



Provincial Fisheries Management: Drought Response Plan

July 2025



Provincial Fisheries Management: Drought Response Plan

Prepared by

Ministry of Water, Land and Resource Stewardship
Provincial Fisheries Policy and Allocation
Aquatic Ecosystems Branch
Victoria B.C.

Updated July 2025

Executive Summary

The government of British Columbia has developed a general criterion for the implementing of fish protection measures on streams and rivers in B.C. The role of the provincial fisheries management group is to coordinate drought response throughout the province and support the region-specific actions on impacted populations and watersheds. The guideline creates a consistent approach by recognizing many of the most sensitive species in the stream ecosystems in B.C. The provincial fisheries management response plan recognizes that drought has variable effects on streams within the province; the plan encompasses all regions but recognizes that the framework is intended to for specific systems identified as priorities within regions.

Drought conditions, including their regular recurrence, duration and frequency, can have adverse effects on fish and fish habitat in streams and rivers in B.C., reducing the future productivity and capacity of fish populations. Increased temperature and reduced flows resulting from drought conditions can be potential factors that reduce fish populations. The ability to mitigate or offset effects of drought is crucial for the conservation and sustainability of fish populations and is considered a management priority in B.C.

Based on the drought level assessment developed in the B.C. Drought and Water Scarcity Response Plan, it is recommended that fish protection measures be put in place prior to reaching critical levels. Based on extensive review, depending on monitoring, it is recommended that trout specific streams and watersheds be closed to recreational angling where mean weekly maximum temperature (MWMT) exceeds 20 °C and/or maximum daily temperatures exceed 23°C. Similarly, it is recommended that char specific streams and watersheds be closed to recreational angling where MWMT exceeds 16°C and/or maximum daily temperatures exceed 20°C. In addition, flows equating to percent long-term (% LT) mean annual discharge (MAD) are a convenient check on the ecological health of a particular stream discharge. Flows that drop to or below 10% LT MAD are of acute fisheries concern as key rearing habitats begin to severely dewater. Stream flows below 5% LT MAD represent flows and can have severe impacts on fish populations. Combined with temperature thresholds, it maybe recommended that streams and watersheds be closed to recreational angling where the flows are reduced below 5% LT MAD.

Early and frequent communication about water supply conditions and responses to stakeholders is key to successful drought management, a priority action developed in the B.C. Drought and Water Scarcity Response Plan. Such information requires agencies and local authorities to use a combination of communication tools, water supply and demand data, regulatory instruments, and other tools to advocate for water conservation across

communities. Likewise, early communication will be necessary and critical for fisheries management to implement fish protection measures on streams and rivers in B.C. Provincial, regional and local drought preparedness teams provide the necessary communication tools for updating and assessing the status of drought in B.C. Such tools will be utilized by fisheries management agencies to communicate the implementation of fish protection measures on streams and rivers in B.C.

Acknowledgements

Ron Ptolemy (Provincial Rivers Biologist/Instream Flow Specialist, Ministry of Water, Land and Resource Stewardship, Victoria, B.C.), Hillary Ward (Fisheries Stock Assessment Specialist, Ministry of Water, Land and Resource Stewardship, Penticton, B.C.) and Emmanuel Abecia (Provincial Fish Biologist, Ministry of Water, Land and Resource Stewardship, Victoria, B.C.) are gratefully acknowledged as co-authors on developing the provincial fisheries management plan in response to drought conditions in B.C.

Tara White (Senior Fish Biologist, Ministry of Water, Land and Resource Stewardship, Penticton, B.C.) is acknowledged for providing technical assistance and guidance on developing the provincial fisheries management plan in response to drought conditions in B.C.

Suggested Citation: Andrusak, G.F., Ward H., Abecia E. and R. Ptolemy. 2025. Provincial Fisheries Management: Drought Response Plan-2025. Prepared for the Ministry of Water, Land and Resource Stewardship, Victoria, B.C. Updated July 2025. 22 pp+

Table of Contents

| | |
|---|-----|
| EXECUTIVE SUMMARY | I |
| ACKNOWLEDGEMENTS..... | III |
| TABLE OF CONTENTS..... | IV |
| LIST OF TABLES..... | V |
| LIST OF FIGURES..... | V |
| ACRONYMS AND ABBREVIATIONS USED | V |
| OVERVIEW..... | 6 |
| Rationale of Plan..... | 6 |
| Objectives of Plan | 7 |
| BACKGROUND..... | 7 |
| What is Drought? | 7 |
| Drought Levels | 7 |
| Drought Response Specific to Fish..... | 8 |
| Flow Criteria..... | 9 |
| Temperature Criteria | 9 |
| FISHERIES MANAGEMENT RESPONSIBILITIES..... | 12 |
| Provincial and Regional..... | 13 |
| DROUGHT INDICATORS AND ACTIONS..... | 14 |
| Flow..... | 14 |
| Temperature | 14 |
| Fish Protection Measures | 16 |
| Fisheries Stream Watch List..... | 17 |
| Regional Fisheries Drought Response Plans | 18 |
| SUMMARY..... | 19 |
| REFERENCES..... | 21 |
| APPENDIX 1. FISHERIES MANAGEMENT DROUGHT LEGISLATION..... | 23 |
| APPENDIX 2. OPTIMAL TEMPERATURE RANGES FOR SALMONIDS AND OTHER SPECIES | 24 |
| APPENDIX 3. VARIATION ORDER TEMPLATE..... | 25 |
| APPENDIX 4. WATERSHEDS POTENTIALLY AFFECTED BY LOW-FLOW OR HIGH-TEMPERATURE CONDITIONS (BY REGION) | 29 |
| Region 1 | 29 |
| Region 2 | 30 |
| Region 3 | 31 |
| Region 4 | 31 |
| Region 5 | 31 |
| Region 6 | 31 |
| Region 7A and 7B..... | 32 |
| Region 8 | 32 |

List of Tables

| | | |
|----------|---|----|
| TABLE 1. | TEMPERATURE OPTIMA FOR WHITE STURGEON FROM DFO (2012A) | 11 |
| TABLE 2 | QUANTITATIVE THRESHOLDS FOR PERCENTILE-BASED INDICATORS AND STANDARDIZED INDICES CORRESPONDING TO DROUGHT LEVEL CLASSIFICATION FROM DROUGHT RESPONSE AND WATER SCARCITY RESPONSE PLAN (WLRS 2025) 14 | |
| TABLE 3. | RELATIVE TEMPERATURE THRESHOLDS FOR FISH HANDLING IN RECREATIONAL FISHERIES BY SPECIES AFFECTED BY DROUGHT CONDITIONS IN B.C. | 15 |
| TABLE 4. | STRESS-INDUCED TEMPERATURE (MWMT) AND FLOW CRITERIA (%MAD) FOR IMPLEMENTING FISH PROTECTION MEASURES (ANGLING CLOSURES). | 20 |

List of Figures

| | | |
|-----------|---|----|
| FIGURE 1. | B.C.'S DROUGHT LEVEL SCALE FOR DROUGHT CONDITIONS. THE SEVERITY OF DRYNESS INCREASES FROM LEVEL 0 (NO DROUGHT) TO LEVEL 5 (HIGHEST SEVERITY OF DROUGHT) ALONG A SIX LEVEL SCALE WHICH ALSO REPRESENTS HOW OFTEN A GIVEN LEVEL OF DRYNESS MAY NATURALLY REOCCUR | 8 |
| FIGURE 2. | GENERAL BIOLOGICAL EFFECTS OF TEMPERATURE ON SALMONIDS IN RELATION TO DURATION AND MAGNITUDE OF TEMPERATURE FROM SULLIVAN ET AL. (2000)..... | 11 |
| FIGURE 3. | KEY PROVINCIAL LED COORDINATING BODIES AND COMMITTEES IN B.C. DROUGHT RESPONSE ADAPTED FOR FISHERIES MANAGEMENT DROUGHT RESPONSE PLAN (IN COLOUR). DOTTED ARROWS INDICATE A COMMUNICATION / ISSUES MANAGEMENT RELATIONSHIP. SOLID ARROW INDICATES A FORMAL REPORTING RELATIONSHIP. | 13 |
| FIGURE 4. | BRITISH COLUMBIA WATERSHED BASIN MAP (ILLUSTRATIVE PURPOSES). | 18 |

Acronyms and Abbreviations used

WLRS: B.C. Ministry of Water, Land and Resource Stewardship

% LT MAD: Percent long-term mean annual discharge MAD): The long term mean annual discharge is equivalent to the mean annual flow rate that would occur naturally in the absence of storage reservoirs and water extractions.

MWMT: Mean weekly maximum temperature: Defined as the average of the warmest daily maximum temperatures for seven consecutive days.

Overview

British Columbia has experienced a marked increase in the frequency, duration, and severity of drought conditions. These events have become more widespread and persistent, affecting a growing number of watersheds and ecosystems across the province. Many B.C. streams and rivers are experiencing increasing water temperatures and reduced seasonal flows. Factors associated with changes in climate, increased water demand, reduced accumulated snowpack plus earlier melt and seasonal precipitation are contributing factors affecting many streams and rivers within B.C.

Drought conditions can have adverse effects upon fish and fish habitat in streams and rivers in B.C. The regular occurrence and duration of drought conditions can contribute to factors that impact fish populations thus reducing their future productivity and capacity. Increased temperature and reduced flows associated with drought conditions can be potential factors that impact fish populations. Effective response to drought is crucial for the conservation and sustainability of fish populations and is considered a management priority in B.C.

Provincial and regional fisheries management teams recognize the need for a coordinated response to drought and its effects upon fish populations in B.C. There is a substantial diversity of fish species within streams and rivers within B.C. which are managed by regional operations within Ministry of Water, Land and Resource Stewardship (WLRS). The provincial management plan provides a framework for the development of regional operational plans that invoke fish protection measures during drought conditions in B.C. This fisheries management plan supplements guidance provided by the British Columbia Drought and Water Scarcity Response Plan (WLRS 2025)¹.

Rationale of Plan

To develop criteria that provides provincial direction for fisheries management and guides the implementation of regional management actions during drought conditions in B.C.

¹ Drought Response and Water Scarcity Response Plan (WLRS, 2025) This plan is reviewed annually and updated as required to reflect emerging research, broader standards and agency mandates, The 2025 version is available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/drought-info/drought_response_plan_final.pdf.

Objectives of Plan

1. Develop universal drought response framework for fisheries management in B.C.,
2. Identify drought criteria by managed fish species in B.C.,
3. Assist regional operations with implementation of fish protection measures,
4. Communicate and outline public fishing regulation response to drought at various levels, including an updated table of likely impacted waterbodies, and
5. Coordinate with Provincial Technical Drought Working Group (PTDWG) to outline potential impacts and mitigation measures related to decreased flow conditions.

Background

What is Drought?

Drought is a naturally reoccurring period of abnormally dry conditions that may result in water scarcity or other adverse impacts on people, aquatic ecosystems, wildlife or vegetation. In British Columbia, drought may be caused by combinations of insufficient snow accumulation and/or advanced melt, hot and dry weather, or a delay in rainfall. Droughts can be defined as meteorological, hydrological, agricultural, or socioeconomic, each of which implies different impacts. Further details on drought conditions and the provincial response can be found in the Drought and Water Scarcity Response Plan (WLRS 2025).

Drought Levels

B.C. Drought and Water Scarcity Response Plan (WLRS 2025)

“Provincial drought levels serve as an objective measure of the severity and prevalence of drought hazard across the province. This data can support risk assessments to help water users understand their exposure and vulnerability to experiencing drought impacts and the actions needed to protect different values or assets from drought.

The Province of B.C. uses a six-level classification system to assess drought conditions (Level 0 to Level 5). This six-level rating scale was established in 2021 to correspond to the North American Drought Monitor’s framework. To improve clarity and consistency in interpreting the meaning of drought levels, the B.C. Government has updated the definition of drought levels for 2025, while maintaining the same six-level rating scale. This update means that drought levels now provide a data-driven measure of drought conditions, aimed at improving the evaluation of drought impacts and risk.

Drought levels represent the severity of dryness relative to the historical record (Figure 4). At Level 0, no drought is occurring. As drought conditions occur at Level 1 and escalate in severity towards Level 5, the drought level also represents how often drought conditions may be expected to occur based on the historical record, with Level 1 being more common and Level 5 being rarer. Drought levels also provide a measure of drought conditions at a point in time and do not incorporate forecasted conditions. A drought level is assessed based on how key drought condition indicators, such as precipitation and natural streamflow, differ from normal values. This enables an assessment of the natural pattern of drought conditions over time”.

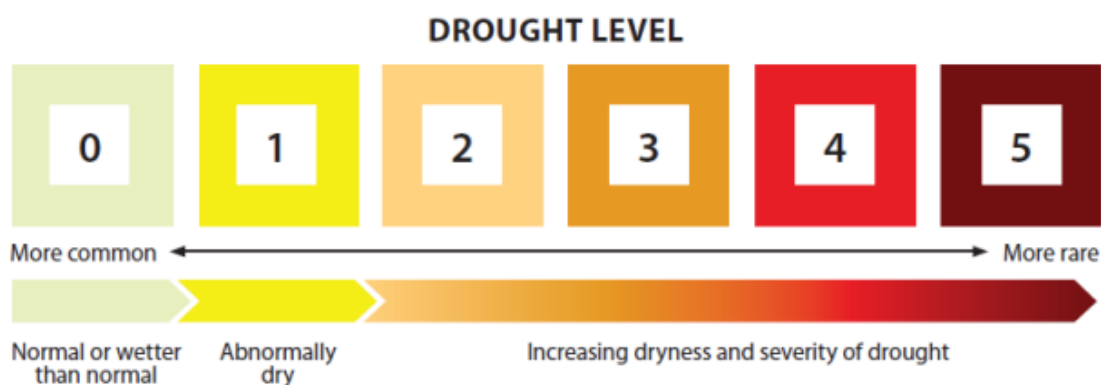


Figure 1. B.C.'s drought level scale for drought conditions. The severity of dryness increases from Level 0 (no drought) to Level 5 (highest severity of drought) along a six-level scale which also represents how often a given level of dryness may naturally reoccur.

Drought Response Specific to Fish

While the Drought and Water Scarcity Response Plan (WLRs 2025) focuses on addressing water needs for people and aquatic ecosystems during times of water scarcity, the Provincial Fisheries Management Drought Response Plan (PFMDRP) focuses directly on specific fish protection measures during drought conditions directly associated with angling related activities. Increased water temperature, reduced oxygen concentration, degraded water quality, and reduced fish food supply/delivery through reduced flows are key factors that impact fish populations during drought conditions.

Focal species within this plan include trout (*Oncorhynchus spp.*), Bull Trout and Dolly Varden char (*Salvelinus spp.*), and White Sturgeon (*Acipenser transmontanus*) which are often associated with recreational fisheries and primarily affected by drought. For example, Bull Trout, a species of concern in B.C., are highly adapted to cold water environments and are very sensitive to temperature increases beyond the optimal of 13°C (Selong et al. 2001). In comparison, Rainbow Trout (*Oncorhynchus mykiss*) and Cutthroat Trout (*Oncorhynchus clarki spp.*) are more resilient to higher temperatures that cover a

range between 8 to 20°C and optimal temperatures near 13°C (Bear et al. 2007). In general, Rainbow Trout are the dominant salmonid in British Columbia streams where maximum temperatures are greater than 14°C, whereas Bull Trout are dominant where maximum temperatures are less than 13°C (Benjamin et al. 2016). It is understood that the province manages other sportfish and non-sport fish freshwater species, however, the range of temperatures and physiological responses of salmonids are well documented and act as proxies for general fish health tolerances under adverse conditions.

Preliminary results from research on White Sturgeon in the lower Fraser River suggest that angling stress from catch and release fisheries appear to cause an acute stress response (McLean et al. 2014). Similar to salmonids, increased water temperatures in conjunction with handling stress from the recreational fishery may invoke unintended post release mortality and/or sub-lethal alterations.

Flow Criteria

Fish flow needs vary across the year by species and life-stage and are dictated by seasonal high- and low-flow timing and duration. Despite the biases associated with methodologies used to assess impacts of lower flows (Rosenfeld et al. 2016), it is well understood that seasonal flow reductions can create severe resource and habitat limitations for juvenile salmonids leading to increased density dependent effects on growth and survival (Grantham et al. 2012). Available habitat for fish life processes is typically expressed as a proportion of long-term mean annual discharge (LT MAD). Flow needs during summer droughts will range from rearing flows near 20% (preferred) LT MAD to adult salmon/char passage flows (>20% LT MAD) required prior to spawning. Presumptive flows required for the maintenance of physical and biological stream processes also vary in requirement and duration. Sub-standard flows (<10% LT MAD) can affect fish by reducing the area and quality of riffle habitats that generate fish food and aeration. Flows nearing 5% LT MAD on highly flow-regulated streams due to excessive diversions may trigger regulatory measures to restrict water use. The intended benefit of restricting water diversions is to mitigate survival impacts on fish populations that are otherwise warming too much, experiencing decreased water quality due to poor dilution of pollutants, and/or impacted due to reduced food availability.

Temperature Criteria

Thermal tolerance associated with increasing water temperatures (McCullough 1999; McCullough et al. 2001) and associated impacts of recreational fisheries have been identified as a critical factor impacting salmonid (Bear et al. 2007, Boyd et al. 2010) and White Sturgeon populations (McLean et al. 2014). Temperature sensitivity and tolerance can vary by species and increased stress associated with fish handling in recreational

fisheries can substantially increase mortality under drought conditions (Wilkie et al. 1997; Meka and McCormick 2005). However, given the range of temperatures for specific life history stages among fish species encountered in B.C., the selection of a single criterion to meet the temperature requirements of all species is considered exceedingly difficult (Appendix 2).

Physiological effects of temperature on fish can vary based on species and life history stage (McCullough et al. 2001). During incubation, water temperature affects the rate of embryo and alevin development, the amount of dissolved oxygen in the water, and, to a significant extent, the survival of early fry (McCullough et al. 2001). Similarly, water temperature can also have a substantial influence on growth and survival at the older juvenile and adult life stages. The effects of temperature on fish growth and survival depend on the magnitude and duration of temperature exposure and can be separated into three categories (Sullivan et al. 2000): zone of preference, zone of resistance, and zone of tolerance (Figure 2).

1. **Zone of Preference** – This is the optimal temperature range for the species. In this temperature range, fish exhibit normal patterns of behaviour.
2. **Zone of Tolerance** – Temperatures in this range result in chronic, sub-lethal effects, after longer time periods of exposures (ranging from weeks to months). The sub-lethal effects of chronic temperatures can include changes in growth, competitive interactions, behaviour and/or disease prevalence. A common quantitative metric to delineate the lower threshold for this zone is the maximum growth temperature. This is the temperature at which daily growth rates decline after longer time periods of exposure (weeks to months).
3. **Zone of Resistance** – Temperatures in this range result in death within minutes to 96 hours after exposure. The most common quantitative metric used to define the lower boundary of this zone is the Ultimate Upper Incipient Lethal Temperature (UUILT). The UUILT is the temperature at which 50% of the population experiences mortality after a given time period.

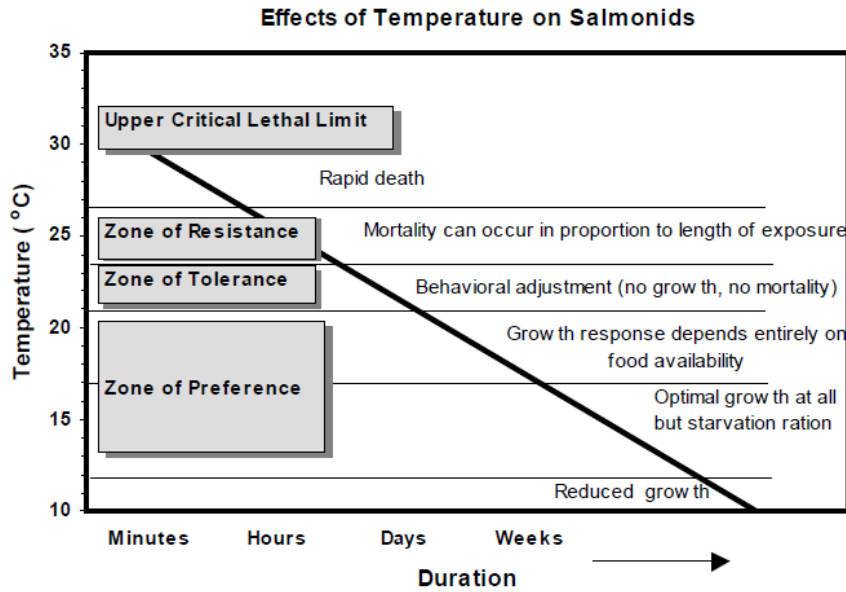


Figure 2. General biological effects of temperature on salmonids in relation to duration and magnitude of temperature from Sullivan et al. (2000).

Appendix 2 outlines optimum temperature guidelines to protect specific life history stages of salmonids include juvenile and adult rearing, 18 to 19°C (maximum weekly average); maximum water temperatures between 22 and 24°C; adult spawning, 8 to 10°C (maximum weekly average); and egg incubation, 13 to 15°C (maximum). Similarly, Appendix 2 outlines optimum temperature guidelines for White Sturgeon for incubation and spawning. However, updated temperature optima for specific life stages from recent sturgeon research is provided in Table 1 (DFO 2012a).

Table 1. Temperature optima for White Sturgeon from DFO (2012a)

| Life History Stage | Optimal and Range °C |
|--------------------|----------------------|
| Incubation | 9-19 |
| Rearing | 1-22 |
| Migration | 5-19 |
| Spawning | 9-18 |

Maximum water temperatures in the range of 22 to 24°C represent the upper thermal limits to salmonid and sturgeon distribution and represents threshold values at which individual species are at high risk of impairment or death. Based on the review of the literature to date, individual species will experience an impairment threshold (i.e. net zero growth or cumulative effects leading to death) at a point between optimum temperature and incipient lethal level (McCullough 1999). Setting the guideline at the impairment threshold offers consistency in its approach by recognizing the most sensitive species in the stream ecosystem. Moreover, the guideline is highly amenable to regional

adjustments in species-specific temperature optima owing to differences in latitude or elevation across the province that may influence a species' local adaptation to ambient temperature regimes.

In summary, recommended guidance for the protection of fish species in streams or rivers in B.C. include:

1. Temperature thresholds are described by the 7-day average maximum temperature or mean weekly maximum temperature (MWMT) where more intensive monitoring occurs (continuous temperature monitoring via loggers),
2. Alternatively, where temperature monitoring is limited or not readily available (daily temperature data), maximum daily temperature can be used as a proxy to the MWMT approach,
3. MWMT should not exceed 20°C, and maximum daily temperature should not exceed 23°C, and
4. Mean weekly maximum water temperatures should not exceed 1 C° beyond the optimum temperature range for each life history phase of the most sensitive salmonid species present (Appendix 2).

Fisheries Management Responsibilities

A number of provincial and federal agencies are involved in drought management, summarized in the B.C. Drought and Water Scarcity Response Plan (WLRS 2025) and detailed in Figure 3. As part of the drought response the Provincial Technical Drought Working Group (PTDWG), along with First Nations and DFO coordinate actions to effectively respond to drought and mitigate impacts to a broad range of concerns including agricultural, First Nations, domestic and environmental.

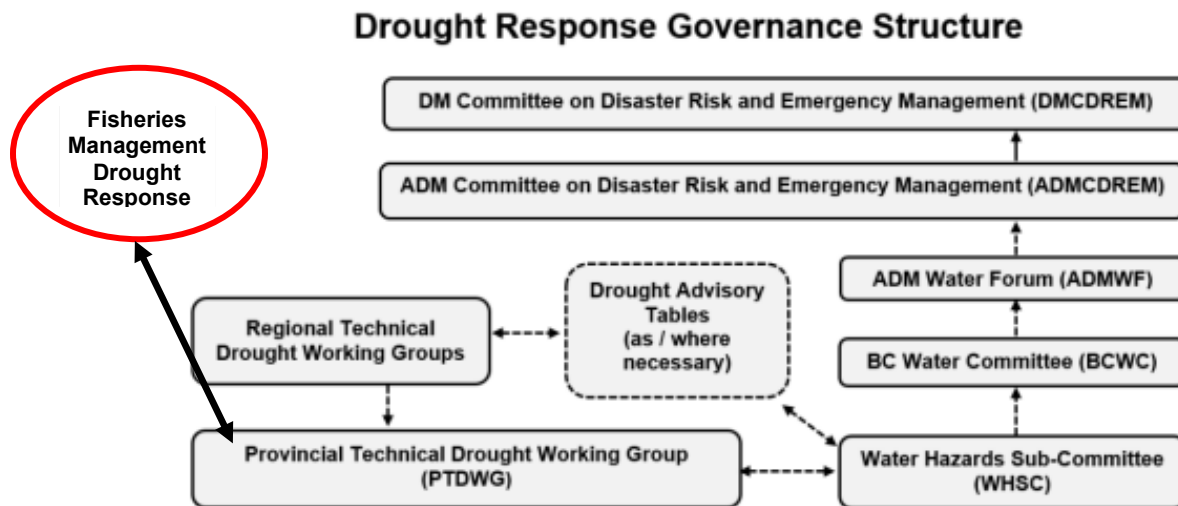


Figure 3. Key provincial led coordinating bodies and committees in B.C. drought response adapted for Fisheries Management Drought Response Plan (in red). Dotted arrows indicate a communication / issues management relationship. Solid arrow indicates a formal reporting relationship.

Provincial and Regional

Following the B.C. Drought and Water Scarcity Response Plan (WLRs 2025), the role of the provincial fisheries management group is to coordinate fisheries management drought response throughout the province and support the region-specific actions on drought impacted watersheds. The Provincial Fisheries Management Response Plan recognizes that drought has variable effects on streams and rivers by region in B.C. Therefore, the plan encompasses all regions but recognizes that the framework is intended for specific systems identified as priorities within regions.

It is well understood that the cumulative impacts of above normal water temperatures and reduced stream flow are anticipated to generate excessive stress in fish populations by reducing habitat and food availability, increasing competition in reduced habitat areas, disrupting patterns of movement into and out of sanctuary habitats and increasing metabolic stress particularly where fish are angled to exhaustion.

Two key objectives for implementing fish protection measures provincially include:

1. Conservation - ensure population persistence and maintenance during drought conditions, and
2. Sustainability - ensure the future sustainability of social and economic benefits associated with recreational fishery opportunity.

Drought Indicators and Actions

The B.C. drought levels will be used to inform and guide the provincial and regional fisheries management response to fish and fish habitat associated with drought conditions. Main indicators for the B.C. drought response plan are identified in Figure 1 (WLRs 2025). For the fisheries management plan, key indicators such as flow and temperature criteria will provide fisheries management the necessary guideline of when to invoke fish protection measures within streams and rivers in B.C.

Table 2 Quantitative thresholds for percentile-based indicators and standardized indices corresponding to drought level classification from Drought Response and Water Scarcity Response Plan (WLRs 2025)

| Indicator Type | Level 0 | Level 1 | Level 2 | Level 3 | Level 4 | Level 5 |
|--------------------|-------------------|-------------------------------------|-------------------------------------|------------------------------------|-----------------------------------|-------------------|
| Percentile | >30 th | 21 st - 30 th | 11 th - 20 th | 6 th - 10 th | 2 nd - 5 th | < 2 nd |
| Standardized Index | ≥ -0.49 | -0.5 to -0.79 | -0.8 to -1.29 | -1.3 to -1.59 | -1.66 to -1.99 | ≤ -2.0 |

Flow

Drought flows observed on a given day or hour or averaged over seven days are as a rule below the lower quartile. As part of Environment and Climate Change Canada Hydrometric Data, Water Survey of Canada (WSC) continuously tracks real-time flow information on selected locations within B.C. (https://wateroffice.ec.gc.ca/index_e.html). The map depicts streamflow conditions as computed at WSC stream gages. The colours represent real-time streamflow compared to percentiles of historical daily streamflow for the day of the year. Mapping of flow state uses colour-coded spots by stream ranging from red indicating much below normal (<10 percentile) to dark blue indicating much above normal (>90 percentile; Table 2). Flows that qualify as drought flows in April-May may still represent relatively high environmental flows in LT MAD. Flows that drop to or below 10% LT MAD are of acute fisheries concern as key rearing habitats (riffles) begin to severely dewater. Flows equating to % LT MAD are a convenient check on the ecological functioning of a particular stream discharge.

Temperature

A cross-jurisdiction review of temperature related closures for salmonid sport fishing revealed an average stream temperature of 18°C as the trigger for the closure for Atlantic salmon (*Salmo salar*) in New Brunswick (DFO 2012b). Montana uses a daily maximum water temperature of 23°C for three consecutive days as a closure threshold (Boyd et al. 2010). Within B.C., Kootenay Region uses 18°C as the trigger for a seasonal fishery closure

on the Slokan River and Cariboo Region uses 18°C as the trigger for the Horsefly River time and area closures. In addition, Okanagan (Region 8) provides an excellent example of the rationale for implementing fish protection measures under a regulatory amendment, known as variation order (VO), for the Kettle River watershed where summer temperatures are often >23°C and numerous fish kills have been documented over the last decade.

Based on the review of information and literature from within B.C. and outside, it is recommended that 7-day average maximum temperature or mean weekly maximum temperature (MWMT) be used to assess temperature criteria for fish protection measures. For streams or rivers that are inhabited by trout species, the summer water temperature conditions should not exceed a mean weekly maximum temperature (MWMT) of 20°C and maximum daily temperatures of 23°C. For streams or rivers inhabited by char species, the summer water temperature conditions indicate that a mean weekly maximum temperature (MWMT) of 14°C and maximum daily temperatures of 16°C should not be exceeded. However, adult Bull Trout can often be found in systems that exceed the recommended temperature thresholds previously mentioned (Selong et al. 2001; Parkinson et al. 2012). Therefore, increasing the threshold to a mean weekly maximum temperature (MWMT) of 16°C and maximum daily temperatures of 20°C is more appropriate for this species (Table 3). However, it should be recognized that daily maximum temperatures are likely not the best trigger for implementing fish protection measures since there is substantial fluctuation in daily temperatures during the summer. Temperature thresholds and definitions include:

- **Stress Induced Threshold** – stress induced temperature thresholds developed for recreational fisheries in B.C.,
- **Optimal** – selected growth optima (McCullough et al. 2001),
- **Ultimate Upper Incipient Lethal Limit (UUILT)** – the temperature at which 50% of the population experiences mortality after a given time period (usually 7 days)(Selong et al. 2001), and
- **Critical Thermal Maximum (CTM)** – the temperature at which fish lose equilibrium after changing water temperature at a rapid rate from a series of acclimation temperatures (Selong et al. 2001).

Table 3. Relative temperature thresholds for fish handling in recreational fisheries by species affected by drought conditions in B.C.

| Species | Stress Induced Threshold (°C) | Optimal and Range | Upper Limit (°C) | CTM (°C) |
|-----------------|-------------------------------|-------------------|------------------|----------|
| Rainbow Trout | 20.0 | 13.1 (8-20) | 25.6 | 28.0 |
| Cutthroat Trout | 18.0 | 13.6 (8-20) | 25.0 | 28.0 |
| Sturgeon* | 20.0 | 13.1 (8-20) | 24.0 | 28.0 |
| Bull Trout | 16.0 | <13 (6-13) | 20.0 | 24.0 |

*Note-due to the overlap, salmonid optimum temperatures were used as surrogates for sturgeon based on expert opinion.

Fish Protection Measures

Various tools can be used to implement fish protection measures on recreational fisheries during drought conditions. Tools include angling regulations, implementation of water use plans for the allocation of water, and complete closures that mitigate the effects of environmental variables (i.e., climate) that are not readily controlled. Legislation and regulatory tools by the provincial government include use of authority provided under the Water Sustainability Act, the Fisheries Act and other legislation detailed in Appendix 1.

1. Angling Regulations

Changes or variation in angling regulations can provide an immediate effect for the conservation and status of various stocks of fish within recreational fisheries during drought conditions. Implementation of various types of gear restrictions, time area closures, and catch-and-release are all intended to minimize mortality effects associated with angling. Regulatory amendments to using variation order are a delegated authority to the government of B.C. under the Federal Fisheries Act (FA).

For example, implementing angling gear restrictions (i.e., natural bait ban, single barbless hooks) would be considered a first step in addressing chronic drought conditions on specific streams and rivers within B.C. It is acknowledged that a single barbless hook restriction on streams has been already adopted throughout the province. Reduction in harvest quotas and or replacement of harvest fisheries with catch-and-release fisheries would also be considered a viable tool in reducing unnecessary mortality on fish during drought conditions. Lastly, seasonal time and area closures provide another useful tool in minimizing mortality in fish stocks under stressful conditions. There are numerous variations of time (i.e., time of day) and area (proportion of stream closed) closures specific to certain fisheries throughout the province that are already implemented during low flow and high temperature conditions. In all, such measures attempt to reduce handling stress associated with angling during stressful conditions associated with reduced flow and high temperatures.

Administration and implementation of regulatory amendments using variation orders can be undertaken in a timely manner but only if specific requirements are met. Ensuring proper and appropriate stakeholder engagement (First Nations, public) along with support of compliance and enforcement agencies is a key factor in increasing the efficiency of the VO process. In general, implementation of VO relies on regional operations (WLRS) to provide specific rationale for regulatory action. Regional operations initiate a VO which is then forwarded to be approved by the statutory decision maker (Appendix 3).

2. Regional Watershed Planning

When it comes to water planning and management on streams with a long history of provincial allocations with limited consideration for fish impacts, a wide variety of human uses, societal values and instream environmental needs must be considered and balanced. Regional water planning processes are one approach to achieving this balance for a specified watershed. A watershed-based approach is particularly relevant because it includes all water uses, including instream environmental flows. These planning processes have provided valuable information about environmental flow requirements in many of B.C.'s water systems. Many droughts affected watersheds are developing water use plans that address multi-stakeholder water use within regions. An example of this was a water use plan developed for the Kettle River watershed in Okanagan Region, developed in 2015 (Epp 2012).

3. Recreational Angling Closures

Complete angling closure on recreational fisheries for specific watersheds is one of the last steps available to fisheries management teams during drought conditions. Complete closure provides blanket mitigation from angling-induced mortality during drought. Such action could be viewed as a proactive and responsive plan to protect fisheries resources over a broad geographic area during conditions that increase stress to fish.

Fisheries Stream Watch List

Based on the drought conditions experienced in 2015 and mapped flow-sensitive landscape units from provincial hydrometric analyses (Figure 4), a provincial priority list of flow sensitive streams by ecoregion has been developed to guide monitoring activities during the drought season (July through September) (Appendix 4). This group of prioritized streams is the "Stream Watch List." As geography, human population distribution, and water management activities are specific to individual basins and ecoregions, the response to drought conditions will vary between streams and ecoregions.

The two main categories of streams on the Watch List include streams with Water Survey of Canada (WSC) automated real-time data and streams where manual streamflow measurements will be required (Appendix 4). A set of hydrological descriptors for each stream on the list will be developed to help place the reported discharge measurement from any given date into context. Streams requiring manual flow monitoring include those that have been monitored on previous drought circuits (e.g., Doyle 2004 and Nyhof 1988), those identified as having water demand levels that can pose a high risk to environmental values, reference streams, and those that have been identified by water officers as flow sensitive streams with high demand. For each stream requiring manual

flow monitoring, the regional operations will pre-determine the specific locations for measuring stream flow, water level, water temperature, and fish habitat condition (e.g., riffle depth).

Regional Fisheries Drought Response Plans

A number of regions have also developed regional action plans for responding to drought conditions which identify priority streams and rivers for in their area. Regions that do not have regional specific action plans will rely on the general guidelines within the provincial response plan to manage their fisheries.

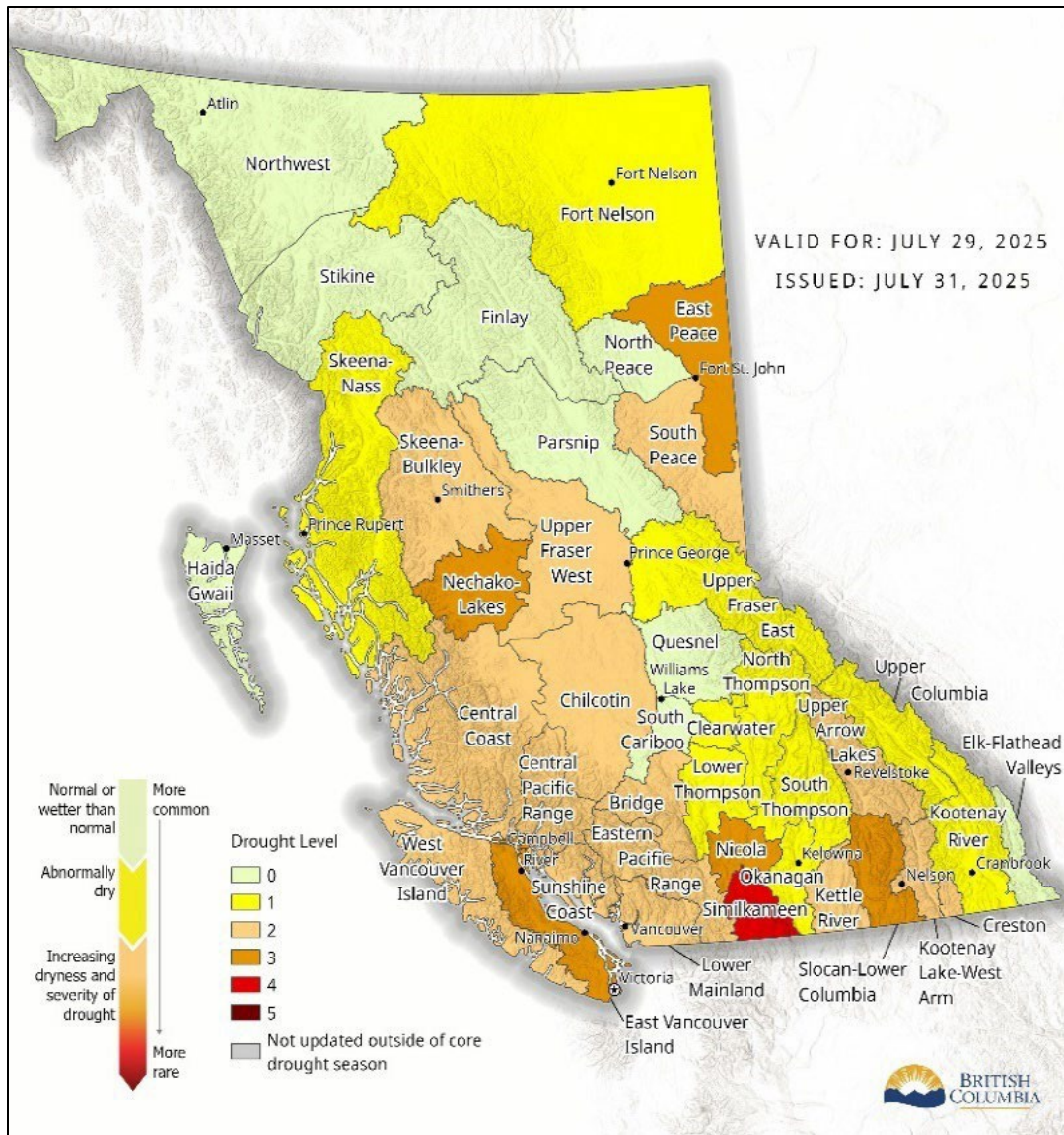


Figure 4. British Columbia watershed basin map (illustrative purposes).

Summary

Drought conditions can have adverse effects upon fish and fish habitat in streams and rivers in B.C. Periodicity, duration, and frequency of drought conditions can all contribute to factors that impact fish populations thus reducing their future productivity and capacity. Increased temperature and reduced flows resulting from drought conditions can be potential factors that reduce fish populations. The cumulative effects of low flow and increased water temperature during drought and associated impacts with recreational fisheries have been well documented for various salmonid species. Reduced flow and high temperatures can invoke stress and mortality which can be intensified by catching and handling fish during drought conditions.

Native fish stocks within B.C., particularly trout and char species, are closely tied to their natal streams and have evolved with natural fluctuations in stream temperatures and other environmental variables. This natural variation is characterised by the following quote:

“British Columbia is a landscape of diverse geography, geology, vegetation, and climate that together define the physical and chemical characteristics of the streams and rivers draining the land. These stream characteristics in turn can define the fish species assemblages that have colonized and adapted to them. Salmonids exhibit various natural adaptations to the range of local stream conditions that reflect this diverse landscape.” – (MacIsaac 2009)

Many species of char are often considered as a stenothermal species because they require a narrow range of cold temperatures to rear and reproduce and may thrive in waters too cold for other salmonid species. These cold-water adapted species often have temperature thresholds well below the optimal range for other salmonids native to the Pacific Northwest. Some of the observed effects of increased temperature on salmonids include decreased oxygen supply, disrupted metabolism, increased vulnerability to disease, and reduced ability to avoid predators.

Early and frequent communication about water supply conditions and responses to stakeholders is key to successful drought management, a priority action developed in the B.C. Drought and Water Scarcity Response Plan (WLRS 2025). Such information requires agencies and local authorities to use a combination of communication tools, water supply and demand data, regulatory instruments, and other tools to advocate for water conservation across communities. Likewise, early communication will be necessary and critical in the ability for fisheries management to implement fish protection measures on streams and rivers in B.C. Provincial, regional, and local drought response plans provide the necessary communication tools for updating and assessing the status water scarcity

in B.C. Such tools will be utilized by fisheries management agencies to prioritize and communicate the implementation of fish protection measures on streams and rivers in B.C.

The government of British Columbia has developed a general criterion for the implementation of fish protection measures on streams and rivers in B.C. The role of the provincial fisheries management group is to coordinate drought response throughout the province and support the region-specific actions on drought impacted watersheds. This plan offers a consistent approach by recognizing many of the most sensitive species in the stream ecosystems in B.C. The provincial fisheries management response plan recognizes that drought has variable effects on streams in B.C. and the plan encompasses all regions but recognizes that the framework is intended for specific systems identified as priorities within regions.

Flow and temperature monitoring data should be used for making informed decisions on watershed and stream specific cases and regional priority. It is recommended that management measures be implemented on recreational angling where MWMT exceeds 20°C and/or maximum daily temperatures exceed 23°C (Table 4). Similarly, it is recommended that char specific streams and watersheds be closed to recreational angling where MWMT exceed 16°C and/or maximum daily temperatures exceed 20°C (Table 4). In addition, flows equating to %LT MAD are a convenient check on the ecological functioning of a particular stream discharge. Flows that drop to or below 10%LT MAD are of acute fisheries concern as key rearing habitats begin to severely dehydrate. Stream flows below 5% LT MAD represent flows that can have severe impacts on fish populations. Combined with temperature thresholds, it is recommended that streams and watersheds be closed to recreational angling where the flows are reduced below 5% LT MAD (Table 4).

Table 4. Stress-induced temperature (MWMT) and flow criteria (%MAD) for implementing fish protection measures (angling closures).

| Species | MWMT Threshold (°C) | Maximum Daily Threshold (°C) | Flow (%LT MAD) |
|----------------|----------------------------|-------------------------------------|-----------------------|
| Trout | >20.0 | >23.0 | <5% |
| Sturgeon | >20.0 | >24.0 | NA |
| Char | >16 | >20 | <5% |

References

- Bear, E.A., McMahon, T.E., and Zale, A.V. 2007. Comparative Thermal Requirements of Westslope Cutthroat Trout and Rainbow Trout: Implications for Species Interactions and Development of Thermal Protection Standards. *Trans. Am. Fish. Soc.* **136**(4): 1113–1121. doi:10.1577/T06-072.1.
- Benjamin, J.R., Heltzel, J.M., Dunham, J.B., Heck, M., and Banish, N. 2016. Thermal Regimes, Nonnative Trout, and Their Influences on Native Bull Trout in the Upper Klamath River Basin, Oregon. *Trans. Am. Fish. Soc.* **145**(6): 1318–1330. doi:10.1080/00028487.2016.1219677.
- Boyd, J.W., Guy, C.S., Horton, T.B., and Leathe, S.A. 2010. Effects of Catch-and-Release Angling on Salmonids at Elevated Water Temperatures. *North Am. J. Fish. Manag.* **30**(4): 898–907. doi:10.1577/M09-107.1.
- DFO. 2012a. Recovery strategy for White Sturgeon (*Acipenser transmontanus*) in Canada.
- DFO. 2012b. Temperature Threshold to Define Management Strategies for Atlantic Salmon (*Salmo salar*) Fisheries under Environmentally Stressful Conditions. Fisheries and Oceans, Canada.
- Epp, P. 2012. Kettle River Fish Protection Recommendations-2011. Ministry of Forests, Lands and Natural Resource Operations, Penticton, B.C.
- Grantham, T.E., Newburn, D.A., McCarthy, M.A., and Merenlender, A.M. 2012. The Role of Streamflow and Land Use in Limiting Oversummer Survival of Juvenile Steelhead in California Streams. *Trans. Am. Fish. Soc.* **141**(3): 585–598. doi:10.1080/00028487.2012.683472.
- MacIsaac, E.A. 2009. Salmonids and the Hydrologic and Geomorphic Features of their Spawning Streams in British Columbia. B.C. Ministry of Forests and Range Research Branch Victoria, B.C. and FORREX Forum for Research and Extension in Natural Resources Society, Kamloops, B.C.
- McCullough, D., Spalding, S., Sturdevant, D., and Hicks, M. 2001. Summary of Technical Literature Examining the Physiological Effects of Temperature on Salmonids. United States Environmental Protection Agency.
- McCullough, D.A. 1999. A review and synthesis of effects of alterations to the water temperature regime on freshwater life stages of salmonids, with special reference to chinook salmon. Agency Report EPA, U.S. Environmental Protection Agency, Seattle, Washington.
- McLean, M., Litvak, M., Hinch, S., Cooke, Steve., and Crossin, G. 2014. Understanding the consequences of recreational angling stress on the biology and movement of White Sturgeon in the Fraser River, British Columbia. Department of Biology 2/Department of Biology Dalhousie University, NS.
- Meka, J.M., and McCormick, S.D. 2005. Physiological response of wild rainbow trout to angling: impact of angling duration, fish size, body condition, and temperature. *Fish. Res.* **72**(2–3): 311–322. doi:10.1016/j.fishres.2004.10.006.

- MOE. 2021. British Columbia Drought and Water Scarcity Response Plan. Prepared by the Ministry of Environment and Climate Change Strategy on behalf of the Inter-Agency Drought Working Group.
- Parkinson, E., Lea, E., and Nelitz, M. 2012. A framework for designating “Temperature Sensitive Streams” to protect fish habitat, Part 2: Identifying temperature thresholds associated with fish community changes in British Columbia, Canada. Fisheries Technical Report, Ministry of Environment Ecosystem Protection & Sustainability Branch, Vancouver, B.C.
- Rosenfeld, J., Beecher, H., and Ptolemy, R. 2016. Developing Bioenergetic-Based Habitat Suitability Curves for Instream Flow Models. *North Am. J. Fish. Manag.* **36**(5): 1205–1219. doi:10.1080/02755947.2016.1198285.
- Selong, J.H., McMahon, T.E., Zale, A.V., and Barrows, F.T. 2001. Effect of temperature on growth and survival of bull trout, with application of an improved method for determining thermal tolerance in fishes. *Trans. Am. Fish. Soc.* **130**(6): 1026–1037.
- Sullivan, K., Martin, D.J., Cardwell, R.D., Toll, J.E., and Duke, S. 2000. An Analysis of the Effects of Temperature on Salmonids of the Pacific Northwest with Implications for Selecting Temperature Criteria.
- Wilkie, M.P., Brobbel, M.A., Davidson, K.G., Forsyth, L., and Tufts, B.L. 1997. Influences of temperature upon the postexercise physiology of Atlantic salmon (*Salmo salar*). *Can. J. Fish. Aquat. Sci.* **54**(3): 503–511. doi:10.1139/f96-305.
- WLRS. 2025. British Columbia Drought and Water Scarcity Response Plan. Prepared by the Ministry of Water, Land and Resource Stewardship.

Appendix 1. Fisheries Management Drought Legislation

| Legislation | Agency | General Scope |
|--------------------------------|--|---|
| Water Sustainability Act, 2016 | Ministry of Water, Land and Resource Stewardship | <p>Provides for the allocation and management of surface water by authorizing water licences and approvals, creating water reservations, and developing of water sustainability plans.</p> <p>The Minister may issue Fish Population Protection Orders where low water flow in a stream may impact fish survival. This allows the Minister responsible to temporarily order regulation or reduction of the diversion, rate of diversion or time of diversion of water from a stream in order to ensure the survival of a fish population, provided that consideration has been given to the needs of agricultural users.</p> <p>The Act also sets out protective measures for wells and groundwater and identifies offences and penalties.</p> <p>Protects fish and fish habitat by prohibiting bank-to-bank dams on protected rivers and authorizing designation of “Sensitive Streams” for fish sustainability.</p> |
| Riparian Areas Protection Act | Ministry of Water, Land and Resource Stewardship | <p>Riparian vegetation provides drought buffers for fish habitat around streams along with food sources, woody debris, and shade.</p> <p>The Act enables local governments to protect and enhance riparian habitat through the development permit process on residential, commercial, and industrial development. It uses a set methodology to determine an appropriate riparian setback to development from streams.</p> |
| Fisheries Act | Fisheries and Oceans Canada | Protection of fish and fish habitat |

Appendix 2. Optimal Temperature Ranges for Salmonids and Other Species

| Species | Incubation | Rearing | Migration | Spawning |
|----------------------|-------------------|----------------|------------------|-----------------|
| <i>Salmon</i> | | | | |
| Chinook | 5.0-14.0 | 10.0-15.5 | 3.3-19.0 | 5.6-13.9 |
| Chum | 4.0-13.0 | 12.0-14.0 | 8.3-15.6 | 7.2-12.8 |
| Coho | 4.0-13.0 | 9.0-16.0 | 7.2-15.6 | 4.4-12.8 |
| Pink | 4.0-13.0 | 9.3-15.5 | 7.2-15.6 | 7.2-12.8 |
| Sockeye | 4.0-13.0 | 10.0-15.0 | 7.2-15.6 | 10.6-12.8 |
| <i>Trout</i> | | | | |
| Brown | 1.0-10.0 | 6.0-17.6 | | 7.2-12.8 |
| Cutthroat | 9.0-12.0 | 7.0-16.0 | | 9.0-12.0 |
| Rainbow | 10.0-12.0 | 16.0-18.0 | | 10.0-15.5 |
| <i>Char</i> | | | | |
| Arctic char | 1.5-5.0 | 5.0-16.0 | | 4.0 |
| Brook trout | 1.5-9.0 | 12.0-18.0 | | 7.1-12.8 |
| Bull trout | 2.0-6.0 | 6.0-14.0 | | 5.0-9.0 |
| Dolly Varden | | 8.0-16.0 | | |
| Lake trout | 5.0 | 6.0-17.0 | | 10.0 |
| <i>Grayling</i> | | | | |
| Arctic grayling | 7.0-11.0 | 10.0-12.0 | | 4.0-9.0 |
| <i>Whitefish</i> | | | | |
| Lake whitefish | 4.0-6.0 | 12.0-16.0 | | >8.0 |
| Mountain whitefish | <6.0 | 9.0-12.0 | | <6.0 |
| <i>Other species</i> | | | | |
| Burbot | 4.0-7.0 | 15.6-18.3 | | 0.6-1.7 |
| White sturgeon | 14.0-17.0 | | | 14.0 |

Appendix 3. Variation Order Template



VARIATION ORDER REQUEST FORM

| HQ Use Only | | |
|------------------------|-----------------------------------|--------------------------|
| Fisheries Mgr Approval | <input type="checkbox"/> Map | <input type="checkbox"/> |
| Variation Drafted | <input type="checkbox"/> Synopsis | <input type="checkbox"/> |
| Website | <input type="checkbox"/> AHTE | <input type="checkbox"/> |

Contact: _____ **Phone:** _____ **Date of Submission:** _____

Subject: _____

Water Body: _____ **Watershed Code:** _____

Region: _____ **Management Unit:** _____

Species: _____

Proposed effective date if different from the regular posting of the synopsis: _____

For In-Season Regulation Changes only, please indicate if proposal is:

Permanent Temporary If temporary, period of regulation: _____

Note: A minimum of 3 days is required to co-ordinate with Government Communications and Public Engagement (GCPE) should a news release be required.

Who is the regional contact for communications issues?

(someone with authority to deal with media requests if requested by Communications and Public Engagement)

Name: _____ Phone: _____

PART A: PURPOSE

1. Nature of the change:

New regulation Amending Existing Regulation Deletion of an existing regulation
(e.g., method/gear/bait, quota, no fishing)

2. What is currently in the synopsis? (exact wording preferred)

Copy the exact wording from the synopsis (not the regulation) as it presently exists. Victoria staff will translate what is requested in the synopsis to regulation.

3. Briefly describe the proposed wording in the synopsis:

You may be able to copy #2 and add new wording.

4. Is there, or will there be, an associated map in the synopsis (page and map# if applicable)?

Yes No N/A

- This map may be used to form the regulation or for a news release, therefore it should be digital and professional. Ensure that all maps are sent via post and email.

5. Brief Description of variation order (Are tributaries included?)

6. Rationale for variation order:

What is the problem or issue that the regulation change is intended to address or resolve?

Why is government action required at this time?

Write at a professional level. This document may be part of the OIC/MO package and is subject to FOI requests.

7. Is a DFO Mirror Order required?

Yes No N/A

PART B: ANALYSIS

1. Describe surveys used for conservation issues and their results as they relate to this submission:

What were the results of scientific surveys? For example, what population monitoring techniques were used? Anecdotal (hunter comments) and/or scientific information can be used. Be brief and write at layman’s level. Doesn’t require a lot of technical detail. (Reports, technical data can be sent as an attachment.)

2. Alternatives to regulation considered:

If no alternatives were considered, explain why.

What other methods of regulation were considered and rejected and why? (e.g., voluntary codes, self-management, partnerships, etc.)

Could other bodies outside of government ensure standards are met? (e.g., accreditation, certification, auditing, etc.)

3. Pros/Cons analysis undertaken & results:

Explain how the benefits outweigh the costs. An example of a pro would be an increase in recreational opportunity or reduced costs. An example of a con would be impact on species population or increased regulatory complexity.

Can the costs or benefits for proposed regulation be quantified? What factors were evaluated to determine this impact?

4. Identify risks of NOT implementing the new provision:

‘Risk’ is the potential of loss or damage resulting from a decision. Risks would include conservation issues and relationships with stakeholders. Describe the “worst case scenario”. (A risk in the broadest sense is the potential for loss. Risk may be represented by any unintentional event or situation that leads to harm for an organization, group, habitat, species, or individual. The loss might be as simple as the pain of a twisted ankle or as complex as a liability claim ending in a lawsuit.)

8. Comments by Reviewers: (if relevant)

Use separate page, as comments may not be included in the final OIC/MO Package. Copies of email correspondence may be attached.

PART D: STAKEHOLDER CONSULTATION & FIRST NATIONS ENGAGEMENT

ADEQUATE CONSULTATION AND ENGAGEMENT MUST BE RECORDED, OR THE FORM WILL BE RETURNED TO THE ORIGINATOR.

Please attach supporting documentation, such as letters, meeting minutes, etc.

Identify who was consulted and when consultations took place.

Who raised concerns and what was the nature of their concerns?

Has the regulation been changed to respond to the First Nations' or Stakeholders' Concerns?

| Organization | Contact Name | Date and type of Consultation & Engagement | Support? (If no, attach an explanation) |
|---|--------------|--|--|
| CO Service | | | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A |
| Fish & Wildlife Branch Consultation is required BEFORE submission is sent to Victoria. Consultation for: Greg.Andrusak@gov.bc.ca | | | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A |
| Other Regions | | | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A |
| DFO Field Staff | | | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A |
| DFO Management | | | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A |
| Local fisheries advisory committee (if relevant) | | | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A |
| B.C. Parks | | | <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A |
| First Nations: If incomplete, this form will be returned. * | | | <input type="checkbox"/> Yes <input type="checkbox"/> No (No is not an option without full explanation why) |

List attachments:

List number of attachments and their nature (e.g., letter from local rod and gun club, minutes from public meeting)

***First Nations**

We require the name of each FN group engaged and individuals within the group. When did the engagement take place and in what forum (letter, fax, meeting, etc.)? What was the response or outcome of engagement (band by band or tribal association)? What might be the anticipated impact of this proposal on the First Nation's ability to practice their Aboriginal Interests?

CHECKLIST – Variation requests should not be submitted without the following:

- Map showing subject area
- Effective dates and date Variation Order needed
- Rationale clearly indicated
- Consultation with DFO is salmon involved Management sign-off
- Consultation completed and itemized
- Consultation
- Your response to negative feedback
- Regional

PART E: APPROVAL

1. Section Head, Originating Office ([GIVE LOCATION](#))

2. Regional Manager

Reviewed by: _____
Date: _____
Signature: _____

Supported Not Supported

Reviewed by: _____
Date: _____
Signature: _____

Supported Not Supported

Appendix 4. Watersheds Potentially Affected by Low-Flow or High-Temperature Conditions (By Region)

Region 1

| Region | Management Unit (MU) | Watershed | Eco-Region | Species |
|----------|----------------------|-----------------|------------|---------------|
| Region 1 | Aggregate | All 1-1 to 1-6 | EVI | |
| Region 1 | 4 | Cowichan | EVI | |
| Region 1 | 5 | Nanaimo | EVI | |
| Region 1 | 3 | San Juan | EVI | |
| Region 1 | 3 | Gordon | WVI | |
| Region 1 | 2 | Sooke | EVI | |
| Region 1 | 6 | Oyster | EVI | |
| Region 1 | 5 | Englishman | EVI | |
| Region 1 | 6 | Little Qualicum | EVI | |
| Region 1 | 3 | Caycuse | WVI | |
| Region 1 | 5 | Chemainus | EVI | |
| Region 1 | 3 | Nitinat | WVI | |
| Region 1 | 6 | Trent | EVI | |
| Region 1 | 6 | Tsable | EVI | |
| Region 1 | 6 | Big Qualicum | EVI | Exception*DFO |
| Region 1 | 6 | Puntledge | EVI | Exception*DFO |

Region 2

| Region | Management Unit (MU) | Watershed | Eco-Region | Species |
|----------|----------------------|--|------------|-------------------------|
| Region 2 | Aggregate | All Rivers Streams and Sloughs, MU 2-2 to 2-12 inclusive and MU 2-16 to 2-19 inclusive | LOM+PAC | |
| Region 2 | 8 | Alouette | PAC | |
| Region 2 | 6 | Ashlu | PAC | |
| Region 2 | 4 | Bear (Mahood) Cr. | LOM | |
| Region 2 | 18 | Big Silver Cr. | PAC | |
| Region 2 | 11 | Birkenhead | PAC | |
| Region 2 | 8 | Brunette | LOM | |
| Region 2 | 4 | Campbell | LOM | |
| Region 2 | 8 | Capilano | PAC | |
| Region 2 | 5 | Chapman Cr. | PAC | |
| Region 2 | 7 | Cheakamus | PAC | |
| Region 2 | 19 | Chehalis | PAC | |
| Region 2 | 4 | Chilliwack (Vedder) | PAC | |
| Region 2 | 18 | Cogburn Cr. | LOM | |
| Region 2 | 17 | Coquihalla | PAC | |
| Region 2 | 8 | Coquitlam | PAC | |
| Region 2 | 8 | Corbold Cr. | PAC | |
| Region 2 | 6 | Elaho | PAC | |
| Region 2 | 2 | Fraser River | Multiple | Sturgeon concerns |
| Region 2 | 3 | Frost Cr. | LOM | |
| Region 2 | 18 | Harrison | PAC | |
| Region 2 | 4 | Hyland Cr. | PAC | |
| Region 2 | 8 | Indian | PAC | |
| Region 2 | 8 | Kanaka Cr. | LOM | |
| Region 2 | 9 | Lillooet | PAC | |
| Region 2 | 4 | Lonzo (Marshal) Cr. | LOM | |
| Region 2 | 8 | Lynn Cr. | PAC | |
| Region 2 | 7 | Mamquam | PAC | Downstream of CN Bridge |
| Region 2 | 19 | Miami Cr. | LOM | |
| Region 2 | 19 | Morris Cr. | PAC | |
| Region 2 | 4 | Nicomeki | LOM | |
| Region 2 | 8 | Noons Cr. | LOM | |
| Region 2 | 8 | Norrish Cr. | PAC | |
| Region 2 | 8 | North Alouette | PAC | |
| Region 2 | 8 | Upper Pitt | PAC | |
| Region 2 | 8 | Lower Pitt | PAC | |
| Region 2 | 5 | Ruby Cr. | LOM | |
| Region 2 | 4 | Salmon | LOM | |
| Region 2 | 4 | Serpentine | LOM | |
| Region 2 | 4 | Seymour | PAC | |
| Region 2 | 2 | Silverhope Cr. | PAC | |
| Region 2 | 2 | Skagit | PAC | |
| Region 2 | 6 | Squamish Powerhouse Channel | PAC | |
| Region 2 | 6 | Squamish River | PAC | |
| Region 2 | 8 | Stave | PAC | |
| Region 2 | 9 | Stawamus | PAC | |
| Region 2 | 4 | Sumas | LOM | |
| Region 2 | 2 | Sumallo | PAC | |
| Region 2 | 2 | Tamih Cr. | PAC | |

Region 3

| Region | Management Unit (MU) | Watershed | Eco-Region | Species |
|----------|----------------------|--|------------|---------|
| Region 3 | 13 | Nicola River below outlet of Nicola Lake | TOP | |
| Region 3 | 13 | Spilus | NCR | |
| Region 3 | 13 | Coldwater | NCR | |
| Region 3 | 29 | Deadman Cr. | TOP | |
| Region 3 | 30 | Bonaparte River Below Bonaparte Lake | FAP | |
| Region 3 | 38 | Barrier | COH | |
| Region 3 | 40 | Raft | COH | |

Region 4

| Region | Management Unit (MU) | Watershed | Eco-Region | Species |
|----------|----------------------|-------------------------|------------|---------|
| Region 4 | Aggregate | MU 4-3 to-4-9 inclusive | NCM | |
| Region 4 | 6 | Goat | NCM | |
| Region 4 | 8 | Salmo | NCM | |
| Region 4 | 17 | Slocan | NCM | |
| Region 4 | 17 | Bonanza Cr. | NCM | |
| Region 4 | 20 CW | Lower St. Mary | NCM | |
| Region 4 | 2 | Upper Wigwam | SRM | |
| Region 4 | 21 | Ram Cr. | NCD | |
| Region 4 | 23 CW | Michel Cr. | NCD | |

Region 5

| Region | Management Unit (MU) | Watershed | Eco-Region | Species |
|----------|----------------------|-----------|------------|---------------|
| Region 5 | Aggregate | Horsefly | COH | Rainbow trout |

Region 6

| Region | Management Unit (MU) | Watershed | Eco-Region | Species |
|----------|----------------------|-----------------------|------------|-------------|
| Region 6 | 30 | Kispiox River | NRA | BT/DV/ST |
| Region 6 | 10 | Lakelse River | NRA | BT/DV/ST/CT |
| Region 6 | 08/09 | Morice/Bulkley Rivers | FAP/EHN | BT/DV/ST |
| Region 6 | 04/09 | Nadina River | FAP/EHN | RB/BT/DV |
| Region 6 | 16 | Meziadin River | NRA | ST/BT |
| Region 6 | 15 | Cranberry River | NRA | ST/BT |
| Region 6 | 30 | Kitwanga River | NRA | ST/BT/DV/CT |
| Region 6 | 9 | Zymoetz River | NRA | ST/BT/DV |
| Region 6 | 8 | Suskwa River | NRA | ST/BT |

Region 7A and 7B

| Region | Management Unit (MU) | Watershed | Eco-Region | Species |
|-----------|----------------------|-------------------------|------------|-----------------------------------|
| Region 7A | 12 CW | Stellako | FAP | Rainbow trout |
| Region 7A | 7 | Bowron | COH | Rainbow trout Bull trout |
| Region 7A | 30 | Nation | FAB | Rainbow trout, Arctic Grayling |
| Region 7A | 23 | Parsnip and tributaries | FAB | Bull trout, Arctic grayling |
| Region 7A | 5 | Goat | FAB | Bull trout |
| Region 7A | 3 | Walker | FAB | Bull trout |
| Region 7A | 3 | McKale | FAB | Bull trout |
| Region 7A | 17 | Torpy | FAB | Rainbow trout Bull trout |
| Region 7A | 5 | Haggen | FAB | Bull trout |
| Region 7A | 11 | Chilako | FAB | Rainbow trout |
| Region 7A | 3 | Chalko | FAB | Bull trout |
| Region 7B | | Confirmed Low Risk | | |

Region 8

| Region | Management Unit (MU) | Watershed | Eco-Region | Species |
|----------|----------------------|--|------------|-----------------------------|
| Region 8 | Aggregate | All streams, WU 8-2 through 8-7 inclusive and 8-12 through 8-14 inclusive includes all Similkameen and Kettle drainage and all tributaries, all streams of MU 8-15 with the exception of the Grandby River | TOP+NCR | Rainbow Trout, Whitefish |
| Region 8 | 15 | Grandby | SBF | |
| Region 8 | 14 | Kettle | TOP | |
| Region 8 | 2 | Similkameen | NCR | |
| Region 8 | 24 | Duteau | TOP | |
| Region 8 | 24 | Creighten | TOP | |
| Region 8 | 24 | Bessette | TOP | |
| Region 8 | 23 | Mid-Shuswap | COH | |