Drought Management Planning Session Summary
Okanagan Water Stewardship Council Discussion Series
For the meeting of December 14, 2006

In 2006 and 2007, the Okanagan Water Stewardship Council (Council) intends to review the major water resource issues of the Okanagan Basin. The following summary outlines presentations made to the Council, and provides a synthesis of the discussion that followed. The ideas expressed here represent a work in progress, and *do not in any way* signify policy positions of the Council, or of the Okanagan Basin Water Board.

Objective

The objective of this meeting was to discuss ways that communities can prepare for times of water scarcity. Advance planning and cooperative agreements reduce conflicts and meet basic needs during crises, and water users can develop their own water conservation systems to get more productivity and value from the limited resource. In this session we compared different approaches to the development of Drought Management Plans which are a set of pre-planned responses to specific levels of drought conditions or trigger points.

Presenters

- Wenda Mason, A/Manager, Provincial Drought Program, Water Stewardship Division, BC Ministry of Environment
- David Sellars, Principal, Water Management Consultants

Presentations

Slides of all presentations can be viewed on the Okanagan Basin Water Board website at: http://www.obwb.ca/presentations/

I. Wenda Mason: *Dealing with Drought*

Background

In the Okanagan, it is normal to have extended dry periods alternating with times of wet weather. Whether a dry period is considered a drought depends in part on the demand on water supplies. Shortages vary in effect and intensity depending on geography, existing infrastructure and management regimes, and water demand for agriculture, fish, domestic use, and other needs. Droughts are also difficult to characterize because they have no clear onset or end. Meteorologists define drought as a lack of precipitation in comparison to normal or average conditions. Hydrologists compare stream levels between normal years and dry years. Agriculturists define drought in terms of low soil moisture, low groundwater and irrigation supply, and whether these impact production.

When do you ask people to stop watering their lawns? When should the Province declare a drought? In order to develop appropriate response plans it is essential to characterize different drought intensities. If an official drought declaration is called too late, we can lose opportunities to enact conservation measures; if a drought is called too early and is less severe than forecast, the public may become skeptical of drought warnings. For this reason, it is best to have locally-determined drought trigger points, and community-specific drought management plans. The BC

government's definition of drought is a period of sustained low precipitation and high evaporation, resulting in low streamflow and groundwater levels which lead to socio-economic or health impacts to a community. The Province uses four different indices to measure drought intensity: the Standardized Precipitation Index (SPI), and indices related to snowpack, stream and groundwater levels. These are monitored throughout the year, along with weather conditions. Drought affects different sectors in different ways.

- **Water supply**: There are three primary holding areas for water in the Okanagan: the snowpack, the reservoir lakes, and groundwater aquifers. Large and persistent snowpacks are very valuable for water storage, slowly releasing water throughout the spring and summer. But years with high snowfall can still be associated with drought conditions when the snow melts too quickly. Lakes and reservoirs only hold a fraction of the precipitation that falls in the upper watershed and lakeshore development often limits the possibility to raise lake levels and increase capacity (under natural conditions this is known as "flooding"). With too rapid snowmelt, water behind the dams must be released and is lost to the system. If the snowpack is small, reduced stream flows may not be able to keep pace with demands. Although groundwater aquifers can hold vast quantities of water supplies and buffer the effects of drought, little is known about the physical processes of groundwater recharge in the Okanagan. Surface water shortages during droughts can increase groundwater pumping and drop water tables.

- **Water quality**: During extended droughts, lakes and streams are drawn down to low levels, which make them warmer and more vulnerable to algal blooms, fish kills, and concentrated pollutants.

- **Agriculture**: Rangeland, and other forms of non-irrigated agriculture rely on having adequate supplies of soil moisture. Hot weather, with high evaporation rates, following periods of low rain and snowfall can reduce crop quality. Irrigated agriculture depends on consistent water supplies from streams, lakes, and aquifers. Under extreme conditions, complete cessation of irrigation can cause more than just one season of crop loss by killing perennial plantings like fruit trees and grapes, or forcing ranchers to reduce their herd size.

- **Forestry**: Drought conditions weaken trees, making them more susceptible to disease. Low soil moisture and high temperatures can dry out the canopy and understory, and increase vulnerability to fires. In extreme cases, droughts can reduce the amount of water available to fight fires.

- **Aquatic ecosystems**: Low snowpacks mean long periods of low stream flows in the summertime. Low stream flows increase water temperatures, which stress fish and in some cases, lead to fish kills. Riparian vegetation becomes vulnerable to disease and fires. Low stream flow in the winter can lead to increased water freezing, and more fish mortality.

During a run of wet years, it is easy for communities to become complacent and forget the risks of running out of water. City councils approve more subdivisions, farmers plant thirsty crops,

and we assume that the wet conditions are the new norm. Because of increased demand, when dry conditions return we may be even more vulnerable to drought – similar to the way that a succession of dry years might lead to floodplain development that becomes swamped when the water rises again. Over the past 50 years, there has been a great increase in Okanagan water licensing. Meanwhile, global climate change is predicted to reduce water supplies on average, and increase the variability of weather conditions. Already, we are seeing a change in the timing of the spring freshet (earlier snowmelt), and longer periods of low-flows in the summertime.

Provincial Response to Drought

The droughts of 2003 led the BC government to develop a formal, provincial-level drought action plan to protect drinking water supplies, enable continued economic development despite water shortfalls, and maintain the health of aquatic ecosystems for fish and wildlife. The Province established a drought task force, and surveyed community water supplies throughout BC (see: http://www.env.gov.bc.ca/wsd/public_safety/drought_info/). They also looked at what kinds of water management plans communities had in place.

Water Supply Plans analyze the current system and project future supply and demands while exploring options to meet these needs. Water Conservation Plans encourage consumers to increase water use efficiency in a variety of ways. Drought Management Plans spell out appropriate trigger conditions for different drought stages, and regulatory responses that might be imposed at each stage. For example, limiting lawn watering when a reservoir drops to a given level. Every drought is different, and every community responds differently to droughts. As a consequence, drought management plans have to be tailored specifically to each community. The plans have to have enough detail that anyone can follow it, and they must be practiced so that flaws and gaps can be identified. As of 2003, less than a quarter of BC communities had long-term drought plans in place. To address this gap, the Province instituted a $2M grant program to help communities develop water plans, water conservation policy, and drought management teams. The Okanagan received about 20% of this funding, which went to the following communities:

> CORD; NORD; RDOS; Black Mountain Irrigation District; Glenmore Ellison Improvement District; Rutland Waterworks District; South East Kelowna Irrigation District; South Okanagan Mission Improvement District; Okanagan Falls Irrigation District; West Bench Irrigation District; Westbank Irrigation District; Lakeview Irrigation District; District of Peachland; District of Summerland; City of Penticton; Town of Oliver; Osoyoos Irrigation District; City of Kelowna; Kaleden Irrigation District; District of Lake Country; and the Village of Lumby.

Because of the structure of water law and governance in BC, many communities have to rely on voluntary use reductions by water license holders. As development in the Okanagan began on the valley floor, newer licenses are often upstream of older licenses. Water allocation decisions are made by determining whether there is sufficient water passing the diversion point to meet the needs of downstream licensees. Under drought conditions, this water may not make it to downstream users – lost to evaporation or seepage into depleted aquifers. The Water Act gives priority to senior license holders, so if there is not enough water to go around, the newest license holders are required to stop diverting water first. However, “stop diversion” orders can be problematic, as the most recent licenses are typically for small volumes for domestic use.

Shutting these off has a big effect on many individual users, but small effect on the overall water supply. As a result, Water Managers with the Ministry of Environment (MoE) encourage neighbors to resolve disputes amongst themselves. The Water Manager can also appoint a bailiff to resolve disputes, but the water users must pay a fee for this service.

The federal Fisheries Act is the only law that trumps the priority doctrine within the Provincial Water Act. This allows the Department of Fisheries and Oceans (DFO) to stop water diversions if fish are impacted. However, this is reactive legislation, and sometimes it is difficult for a stream to recover from the damage. The Water Act does have provisions for new licensees on sources with a past history of low flows, allowing the water managers to stop diversions by these specific licensees in case of emergencies. The DFO and MoE may also issue joint letters requesting that licensees reduce diversions to protect fish, but these are strictly voluntary.

One of the Provincial plan's long-term actions was to review its own policies on water allocation and use. This has developed into a program to create a new Provincial "Water Strategy," which will examine whether amendments are needed to the Water Act, study the feasibility of new infrastructure to move water intakes from streams to lakes, and to link water availability to land use planning and growth management. Overall, the Province's role in drought management planning is chiefly to provide support and information for local jurisdictions – through communication, funding and regulation. The detailed development and execution of drought plans are left to the local communities.

II. David Sellars: *Using the Water Use Plan process as a framework for drought management planning*

Background

Water Use Plans are non-binding, voluntary agreements by water users on how to manage shared water supplies. They apply under all conditions, and are not limited to droughts – although they are usually developed as a way of apportioning limited water resources. Water Use Plans were originally developed as a way of resolving conflicts between BC Hydro's water use and fish habitat needs, and have been particularly effective for improving water management where there are reservoirs in the supply system. Their goal is to avoid costly litigation by achieving consensus on a plan that satisfies the range of water use interests at stake. Detailed guidelines for preparing these plans have been prepared by an interagency committee including the Province, DFO, and BC Hydro.

The first principle of Water Use Planning is that there are tradeoffs between different water uses. Tradeoffs have always occurred and will continue; for example, between fish needs and water for irrigation. The plans make no change to existing legal and constitutional rights and responsibilities, and must be consistent with both the Water Act and the Fisheries Act. Nonetheless, the plan may recommend voluntary changes to water use that result in a diminishment of water rights. If there are financial impacts from the reduction in water rights, compensation for losses will be a consideration in the plan's implementation. Finally, the process is intended to be collaborative, cooperative and inclusive, bringing a variety of stakeholders to be a part of the decision making.

The design of the consultation process has to be flexible to adapt to local circumstances, but the intention is to develop a sense of shared resource stewardship. Participants have to seriously commit to articulating their own interests and listening to the interests of others, explore a range of possible alternatives, and (recognizing the importance of tradeoffs) seek compromises. At the end of the process there is ideally a sense of ownership and support for the water management decisions. The water licensee is responsible for plan development, including the costs of the consultation process and the assessment of different operating alternatives.

The task of the consultative committee is to define the water use objectives for each of the issues and interests, and identify workable compromises. For example, timing water releases to favor the survival of juvenile salmon, while protecting lakeshore residents from flooding. The process may require additional technical studies to evaluate potential impacts, and then models are developed to evaluate how different water management alternatives affect different water use objectives. The committee evaluates the different alternatives, and the Water Use Plan is developed to incorporate the strategy that provides the best balance. Before it is made official, the Plan is reviewed and approved by provincial and federal regulators.

Water Use Planning in Summerland

The District of Summerland initiated a Water Use Planning process for the management of Trout Creek, following the droughts in 2003 when DFO had restricted diversions to protect fish habitat. The consultative committee included representatives from the District of Summerland Council; agricultural water users; the Province of BC; DFO; and First Nations. The goal of the plan was to determine the amount of water that can be diverted from the creek, while providing flows for fish. The water management models showed that it was not possible to meet the objectives of all the stakeholders, in full; so the committee worked on developing compromise alternatives.

The plan had to be able to reflect the natural variability in stream flows depending on different climate conditions – that is, there would not be a requirement to retain constant flow rates under drought conditions. Fortunately, the Trout Creek basin includes Camp Creek, an unregulated stream that has 38 years of stream-flow monitoring data that could be used to calibrate a model of the basin's hydrology. In the end, the fish flows were based on an index of watershed conditions, based on the Camp Creek hydrograph and different reservoir storage levels.

The primary water management tool to emerge from this process was a Trigger Graph, with five use-reduction stages corresponding to different reservoir and stream conditions. Off the top, the committee agreed to a 10% permanent reduction in water use, compared to 2002 levels. This plan has been effective both for reducing water use in Summerland, and reducing conflicts between different water users. However, two factors were essential for its success. The first is that there was good stream-flow and water consumption data available for the Trout Creek basin. The second is that agricultural water users in Summerland had begun to initiate water conservation measures 10-15 years ago, but because the conservation measures were undetected, the water had not been reallocated to other uses.

Water Use Plans for the Okanagan Basin

The Water Use Planning process may be a practical framework for basin-scale water management planning. This would require two kinds of WUPs: one for the Okanagan River, to

define overall basin objectives and target flows at the Basin's outlet; and individual WUPs for the Okanagan's major sub-basins. The plan for the Okanagan River would incorporate a simple water balance model. The plans for individual sub-basins would be developed by the major licensee for that basin, but would likely require more complex reservoir operation models. One potential obstacle for developing these plans is the scarcity of stream flow and water demand data, however, these may be acquired through the process of developing the Okanagan Water Supply & Demand study. The process for basin-wide water use planning could proceed as follows:

1. Define the overall water balance for the Basin
2. Establish the required flow regime the basin outlet with an Okanagan River WUP, incorporating a 3-year drought scenario in the analysis
3. Determine required target contributions from each sub-basin for a range of different drought conditions
4. Complete WUPs for each sub-basin
5. Revisit and refine the Okanagan River WUP

The benefit of this particular process is that it is very effective at developing plans for drought management under different scenarios. They clarify responsibilities and objectives, and identify feasible alternatives. They include a very rigorous consultative process that may be lacking in the drought management plan development. They can incorporate existing management frameworks and models. They can in turn be incorporated into more formal Water Management Plans that can provide regulatory teeth.

III. Staff Synthesis of Discussion

The following section is a synthesis of the discussion that followed the Mason and Sellars presentations. It reflects the opinions put forth at the meeting, but does not represent consensus ideas, or the last word of the Council on these items. This synthesis was developed by OBWB staff using notes taken during the discussion, rather than verbatim minutes.

One question that continues to arise is: "Why should we promote conservation, if it just frees up more water for development and leads to overallocation"? Water conservation provides communities with buffers that allow them to avoid drought altogether. However, without careful planning there is a risk that water saved through conservation may lead to greater water shortages in the future. The fundamental need is to create more flexibility in the water supply, but the challenge is how to actually plan for this, and how to implement different strategies. What are the best ways to minimize conflicts, and meet basic needs?

Drought Management Plans (DMPs), Water Management Plans (WMPs) and Water Use Plans (WUPs), are all tools that can reduce the risk of water shortages in the Okanagan Basin. They have varying levels of complexity, but can be nested or complementary to one another. The process of developing the plans – analyzing water supply and demand, forming agreements between water users – is almost as valuable to the community as the plans themselves.

DMPs are the simplest of the three types, laying out different stages of drought response depending on specific triggers, like reservoir levels. They are developed with input from a drought task force (see the Dealing with Drought handbook), and may include bylaw-type restrictions on lawn watering or other water use. DMPs can be a building-block for more elaborate water plans. The difference between a DMP and a WUP is essentially a question of process. They are both "process tools" to arrive at the same result, a way of managing droughts. A number of Okanagan utility districts have developed drought management plans, but not all of these have common drought trigger points.

Water Management Plans are a new tool – still being developed by the Ministry of Environment. They are intended to be comprehensive, integrated watershed plans that can be used as a basis for provincial regulation on water quality, instream flow requirements and water supply – among other issues. They may also affect water license approvals or amendments. For the planning process to become official, the Minister of Environment must give an order to designate the plan area and outline its content and process. Once developed by a community, the plan must be approved by the Lieutenant Governor in Council before it attains official status. The Minister has the option to approve only a portion of the plan, rather than the entire package.

BC's first WMP is currently underway as a pilot project for the City of Langley, and is being developed primarily to deal with groundwater issues – at this time there is no other legislative tool for regulating groundwater in BC. The intention is that each community will develop a customized WMP, and will incorporate a consultation process to reduce conflicts and increase the community's acceptance of the plan. However, because WMPs are comprehensive, they can potentially take quite some time to develop and to work through the approvals process.

Water Use Plans lay out year-round guidelines for water management (usually releases from reservoirs), and incorporate a formal process for stakeholder participation. As they are designed to be all-inclusive plans for managing a particular water source, WUPs include drought response plans and use hydrology models and water budgets to determine the drought response stages. Although they have no legal "teeth" or commitments, they can be used by local governments as a basis for water use regulation. They are much narrower than WMPs, because they focus on water supply rather than quality or other ecosystem values.

The process of preparing a Drought Management Plan described in the provincial Dealing with Drought Handbook is actually very similar to the WUP process. However, the outlined process for a Drought Management Plan is more general than a WUP and could be applied in more circumstances, particularly on a region scale with limited hydrologic and reservoir operations studies and without detailed modelling. A Water Use Plan, however, is a defined and detailed process for preparing and implementing a Drought Management Plan for a specific basin. A Water Use Plan also addresses water allocation during non-drought periods (which is very positive for fisheries). One of the difficulties of droughts is "knowing when you are in them" particularly as the critical drought period is different depending on the presence or absence of a reservoir and the size of storage available. With a WUP in place there is no need to externally "define a drought stage". The implementation of the WUP automatically responds to drought conditions. The triggers are built in.

WUPs have been quite successful for reducing the threat of litigation and regulations related to fisheries, and decreasing conflicts between water users. In large part, this is because of the design of the public participation process. In his presentation, David Sellars described a process for developing basin-wide WUPs for the Okanagan, in which a basin-scale WUP specifies how much water must be delivered from each sub-basin to the mainstem system. The sub-basins are the areas with tightest constraints on water supply, but the biggest pressure for new licenses will likely be on Okanagan Lake itself. However, in sub-basins that do not have the threat of lawsuits or other intense conflicts, there may be little motivation for licensees to initiate and fund the water use planning process. If instead of a basin-wide WUP, a WMP was used to specify minimum return flows, it could provide regulatory power to require WUP development in sub-basins. This would help protect water supplies in the main lakes.

Another question for developing sub-basin WUPs in the Okanagan valley is that the process is designed to be initiated and run by the primary licensee for a particular source – in most cases, BC Hydro. The process would have to be modified where a sub-basin has many licensees, to determine how to include them, and who would run the process. Although each water extraction may not have a substantial impact on overall flows, the cumulative extractions may be significant for fish or other environmental needs downstream. A single large-scale user like BC Hydro may also have greater resources for making necessary changes to dams and channels. Providing sufficient return flows to the mainstem lakes is of interest to all residents of the Basin, yet the costs of water use planning and infrastructure improvements are placed on local communities. The Province makes planning tools available – such as WMPs or even Drinking Water Protection Plans – but provides little funding. In the end, this policy may result in inequitable resource management, with management and regulatory opportunities based on access to funds rather than on need. There are also ongoing concerns about the fairness of local communities having to bear the costs of planning and infrastructure expansion to address the needs of fisheries. The burden of preserving fish stocks (which is of national interest) is placed on the local community. It would be much more equitable if DFO contributed funding for water planning and infrastructure improvements.

There are substantial concerns about the affect of climate change on water availability in the Okanagan, but it is difficult to incorporate climate change into water plans. The experience in Summerland showed that the predicted effects of climate change left too little water to meet allocations in some years, and under those conditions, too much water had to be given up by the participating user-groups for any agreements to be reached. Climate change scenarios describe conditions that are outside of historical precedent, and it was considered to be more valuable to come to working agreements based on existing data. If extreme drought events occur, the participants will need to reconvene and re-evaluate water sharing arrangements and ways to increase water conservation.

It is possible that legislative changes could help resolve water conflicts under drought conditions, but these have their own potential pit-falls. The Water Act gives priority water rights based on water license seniority. In developing WUPs, these priority rights are set off the table – that is, people with senior rights do not demand that others concede to their needs. Instead, the group comes to a collective agreement about what the allocations should be. However, there may still be problems under extreme conditions, because there is no existing legislation that pre-empts

water license priority or any formal mechanism for providing compensation for financial losses. Both Alberta and Washington State are reported to have programs that pay agricultural users compensation for lost production in order to temporarily transfer allocations. Okanagan First Nations may also have water rights and needs that are not yet being taken into consideration. Nonetheless, the first-in-time, first-in-right provisions of the Water Act have provided an important part of the legal basis protecting agricultural lands in the Basin. Water that is diverted permanently from agriculture to development is near to impossible to retrieve. The feasibility of maintaining lands in the ALR depends on adequate water reserves remaining available; reserves sufficient to support a range of crop varieties under all but extreme drought conditions, and that account for currently fallowed or unirrigated fields.

Another legislative gap is that (outside of the context of a groundwater management plan) the Province does not regulate groundwater use. As surface water sources become fully allocated, more users from all sectors will turn to underground sources. This has the potential to undermine the work of groups developing all types of plans for water use and management – especially if groundwater extractions lower water tables and reduce stream flows from springs.

Ultimately, we need holistic water management. We need to reduce demand rather than just increasing capacity. What other ecosystem services do watersheds provide us? Riparian health has to be considered in our planning process.

IV. Potential Actions for Future Consideration

The following actions were proposed by different Council members within the context of the discussion, and may be considered in the future as potential recommendations to be forwarded to the OBWB. These do not represent consensus ideas of the Council.

- Agreements must be based on objective measurements of streamflows and water needs. For this reason it is essential to have a network of reliable hydrometric monitoring stations, and end-use metering. Phase 2 of the Water Supply & Demand Study should contribute a solid base of monitoring infrastructure that can be used to support water planning in the future.

- The OBWB should consider expanding its grants program to encourage Drought Planning. Development of Drought Management Teams should also be strongly encouraged.

- Every utility district should have a Drought Plan, and districts with shared sources (such as Okanagan Lake) should have common trigger points for enacting conservation measures.

- Ellis Creek and Mission Creek sub-basins are good candidates for developing Water Use Plans.

- The Council and Board should urge the province to move aggressively forward with groundwater research. Groundwater is 25-30% of water use in OK at this time. There are

many stakeholders, and we need to consider them all before developing policies. These studies may contribute to the basic rationale for developing a groundwater management plan, which would be one way to regulate drilling locations and volumes.

- Riparian health and continued ecosystem services must be considered in our planning process.
- Build broad-based support across all sectors
- Cultivate basin-wide thinking and culture
- Instill the water ethic – everyone has a stake, responsibilities and accountabilities for their actions
- Hold a "drill day" – challenge all water suppliers to test their drought management plan and find flaws
- Identify and seek support for local initiatives which address local capacity issues, especially community engagement for local water use areas.

Resources

Water Use Plan Guidelines. 1998. Province of British Columbia
http://www.env.gov.bc.ca/wsd/plan_protect_sustain/water_use_planning/index.html

C. David Sellars and Rod Smith. 2005. Application of the Water Use Plan Approach to Resolve Water Management Issues on Trout Creek in Summerland. Proceedings of CWRA Kelowna Conference: Water- Our Limiting Resource

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http://www.env.gov.bc.ca/wsd/public_safety/drought_info/index.html

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Status of Community Water Supplies in British Columbia: 2003 Drought Survey. Land and Water BC. http://www.env.gov.bc.ca/wsd/public_safety/drought_info/index.html