} (from the Upsalquitch real-time station)	**T_{min} > 23ºC for 2 consecutive periods of 24hrs**	Implement a closure of angling for all in the section of Upsalquitch River described on page 2, until conditions improve (see reopening criteria)
Water levels	Water levels	
Long term forecast (next 7 days)	Daily temp Night temp Precipitation	
Fish behaviour (anecdotal information)	Fish moving in and out of cold refuges Mortalities observed	
Water temperature	**Tmax ≥ 27ºC**	Implement a closure of angling for all species in the main section of the Restigouche River as defined on page 2 for a minimum duration of 48hrs, until conditions improve (see reopening criteria)
Water levels	Water levels	
Long term forecast (next 7 days)	Daily temp Night temp Precipitation	
Fish behaviour (anecdotal information)	Fish moving in and out of cold refuges Mortalities observed	

Reopening criteria

Parameters recorded / observed	Information collected	Management action
Mean of all T_{min} (MT_{min}) provided by partners for a given day (Restigouche) or T_{min} (Upsalquitch River)	**MT_{min} or T_{min} < 23°C for two consecutive periods of 24H and Tmax ≤ 27ºC**	Reopen angling daily until 11 a.m. in the concerned section of the river
Water levels	Water levels	
Long term forecast (7 days)	Daily temp Night temp Precipitation	
Fish behaviour (anecdotal information)	Fish moving in and out of cold refuges Mortalities observed	
Mean of all T_{min} (MT_{min}) provided by partners for a given day (Restigouche) or T_{min} (Upsalquitch River)	**MT_{min} or T_{min} < 20°C for 2 consecutive periods of 24H**	Remove angling restrictions – return to normal rules.
Water levels	Water levels	
Long term forecast (next 7 days)	Daily temp Night temp Precipitation	
Fish behaviour (anecdotal information)	Fish moving in and out of cold refuges Mortalities observed	

Communications

Variation orders will be communicated as required under the Fisheries Act by Fisheries and Oceans Canada. Management actions will also be published on the Gulf Region Recreational Fisheries web page as a Notice to Recreational Anglers under Atlantic salmon. A link to the notice will also be emailed to the partners of this protocol for distribution at large.

Once a decision is made to restrict or reopen fishing, the administrative time required to implement the management action through a variation order and to communicate it to stakeholders and the public should normally be between one and one and a half business days. The variation orders will be effective after the notice to anglers is published online and communicated to stakeholders.

DFO will send a pre-notice. The goal of the pre-notice is for the stakeholders to start distributing this information to their members as soon as possible.