



British Columbia Drought Response Plan

Updated June 2018

**Prepared by the Ministry of Environment and Climate Change Strategy
on behalf of the Inter-Agency Drought Working Group**

June 2018

BC Drought Response Plan Authorship and Editions

This plan was originally authored by Econics, Victoria, BC in 2010. The plan is reviewed annually.

Acknowledgements

The following agencies were involved in the development of the Drought Response Plan and provided valuable input:

- ◆ British Columbia Ministry of Environment and Climate Change Strategy
- ◆ British Columbia Ministry of Agriculture
- ◆ British Columbia Ministry of Municipal Affairs and Housing
- ◆ British Columbia Ministry of Health
- ◆ British Columbia Ministry of Transportation and Infrastructure
- ◆ British Columbia Ministry of Public Safety and Solicitor General, Emergency Management BC
- ◆ British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development
- ◆ Fisheries and Oceans Canada
- ◆ Agriculture and Agri-Food Canada

Legal Disclaimer

This plan does not address emergency response measures as defined in the *Emergency Program Act* (1996). The declaration of any drought level or condition and subsequent response does not imply municipal or provincial compensation for economic loss.

The information provided in this plan is offered as a public service. Many factors may influence water supply availability including, but not limited to, precipitation, topography, geography, the existence of microclimates, storage capacity, and population demands. As a result, the information in this plan is general in nature and should not be relied upon as specific advice for responding to particular circumstances. You will have to review your particular circumstances and then determine whether the suggestions in this plan are appropriate to those circumstances.

Water suppliers, local governments, improvement districts, other authorities, and water licensees should consider the appropriateness of the suggestions in this plan and adapt them to suit their specific local conditions and requirements; water suppliers or users should not put plans and bylaws in place without receiving appropriate professional and legal advice.

While information provided within this plan is believed to be accurate at the time of publication, we cannot confirm its currency, accuracy, or completeness or its applicability to or suitability for individual circumstances. Therefore, persons using this plan should take steps to independently verify the information.

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Acronyms Used In This Document

AAFC	Agriculture and Agri-Food Canada
ADMCD	Assistant Deputy Ministers Committee on Drought
AGRI	BC Ministry of Agriculture
CEF	Critical Environmental Flow
CEFT	Critical Environmental Flow Threshold
MAH	BC Ministry of Municipal Affairs and Housing
DFO	Fisheries and Oceans Canada
DMCD	Deputy Ministers Committee on Drought
DRI	Drought Research Initiative
EHU	Essential Household Use
EMBC	Emergency Management BC, BC Ministry of Public Safety and Solicitor General
ENV	BC Ministry of Environment and Climate Change Strategy
FITFIR	First-in-time First-in-right
FLNRORD	BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development
GCPE	Government Communications and Public Engagement
IADWG	Inter-Agency Drought Working Group
IIABC	Irrigation Industry Association of BC
INAC	Indigenous and Northern Affairs Canada
MAD	Mean Annual Discharge
HLTH	BC Ministry of Health
NDMC	National Drought Mitigation Centre
NIDIS	National Integrated Drought Information System
NRB	Natural Resources Board (Deputy Ministers)
PTDWG	Provincial Technical Drought Working Group
SWS	Significant water shortage
WSA	<i>Water Sustainability Act</i>

1. Overview

1.1. *What is Drought?*

Drought is a recurrent feature of climate involving a deficiency of precipitation over an extended period, resulting in a water shortage for activities, communities or aquatic ecosystems.¹ In British Columbia (BC), combinations of insufficient snow accumulation, hot and dry weather, or a delay in rainfall may cause drought.

Drought conditions can affect communities and individuals in many different ways. Drought can lead to reduced water availability for household and business use. Lower stream flows may cause warmer river temperatures, affecting fish and other aquatic life. Low stream flows can also affect the growth of agricultural crops and limit the water available for irrigation. Low stream flows can also have impacts on groundwater levels. Aquifers may develop a lowered water table due to drought in a given year and from previous drought seasons, as there may not be enough water to recharge the aquifer. If natural water sources or adequate storage is not available in a community, it may also lead to insufficient supplies for firefighting. Drought season in BC also coincides with summer tourism and associated increased demand for water. Reduced water availability during the summer can have significant economic impacts where communities rely on the summer tourism industry.

Droughts are defined as meteorological, hydrological, agricultural or socioeconomic; each of which implies different impacts. Definitions of these different types of drought, developed in conjunction with other western and northern provinces and territories through the Western Water Stewardship Council, can be found in Appendix 1.

Being prepared to respond to droughts will help communities protect water for drinking, sanitation, fire protection and fish and aquatic ecosystems. By being able to meet requirements under the *Water Sustainability Act* (WSA) during times of drought, it will help the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) in wildfire response and help sustain agricultural and other economic activity.

1.2. *About The Drought Response Plan*

This plan focuses on hydrological drought *response*: the actions taken preceding, during and immediately following a hydrological drought to reduce its impacts. It will assist with ensuring that water needs for people and aquatic ecosystems are met in times of drought.

The plan is organized as follows: First, it provides context and outlines the principles that informed plan development. Second, it outlines the responsibilities of agencies at both the provincial and regional/local levels. Third, it briefly recommends actions

¹ Adapted from definitions in National Drought Mitigation Centre (2006). What is Drought? Accessed at <http://drought.unl.edu/DroughtBasics/WhatIsDrought.aspx>, accessed 12 June 2015.

to take prior to the onset of drought. Fourth, it describes drought indicators, the four drought levels and recommended actions. This section includes the Drought Indicators Criteria used to determine which level of drought is in effect and an overview of the actions that should be taken by different levels of government and water users. Finally, it recommends actions to undertake after drought conditions have subsided.

While this plan does include some discussion on *drought preparedness*, actions taken before a drought to increase the level of readiness by all stakeholders, this is not its primary focus. Issues around drought preparedness and water conservation during normal conditions are addressed in other provincial government policies and guidelines (Appendix 4).

This plan is intended primarily to guide actions of staff in provincial government agencies, but it also provides recommended actions for federal government agencies, local government, First Nations and water licensees under the WSA (Appendix 2).

In providing guidance to provincial staff, it is important to note that the Province's ability to regulate water during drought is not dependent on an area's drought level. The authorities in the WSA operate independently of an area's drought level and can be used to deal with conflicts and concerns in a single water source or with significant water shortages (SWS) in a specific area.

1.3. Context

Drought response in BC is based on existing legislation and regulations. The Drought Response Plan is supported by established legal authorities provided in the *Water Sustainability Act*, the *Drinking Water Protection Act*, the *Environmental Management Act*, the *Local Government Act*, the *Emergency Program Act* and their supporting regulations. However, the actions available under these pieces of legislation are independent of the Drought Response Plan. Appendix 3 provides an inventory of key provincial legislation and programs relevant to drought management.

The Drought Response Plan was developed in part by drawing from experience with previous droughts, including the summers of 2009 and 2015, both of which saw extremely low flows for many streams and low groundwater wells in BC.

1.4. Principles

The following principles guided development of this plan:

Partnership: Federal, provincial and local agencies and stakeholders need to work together to manage drought. British Columbia is a large and climatically diverse province. In any year drought may strike some geographic areas and watersheds while others experience normal conditions or even flooding. Our response to drought must occur at two levels. At the federal and provincial level, agencies' roles include communication and coordination, science, and emergency support services. At the local level, water providers, local governments, First Nations and other authorities undertake duties including data collection, water conservation promotion and enforcement, and emergency response.

Knowledge: Sound science, traditional knowledge, education and innovation are the foundation for adapting to changing environmental conditions. In times of drought, this includes using the best available information on stream water, groundwater, snowpack and soil conditions to assess current and forecasted circumstances.

Stewardship: All British Columbians are responsible for the sustainability of water and aquatic ecosystems. This means that all water users in drought affected areas are asked to cooperate and contribute to the goal of conservation. Wherever possible, reductions in water use will be achieved through voluntary measures, recognizing that at times it may be necessary to turn to regulatory responses to protect fish, aquatic ecosystems and the rights of water users.

Timely communication: Communicating early in the season is essential to ensuring cooperation and effective water conservation. Providing timely, clear and appropriate information ensures that communities and water users are aware of environmental conditions, can take on shared responsibility, have the opportunity to implement conservation measures and are notified in advance of essential regulatory responses by government.

2. Drought Management Responsibilities

Drought impacts are complex and affect many different sectors of society. As a result, a number of different local, provincial and federal agencies share responsibility for managing and responding to drought.

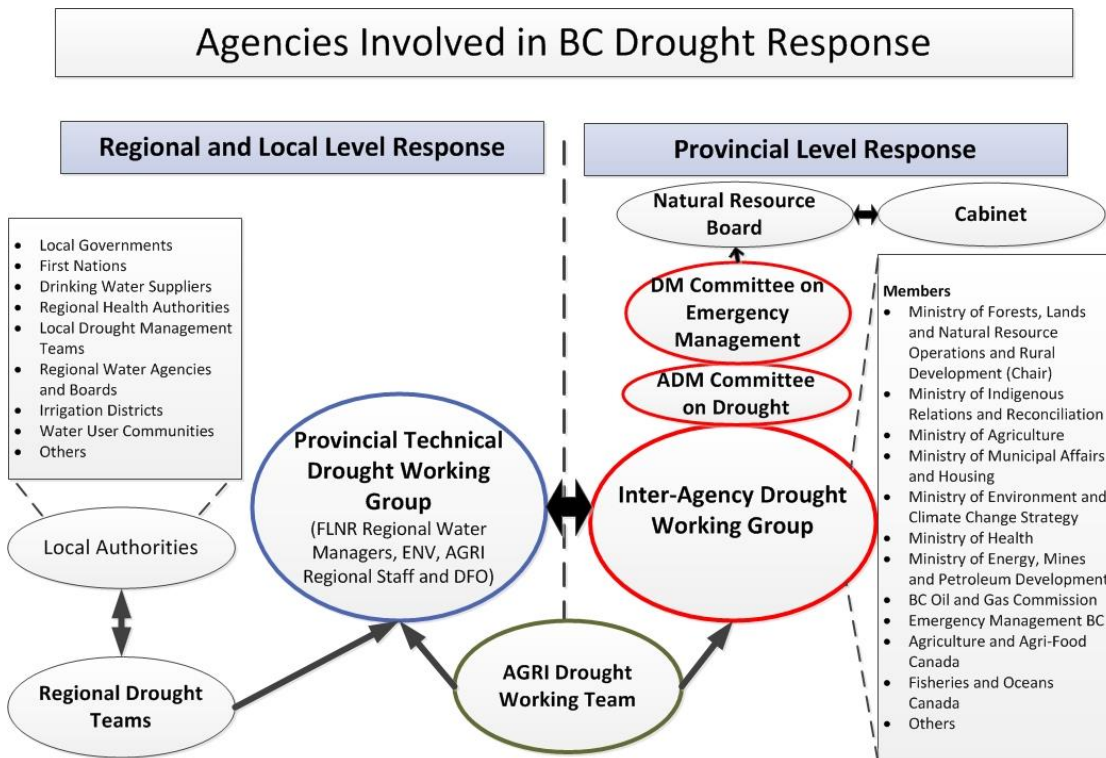


Figure 1. Key coordinating bodies and groups involved in BC drought response.

2.1. Provincial Level Response

A number of provincial and federal agencies are involved in drought management (Appendix 4). They cooperate to effectively respond to drought and mitigate its impacts. In order to harmonize their responses, a number of organizing bodies and individual decision makers have been delegated specific responsibilities (Table 1).

Table 1: Key Provincial Level Drought Coordination Committees and Individuals

Who	Responsibilities
Deputy Ministers Committee on Emergency Management (DMCEM)	<ul style="list-style-type: none"> ◆ Resolves higher level issues and recommendations ◆ Provides strategic guidance and approval for regulatory, policy and financial decisions during both drought preparation and response ◆ Elevates issues to political or inter-jurisdictional level if necessary
Assistant Deputy Ministers Committee on Drought (ADMCD)	<ul style="list-style-type: none"> ◆ Ensures broad corporate objectives are considered and addressed ◆ Vets and approves IADWG recommendations ◆ Oversees functioning of the working groups ◆ Provides a bridge from working groups to the DMCD ◆ Resolves issues and gaps, and elevates to DMCD if necessary
Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD)	<ul style="list-style-type: none"> ◆ Oversight responsibility for managing drought planning and response in British Columbia ◆ Orders of the Minister, Comptroller, Engineer and Lieutenant Governor in Council (LGIC) under the <i>Water Sustainability Act</i> (s. 22, 86, 87, 88 and 93)
Ministry of Environment and Climate Change Strategy (ENV)	<ul style="list-style-type: none"> ◆ Lead development of legislation and policy related to drought management in B.C. ◆ Oversees and coordinates the science required to assess impacts and monitor water before, during, and after droughts
Emergency Management BC (EMBC)	<ul style="list-style-type: none"> ◆ Provides advice and the historic context of response activities in regions related to loss of supply (potable water and firefighting). ◆ Provides support to local governments during emergency response activities. ◆ Supports provincial emergency response coordination ◆ Office of the Fire Commissioner provides advice and support on pre-planning, risk assessment and Fire Code requirements relating to water supplies for fire-fighting purposes
Ministry of Health (HLTH)	<ul style="list-style-type: none"> ◆ Provides policy development and guidance related to the <i>Drinking Water Protection Act</i>.
Natural Resources Board (NRB)	<ul style="list-style-type: none"> ◆ Oversees the effective provision of integrated natural resource information and services in B.C. ◆ Provides strategic oversight and coordination of all provincial government drought management efforts
FLNRORD Executive	<ul style="list-style-type: none"> ◆ Oversees Ministry of FLNRORD responsibilities for drought management including River Forecast Centre activities and regional office activities ◆ Coordinates with other ministries at a strategic level through the NRB
Engineer, Water Manager or Comptroller of Water Rights, Ministry of	<ul style="list-style-type: none"> ◆ Makes statutory decisions on priority of water rights under s.22 WSA ◆ Comptroller establishes CEFT orders under s. 87 for streams

FLNRORD	<ul style="list-style-type: none"> under a s. 86 SWS order (either minister or LGIC order) ◆ Engineer or water manager may restrict use by lower priority licensees or those with conditional clauses in their water licence ◆ Authority to regulate non-licensed water use including use approvals, transitioning groundwater users and domestic groundwater users.
Inter-Agency Drought Working Group (IADWG)	<ul style="list-style-type: none"> ◆ Ensures effective delivery of the British Columbia Drought Response Plan; oversight of drought event response actions ◆ Develops and oversees drought response projects ◆ Identifies trends, issues and gaps, and elevates if necessary ◆ Ensures that roles and responsibilities during low flow and drought conditions are clearly defined, communicated and understood both internal and external stakeholders ◆ Ensures documentation and shared learning from drought events
Provincial Technical Drought Working Group (PTDWG)	<ul style="list-style-type: none"> ◆ Ensures effective delivery of the British Columbia Drought Response Plan ◆ Coordinates operational level cross-agency response to drought or low stream flow conditions ◆ Works with regional cross-government drought teams ◆ Determines drought levels at the watershed basin scale ◆ Determines when to take regulatory action under the WSA and <i>Fisheries Act</i>
AGRI Drought Working Team	<ul style="list-style-type: none"> ◆ Assesses role of AGRI staff within Technical Drought Working Group ◆ Informs WSA s. 88 order about the needs of agriculture ◆ Assesses impacts of drought on dry land farming areas and range capacity to carry livestock ◆ Provides lead drought response in non-irrigated areas and assesses livestock needs in drought stricken areas ◆ Assesses livestock feed requirements ◆ Provides information on drought programs and initiatives to producers by liaising with BC Agriculture Council and Agriculture and Agri-food Canada
Regional Drought Teams	<ul style="list-style-type: none"> ◆ Provides advice on region and watershed specific drought response levels based on best available scientific data ◆ Issues advisories/notifications on drought conditions ◆ Supports pre-drought preparedness in B.C.'s most drought vulnerable regions

The Inter-Agency Drought Working Group (IADWG), chaired by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD), has a particularly important role in responding to low water situations. This committee, with membership drawn from key provincial and federal government agencies, is tasked with ensuring that the Drought Response Plan is fully delivered and addresses strategic level drought related issues that may require elevation.

Reporting to the IADWG, the Provincial Technical Drought Working Group (PTDWG) consists of members from regional cross-government drought teams with membership from FLNRORD, ENV, AGRI and other agencies. These teams conduct the work in each region to evaluate and determine when to elevate drought levels based on stream flow. This is discussed in more detail in Section 4. The PTDWG ensures that regional teams can coordinate responses across the province. This group also ensures that

specific actions set out in this plan are considered and delegated to the appropriate person or body for further action and that drought conditions are clearly understood and communicated to internal and external stakeholders.

The AGRI Drought Team provides coordination to AGRI staff on the Technical working groups and coordinates with agricultural commodity groups and Agriculture and Agri-food Canada.

The Inter-Agency Drought Working Group meets at least once every year and on an as needed basis when dry conditions or low stream flows prevail. The PTDWG meets monthly prior to the onset of drought and bi-weekly, or more frequently, if drought conditions or low stream flows occur and require more immediate action. If circumstances warrant, subgroups of the PTDWG may meet on an as needed basis to address specific issues, such as confirming a region-specific drought level. The regional cross-government drought teams and the AGRI Drought Working Team meet on an as needed basis and provide a link with the PTDWG to coordinate if additional resources are needed for effective drought response.

2.2. Regional Level Response

Regional responses are essential in managing drought. At the regional/local level, emphasis is placed on collecting information, delivering programs, communicating with residents and responding to emergencies.

2.2.1 Regional Drought Teams

Regional Drought Teams may be established to provide a coordinated regional drought response; these teams are usually led by the Province. Their focus is often on current low water flows, as well as long-term preparedness strategies. The responsibilities of a regional drought management team may include:

- ◆ establishing a Regional Drought Management Plan and drought communication plan;
- ◆ compiling data on water supplies and users in specific watersheds,
- ◆ coordinating efforts with various stakeholders (including the fisheries sector, the agricultural sector, industry, recreation groups and neighbouring communities);
- ◆ providing timely information to the public about water supplies, low stream flows, projected flow states without water conservation efforts, and drought; and,
- ◆ continually encouraging water conservation and appropriate responses to drought conditions.

Membership should be modified and adapted to suit local circumstances, but may include:

- ◆ staff from provincial and federal government regional offices;

- ◆ representatives of local water users;
- ◆ local governments;
- ◆ First Nations;
- ◆ water suppliers;
- ◆ non-government agencies; and
- ◆ business and recreation sector groups.

The scale at which Regional Drought Teams operate may vary. They usually focus on larger geographic areas or sub-watersheds depending on local climate, geography and other circumstances. The Regional Drought Team may work with Local Drought Management Teams. These local teams are often led by local governments aimed at managing specific water supplies and can work with or replace Regional Drought Teams to manage water in that area. Some areas in BC already have multi-stakeholder committees that address water sustainability issues. These committees would work with the Regional Drought Teams.

2.2.2 Regional Drought Plans

Regional Drought Plans are developed by Regional Drought Teams. They are intended to build on and provide further detail to the plans and actions set out in this document, but specific to the geographic region they cover.

They should identify actions and responses related to the provincial drought response. They should clearly assign responsibilities for these actions to appropriate provincial and local agencies, or stakeholder group. Ideally, these plans will be in place prior to the onset of drought and will be recognized and supported by the major water users in the watershed. Typically, a Regional Drought Plan will include:

- ◆ area the plan covers;
- ◆ members of drought management team;
- ◆ roles and responsibilities of Team Members;
- ◆ details surrounding a Stream Watch List;
- ◆ how drought will be assessed and the corresponding response;
- ◆ a data management plan;
- ◆ a communication plan; and
- ◆ any training that will need to occur.

2.2.3 Local Authorities

Local authorities that may be involved in drought management include local governments, water suppliers, regional health authorities, First Nations and other regional agencies with responsibilities for water (e.g. the Okanagan Basin Water Board, the Columbia Basin Trust, the Salmon River Watershed Roundtable, Cowichan Water Board, Nicola Water Use Management Plan etc.).

The structure of governance arrangements for water varies from region to region, as do climatic and geographic conditions, so it is appropriate that there will be different organizational approaches to drought preparedness and response. The document [*Dealing with Drought: A Handbook for Water Suppliers in BC*](#) includes the recommendation to form a local drought management team. In certain areas, this

team could provide a linkage between the Regional Drought Team and water suppliers, while in others, the regional team may play that role. There is no “one size fits all” solution for BC.

Roles of local authorities may include the following:

- ◆ gathering available drought information for the community;
- ◆ identifying information gaps;
- ◆ identifying vulnerable aquatic ecosystems;
- ◆ targeting water management needs;
- ◆ implementing water conservation strategies;
- ◆ managing community water supplies;
- ◆ communicating with the public; and
- ◆ participating as part of Regional Drought Teams in the coordination of drought response.

Early and frequent communication about water supply conditions and responses is key to successful drought management. Local authorities may use a combination of communication tools, water supply and demand data, regulatory instruments and other tools to advocate for water conservation across the community. They may communicate directly with residents about drought management goals, actions, water supply status, and forecasts. They can also conduct one-on-one meetings with major water users in the community to discuss water conservation plans, and their role in implementation.

Local Drought Management Plans are developed by local authorities and water suppliers to help manage their water supply in times of drought. These plans can include:

- ◆ documentation on the water system profile;
- ◆ evaluation of the potential impacts of drought on the region’s economy;
- ◆ data requirements, frequency of data collection and reporting protocols on local water supplies and climate;
- ◆ clear definitions of local drought stages and corresponding local responses including emergency response and contingency plans;
- ◆ streams or aquatic ecosystems of concern; and
- ◆ communication plans.

See Appendix 2 and 3 in the [Dealing with Drought: A Handbook for Water Suppliers in BC](#) for more information on local drought management plans, water conservation plans and emergency drought planning.

2.2.4 Water Bailiffs

An important role at the local level is that of the water bailiff. Under Section 38 in the WSA, the Comptroller of Water Rights, or water manager, can appoint a water bailiff to act on behalf of the province to manage conflicts in a stream before or during a drought. These people are given the authority to enter on any land and to regulate and control the diversion and use of water by all users (authorization holders

as well as users that are not authorization holders) and control all diversion works on these streams or aquifers.

3. Pre-Drought Preparedness

Droughts can vary dramatically in duration and severity and be difficult to forecast. They can result in great social and economic upheaval, requiring the concerted efforts of numerous parties if a response is to be effective. It is best to not delay preparing for them until the last minute. The escalation of a drought level by the province is not needed to take non-regulatory and regulatory actions.

During normal conditions, there are many tasks that communities and individual water users can do to prepare for drought. One area of example is targeting water use efficiency improvements within the household, industry and agricultural.

At the provincial level, the main activities undertaken to prepare for drought include:

- ◆ monitor and characterize stream flows, critical environmental flow thresholds, lake levels, aquifer levels and groundwater data; (FLNRORD in partnership with other organizations);
- ◆ deliver seasonal volume forecasts based on meteorological, hydrometric and snowpack data and the use of hydrological models (FLNRORD);
- ◆ provide regular updates on stream flow and groundwater data on the internet (ENV and FLNRORD);
- ◆ develop, refine and maintain hydrological hazard and risk models to guide community planning and emergency response (ENV);
- ◆ monitor water levels in priority aquifers through the Provincial Observation Well Network (FLNRORD);
- ◆ monitor snowpack conditions using automated and manual techniques to support stream flow forecasting (ENV and FLNRORD);
- ◆ monitor the Drought Code and Fire Danger Class (FLNRORD and FLNRORD wildfire branch);
- ◆ maintain infrastructure and systems that support monitoring, data collection and data processing (ENV and FLNRORD);
- ◆ conduct data quality assurance and auditing on water and snow related data collected using up-to-date standards (ENV);
- ◆ work with water suppliers and local communities to ensure that they have the necessary information to respond when droughts are forecast (FLNRORD, MAH);
- ◆ provide local governments and water suppliers with planning tools to prepare for drought (FLNRORD, MAH);
- ◆ implement the *Drinking Water Protection Act* (HLTH in partnership with the Regional Health Authorities);
- ◆ maintain a list of available contractors e.g., Environmental monitors or qualified persons, in each region that can be called in as needed (ALL);
- ◆ prepare and update factsheets, guidelines and policies to aid agricultural producers to understand, prepare for and manage drought (AGRI); and,
- ◆ maintain and update provincial drought management policies, procedures and plans including this document (ENV, FLNRORD, AGRI, MAH, HLTH).

Under the WSA, critical environmental flow thresholds (CEFTs) will need to be calculated for the streams in those areas where a significant water shortage has been declared under a s. 86 order. The s. 86 orders enable the CEFT orders under s. 87. The CEFT order becomes the highest priority at this point and can mean an increase in regulating stream water and groundwater use in hydraulically connected aquifers. Where sufficient water is available, these CEFT orders will allow for the protection of the CEFT for the regionally significant aquatic ecosystems in the stream. For an ecosystem to be at risk of significant or irreversible harm there must be at least one stream that has fallen or is at risk of falling below the CEFT. It is therefore beneficial to calculate the CEFTs for different aquatic ecosystems at different times of the year.

At the regional level, the main activities undertaken by provincial agencies (in collaboration with federal agencies, local authorities and water users) to prepare for drought may include:

- ◆ establish Regional Drought Teams;
- ◆ gather available local information on historic droughts, water supply and climate conditions; identify information gaps;
- ◆ identify streams and aquatic ecosystems of concern and calculate the Critical Environmental Flow Thresholds for those streams;
- ◆ encourage water conservation, stewardship and education through local media;
- ◆ continuously promote the improvement of the efficiency of agricultural irrigation systems;
- ◆ encourage agricultural producers to consider water status from the previous season when planning the next year's production. Soil moisture levels, reservoir levels, stream flows, snowpack and groundwater levels are all important factors;
- ◆ encourage agricultural producers to review information on crop selection, irrigation efficiency and water conservation.

As part of drought preparedness, local authorities' responsibilities may include:

- ◆ complete a water supply and demand analysis, local drought management plans and emergency response and contingency plans; update and practice implementation of plans annually;
- ◆ establish water conservation strategies and water use reduction targets;
- ◆ implement water conservation programs; continuously improve water use efficiency;
- ◆ incorporate water conservation into planning and daily operations;
- ◆ municipal authority is required to enforce water restrictions. Local governments should develop bylaws for water conservation, drought management and emergency drought preparedness to respond to low water supply.

4. Drought Response Levels, Indicators and Actions

4.1 Drought Response Levels

The B.C. Drought Response Plan is organized around four successive levels of drought targeted at the water basin and watershed/stream levels. Early in the season, the drought level represents a forecast of potential dry conditions. The likelihood and extent of drought is assessed based, among other indicators, on stream flows and precipitation.

At Level 1 (Green), conditions are normal and there is sufficient water to support ecosystem and water uses. Emphasis is on preparedness and taking action in advance of droughts in order to increase readiness of water users and communities when they inevitably occur.

At Level 2 (Yellow), conditions are dry and first indications of potential water supply shortages are recognized. Emphasis is on stewardship, voluntary conservation through education, communication and planning and possibly curtailing unauthorized use.

At Level 3 (Orange), conditions are becoming very dry. Potentially serious ecosystem or socio-economic impacts are possible or imminent and impacts may already be occurring. Emphasis continues to be on voluntary conservation and restricting or curtailing unauthorized use, while water suppliers may impose increasing watering restrictions. If serious impacts are occurring in an area, the provincial government will likely consider regulatory action.

At Level 4 (Red), conditions are extremely dry and there is insufficient supply to meet community or ecosystem needs, progressively more severe and widespread socio-economic impacts are expected. Voluntary measures and increasing use of watering restrictions will continue but may be augmented by regulatory action by the provincial government.

Further action including emergency responses may be required in the event that a community or system experiences complete loss or near loss of supply. More information can be found in the regional drought plans and in the document; [Dealing with Drought: A Handbook for Water Suppliers in BC](#).

As noted above, BC is a place of extreme biogeoclimatic diversity. These levels are intended to be applied in water basins and where feasible, based on the best available scientific data, within specific watersheds. It is therefore likely that different areas and watersheds will be at different levels of response during any given drought year.

The drought levels and their corresponding objectives are summarized in Table 2. These Provincial drought levels are determined by the Province, based on stream flow levels. Actions under the BC Drought Response Plan are based on these levels. Drought levels are different from local watering restrictions, which are decided by the local water supplier. Targeted drought actions are further discussed in Section 4.5, and Appendix 2.

The Provincial drought level in any given area does not affect the availability of the regulatory tools to manage water in a specific water source during a time of scarcity. It is therefore important to undertake much of the preparatory work described in this document early in the season.

Table 2: Drought Levels Summary

Level	Conditions	Significance	Objective
1 (Green)	Normal Conditions	There is sufficient water to meet human and ecosystem needs	Preparedness
2 (Yellow)	Dry Conditions	First indications of a potential water supply problem	Voluntary conservation
3 (Orange)	Very Dry Conditions	Potentially serious ecosystem or socioeconomic impacts are possible	Voluntary conservation and restrictions
4 (Red)	Extremely Dry Conditions	Water supply insufficient to meet socio-economic and ecosystem needs	Voluntary conservation, restrictions and regulatory action as necessary.

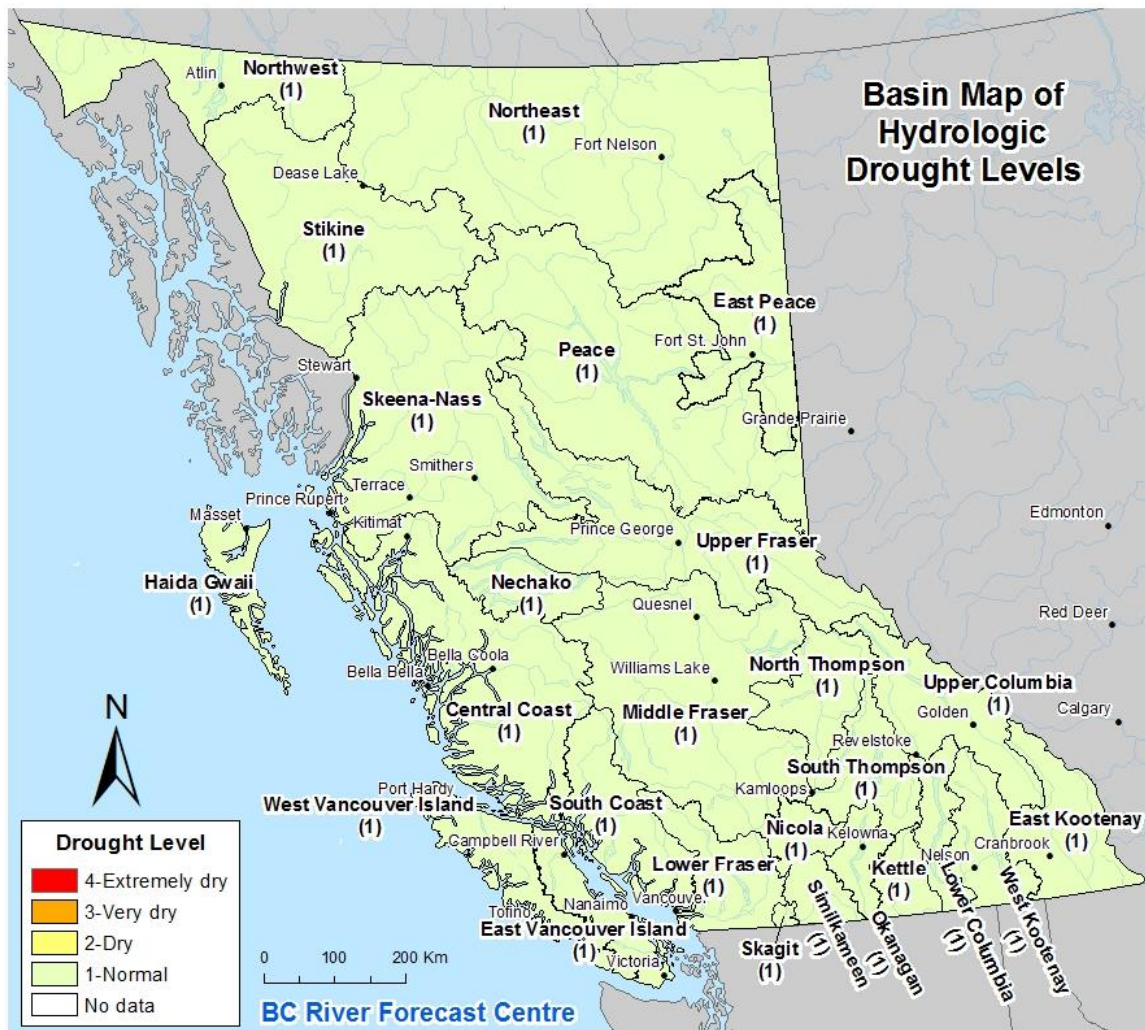


Figure 2. British Columbia watershed basin map representing the corresponding drought level. All basins are illustrated at Level 1 for the purpose of example.

4.2 Drought Indicators Criteria

The Drought Indicators Criteria described in this section assists decision makers with determining when it is necessary to elevate drought response to incrementally higher levels in any particular region or watershed in the province.

Measuring drought is a complex process, particularly in a place like B.C. with its geographic diversity and complex regional microclimates. Most indicators also require comparison to other droughts, which demands robust sets of historical climatic data.

Analysis of previous droughts indicates that there are three major factors involved with drought occurrence: low winter snow accumulation (as measured near the end of the winter), spring weather (low precipitation during May and June) and summer weather (low precipitation during July and August). For drought to occur, often two of the three factors need to exist. For severe drought (as in 1929, 1931, 1955, 2003, 2009 and 2015), often all three factors need to exist, in addition to multiple years of reduced precipitation. As a result, multiple indicators usually need to be consulted to know if drought is occurring or likely.

British Columbia's drought indicators need to refer to the causative factors (snow conditions, spring and summer precipitation, preceding drought) and the resultant factors (stream flow, lake and reservoir levels).

The Drought Indicators Criteria is comprised of four core indicators and a number of supplemental indicators. The core indicators are as follows:

Early Season Forecast Indicators:

- ◆ Basin Snow Indices
- ◆ Seasonal Volume Runoff Forecasts

Drought Season Core Indicators:

- ◆ 30 Day Percent of Average Precipitation; and
- ◆ 7-Day Average Stream flow

These core indicators were chosen because data tends to be readily available, they are relatively easy to use and communicate, and FLNRORD's River Forecasting Centre and other agencies have experience working with them. Good historical data is usually available. They can be used to speak consistently about water supply in particular watersheds while also allowing for meaningful comparisons across the province. Although early season indicators are used to forecast the risk of drought, assessing drought and setting drought levels relies primarily on the drought season core indicators.

The following provides a very brief description of each indicator.

Basin Snow Indices: calculated as the mean of snow water equivalent values (expressed as % of the 1981-2010 normal) for representative snow courses and snow pillows in major river basins in B.C. The critical reporting dates are the first days of the month from January through to May.

Volume Runoff Forecasts: this indicator is based on multi-variate statistical analysis, and is quantitative forecasts of seasonal runoff (e.g., Mar-Aug, Apr-Aug, or Mar-Jun, Apr-Jun) for river basins. These forecasts have the advantages of being quantitative, consistent, repeatable, and having definable confidence limits.

30 Day Percent of Average Precipitation: a simple measurement of rainfall for a single region or a single season. It is calculated by dividing actual precipitation by normal precipitation - typically considered as a multi-decade mean - and multiplying by 100%. Normal precipitation for a specific location is considered to be 100%. Percent of Average Precipitation is tracked by Agriculture and Agri-Food Canada and data is readily available at a number of different timescales [online](#). The 30-day time scale is used for this criterion, but other timescales of 60, 90 or 180 days will also usually be referred to.

7-Day Average Stream flow: As the name suggests, this indicator looks at 7-day average stream flows in selected systems expressed as a percentage of the historic median. It uses a weekly average stream flow for a number of different streams in a particular region or watershed. Data is sourced from indicator Water Survey of Canada hydrometric stations and reviewed or validated by provincial hydrologists.

In addition to the core indicators, the Technical Drought Working Group may also refer to additional information from the supplemental indicators. Although there are no quantitative thresholds associated with these supplemental indicators, they may be used to help assess current and forecasted drought conditions and may be used at the local level to help guide activities and planning, particularly at higher levels of drought alert (i.e. Levels 3 and 4). Supplemental indicators that may be considered include:

- ◆ aquifer levels;
- ◆ individual indicator hydrometric station results;
- ◆ measured flows at discontinued WSC or provincial hydrometric stations;
- ◆ community or commercial operations that are responding to low snow pack or low water supplies;
- ◆ multi-year trends;
- ◆ reservoir inflows;
- ◆ wildfire danger class ratings, tracked by [Wildfire Management Branch](#); and
- ◆ indicator aquatic species.

Table 3 provides a summary of the different indicators and their time of use. Tables 4 and 5 set out the quantitative thresholds for the core indicators.

Table 3: Drought Indicators Criteria Summary

		Timing of Use	
		Early Season	Drought Season
Indicator	Core Indicators	Basin Snow Measures	7-Day Average Stream flow
		Seasonal Volume Runoff Forecasts	30 Day Percent of Average Precipitation

	Supplemental Indicators	Aquifer Levels Individual Indicator Hydrometric Station Results Multi-Year Trends Reservoir Inflows Wildfire Danger Class Ratings
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Note: these are different from the criteria used for the regulatory tools under the WSA.

Table 4: Early Season Forecast Core Indicator Thresholds

	Level 1 (Green)	Level 2 (Yellow)	Level 3 (Orange)	Level 4 (Red)
Basin Snow Measures±	>80%	80-65% of normal	<65% of normal	
Seasonal Volume Runoff Forecasts	>80%	80-61% of normal	60-45% of normal	<45% of normal

±: Basin Snow Measures would not normally be relied on as a basis for elevating drought response to Level 4 (Red). However, the Inter-Agency Drought Working Group may decide that this elevation is warranted in the case of exceptionally low results.

Table 5: Drought Season Core Indicator Thresholds and Levels

	Level 1 (Green)	Level 2 (Yellow)	Level 3 (Orange)	Level 4 (Red)
30 Day % of Average Precipitation ¥	>80%	80-51% of average	50-25% of average	<25% of average
7-Day Average Stream flow	>25 percentile	11-25 percentiles	6-10 percentiles	<6 percentiles

¥: The 30 day time scale is used for this criterion, but other timescales - 60, 90 or 180 days - will also usually be referred to.

4.3 Moving From One Level to Another

The Technical Drought Working Group determines when to move to an elevated level of drought response - Level 1 (Green) through to Level 4 (Red) - in any particular watershed or geographic area based on consideration of the Drought Indicators Criteria, the advice of local authorities and other factors.

The Technical Drought Working Group, in collaboration with the Regional Cross-Government Drought Teams consider the current and forecasted status of all the core indicators in the Drought Indicators Criteria to determine the severity of the drought. Each measure and index serves only as a relative guide. Decisions may be based on what the majority of indicators show or may be based on any one particular indicator. The group may also consider results from the supplemental indicators and other information as appropriate.

During drought years, the Drought Indicators Criteria are re-assessed at a minimum of once a month and the drought levels are typically only adjusted monthly to facilitate a smooth transition for water users and to allow time for conservation measures to take effect. However, in some cases it may be necessary to use finer time scales. For example, FLNRORD’s River Forecast Centre analyses average stream flow data on a weekly basis. Results of this analysis may warrant escalating to a higher level of drought response more frequently than monthly.

In exceptional circumstances, the PTDWG may determine that it is necessary to “leapfrog” over one level to a subsequently higher one. For example, it may be necessary to move directly from Level 1 to Level 3 or Level 4. This could occur for any region as some streams may deteriorate rapidly.

Re-assessment of Drought Indicators Criteria may also lead to easing back of drought levels, such as a movement between from level 3 to level 2 due to changing conditions. For example, basin wide drought level forecasts based on low snow pack may be eased by above average precipitation in spring.

4.4 Drought Regulatory Tools

During a drought, when voluntary water conservation measures are not sufficient to meet all water user rights, protect critical environmental flows or the survival of a fish population, the WSA provides authority for statutory officials to regulate both stream water and groundwater. Implementing regulatory tools to address drought affects the ability of water users to exercise their water rights. The Province can apply the following regulatory tools during water scarcity, alone or in combination. Implementing any of these regulatory tools is not dependent on a specific drought level:

- ◆ Suspend water diversion and use that is not authorized or no longer allowed

One of the actions statutory officials can take at any time is to suspend water diversion and use that was never authorized, is no longer allowed, or is no longer authorized under an applicable authorization, statutory provision or regulation.

- ◆ Enforce special terms and conditions in water authorizations

The WSA gives the decision maker the discretion, when deciding on water authorizations, to include special terms and conditions. These authorizations are issued with particular requirements that allow the user to divert and use water in specific circumstances. Enforcing these special clauses is an early regulatory action that government can take during times of water scarcity.

- ◆ First in Time, First in Right (FITFIR)

First in Time, First in Right (FITFIR) is the priority of water rights under s.22 of the WSA. FITFIR may be enforced during times of water scarcity to reduce or restrict water diversion and use from a stream (and any hydraulically connected aquifer) or an aquifer (and any other hydraulically connected aquifer). In general, the oldest rights have priority over the newer rights, regardless of the water use. This general rule, however, is modified when critical environmental flow thresholds (CEFTs) are established through orders under s. 87 of the WSA to prevent significant or irreversible harm to aquatic ecosystems for streams in an area of declared water shortage. In addition, enforcement of FITFIR must still allow water use of up to 250 litres of water per day per private dwelling for essential household use (EHU).

- ◆ WSA s. 86 order declaring a significant water shortage combined with WSA s. 87 order protecting a critical environmental flow threshold

The WSA introduces two new regulatory tools that are applied together during water scarcity to give priority of water rights to CEFTs when there is potential for significant or irreversible harm to an aquatic ecosystem due to low water flow.

Under s. 86 of the WSA, the minister or the Lieutenant Governor in Council can make an order declaring a significant water shortage in an area, if one or more streams in an area have fallen or are at risk of falling below its CEFT.

Once a significant water shortage order is declared in an area, WSA s. 87 establishes that the Comptroller of Water Rights must, by order, determine the CEFT for each stream that meets a set of specific criteria. Once a s. 87 order has established the CEFT for a stream, the CEFT has precedence over other rights of water users.

- ◆ WSA s. 88 fish population protection order

WSA s. 88(1) authorizes the minister, after considering agricultural needs, to make an order respecting the diversion and use of water from a specified stream or hydraulically connected aquifer if the minister considers that the flow in a stream is so low that the survival of a fish population may become threatened. A fish population protection order is a powerful tool that can be used to regulate specific water users regardless of their priority, when its application is expected to yield immediate, direct benefits to a fish population whose survival is threatened.

4.5 Drought Response Actions

This section provides a high level summary of actions that may be undertaken at each level of drought. A much more detailed inventory of actions is provided in Appendix 2. The activities that follow are intended as general guidance for provincial drought response actions and will mostly be used during drought season. Early season actions are not anticipated to reach Level 4 or include regulatory measures, and will consist mainly of communication with water users and planning. Precipitation in May and June will determine the extent and severity of a drought in the various regions across BC. In addition, every drought is different and creative responses are required to meet the situation at hand and unforeseen circumstances. Deviation from specific actions listed in the framework below is expected.

Level 1 (Green)

At Level 1, conditions are normal and emphasis is on drought preparedness. The recommended actions at both the provincial and local level are summarized in Section 3, above.

Level 2 (Yellow)

At Level 2, emphasis is on stewardship and voluntary conservation through education, communication and planning. As a general guideline, water users should target a

reduction in water use. The overall objective is to begin preparations under the precautionary assumption that stream flow conditions may deteriorate further. Key actions that should be undertaken include the following:

- ☑ issue province-wide news release and targeted news releases in impacted geographic regions;
- ☑ issue information bulletins to local governments, water suppliers, First Nations (all First Nations communications should go through the First Nation Health Authority and be directed to the Ministry of Indigenous Relations and Reconciliation), industry and stewardship groups, major licensees and other key stakeholders in impacted water basins and specific watersheds/streams;
- ☑ review water conservation advice, guidelines and materials for local government, water suppliers and agricultural producers and update as appropriate;
- ☑ where appropriate, advise agricultural producers to take early actions such as filling reservoirs and filling soil profiles with freshet water if available;
- ☑ use direct and indirect communications to request water licensees voluntarily work together, conserve, share water and consider in-stream needs;
- ☑ local governments introduce outdoor watering restrictions;
- ☑ increase monitoring effort as required on stream flow conditions and aquifer levels in impacted geographic regions.

Level 3 (Orange)

At Level 3, conditions are becoming very dry. Emphasis continues to be on voluntary conservation but increasing use of watering restrictions may be imposed by water service providers. As a general guideline, water users should aim to reduce use for all non-essential needs. Key actions that should be undertaken include the following:

- ☑ intensify communication efforts as appropriate based on current conditions; issue updated province-wide news release, and on River Forecast Centre website;
- ☑ continue to issue local media releases and/or targeted advertising to advise of watering restrictions, encourage conservation, provide updates on local water supply status and forecast future conditions specific to the community;
- ☑ provide regular direct updates to local governments, water suppliers, First Nations, industry and stewardship groups, major licensees and other key stakeholders in impacted geographic regions;
- ☑ assess vulnerability of water supplies
- ☑ advise high volume water licensees (or all licensees on high risk streams) directly of conditions via mail or email and request that they implement voluntary conservation measures;
- ☑ local governments implement next stage watering restrictions to achieve targeted reduction in water use; enforce compliance through bylaws.
- ☑ provide access to waiver for agricultural producers seeking to meet minimum production levels to maintain farm status for tax purposes, thereby avoiding unnecessary use of water.
- ☑ determine list of streams at risk and calculate CEFT (if not already done) for these streams. Assess hydraulic connectivity between these streams and adjoining aquifers.
- ☑ Provincial government may take regulatory action.

Level 4 (Red)

At Level 4, voluntary measures and increasing use of restrictions will continue but may be augmented by regulatory responses by the provincial government. This may include mandatory reductions or cessation of water use. Water users should work together to minimize water use wherever possible in order to ensure that community and ecosystem needs will be met. Key actions that should be undertaken include the following:

- ☑ increase frequency of communication by all levels of government and water suppliers with all water users through media, advertising, internet, email updates and other channels;
- ☑ continue to issue information bulletins to local governments, water suppliers, First Nations, industry and stewardship groups, major licensees and other key stakeholders in impacted geographic regions;
- ☑ local governments implement progressively stricter watering restrictions to achieve targeted reduction, including outdoor watering bans where necessary;
- ☑ likely that Provincial government may implement regulatory action under the WSA or other statutes (such as Federal action under the *Fisheries Act*) as appropriate if voluntary measures are not enough to protect water users, aquatic ecosystems and fish;
- ☑ consider diverting available water from annual crops to perennial crops and higher value crops to keep them alive for future years.
- ☑ provide assistance to communities seeking alternative or temporary water supplies;
- ☑ prepare for emergency response where risk of loss of supply exists.

4.6 Loss or Failure of Supply

The extreme outcome of drought is loss, near loss or failure of a community's potable water supply or supply for firefighting. In this event, the objective becomes an emergency response and protecting public health and safety.

Water suppliers remain responsible for ensuring that water supplies are adequate to maintain public health and safety.

Local governments and water suppliers should monitor their situation closely to ensure that mitigation measures undertaken are sufficient to prevent the loss or failure of water supplies. In the event that loss of supply occurs or is forecast, water suppliers should follow the steps in their Emergency Response and Contingency Plan as required by the *Drinking Water Protection Act*. Depending on circumstances, it may be necessary to impose comprehensive and closely monitored watering restrictions, allocate water on a per capita basis, or seek use of alternative water supplies.

Local authorities can find guidance on developing emergency drought plans or an Emergency Response and Contingency Plan in [Dealing with Drought: A Handbook for Water Suppliers in BC](#) (Appendix 3).

Where loss or failure is imminent, local governments and/or water suppliers should contact the local Drinking Water Officer at the Regional Health Authority. Where necessary, the provincial emergency management framework will provide coordination to address community specific requirements. Resources on emergency management in BC can be found in Appendix 7.

All emergency situations that affect the health and safety of the public should be reported to Emergency Management B.C. at 1-800-663-3456.

5. Post-Drought Actions

Following the end of a drought, emphasis should shift to maintaining the resources affected and to applying the lessons learned to improve long term water sustainability. Some tasks to consider include:

- ◆ the Technical Drought Working Group should retract existing drought ratings and advise of return to Level 1 (Green);
- ◆ water suppliers should restore operations and ensure that drought-driven systems improvements and modifications are in compliance with relevant standards;
- ◆ provincial and federal data and information providers may review the effectiveness of systems to monitor and characterize stream flows, water levels, snowpack and groundwater during the drought and implement any identified improvements;
- ◆ the Inter-Agency Drought Working Group, the Technical Drought Working Group, and other involved parties should hold a post drought workshop to assess the equity, efficiency and effectiveness of communications, information, actions and monitoring that were undertaken. Lessons learned should be documented. This might result in recommended improvements to:
 - Local Drought Management Plans;
 - terms of reference for the Inter-Agency Drought Working Group and Technical Drought Working Group;
 - this plan (the British Columbia Drought Response Plan);
 - other provincial policies, guidelines and fact sheets;
 - amendments to provincial legislation and municipal bylaws;
- ◆ stakeholders and individuals who demonstrated a strong stewardship ethic during the drought should be profiled and publicly recognized;
- ◆ revisit established water conservation strategies and reduction targets; continuously improve community water use efficiency; and
- ◆ refer to documented quantitative impacts on fish and aquatic ecosystems as related to indices of stream flow state (% LT MAD) such as delayed spawning access or impacts on smolt production.

6. Future Refinements

This plan is considered a living document and may be updated and revised based on experiences and learning. Changes may be made based on the approval of the IADWG and in consultation with the PTDWG.

Appendix 1: Drought Definitions

Meteorological Drought is generally defined by comparing the rainfall in a particular place and at a particular time with the average rainfall for that place. Meteorological drought leads to a depletion of soil moisture and this almost always has an impact on crop production. When we define drought this way, we only consider the reduction in rainfall amounts and do not take into account the effects of the lack of water on water reservoirs, human needs or on agriculture.²

Hydrological Drought is associated with the effect of low precipitation on water levels in rivers, reservoirs, lakes and aquifers. Hydrological droughts usually are noticed some time after meteorological droughts. First precipitation decreases and, some time after that, water levels drop. Hydrological drought affects uses which depend on groundwater and stream water levels and stream flows. Changes in water levels affect ecosystems, hydroelectric power generation, and recreational, industrial and urban water use.³

Agricultural Drought occurs when there is not enough water available for a particular crop to grow or livestock to thrive at a particular time. This drought does not depend only on the amount of precipitation, but also on the correct use of water. Agricultural drought is typically seen after meteorological drought but hydrological drought may also be a factor.⁴

Socio Economic Drought occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply. The supply of many economic goods, such as water, forage, food grains, fish, and hydroelectric power, depends on weather. Severity and impact are affected by water demand, the extent of water use efficiency measures, and the ability to bring new supplies on-line.⁵

Ecological drought is a prolonged and widespread deficit in naturally available water supplies – including changes in natural and managed hydrology – that create multiple stresses across ecosystems.⁶

² This definition was agreed to by a working group of staff from BC, Alberta, Saskatchewan and Manitoba during the Western Water Stewardship Council Technical Workshop on Drought Preparedness held in Calgary on 4 May 2009 and adapted from the National Drought Mitigation Center (University of Nebraska) <http://drought.unl.edu/Home.aspx>

³ Ibid.

⁴ Ibid.

⁵ Ibid.

⁶ National Drought Mitigation Center (2016) What is Drought? Understanding and Defining Drought, accessed on June 12, 2018, from <http://drought.unl.edu/Education/DroughtIn-depth/TypesofDrought.aspx>

Appendix 2: Detailed Action Tables

Level 2 (Yellow) Actions

Level:	Level 2 (Yellow)	
Objective:	Voluntary conservation among all sectors and users	
Suggested Target:	Minimum 10% reduction in total water use, subject to local conditions.	
Actions	Lead Responsibility	
Communication and Coordination		
Notify IADWG and PTDWG; reaffirm duties and responsibilities; schedule regular meetings for duration of dry season	FLNRORD (Chair IADWG)	
Update drought communications plans based on stream flow conditions and forecasts in impacted geographic regions	FLNRORD (Chair IADWG) GCPE	
Initiate direct contact and information exchange protocols between key contacts in FLNRORD and DFO	FLNRORD DFO	
Initiate direct contact and implement information exchange protocols between FLNRORD and key contact(s) in water suppliers in impacted geographic regions	FLNRORD (Regions) Local government and water suppliers	
Initiate direct contact and implement information exchange protocols between AGRI and key agricultural industry groups in impacted geographic regions	AGRI	
Initiate direct contact and information exchange between FLNRORD and key contact(s) in the FLNRORD-Wildfire Management Branch in impacted geographic regions to coordinate on wildfire threats and potential impact on water supplies, including use of water in fire fighting	FLNRORD (Chair IADWG) FLNRORD Office of Fire Commissioner	
Issue province-wide news release and targeted news releases in impacted geographic regions	FLNRORD GCPE	
Issue information bulletin to local governments, water suppliers, First Nations, industry and stewardship groups, major licensees and other key stakeholders in impacted geographic regions	FLNRORD	
Issue and distribute Low Stream Flow Advisories as required in impacted geographic regions	FLNRORD DFO	
Provide regular updates via email to local governments, water suppliers, First Nations, industry and stewardship groups, major licensees and other key stakeholders in drought areas	FLNRORD	
Update FLNRORD drought and RFC internet sites to provide up-to-date stream flow and groundwater data and information	FLNRORD (Chair IADWG) FLNRORD	
Use local media releases and/or targeted advertising to advise of watering restrictions, encourage conservation, provide updates on local water supply status and forecast	Local government and water suppliers	

future conditions	
Review water conservation advice, guidelines and materials for local government and water suppliers and update as appropriate	FLNRORD MAH
Review water conservation advice, guidelines and materials for agricultural producers and irrigators and update as appropriate	AGRI
Where appropriate, advise agricultural producers to take early actions such as filling reservoirs and filling the soil reservoir where possible.	AGRI
Designate local spokesperson to coordinate interaction with the public and media on local level issues	FLNRORD GCPE
Other Actions	
Notify local governments and water suppliers that they should communicate with residents and businesses to request voluntary conservation efforts	FLNRORD (Chair IADWG) MAH
Implement appropriate watering restrictions to achieve targeted reduction in water use	Local government and water suppliers
Temporarily discontinue issuing major new water licences or short term use approvals as appropriate	FLNRORD (Regions)
Request provincial government agencies to conserve water at public facilities, particularly outdoors	FLNRORD (Chair IADWG)
Use direct and indirect communications to request water licensees voluntarily work together, conserve, share water and consider in-stream needs	FLNRORD (Regions)
Review inventory list of sensitive ecoregions, specific streams and identify likely fish sensitive periods	FLNRORD (Regions)
Encourage and train agricultural producers on the use of irrigation scheduling techniques and other tools such as the on-line irrigation scheduling calculator on specific streams	AGRI
Monitoring	
Increase monitoring effort as required on stream flow conditions and aquifer levels in impacted geographic regions	FLNRORD FLNRORD (Regions) DFO
Monitor stream conditions for additional information such as dry riffles, dewatered spawning redds, reported fish deaths, water temperature, etc. in impacted geographic regions	FLNRORD FLNRORD (Regions) DFO
Monitor community water supply level	Local government Water suppliers
Monitor water use by authorization holders (licensees and use approval holders)	FLNRORD (Regions) Local government Water suppliers
Monitor and enforce compliance with restrictions and allocations through bylaws	Local government and water suppliers

Documentation and Preparation for Next Level	
Develop a database of water licensees and short term use approval holders on streams that have or may have Low Stream Flow Advisories issued	FLNRORD FLNRORD (Regions)
Identify and prepare to use additional communication channels for next level including social media (e.g. Twitter) and mass media advertising	FLNRORD (Chair IADWG) GCPE
Identify possible community groups and key stakeholders that may assist with information distribution in next phase	FLNRORD (Regions)
Inform Natural Resources Board and Minister of FLNRORD of possible move to Level 3 (Orange)	FLNRORD (Chair IADWG) FLNRORD (Executive)
Document conservation actions taken to date; maintain registry of groups and individuals contacted	FLNRORD (Chair IADWG) FLNRORD (Regions) AGRI, MAH

Level 3 (Orange) Actions

Level:	Level 3 (Orange)	
Objective:	Voluntary conservation and restrictions	
Suggested Target:	Minimum additional 20% reduction in total water use, subject to local conditions.	
Actions	Lead Responsibility	
Communication and Coordination		
Increase frequency of IADWG meetings as appropriate	FLNRORD (Chair IADWG)	
Intensify communication efforts as appropriate based on current streamflow conditions; issue updated province-wide news release and targeted news releases with updated information and conservation requests in impacted geographic regions	FLNRORD GCPE	
Hold media news conference to announce activation of additional drought measures and to provide updated information; outline media plan to notify public of changes to streamflows and additional conservation measures	FLNRORD GCPE	
Continue to issue local media releases and/or targeted advertising to advise of watering restrictions, encourage conservation, provide updates on local water supply status and forecast future conditions specific to the community	Local government and water suppliers	
Continue provision of regular updates on streamflow and groundwater data on the internet; increase frequency of updates as appropriate	FLNRORD	
Advise high volume water licensees (or all licensees on high risk streams) directly of conditions via mail or email and request they implement voluntary conservation measures	FLNRORD (Regions)	
Provide regular updates via email to local governments, water suppliers, First Nations, industry and stewardship groups, major licensees and other key stakeholders in impacted geographic regions; intensify frequency of updates as appropriate	FLNRORD (Chair IADWG) FLNRORD (Regions)	
Commence utilization of additional communication channels as appropriate to inform water users and the public about drought conditions including print advertising, social media (e.g. Twitter), community and agricultural associations, etc.	FLNRORD AGRI GCPE	
Ensure ongoing direct contact between key contacts in FLNRORD and EMBC; review information exchange protocols on drought and emergency response	FLNRORD, MOH, MAH EMBC	
To reduce water use on streams for which an order from ENV is under consideration, provide the first communication with producers on the process and requirements that are to be followed.	AGRI	
Prepare to provide access to information on stress management resources for agricultural producers as required via internet and other forums	AGRI	
Prepare information on provincial and federal drought programs that can assist producers to help cope with drought	AGRI	

Organize workshops for producers in affected areas to provide guidance on water conservation activities, drought assistance programs and processes for application if appropriate	AGRI
Submit drought assessment reports as necessary to deputy ministers and other senior executives	FLNRORD (Chair IADWG) FLNRORD (Executive)
Other Actions	
Impose restrictions as appropriate based on priority water licence rights, in addition to voluntary water conservation requests	FLNRORD (Regions)
Limit the number of, or impose restrictions on, new licences, regulate storage or invoke conditions on existing licences	FLNRORD (Regions)
Implement next stage watering restrictions to achieve targeted reduction in water use	Local government and water suppliers
Eliminate filling of public fountains and watering of public parks, gardens, medians and other similar areas	Local government and water suppliers
Limit new connections or uses as appropriate	Local government and water suppliers
Request Stop Work Diversion Initiatives on Flow Sensitive Fish Streams as appropriate	FLNRORD (Regions) DFO
Ensure that water bailiffs are appointed and active on appropriate streams in drought areas; complete any necessary briefings or training with water bailiffs	FLNRORD (Regions)
Modify flood prevention, flow augmentation and power generation reservoir activities as appropriate to minimize impact of drought	BC Hydro Local government and water suppliers
Provide technical assistance and specific measures to water suppliers experiencing problems with system management or promotion of conservation	MAH
Commence reporting on status of water supplies and forecasted future scenarios to ENV	Local government and water suppliers Potential help from Drinking Water Protection Officers
Request provincial government agencies elevate efforts to conserve water at public facilities	FLNRORD (Chair IADWG)
Monitoring	
Monitor and enforce compliance with next stage restrictions and allocations through bylaws	Local government and water suppliers
Prioritize and intensify monitoring of stream conditions as required in impacted regions; identify most efficient alternatives for monitoring	FLNRORD FLNRORD (Regions) DFO
Continue to monitor water use by communities and water licensees; increase monitoring as required	FLNRORD (Regions) Local government

	Water suppliers Health Authorities
Monitor and enforce compliance with restrictions and allocations through bylaws; increase enforcement effort as appropriate	Local government and water suppliers
Documentation and Preparation for Next Level	
Identify additional groups and associations that may assist with actions at next level	FLNRORD (Regions)
Inform Natural Resources Board, Minister of FLNRORD, and EMBC of possible move to Level 4 (Red) and identify impacted geographic regions	FLNRORD (Chair IADWG) FLNRORD (DM Office) EMBC
Assess impacts to livestock and crops in drought affected regions that are currently not irrigated	AGRI
Identify and document needs of agriculture in areas supplied by high risk streams	AGRI
Document conservation actions taken to date; maintain registry of groups and individuals contacted; record potential social, environmental and economic impacts	FLNRORD (Chair IADWG) FLNRORD (Regions) AGRI

Level 4 (Red) Actions

Level:	Level 4 (Red)
Objective:	Voluntary conservation, restrictions and regulatory responses as required
Suggested Target:	Maximum reduction, subject to local conditions.
Actions	Lead Responsibility
Communication and Coordination	
Increase frequency of communication by all levels of government and water suppliers with all water users through media, advertising, internet, email updates and other forums	FLNRORD Local government and water suppliers
Increase frequency of communication between FLNRORD and EMBC regarding geographic areas of concern	FLNRORD (Chair IADWG) EMBC Office of Fire Commissioner
Continue to issue information bulletins to local governments, water suppliers, First Nations, industry and stewardship groups, major licensees and other key stakeholders in impacted geographic regions	FLNRORD

Continue to issue and distribute Low Stream Flow Advisories as required in impacted geographic regions	FLNRORD DFO
Continue to provide regular updates via email to local governments, water suppliers, First Nations, industry and stewardship groups, major licensees and other key stakeholders in impacted geographic regions	FLNRORD (Chair IADWG) FLNRORD FLNRORD (regions)
Continue to update FLNRORD drought and RFC internet sites to provide up-to-date stream flow and groundwater data and information	FLNRORD (Chair IADWG) FLNRORD FLNRORD (regions)
Submit drought assessment reports as necessary to deputy ministers and other senior executives	FLNRORD (Chair IADWG) FLNRORD (DM & ADMs) FLNRORD (regions)
Clearly communicate to agricultural producers the watersheds where the minimum income requirement to maintain farm status for tax assessment purposes may be waived.	AGRI
To reduce water use on streams for which an order from ENV is being considered, provide the first communication with producers on the process and requirements that are to be followed.	AGRI
Prepare information on provincial and federal drought programs that can assist producers to help cope with drought	AGRI
Organize workshops for producers in affected areas to provide guidance on water conservation activities, drought assistance programs and processes for application if appropriate	AGRI
Other Actions	
Use consensus building process to confirm priorities for water use reductions in drought affected areas	FLNRORD (Regions) Local government and water suppliers
Implement next stage watering restrictions to achieve targeted reduction in water use	Local government and water suppliers
Implement regulatory tools under the WSA or other statutes as appropriate if voluntary measures are not enough to protect water users, aquatic ecosystems and fish	FLNRORD
Restrict use by lower priority water users or those with conditional clauses in their water licences	FLNRORD (Regions)
Review emergency response plans and prepare for implementation; ensure alternative water supplies are identified and available on short notice. Connect with Drinking Water Officers as required.	Local government and water suppliers
Coordinate support to local authorities as required to address community specific requirements.	EMBC
Ensure water bailiffs are actively regulating and controlling the diversion and use of water from the streams they are appointed	FLNRORD (Regions)

to and are accurately communicating drought conditions and watering restrictions and targets	
Provide access to information on stress management resources for agricultural producers as required via internet and other forums	AGRI
Continue to provide technical assistance and specific measures to water suppliers experiencing problems with system management or promotion of conservation	MAH
Monitoring	
Monitor and enforce compliance with restrictions and allocations through bylaws; intensify enforcement efforts as appropriate	Local government and water suppliers
Continue reporting on status of water supplies and forecasted future scenarios to FLNRORD	Local government and water suppliers
Monitor and enforce compliance with orders issued under provincial legislation	FLNRORD
Intensify monitoring of stream conditions and aquatic ecosystems examining the efficacy of water conservation measures	FLNRORD FLNRORD (Regions) DFO
Documentation and Preparation for Next Level	
Prepare for emergency response where risk of loss or failure of supply exists	Local government and water suppliers
Coordinate support to local authorities as required to address community specific requirements	EMBC
Inform Natural Resources Board and Minister of FLNRORD of possible loss or failure of supply where the risk exists	FLNRORD (Chair IADWG) FLNRORD (Executive)
Determine losses due to drought and/or from orders to reduce water use for both livestock and crops	AGRI
Document conservation actions taken to date; maintain registry of groups and individuals contacted; record potential social, environmental (e.g., fish population and habitat loss) and economic impacts	FLNRORD (Chair IADWG) FLNRORD (Regions) AGRI

Appendix 3A: Drought Legislation

Legislation	Primary Administering Agency	General Scope
<i>Water Sustainability Act</i>	Ministry of Forests, Lands, Natural Resource Operations and Rural Development	<p>Provides for the allocation and management of groundwater and stream water.</p> <p>Sets out protective measures for wells and groundwater, and identifies offences and penalties.</p> <p>Regulates groundwater, protects stream health, protects fish and fish habitat, and addresses water use during times of scarcity with declarations of SWS, critical environmental flow protection orders and fish population protection orders.</p>
<i>Fisheries Act</i>	Department of Fisheries and Oceans Canada	Protection of fish and fish habitat.
<i>Drinking Water Protection Act</i>	<p>Ministry of Health</p> <p>Regional Health Authorities</p>	<p>Requires water supply systems to provide potable water with appropriate construction and operating permits. It also establishes qualification standards for operators; and requirements for emergency response, water source and system assessments, a process for preparing a drinking water protection plan, and other protective measures for drinking water supplies.</p> <p>HLTH provides policy support and guidance relating to the Act. Regional Health Authorities administer and enforce the Act.</p>
<i>Emergency Program Act</i>	Ministry of Transportation and Infrastructure (EMBC)	<p>Provides enabling legislation that authorizes the Minister to declare and designate any area of the province a disaster area (i.e. State of Emergency), and during an emergency, to obtain reserve powers.</p> <p>Enables local authorities such as a mayor or council to declare a State of Local Emergency, which provides similar, wide-ranging emergency powers.</p>
<i>Environmental Management Act</i>	Ministry of Environment and Climate Change Strategy	Regulates industrial and municipal waste discharge, pollution, hazardous waste, and contaminated site remediation. This Act also requires preparation of environmental plans for flood control, drainage, soil conservation, water resource management, waste management, and air quality management.
<i>Local Government Act and Community</i>	Ministry of Municipal Affairs and Housing	Sets out the corporate authority of various types of local governments (municipalities, regional districts, improvement districts, etc.). From the perspective of water management, of greatest significance are

<i>Charter</i>		powers and responsibilities relating to land use, growth, infrastructure (e.g. stormwater management), works, and similar matters.
<i>Water Utility Act</i>	Ministry of Forests, Lands, Natural Resource Operations and Rural Development	Provides for regulating privately operated water systems servicing five or more persons or a corporation. Operators are subject to the same duties, responsibilities and restraints that are imposed on a public utility under the <i>Utilities Commission Act</i> .
<i>Farm Practices Protection Act</i>	Ministry of Agriculture	Only applicable if drought conditions result in a change from normal farm practices. For instance, irrigation practices or dust control practices may change as a result of lower water availability.
<i>Milk Industry Act</i>	Ministry of Agriculture	This Act describes general farm requirements. If the producer were not able to have an adequate supply of water (i.e. they could not run their dairy farm), then the industry and marketing board would work with the producer to relocate those animals.

Appendix 3B: Drought Relevant Programs for Agriculture

Program	Primary Administerin g Agency	General Scope
Production Insurance Program	Ministry of Agriculture/B usiness Risk Management	Helps producers manage their risk of crop losses caused by drought and other perils (hail, spring frost, excessive rain, flooding, etc.). Each crop has different coverage options and it must be purchased in advance of crop season. Only harvested crops are insured, not the regrowth feed for grazing. Producers need to inform program they are experiencing impacts due to water shortages whether voluntary or as a result of regulatory situations.
AgriStability Program	Ministry of Agriculture/B usiness Risk Management	Helps stabilize farm income by managing the risk of large income declines. It protects agricultural producers against declines in their net farming income due to market conditions, production loss or increased costs of production. Payments are made if a producer's current year margin falls more than 30% below their reference margin.
<i>Western Livestock Price Insurance Program</i>	Cross-provincial program	A risk management tool available in BC, Alberta, Saskatchewan and Manitoba. The program provides producers with protection against an unexpected drop in prices on cattle and hogs over a defined

		period of time.
<i>AgriRecovery Framework</i>	Ministry of Agriculture/ Agriculture and Agri-Food Canada	<p>AgriRecovery is a framework which forms the basis by which federal-provincial-territorial governments can work together when natural disasters occur to assess the impacts and determine whether there is need for an AgriRecovery initiative.</p> <p>AgriRecovery is for extra-ordinary expenses unrelated to production. It does not cover production or revenue declines which could be insured, including those resulting from disasters.</p>
<i>Livestock Tax Deferral Program</i>	Agriculture and Agri-Food Canada (AAFC)	A provision designed to help defer the tax burden for livestock producers who sell all or part of their breeding herd due to drought or flooding in regions designated by AAFC.

Appendix 4: Provincial and Federal Agency Drought Responsibilities

Agency	Drought Management Responsibilities
Provincial Agencies	
Ministry of Environment and Climate Change Strategy (ENV)	<ul style="list-style-type: none"> ◆ Lead development of legislation and policy related to drought management in BC ◆ Oversees and coordinates the science required to assess impacts and monitor water before, during, and after droughts ◆ Administers the <i>Environmental Management Act</i>
Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD)	<ul style="list-style-type: none"> ◆ Lead provincial agency for drought coordination and response ◆ Administers the <i>Water Sustainability Act</i> ◆ Operates the River Forecast Centre; collects and interprets snow, meteorological and stream flow data to provide warnings and forecasts of stream and lake runoff conditions ◆ Monitors ambient water quality and groundwater levels ◆ Protects and restores fish habitat and aquatic ecosystems ◆ Communicates directly with water users under the <i>Water Sustainability Act</i> about actions commenced under this plan ◆ Manages and protects water as a forest resource under the <i>Forest and Range Practices Act</i> ◆ Lead agency for managing wildfire threats
Ministry of Agriculture (AGRI)	<ul style="list-style-type: none"> ◆ Supports agricultural industry water requirements used in the production of food and other agricultural products ◆ Communicates with the broad agricultural community about actions commenced under this plan ◆ Collects and disseminates information on irrigation, crop, soil and livestock management during times of drought
Ministry of Municipal Affairs and Housing (MAH)	<ul style="list-style-type: none"> ◆ Oversees local government activities under the <i>Local Government Act</i> ◆ Provides water conservation resources and advice to local government water suppliers ◆ Communicates with local government about actions commenced under this plan
Ministry of Health (HLTH)	<ul style="list-style-type: none"> ◆ Provides policy support and guidance relating to the <i>Drinking Water Protection Act</i>.
Regional Health Authorities	<ul style="list-style-type: none"> ◆ Administers and enforces the <i>Drinking Water Protection Act</i>. ◆ Drinking Water Officers provide guidance to water suppliers and local governments on preparedness and response planning related to loss of water supply.
Emergency Management B.C.	<ul style="list-style-type: none"> ◆ Coordinates emergency support to local authorities as required to address community specific requirements

(EMBC) Ministry of Public Safety and Solicitor General	<ul style="list-style-type: none"> ◆ Office of Fire Commissioner
Federal Agencies	
Agriculture and Agri-Food Canada (AAFC)	<ul style="list-style-type: none"> ◆ Delivers the federal Drought Watch program to provide timely information of the impacts of climatic variability on water supply and agriculture ◆ Provides information on agricultural practices that reduce drought vulnerability and improve management during a drought
Environment and Climate Change Canada (ECCC) [Water Survey of Canada]	<ul style="list-style-type: none"> ◆ Responsible for the collection, interpretation and dissemination of standardized water resource information ◆ Operates hydrometric, climate and water quality networks in partnership with the B.C. Ministry of Environment and Climate Change Strategy
Fisheries and Oceans Canada (DFO)	<ul style="list-style-type: none"> ◆ Administers the federal <i>Fisheries Act</i>, which protects fish and fish habitats
Indigenous and Northern Affairs Canada (INAC)	<ul style="list-style-type: none"> ◆ Supports Aboriginal people (First Nations, Inuit and Métis) and Northerners in their efforts to develop healthier, more sustainable communities

Appendix 5: Chronology of Key Government Actions in a Model Drought Year

Key Actions	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monitoring												
Complete snow surveys and assess Basin Snow Indices												
Assess Seasonal Volume Runoff Forecasts												
Assess 30 Day Percent of Average Precipitation conditions												
Assess 7-Day Average Stream flow conditions												
Augment stream flow and aquifer level monitoring as required												
Monitor community and licensee water use												
Coordination												
Inter-Agency Drought Working Group												
Technical Drought Working Group												
Convene Local Drought Working Group meetings												
Elevate drought level ratings as appropriate												
Request water licensees voluntarily conserve and share water												
Retract drought level ratings												
Conduct post drought workshop												
Communication												
Drought Portal Map												
Issue first province-wide news release for season												
Issue monthly info bulletins on water supply conditions												
Designate provincial and local drought spokespeople												
Webinars for local governments and First Nations												
Recommend early activities to agricultural producers												
Issue local media advisories as required												
Issue targeted media advertising as required												
Escalate conservation messaging as appropriate												
Contact high volume users directly via mail as required												
Increase frequency and intensity of communication as required												

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Other Action											
Undertake drought vulnerability survey of communities/water suppliers.											
Local authorities introduce watering restrictions as required											
Local authorities update and amend restrictions as appropriate											
Undertake regulatory actions as appropriate											
Undertake enforcement actions as appropriate											
Prepare emergency response where loss or failure of supply risk exists											

Appendix 6: Drought Response Communications Summary Table**

	Province Wide Communications		Region Wide Communications		Targeted Regional Communications*		Direct Communication with Water Licensees	
	Task	Who	Task	Who	Task	Who	Task	Who
Level 2 (Yellow)	Issue province-wide news release	GCPE	Issue targeted news releases in impacted geographic regions	GCPE	Provide updates via email to key stakeholder groups and major licensees	FLNRORD	Use direct and indirect communications to request water licensees voluntarily conserve & share water	FLNRORD, DFO
	Regularly issue updated online water supply and snow bulletins	FLNRORD	Issue Low Stream Flow Advisories in impacted geographic regions	FLNRORD	Attend public meetings	FLNRORD, AGRI, DFO	Where appropriate, advise agricultural producers to take early actions	AGRI
			Designate local media spokesperson(s) for local level issues	GCPE				
Level 3 (Orange)	Task	Who	Task	Who	Task	Who	Task	Who
	Issue updated province-wide news release	GCPE	Intensify local communication efforts as appropriate based on current stream flow conditions	GCPE FLNRORD	Intensify frequency of updates as appropriate via email to key stakeholder groups and major licensees	FLNRORD	Advise high volume water licensees directly via mail; request voluntary conservation	FLNRORD
	Potentially hold media news conference to announce activation of additional	GCPE FLNRORD	Issue updated targeted news releases in impacted geographic regions	GCPE	Commence utilization of additional communication channels (e.g. print, social	GCPE FLNRORD	Use direct and indirect communications to request water licensees voluntarily	FLNRORD, DFO

	drought measures and to provide updated information				media, associations, etc.)		conserve & share water	
	Continue to regularly issue updated online water supply and snow bulletins	FLNRORD			Attend public meetings	FLNRORD, AGRI, DFO	Where appropriate, work with BCAC and other industry organizations to advise agricultural producers to take early actions	AGRI
Level 4 (Red)	Task	Who	Task	Who	Task	Who	Task	Who
	Increase frequency and intensity of province wide communication through media, advertising, internet, email updates and other forums	GCPE	Increase frequency and intensity of targeted local communication through media, advertising, internet, email updates and other forums	GCPE FLNRORD	Continue to issue frequent updates as appropriate via email to key stakeholder groups and major licensees	FLNRORD	Advise high volume water licensees directly of conditions via mail or other direct means;	FLNRORD
	Continue to regularly issue updated online water supply and snow bulletins	FLNRORD					Continue to request voluntary conservation; undertake regulatory action as required	
							Contact producers that may be required to reduce water use	AGRI

* Targeted regional communications includes direct communication with community groups, user groups, local governments, First Nations and others as well as participation in community events, response to local media inquiries and other local level activities.

** A provincial drought communication plan will be prepared each year. Action items will differ from year to year based on the nature of the drought and communication priorities.

Appendix 7: Additional Resources

All emergency situations that affect the health and safety of the public should be reported to EMBC at 1-800-663-3456.

Provincial Government Resources

General Drought Information

<http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/drought-information>

Links to low provincial government drought information including stream flow advisories, handbooks, fact sheets, and more.

Regulatory Resources

Dealing With Drought: A Handbook for Water Suppliers in British Columbia

https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/drought-info/suppliers_drought_handbook_2009.pdf

Updated in 2016, this document provides local government water suppliers with tools to help with drought planning, example bylaws, and links to other resources.

Water Legislation Information

<http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/laws-rules>

Agriculture

<http://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/agricultural-land-and-environment/water/drought-in-agriculture>

Information on drought management in agriculture including information on irrigation, crops, soil, livestock, pasture and range management as well as links to resources on feed and pasture availability and financial programs.

The River Forecast Centre

<http://bcRFC.env.gov.bc.ca/>

The River Forecast Centre collects and interprets snow, meteorological and stream flow data to provide warnings and forecasts of stream and lake runoff conditions around the province.

Emergency Management B.C.

<http://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-recovery>

This site provides an overview of emergency management in B.C. and provides links to training and resources for use before, during and after emergencies.

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<http://www.emergencyinfobc.gov.bc.ca>

This site provides up to date emergency alerts.

Fire Danger Rating Reports

http://bcwildfire.ca/Weather/Maps/danger_rating.htm

Maps on fire danger ratings across BC, produced annually during fire season from April 15th to October 15th.

Federal Government Resources

Drought Watch

Agriculture and Agri-Food Canada

<http://www5.agr.gc.ca/eng/?id=1326402878459>

This is Agriculture and Agri-Food Canada's web hub for national and regional information targeted at the agricultural sector. It links to information on current conditions and access to federal assistance programs.

The Weather Office

Environment and Climate Change Canada

http://www.weatheroffice.gc.ca/forecast/canada/index_e.html?id=BC

Current and forecasted weather from Environment and Climate Change Canada.

Technical Resources

Irrigation Industry Association of BC (IIABC)

www.irrigationbc.com

The IIABC web site provides access to the tools and irrigation manuals that can assist in improving the operation of irrigation systems.

- ◆ Irrigation Management Guide
- ◆ BC Sprinkler Irrigation Manual
- ◆ BC Trickle Irrigation Manual
- ◆ Irrigation Scheduling Calculators

BC Agriculture Council

www.bcac.bc.ca

The BC Agriculture Council has produced the Environmental Farm Planning documents that can provide information on conducting an irrigation system assessment. These documents assist in evaluating irrigation system operation.

- ◆ Environmental Farm Plan Reference Guide
- ◆ Irrigation Assessment Guide

Other Resources

National Drought Mitigation Centre (NDMC)

University of Nebraska - Lincoln

<http://drought.unl.edu/DroughtBasics/WhatisDrought.aspx>

The NDMC is dedicated to helping “people and institutions develop and implement measures to reduce societal vulnerability to drought, stressing preparedness and risk management rather than crisis management.” While focused on the United States, the NDMC website has a wealth of information on drought planning, monitoring, impacts and mitigation.

U.S. Drought Portal

National Integrated Drought Information System (NIDIS)

<http://www.drought.gov>

The U.S. National Oceanic and Atmospheric Administration leads implementation of the NIDIS. The U.S. Drought Portal is part of this interactive system to provide early warning about emerging and anticipated droughts, assimilate and quality control data, and provides information about risk and impact to different agencies and stakeholders.

North-America WaterWatch

<http://watermonitor.gov/naww/index.php>

Map of real-time stream flow compared to historical stream flow for BC and adjoining states using percentile flows.