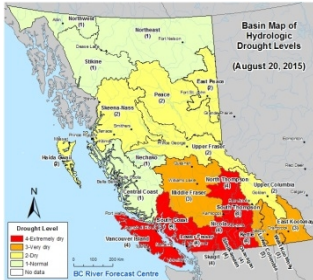


## REPORT

### Okanagan Basin Water Board

#### Building Drought Resilience in the Okanagan

#### Phase I: Gap Analysis and Recommendations



January 2016

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## 1 INTRODUCTION TO THE PROJECT

In April 2015, the Okanagan Basin Water Board (OBWB) retained Associated Environmental Consultants Inc. (Associated) to document the state of “drought readiness” of Okanagan water suppliers, and to provide recommendations on how to prepare for and minimize the impacts of drought in the Okanagan (the Project).

### 1.1 Project Scope and Goals

The Project consists of two phases: Phase 1 includes background research, consultation, and reporting (i.e. this final report), and Phase 2 will focus on disseminating information and implementing recommendations from Phase 1.

The goals of the Project are to:

1. Define the status quo of drought planning in the Okanagan Basin (Phase 1);
2. Identify what needs to be done to prepare Okanagan communities for drought (Phase 1);
3. Provide recommendations on how to coordinate a basin-wide approach to drought planning and response (Phase 1);
4. Support Okanagan communities in their move toward the desired drought planning structure (Phase 2); and
5. Encourage the provincial government to better support Okanagan communities in their drought planning process (Phase 2).

This report presents the results and recommendations from Phase 1 of the Project.

### 1.2 Overview of Consultation Completed for the Project

A focus group guided the development of the recommendations and actions outlined in this report. The group had two meetings; the first focused on identifying the issues and developing recommendations to address them (the “what” and “why”), and the second meeting focused on refining the recommendations and actions and discussing how they could be implemented (the “how,” “who,” and “when”).

The focus group included the following people:

- Christine Dendy**, Trustee, South East Kelowna Irrigation District and Owner, Dendy Orchards
- Jennifer Miles**, Water Sustainability Coordinator, Regional District of North Okanagan
- John Bartell**, Manager of Engineering and Operations, Glenmore Ellison Improvement District
- Kevin Van Vliet**, Utility Services Manager, City of Kelowna
- Mitch Moroziuk**, General Manager of Infrastructure, City of Penticton
- Ted van der Gulik**, Irrigation Industry Association of British Columbia
- Zoe Kirk**, RDOS Public Works Projects Coordinator, Regional District of Okanagan Similkameen

Kellie Garcia also gave several presentations about the Project to gather feedback from a wider group of stakeholders. Presentations were given at the Osoyoos Lake Water Science Forum (October 2015), the Water Supply Association of B.C. annual conference (October 2015), the November OBWB Board of Directors meeting, and the December OBWB Water Stewardship Council meeting.

Lastly, key provincial government staff were contacted to notify them of the Project, get their perspective on the most important things a community can do to prepare for drought, and discuss how to integrate drought planning in the Okanagan with province-wide drought planning. Valerie Cameron, water stewardship manager for Ministry of Forests, Lands and Natural Resource Operations (FLNRO) was contacted by phone on June 3, 2015, and by email on September 3, 2015. Celine Davis, manager of science and adaptation for the Ministry of Environment, was contacted by phone on August 21, 2015. Lastly Kellie spoke with Ray Crampton, regional executive director of resource management for the Okanagan-Shuswap for FLNRO, during the Water Supply Association conference where he was also a speaker. The OBWB is interested in continuing discussions with these ministry staff and others in early 2016 to ensure learnings from the 2015 drought are incorporated into future response plans.



## 2 BACKGROUND ON DROUGHT MANAGEMENT

### 2.1 Definition of Drought

Drought can occur when there is a combination of sustained low precipitation and high rates of evaporation, resulting in low water flows in streams and/or low water storage levels in wells and reservoirs. In the Okanagan, drought may be caused by insufficient snow accumulation, hot and dry weather, a delay in rain fall, or by a combination of these factors. Increased irrigation demand during hot and dry conditions intensifies the effects of drought conditions.

Droughts can be defined as meteorological, hydrological, agricultural or socioeconomic (ecconics 2010):

- Meteorological drought is defined by comparing the rainfall at a particular place and time with the average rainfall for that place and time. This depletes soil moisture and impacts crop production.
- Hydrological drought is associated with the effect of low precipitation on water levels in rivers, reservoirs, lakes and aquifers. Changes in water levels affect ecosystems, hydroelectric power generation, and recreational, industrial, and urban water use.
- Agricultural drought occurs when there is not enough water available for a particular crop to grow or livestock to thrive at a particular time. Although agricultural drought often occurs during dry, hot periods of low precipitation, it can also occur during periods of average precipitation when soil conditions or agricultural techniques require extra water.
- Socioeconomic drought is based on the impact of drought conditions (meteorological, hydrological, or agricultural drought) on supply and demand of some economic goods. Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related deficit in water supply.

### 2.2 Why Prepare for Drought?

It is increasingly important for local water suppliers to prepare for the impacts of population growth, development, and climate change on water supplies. The Okanagan naturally has large seasonal and annual cycles, alternating between wet and dry periods, and some areas of the valley regularly experience water shortages. Climate change is expected to intensify this pattern: to bring more powerful storms, longer drought cycles, greater evaporation, and a longer, hotter growing season with increased irrigation demand. Climate change is expected to bring increased overall precipitation but decreased snowpack, resulting in a greater need for storage. In addition, a growing population places increased demands on supplies, causing greater stress on water resources and intensifying the effects of drought conditions.

Drought conditions impact communities in many different ways, including: reducing supplies for drinking water and household use and for irrigating crops, orchards and vineyards; impacting water quality by lowering water levels, thus increasing water temperature and concentrations of pollutants; and increasing fish mortality. Reduced water availability and other impacts of drought (e.g. fires) can also have significant economic impacts in the Okanagan, where communities rely on the summer tourism industry.

Being prepared for droughts will protect water for drinking, sanitation and fire protection. It will help sustain agricultural and other economic activity during dry periods.

Drought-risk and, in turn, sound drought planning, varies between communities and depends on local climate, water supplies and system, water use priorities, and demand. It is therefore expected that communities will have different organizational approaches to drought preparedness and response.

### 2.3 Components of Drought Resilience

Drought resilience is the capacity to limit the effects of, cope with, or adapt to the impacts of drought. It has at least five components:

- **Information** - a good understanding of current and future water supply and demand (including instream flow needs) and key drought indicators obtained through monitoring, record-keeping, and reporting;
- **Planning** - workable strategies, plans, and policies backed by sufficient financial and human resources, political support, and enforcement;
- **Conservation** - continued and heightened conservation;
- **Communication** - formal strategies to clearly communicate with customers, regulators, and other water suppliers in the shared water source area; and
- **Coordination** - building relationships and coordinating systems before the drought.

### 2.4 Roles and Responsibilities

#### 2.4.1 Provincial Government

Several provincial agencies are involved in drought management. To harmonize their responses, a number of organizing bodies and individual decision makers have been delegated specific responsibilities, which are outlined in the provincial Drought Response Plan.

The Drought Response Plan is carried out under established legal authorities provided in the current *Water Act* (to be repealed as the *Water Sustainability Act* (WSA) in 2016), the *Fish Protection Act* (also to be replaced by WSA), the *Drinking Water Protection Act*, the *Environmental Management Act*, the *Local Government Act*, and their supporting regulations.

The Ministry of Forests, Lands and Natural Resource Operations oversees drought response in B.C. The Ministry of Environment leads the development of legislation and policy related to drought management and oversees and coordinates the science required to assess impacts and monitor water before, during, and after droughts.

The Inter-Agency Drought Working Group (IADWG), which includes both provincial and federal government agencies, is tasked with carrying out the Drought Response Plan. The IADWG is advised by the Technical

Drought Working Group, which includes representatives from cross-government regional drought teams. The working group ensures the regional teams coordinate responses across the province, and that specific actions set out in the Drought Response Plan are delegated to the appropriate regional person or body for further action.

### 2.4.2 Okanagan Basin Water Board

The Okanagan Basin Water Board (OBWB) was instituted in 1970 as a collaboration of the three Okanagan regional districts to provide leadership on water issues spanning the valley. Advised by a cross-disciplinary Council, the OBWB delivers programs to promote coordinated water management for long-term sustainable water supplies while supporting the capacity of jurisdictions throughout the Okanagan to meet their own water management goals (OBWB 2015).

Because of this valley-wide mandate, the OBWB is able to lead communication and coordination activities during a drought, and to support local governments and other water suppliers with their drought management activities.

### 2.4.3 Local Governments and Other Water Suppliers

Local governments and other water suppliers are responsible for managing their water supply to provide sufficient water to their communities for consumption and irrigation. Therefore, local preparedness and response is essential to managing drought. At the local level, the emphasis is on collecting information, delivering programs, communicating with residents, and responding to emergencies.

Local water suppliers' roles in drought planning and response may include (econics 2015):

- gathering available drought information for the community;
- identifying information gaps;
- developing water conservation strategies;
- managing community water supplies; and
- communicating with the public.



## 3 DROUGHT IN THE OKANAGAN

This section provides history on recent droughts in the Okanagan, the lessons we learned from those droughts, the current status of drought readiness, and barriers that have slowed progress on drought planning.

### 3.1 Recent Okanagan Droughts and Lessons Learned

Extreme low streamflow events in 2003 caused significant harm to fish and fish habitat in the Thompson and Okanagan regions. The Southern Interior Drought Management Workshop was held in March 2004 for people who manage water and fisheries to examine and discuss issues and experiences of the 2003 drought (Chilibeck and Matthews 2004). There was a general consensus on the need for proactive management strategies to address potential water supply limitations and associated low flows, better water and fisheries information, and improved sharing of this information to resource agency managers, water users and suppliers, and the public.

In 2009, the Okanagan also experienced well below normal winter and early spring inflows to Okanagan Lake, below normal snowpack and snowmelt runoff, well below normal spring precipitation, and a sustained hot and dry summer. The OBWB hosted a drought planning workshop on July 23, 2009 and subsequently produced the report entitled *Living Within Our Means: Recommendations for Drought Proofing the Okanagan* (OBWB 2009).

In 2015, the Okanagan had unusual climatic conditions, including a mild winter with little snow, early peak inflows, and persistent below-average precipitation and warmer-than-normal temperatures in June and July. This was followed by increased demand and evaporation from lakes, and an early and severe fire season. In mid-July, in response to low streamflows region-wide, the province declared a Level 3 drought in the Okanagan (despite many suppliers beginning the season with full reservoirs). The province's drought response process was based on the 2015 B.C. Drought Response Plan. Under Level 3, all municipal, agricultural and industrial users (including water suppliers on storage) are asked to voluntarily reduce their water use by 30%. On August 5, the province moved the Okanagan into Level 4 drought. At Level 4, water suppliers are asked to target "maximum reduction," and provincial response may include use of authorities under existing legislation (see Section 2.4.1).

**The greatest threat to our water supplies is from a multi-year drought.** With consecutive drought years, surface water reservoirs do not refill in the spring, and groundwater levels drop – meaning that most water supplies are impacted. Although most water suppliers with storage (i.e. upper reservoirs and mainstem lakes) did not experience water shortages in 2015, it is important to consider what could happen if we experience the same conditions in 2016.

Unfortunately, attempts to develop drought action plans are often abandoned when rain and snowfall returns to normal, reducing the urgency for action. Limited resources in the region to complete the work and other barriers described in Section 3.3 also hinder drought preparedness.

### 3.2 Status of Drought Readiness

Because there is no one-size-fits-all approach to drought planning, it is difficult to quantitatively evaluate drought readiness in the Okanagan. Instead, we reviewed drought-related plans and bylaws that are used by major water suppliers (Table 3-1), and identified gaps to build and improve existing documents.

**Table 3-1**  
**Summary of drought-related plans and bylaws used by the major water suppliers in the Okanagan Valley**

Water Supplier	Drought-related Plans and Bylaws
Greater Vernon Water (GVW) – Regional District of North Okanagan (RDNO)	Drought Management Plan, 2011 Staged watering restrictions (Bylaw 2545)
Town of Armstrong	Staged watering restrictions (Bylaw 1689)
District of Spallumcheen	Staged watering restrictions (vary by water supplier)
Regional District of Central Okanagan (RDCO)	Emergency Response Manual section 11.1 Staged watering restrictions (Bylaw 1268)
District of Lake Country	Drought Preparedness and Water Conservation Strategy, 2010 Staged watering restrictions (Bylaw 633)
Rutland Water Works	Staged watering restrictions
City of Kelowna	Drought Response Plan, 2010 Water Sustainability Action Plan, 2007 Staged watering restrictions
Black Mountain Irrigation District (BMID)	Drought Management Plan, 2005 Staged watering restrictions (Bylaw 610) Mission Creek Water Use Plan, 2010
South East Kelowna Irrigation District (SEKID)	Agricultural metering program Staged watering restrictions (Bylaw 579) Mission Creek Water Use Plan, 2010
Glenmore Ellison Improvement District (GEID)	Drought Management Plan, 2005 Staged watering restrictions (Bylaw 147)
City of West Kelowna	Water Conservation Plan Staged watering restrictions (Bylaw 0188)

Water Supplier	Drought-related Plans and Bylaws
District of Peachland	Staged watering restrictions (Bylaw 1688)
Regional District of Okanagan Similkameen (RDOS)	Drought Management Plan for Naramata, Olalla and Faulder Water Systems, 2006 Staged watering restrictions (vary by water supplier)
District of Summerland	Drought Response Plan Trout Creek Water Use Plan Staged watering restrictions
Kaleden Irrigation District	Staged watering restrictions
City of Penticton	Staged watering restrictions (Bylaw 2005-02)
Okanagan Falls Irrigation District	Emergency Response Plan that includes drought
Town of Oliver	No watering restrictions
Town of Osoyoos	Staged watering restrictions (Bylaw 1273) Water Conservation Plan, 2010

All but one water supplier have staged watering restrictions (see Section 4.3 for more information about the restrictions). Several water suppliers have drought plans<sup>1</sup> (GVW, Lake Country, Kelowna, BMID, SEKID, GEID, Summerland, RDOS), and some have formal water conservation plans<sup>2</sup> (Kelowna, West Kelowna, and Osoyoos).

While some of the drought plans listed above are comprehensive and address all or most of the components of drought resilience listed in Section 2.3, several of the plans could be improved (see Action 2-1 and Appendix B for recommendations). It is also unclear whether all of the water suppliers with drought management plans actually use the plans. Several of the plans were prepared in the mid-2000s (after the provincial government provided grant money for drought management plans) and have not been updated since.

Lastly, as shown in Table 3-1, several water suppliers do not have formal drought plans or water conservation plans.

<sup>1</sup> A drought plan is a written document that identifies how water resources will be managed during extended periods of dry weather. It includes information on water supply and susceptibility to drought, actions that will be taken to reduce demand or increase supplies during drought, how decisions will be made and when, communication plans for with customers, regulators and other stakeholders during a drought, and who will be responsible for what actions.

<sup>2</sup> A water conservation plan is a written document that evaluates current and projected water use, assesses infrastructure, operations, and management practices, and describes actions to reduce water losses, waste, or consumption, and increase water use efficiency in all years.

### 3.3 Barriers to Drought Planning

The 2003, 2009 and 2015 droughts highlighted the barriers and challenges facing drought planning in the Okanagan (Table 3-2). These barriers identify opportunities to focus efforts on building drought resilience in the Okanagan, and are the framework for the recommendations and actions presented in Section 4.

**Table 3-2**  
**Barriers to drought planning and response in the Okanagan Valley**

Barrier	Description
Myth of water abundance.	<ul style="list-style-type: none"> <li>The Okanagan has several large lakes, so it is easy to believe there is more than enough water. However, water levels can be drawn down quickly if water is not replenished at the same rate it is removed.</li> </ul>
Difficult to gather and distribute timely information about status and vulnerability of water supplies.	<ul style="list-style-type: none"> <li>Many water suppliers with little coordination between them.</li> <li>Gaps in information; lack of early warning mechanism, and low level of preparedness.</li> <li>Crises response rather than proactive planning.</li> <li>Lack of information about actual demand (no formal water use reporting requirements; infrequent meter reading and reporting to customers).</li> <li>No formal valley-wide drought response strategy.</li> </ul>
Financial and staffing capacity of water suppliers.	<ul style="list-style-type: none"> <li>Staffing and cost can be a barrier to adequate drought planning (especially among the smaller water suppliers).</li> </ul>
Confusion about how local water suppliers should respond to provincial drought declarations.	<ul style="list-style-type: none"> <li>Lack of communication between local drought management authorities and provincial drought response teams.</li> <li>Variation in drought conditions and water supply and demand between suppliers.</li> <li>Variation between provincial basin boundaries and water supplier watersheds.</li> </ul>
Differences in how local water suppliers respond to drought (variation in bylaws & policies).	<ul style="list-style-type: none"> <li>Variation in drought conditions and water supply and demand between suppliers.</li> <li>Absence of standard drought indicators and guidelines on plan development.</li> <li>Differences in local preferences</li> <li>Perceived lack of urgency to change existing rules</li> </ul>
Difficult to show cumulative benefits of conservation and hydrological connectivity.	<ul style="list-style-type: none"> <li>Gaps in information (demand and withdrawals, streamflow requirements, aquifer recharge, evaporation, requirements of downstream water users).</li> </ul>



## 4 RECOMMENDATIONS AND ACTIONS

Five recommendations and fourteen actions for improving drought planning and response in the Okanagan are given for the five components of drought resilience (see Section 2.4): information, planning, conservation, coordination, and communication (Table 4-1). The following sections explain **why** the action is important, **who** should complete the action, and in what timeframe (**when**). Actions that should be started immediately (2016) are given a timeframe of 1-2 years and actions that can be completed later are given a timeframe of 2-3 or 3-5 years. The timeframes were determined based on consultation with the focus group and other key stakeholders and the expertise of the study team.

**It is important to note that although water suppliers are identified as the “who” for many actions, the OBWB and the provincial government can provide leadership and financial, technical, and other support for all actions identified in this report.**

**Table 4-1**  
**Summary of recommendations and actions to improve drought resilience in the Okanagan Valley**

Category	Recommendations	Actions
Information	1. Collect information to prepare for and make decisions during drought, and have that information readily available.	1-1 Prepare standard water supply and demand analyses for each major water supplier and include in their drought plans.
		1-2 Complete valley-wide universal metering and increase the frequency of meter reading and water use reporting during drought.
		1-3 Create a hub for the information to prepare for and respond to drought.
Planning	2. Ensure each community has a formal drought plan and water supplies that can withstand a multi-year drought.	2-1 Prepare drought plans for each major water supplier that contain decision-making guides for moving between drought stages, and a communication strategy.
		2-2 Evaluate opportunities to increase storage and identify back-up supplies in each water supply area.
Conservation	3. Make water conservation a year-round priority, valley-wide.	3-1 Prepare or update water conservation plans for each major water supplier.
		3-2 Enact and enforce bylaws to improve irrigation efficiency.
Coordination	4. Improve coordination between water users, suppliers, managers, and regulators.	4-1 Prepare (or update) drought agreements for shared water sources in priority sub-basins.
		4-2 Prepare a valley-wide drought response strategy.
		4-3 Adopt consistent definitions of local drought stages and associated restrictions.
		4-4 Work with the province and water suppliers to address communication and other issues experienced during the 2015 drought.
Communication	5. Develop consistent drought communication tools and messaging.	5-1 Use consistent communication materials and messaging to reduce public confusion and uncertainty.
		5-2 Launch an outreach campaign that focuses on the “new normal” (i.e. fluctuations between droughts and floods).
		5-3 Develop simple, public-friendly graphics to communicate the “One Valley. One Water.” message.

### 4.1 Information

**Recommendation: Collect information to prepare for and make decisions during drought, and have that information readily available.**

**Action 1-1 Prepare standard water supply and demand analyses for each major water supplier and include in their drought plans.**

**Why:** Understanding of current water supply and demand (including instream flow needs), future growth in demands, and the adequacy of the supply to meet those demands is essential to plan and respond to water shortages. A standard approach to gathering and reporting this information would promote a better understanding of the status and vulnerability of water supplies in the Okanagan. The recommended framework for a water supply and demand analyses is provided in Appendix A.

Note that many water suppliers already have this information for their water systems. The framework in Appendix A is provided to help suppliers identify any gaps in the information they need to plan for drought, and to give them a clear outline to develop an analysis if they do not already have one.

Lastly, provincial and federal climate and hydrology monitoring is also important information and water suppliers need support from these levels of government to collect and analyze the data.

**Who:** Water suppliers

**Timeframe:** 1-2 years

**Action 1-2 Complete valley-wide universal metering and increase the frequency of meter reading and water use reporting during drought.**

**Why:** Water meters make it possible to monitor how much water is being used and by whom, and provide a method of collecting time-series data that can identify trends in water consumption and factors contributing to these trends. Metering also lets water suppliers establish water pricing levels that promote water conservation. Many communities already have metering programs but meter reading and billing is infrequent (as seldom as once per year) in some communities. During drought, access to water use data is essential in order to identify water waste and more accurately quantify reduction in use at a higher watering restriction stage (for example).

Federal and provincial governments should be lobbied to provide grants or allow existing grants to fund water meters for both potable and irrigation purposes.

It is worth noting that Greater Vernon Water is moving to automatic meter reading (AMR) technology, which will be attached to the outside of homes so that meters can be read remotely. This technology can detect anomalies in water use (e.g. leaks) and notifies the water supplier within a day or two so

they can follow up with the customer. Their challenge is managing and making use of the huge amount of water use data that is collected by the meters.

**Who:** OBWB and water suppliers

**Timeframe:** 1-2 years

### Action 1-3 Create a hub for information to prepare for and respond to drought.

**Why:** Central access to current information, structured as a “drought information network,” would give a more consistent approach to plan for and respond to sub-watershed and valley-wide droughts. Information would include water storage levels (including upper reservoirs, main stem lakes, and aquifers), streamflows, water withdrawals, snow pack, climate, and watering restrictions across the valley. Water suppliers would benefit from shared access to Okanagan drought strategies and water conservation plans, irrigation scheduling calculators, and other planning tools for drought management.

Several platforms already exist that could be considered for the drought information network, including the BC Water Use Reporting Centre, and the Okanagan Basin Water Board, the Okanagan WaterWise, and the Okanagan Water Supply and Demand Project websites.

Another component could be a handbook for Okanagan water suppliers that shares the information presented in this Phase 1 Report (including the templates in the appendices) and provides a list of important resources and available drought planning tools and models.

**Who:** OBWB

**Timeframe:** 1-2 years

## 4.2 Planning

**Recommendation:** Ensure each community has a formal drought plan and water supplies that can withstand a multi-year drought.

### Action 2-1 Prepare drought plans for each major water supplier that contain decision-making guides for moving between drought stages, and a communication strategy.

**Why:** A local drought plan identifies drought stages and corresponding responses, and clearly assigns responsibilities for communication and other aspects of drought response. It also includes information on how to communicate water management goals, actions, water supply status, and forecasts. Ideally, drought plans are in place prior to a drought and are recognized and supported by the major water users in the watershed. Drought plans must be specific to the community, contain sufficient detail that anyone can follow, and be revised or updated as needed.

The drought planning process should include stakeholder consultation focused on large volume and sensitive user groups that would be impacted by water shortages, such as agricultural producers, beverage manufacturers, and hospitals. This consultation process will help inform the drought plan and also build awareness within those stakeholders of their role in dealing with drought.

The drought plan should also include risk assessment of wildfires and floods (which can increase during drought due to high temperatures, dry vegetation, and compacted soil), prevention/protection measures to mitigate the impacts to water catchment areas and water systems, and related emergency preparedness to maintain supply of water.

A recommended framework for local drought plans is included in Appendix B.

**Who:** Water suppliers

**Timeframe:** 1-2 years

### **Action 2-2 Evaluate opportunities to increase storage and identify back-up supplies in each water supply area.**

**Why:** One of the central water management problems in the Okanagan is a lack of storage. Even with improved conservation and efficiency, water storage capacity will need to be increased in some sub-basins to accommodate variation in precipitation, impacts of climate change, and increased demand.

**Who:** OBWB, water suppliers

**Timeframe:** 3-5 years

## 4.3 Conservation

**Recommendation: Make water conservation a year-round priority, valley-wide.**

### **Action 3-1 Prepare or update water conservation plans for each major water supplier.**

**Why:** Reducing water waste and promoting water use efficiency is central to drought resilience. In addition to the environmental benefits, reductions in water use translate into lower costs for water supply and wastewater infrastructure. It makes economic, environmental, and social sense to conserve water year round. It is also generally easier to get the public to understand and cooperate with water restrictions during a drought if they are already using less water and if they understand that water supply is not unlimited. Now, and increasingly into the future, a comprehensive water conservation plan will be a requisite for provincial and federal infrastructure funding. Appendix C includes a recommended template for local water conservation plans.

**Who:** Water suppliers

**Timeframe:** 2-3 years

### Action 3-2 Enact and enforce bylaws to improve irrigation efficiency.

**Why:** The greatest potential for domestic and agricultural water savings in the Okanagan is during the irrigation season of May through September, which is also the time when water shortages are likely to occur. Ensuring that irrigation systems are correctly designed and installed, selecting the most efficient systems possible, enacting (and enforcing) soil and landscape standards bylaws, and improving irrigation scheduling are techniques that can be used to reduce outdoor water use. Increased frequency of meter reading and timely reporting to customers (Action 1-2) will help encourage more efficient water use. This is the most cost-effective way to increase water supplies, especially compared to building new storage reservoirs.

**Who:** OBWB, water suppliers

**Timeframe:** 3-5 years

## 4.4 Coordination

**Recommendation: Improve coordination between water users, suppliers, managers, and regulators.**

### Action 4-1 Prepare (or update) drought agreements for shared water sources in priority sub-basins.

**Why:** Formal agreements are needed for sharing water between licensees in a sub-basin while still providing adequate flows for fish and wildlife. Each agreement should include development of a “trigger graph” with water use reduction stages corresponding to different reservoir and stream conditions, and should outline the target water use reductions for the community and the required releases for fish flow needs. The agreements would reduce potential conflicts among user groups and improve coordinated management efforts during drought. The Trout Creek Water Use Plan Operating Agreement (Water Management Consultants 2005) and the Mission Creek Water Use Plan (Water Management Consultants 2010) can be used for reference.

Priority sub-basins should be determined through consultation with the province and local water suppliers.

**Who:** Water suppliers and other licensees (including groundwater) in each sub-basin

**Timeframe:** 3-5 years

### Action 4-2 Prepare a valley-wide drought response strategy.

**Why:** The strategy would help provincial and local agencies and stakeholders to work together to manage drought. It would lay out processes designed to reduce confusion and promote cooperation during drought, and would also establish procedures for facilitating and coordinating discussion

between local governments and the province when needed. The strategy would focus on communication and coordination activities and would be guided by an “Okanagan Drought Team.”

A recommended template for the strategy is included in Appendix D.

**Who:** OBWB

**Timeframe:** 1-2 years

### Action 4-3 Adopt consistent definitions of local drought stages and associated restrictions.

**Why:** Local water suppliers have water use bylaws (mainly related to yard sprinkling) to reduce water demands on the local supply system during water shortages. Within the valley, the definitions of watering restriction stages and the decision-making process for moving between the stages differ between water suppliers (see Appendix E). Having different watering restriction definitions is confusing and makes reporting on overall status within the Okanagan difficult. A coordinated and unified approach to water management across the valley requires consistent definitions, interpretation, enforcement, and messaging.

Water suppliers should be further consulted to determine the most suitable structure for watering restriction stages. A common definition of how to calculate the base water use amount should be developed to allow consistent comparison of water use reduction between water suppliers.

**Who:** Water suppliers

**Timeframe:** 2-3 years

### Action 4-4 Work with the province and water suppliers to address communication and other issues experienced during the 2015 drought.

**Why:** Several opportunities for improvement were identified during the provincially-declared Level 4 drought in 2015, including:

- Need for better communication between the province and local suppliers.
- Need for clarification about the province’s expectations regarding water conservation:
  - When a water supplier uses less water under the voluntary restrictions requested by the province, is the expectation that the water will be left in the system for fish and downstream licence holders (resulting in less revenue for the water supplier and less water in their reservoir)?
  - Some water suppliers already practice good conservation so decreasing water use by 30% is more difficult and has higher ramifications than for those communities that do not have good conservation in place.
- Need to identify opportunities for better decision-making around restricting agricultural water use (e.g. consider different water needs for different crops and consider allowing farmers to waive farm status during drought years so they do not have to grow a crop).

**Who:** Okanagan Basin Water Board

**Timeframe:** 1-2 years

### 4.5 Communication

**Recommendation: Develop consistent drought communication tools and messaging.**

Early and frequent communication with users (e.g. residents or agricultural irrigators) about water supply conditions and responses is key to successfully weathering a drought with minimal hardship and economic losses. Water suppliers 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 reducing water consumption.

**Action 5-1 Use consistent communication materials and messaging to reduce public confusion and uncertainty.**

**Why:** Having consistent and collaborative drought communication tools and messaging will help with coordinating drought responses among water suppliers, building public awareness and understanding of the roles of government agencies, local stewardship groups, and others in responding to drought. For example, the graphics and outreach materials on watering restrictions recently created by Greater Vernon Water could be adopted by all major water suppliers across the valley to create consistent and recognizable messaging.

**Who:** OBWB, water suppliers

**Timeframe:** 2-3 years

**Action 5-2 Launch an outreach campaign that focuses on the “new normal” (i.e. fluctuations between droughts and floods).**

**Why:** The OBWB’s Make Water Work (MWW) campaign, a program under Okanagan WaterWise, has been effective in reaching the community and bringing together water suppliers across the valley. The MWW program could be built out to include specific messaging and information related to drought and floods. The “Living the New Normal” campaign in the Cowichan Valley should be considered as a guide for developing the Okanagan drought outreach campaign (<http://cvrdnewnormalcowichan.ca/>).

**Who:** OBWB

**Timeframe:** 1-2 years



### **Action 5-3 Develop simple, public-friendly graphics to communicate the “One Valley. One Water.” message.**

**Why:** Local decisions must consider watershed and aquifer connections within the larger Okanagan Basin. The OBWB’s Okanagan WaterWise campaign is a great platform to encourage this thinking. Simple, public-friendly graphics should be created to focus on two important topics: 1) addressing the myth of abundance by showing the inputs and outputs to the lakes and the volume of water actually available for use, and 2) using real examples to demonstrate how specific conservation or management changes upstream can reduce water shortages and impacts downstream.

The Okanagan Basin Waterscape poster, which was created by the federal government in the early 2000s as an educational tool for water use in the Okanagan, should be revisited to see if the graphics on the poster could be adapted and re-launched.

**Who:** OBWB

**Timeframe:** 2-3 years



## 5 CONCLUSIONS AND NEXT STEPS

This report identifies 14 actions that will help build drought resilience in the Okanagan. Implementing the actions will require collaboration between the OBWB and local water suppliers and support from the province.

Actions that should be worked on immediately and completed in the next two years include:

- Action 1-1 Prepare standard water supply and demand analyses for each major water supplier and include in their drought plans;
- Action 1-2 Complete valley-wide universal metering and increase the frequency of meter reading and water use reporting during drought;
- Action 1-3 Create a hub for information to prepare for and respond to drought;
- Action 2-1 Prepare drought plans for each major water supplier that contain decision-making guides for moving between drought stages, and a communication strategy;
- Action 4-2 Prepare a valley-wide drought response strategy;
- Action 4-4 Work with the province to address communication and other issues experienced during the 2015 drought; and
- Action 5-2 Launch an outreach campaign that focuses on the “new normal” (i.e. fluctuations between droughts and floods).

Actions that should be completed by 2019 include:

- Action 3-1 Prepare or update water conservation plans for each major water supplier;
- Action 4-3 Adopt consistent definitions of local drought stages and associated restrictions;
- Action 5-1 Use consistent communication materials and messaging to reduce public confusion and uncertainty; and
- Action 5-3 Develop simple, public-friendly graphics to communicate the “One Valley. One Water.” message.

Actions that may take up to five years to complete include:

- Action 2-2 Evaluate opportunities to increase storage and identify back-up supplies;
- Action 3-2 Enact and enforce bylaws to improve irrigation efficiency; and
- Action 4-2 Prepare (or update) drought agreements for shared water sources in priority sub-basins.

To overcome the barriers described in this report (Section 3.3) and accomplish these actions will take sufficient financial and human resources and strong leadership and collaboration. It is critical that momentum gained during the 2015 drought is continued into 2016 with a clear vision for building drought resilience in the Okanagan valley.



# REPORT

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## Appendix A - Water Supply and Demand Analysis Template

Please see **Dealing with Drought: A Handbook for Water Suppliers in British Columbia (LWBC 2004)** for a description of what to include in each section. Note that it may not be necessary or possible to complete each section.

### INTRODUCTION

- Study Area
- Background
- Water Management Issues and Concerns
- Purpose and Objectives of Study

### BASIN DESCRIPTION

- Location and Size
- Population
- Land Use (Agriculture, Forestry, Urban, Future Land Use)
- Basin Features

### WATER RESOURCES

- Surface Waters
  - Streamflow Records
  - Reservoir and Lake Levels
  - Inflows to Treatment/Distribution Infrastructure
  - Effects of Storage and Diversion
  - Critical Low Flows and Probabilities
- Groundwater
  - Description of Groundwater Resource
  - Water Well Data
  - Groundwater Potential

### WATER QUALITY

- Surface Water Quality
  - Data Collection
  - Water Quality Assessment
  - Trend Assessment
  - Potential Effects of Low Flows
- Groundwater Quality
  - Data Collection
  - Groundwater Quality Assessments
  - Aquifer Contamination Potential

**WATER RESOURCE USES**

Surface Water Rights  
Instream Water Requirements  
Identification of Species at Risk  
Identification of Designated Sensitive Streams  
Groundwater Uses  
Downstream Uses  
Future Water Resource Requirements

**WATER MANAGEMENT ANALYSIS**

Natural Flows  
Demands (by customer sector, where possible)  
Supply/Demand Comparison  
Quantification of System Leaks  
Analysis Results  
Assessment of Demand Management Potential and Supplementary Storage

**CONCLUSIONS AND RECOMMENDATIONS**



## Appendix B - Drought Plan Template

- EXECUTIVE SUMMARY**
- ACKNOWLEDGEMENTS**
- TABLE OF CONTENTS**
- LIST OF FIGURES**
- LIST OF TABLES**
- LIST OF APPENDICES**

### **INTRODUCTION AND OBJECTIVES**

*This section introduces the water supplier and provides context for the drought plan. Sub-sections may include:*

- Background
- Drought Plan Objectives
- Components of the Drought Plan

### **WATER SUPPLY AND DEMAND PROFILE**

*This section includes a detailed overview of the water supplier's current and future supply and demand (based on the water supply and demand analysis completed by the water supplier). Sub-sections may include:*

- Current and Future Water Supply
- Current and Future Water Demand (by customer sector, where possible)
- Potential Emergency Water Supply

### **FACTORS INFLUENCING THE POTENTIAL FOR DROUGHT**

*This section provides a description of the hydrological nature of the water supplier with respect to its vulnerability to drought. Sub-sections may include:*

- Winter Snowpack
- Spring Rains
- Summer Climate and Fall Reservoir Levels
- Watershed Factors
- Global Climate Trends
- Forecasted Impact of Climate Change on Okanagan Valley

### **DROUGHT FORECAST APPROACH**

*This section characterizes a drought forecast approach as a means of predicting future water supply conditions. By recognizing the potential for future drought, the drought response measures may be implemented to reduce the incidence and/or potential impact of water shortages. Sub-sections may include:*

- Forecast Parameters
  - Storage Levels
  - Snowpack Conditions
  - Temperature and Precipitation

River Forecast Centre Bulletins  
Provincial Drought Declarations  
Customer Demand Levels  
Decision-making Approach (include flow chart, checklist, and/or decision tree)

### **DROUGHT STAGES**

*This section describes the conditions under which the drought response plan is implemented. It should include a summary table/matrix that describes the supply status and trigger factors, goals, drought response, and communication and enforcement for each stage. Sub-sections may include:*

Normal (No Drought, Average, or Wet Years)  
Stage 1 – Dry (Mild Drought)  
Stage 2 – Very Dry (Moderate Drought)  
Stage 3 – Extremely Dry (Severe Drought)  
Stage 4 – Emergency (Emergency Drought)  
Loss of Community Supplies

### **DROUGHT PLAN IMPLEMENTATION (DROUGHT RESPONSE PLAN)**

*This section outlines the staged approach to water management and defines the roles of the water supplier and the water users/customers during drought. Sub-sections may include:*

Drought Response Team (include information on the team in Appendix A)  
Communications (include communications plan in Appendix B)  
Monitoring  
Operational Measures  
Demand-side Measures (include copy of water use bylaw and water conservation plan in appendices C and D)

### **DROUGHT PLAN UPDATES**

*This section describes when, why, and by whom the drought plan should be reviewed and updated.*

### **RECOMMENDATIONS**

*This section includes any recommendations that come up while preparing the drought plan.*

### **REFERENCES**

**APPENDIX A – DROUGHT RESPONSE TEAM**  
**APPENDIX B – COMMUNICATIONS PLAN**  
**APPENDIX C – WATER USE BYLAW (RESTRICTIONS)**  
**APPENDIX D – WATER CONSERVATION PLAN**

## Appendix C - Water Conservation Plan Template

Adapted from the Water Conservation Guide for British Columbia (Belzile et. al. 2013).

### **INTRODUCTION**

- Conservation Plan Objectives
- Community Values
- Plan Context and Scope
- Planning Process
- Endorsements and Supporters

### **WATER SYSTEM PROFILE**

See Appendix A

### **FORECASTING FUTURE DEMAND**

- Water Demand Forecasts
- Future Trends
- Climate Change Impacts

### **CONSERVATION OBJECTIVES**

- Future Water Needs
- Supply Limits
- Potential Cost of New Supply Infrastructure to Meet Future Demand
- Community Water Conservation Objectives

### **CONSERVATION OPTIONS**

- Lessons from Past Experiences with Water Conservation
- Options for Consideration
- Examples and Lessons from Elsewhere

### **SELECTED CONSERVATION MEASURES**

- Local Evaluation Criteria
- Selected Measures

### **STRATEGY FOR SUCCESS**

- Project Designs
- Implementation Strategy
- Conservation Plan Presentation



## Appendix D - Valley-wide Drought Response Strategy Template

- EXECUTIVE SUMMARY**
- ACKNOWLEDGEMENTS**
- TABLE OF CONTENTS**
- LIST OF FIGURES**
- LIST OF TABLES**
- LIST OF APPENDICES**

### **INTRODUCTION**

*This section provides contextual information for the strategy. Sub-sections may include:*

- Definition of Drought
- Scope of the Strategy
- Principles of the Strategy
- Map of Sub-basins

### **OVERVIEW OF RESPONSIBILITIES DURING DROUGHT**

*This section will give an overview of who is responsible for what during drought. It should include a table that lists key organizations and individuals and their responsibilities. Sub-sections may include:*

- The Okanagan Drought Team
- Local Water Suppliers and Individual Water Licensees
- Water Users
- The Province

### **PRE-DROUGHT PREPAREDNESS**

*This section will give an overview of the activities that should be undertaken to prepare for drought at a local, regional, and provincial level. Sub-sections may include:*

- Meeting of Okanagan Drought Team
- Communications with the Province
- Local monitoring and reporting
- Identify streams and aquatic ecosystems of concern

### **DROUGHT RESPONSE LEVELS, INDICATORS, AND ACTIONS**

- Provincial Drought Response Levels and Indicators Criteria
- Valley-wide Drought Response Actions under Each Drought Level

### **COMMUNICATION AND COORDINATION DURING DROUGHT**

*This section will reiterate and emphasize the actions and responsibilities related to communication and coordination during drought.*

**POST-DROUGHT ACTIONS**

*This section discusses the tasks that will be done after a drought to document lessons learned and improve long term water sustainability.*

**APPENDIX A – Key Drought Legislation and Resources**

**APPENDIX B – Detailed Action Tables**

**APPENDIX C – Chronology of Actions in a Model Drought Year**

**APPENDIX D – Drought Response Communications Summary Table**

## Appendix E - Outdoor Water Use Restrictions of Okanagan Water Suppliers

Water Supplier	Normal	Stage 1	Stage 2	Stage 3	Stage 4
Greater Vernon Water	default, 3 days per week, drip anytime	below normal, 3 days per week, drip any day between 7pm and 10am	low supply, 2 days per week	very low supply, 1 day per week	critical, no outdoor watering
Armstrong	n/a	every other day watering (year round)	hand watering only	in home water use only	n/a
Spallumcheen	varies between systems	varies between systems	varies between systems	varies between systems	varies between systems
RDCO	n/a	odd/even (alternate days)	2 days per week sprinkling	1 day per week sprinkling	no sprinkling
Lake Country	n/a	normal conditions, alternate days	Lower than normal reservoirs, 2 days per week	drought conditions, 1 day per week	n/a
Rutland	year round odd/even	similar to normal	2 days per week	1 day per week	no outdoor use
Kelowna	year round odd/even	mild drought, same restrictions as normal except no sprinkling on 31 <sup>st</sup> day of month	moderate drought, 2 days per week and none on 31 <sup>st</sup> day of month	severe drought, 1 day per week	emergency, no outdoor water use (except for livestock)

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Water Supplier	Normal	Stage 1	Stage 2	Stage 3	Stage 4
Black Mountain Irrigation District	year round odd/even	similar to normal but acknowledge there may be shortages to water system or nearby supply areas	2 days per week	1 day per week	no outdoor use
South East Kelowna Irrigation District	year round odd/even	similar to normal	2 days per week	1 day per week	no outdoor use
Glenmore Ellison Improvement District	year round odd/even	similar to normal	2 days per week	1 day per week	no outdoor use
West Kelowna	n/a	odd/even (alternate days)	2 days per week	1 day per week	no outdoor use
Peachland	n/a	odd/even (alternate days)	2 days per week	1 day per week	no outdoor use
Regional District Okanagan Similkameen	varies between systems	varies between systems	varies between systems	varies between systems	varies between systems
Summerland	n/a	3 days per week	2 days per week	1 day per week	no lawn watering
Penticton	n/a	odd/even (alternate days)	2 days per week	1 day per week	no irrigation
Oliver	n/a	n/a	n/a	n/a	n/a



## Appendix E - Outdoor Water Use Restrictions of Okanagan Water Suppliers

Water Supplier	Normal	Stage 1	Stage 2	Stage 3	Stage 4
Kaleden	n/a	default from Apr 15 <sup>th</sup> to Oct 15	3 days per week	2 days per week	no outside watering
Osoyoos	n/a	odd/even (alternate days)	2 days per week	1 day per week	no lawn watering