

**SOUTHERN INTERIOR
DROUGHT MANAGEMENT WORKSHOP REPORT**

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Penticton, BC

by

**Barry Chilibeck, M.A.Sc., P. Eng.
Northwest Hydraulic Consultants**

and

**Steve Matthews, B.Sc., RPBio.
Senior Fisheries Biologist
Ministry of Water, Land and Air Protection**

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Executive Summary

The Southern Interior Drought Management Workshop gave an opportunity for people who manage water and fisheries to examine and discuss issues and experiences of the 2003 drought. The perspectives, issues and concerns were varied, but a general consensus on the need for elements of improved planning, better resource information and improved water management systems was apparent. The workshop provided some interesting hindsight into the climactic and water resource issues preceding the drought and a valuable review of current drought indicators in the province. It underscored the requirement for more current water and fisheries resource information, but also a system for analysis and dissemination of the information to resources agency managers, water users and purveyors, and the public.

The experiences and outcomes of the 2003 drought led to the review of several situations in local watersheds of how the drought was managed. In the context of future regional or local drought management plans, these experiences provide potential examples of drought management models that could be broadly reviewed and adapted for the future.

One model is a stewardship model, that emphasizes communication to individual water users through public contact and interaction. Fisheries resources and risks are identified and conservation goals are addressed through education and information. In the Salmon River basin, this model was used to address water conservation and fisheries resource needs over a wide area with many dispersed water users. Fisheries resource issues in the basin are relatively well known and valued, and stewardship is an important activity in fish and fish habitat management.

A second model might be considered the single supplier model, where water is supplied from a single purveyor or supply source to a water distribution system. The supplier controls and manages the supply and has the ability to modify water use and demand through management actions. In the SEKID supply system, the ability to modify demand through water rates proved key to reducing consumption and conserving water for the single source supply system. It highlighted the potential effectiveness of demand management on a larger scale – potentially to other licences.

A third model is based on the provincial Water Use Planning process. Largely a licensee-initiated exercise, the process provides a structured review and analysis of resource values, trade-off analysis and determination of potential benefits and costs through operational changes or other measures. In the Trout Creek watershed, this model is being used with MWLAP, DFO and the District of Summerland. The process will investigate longstanding water and fish resource conflicts and seek mutually acceptable conditions that could improve water flows for fish.

Each of these models have strengths and short comings: resource information and data, costs, flexibility, time requirements, adaptability, etc. However, they highlight the fact the practical issue of regional drought planning and management is underway – largely due to commitment and determination of individuals or small groups. With improved resource information and management tools, political support and resources, cooperation and flexibility, it is likely that watershed or supply system-based drought management plans can be developed.

1.0 Introduction

1.1 Workshop Background

Recent extreme low flow events have resulted in significant impacts to fish and fish habitat in the Thompson and Okanagan regions – collectively known as the Southern Interior. These events have highlighted the need for developing proactive management strategies to address potential water supply limitations and associated low flows. The approach to date has been largely reactive, with limited proactive planning and few effective strategies in place to address low water supplies and high water demand. Unfortunately, prior attempts to develop drought action plans were abandoned due to increases in precipitation and limited manpower resources in the region to complete the work.

The Southern Interior has had a long history of water shortage and fish / water conflicts as a result of historic licensing practices and chronic, reoccurring low flows. Many licences are unsupported by storage, nor have restrictive clauses for protection of other uses, or pose cumulative instream demands in excess of available flows. There is also the potential for more frequent and extreme drought events in the future, which is highlighted by climate change predictions indicating the 2003 experience may become the normal within the next 50 years.

Both current and potential future conditions elude to the strong need to develop a plan to better address drought conditions in order to minimize impacts on the aquatic environment, if resource values are to be maintained at current levels or populations. Unfortunately, more work is needed as simply meeting the needs of today does not address the potential cumulative losses of productivity that have historically occurred or might occur due to other factors such as land-use changes, populations growth and other impacts within watersheds. However without water, aquatic ecosystems, their diversity and biomass are likely to diminish at even greater rates therefore managing the supply and demand of water is critical.

1.2 Workshop Goal

This workshop provided a venue to review drought management to date, and explore strategies for improvement through participation from water/fish resource managers (Provincial MWLAP Regions 3 and 8, Federal DFO BC Interior Region), as well as government hydrology and fish flow specialists. Input was also sought from water purveyors in terms of their operational planning and applicability of proposed strategies.

The overall goal of the workshop was to develop strategies and tools for implementation by regulatory agencies, purveyors and water users aimed at reducing low flow duration/severity and subsequent impacts on the aquatic environment in realistic balance with human requirements. Methods and strategies relevant to water use practices and systems in the Southern Interior were emphasized, but concepts and experiences from other areas and jurisdictions were also welcomed background to local issues.

1.3 Workshop Objectives

The obvious objectives of a workshop is to distribute information, listen to experiences of others and solicit feedback on ideas through discussion. The workshop held in Penticton was no different. However, the workshop was organized on a prepared agenda to provide feedback on key issues that would assist in achieving the overall goals.

The overview objectives of the workshop were to:

- Review 2003 drought experiences through the presentation and discussion of experiences of individuals from regulatory agencies, research and industry.
- Understand how low flows and drought may impact aquatic ecosystems found in the Southern Interior Region through specific examples on stream and river in the area,
- Review current research and discuss the implications of climate change on future drought/low water supply events,
- Review the current and proposed provincial and regional drought / low flow management strategies and comment on their application and use,

Based on the analysis and discussions of presentations and through break-out sessions, the workshop would then:

- Identify key components for potential expansion or improvement of Southern Interior water supply systems,
- Review tools and strategies that are required to improve water management in all water supply scenarios,
- Identify / document proactive and reactive strategy options for limiting low flow duration and severity in Southern Interior aquatic ecosystems,
- Examine existing data and knowledge data gaps with respect to resource information, analysis and distribution of that information,
- Identify useful communication strategies for agency/water user awareness, preparedness and response to low water supply problems,
- Identify next steps for implementation of regional and local drought management plans

The output from the workshop will provide information that will be key to shaping the framework of a regional drought management plan, as well as local management plans – ideally tailored to the resources and uses within the area. Although this work will assist agency staff, distribution to, and involvement of the public, water utilities, local governments and the agricultural community is key.

2.0 Presentation Summaries and Discussion Points

Topic 1: Workshop Introduction Steve Matthews, MWLAP, Penticton

Steve's presentation outlined the context of the workshop in terms of the 2003 drought and the need to support tackling the water management issues in the region, not just drought

management. The wide range of representation and level of interest in attending this workshop was a clear indication of both concern of issues and need to continue to develop a broader engagement of the public, First Nations, local governments and industry. As a participant-driven workshop, dialogue and discussion are key to forming the elements of what needs to be considered, the format and application of an action plan or drought management plan for the region. Without continued support at levels higher in the provincial government, the funds and manpower to engage and deal effectively with this type of planning exercise will diminish. A business case is required when dealing within the current government as well as a broad level of support.

**Topic 2: 2003 Provincial & Okanagan Drought Experience
Ron Ptolemy, MWLAP, Victoria**

Ron provided a review of 2003 regional stream flows from gauged data, as well as some relative impacts based on standard-setting conservation instream flows for fish. Streamflows – as measured as a percentile – give an accurate indication of relative flows to historical conditions. Hydraulic drought was indicated as flows less the 25th percentile daily flows. A review of stream flows through the flow-sensitive ecoregions of the province indicated that drought conditions persisted in stream and rivers, and in fact was wide-spread, extending from Vancouver Island into the Southern Interior, North to the center of the province and South into the US PNW states. Many systems had less than 5% MAD, many with no surface flow that resulted in fish stranding, kills and loss of productivity and fish populations.

**Topic 3: BC Southern Interior Drought Strategy 2003
Dean Watts, Fisheries and Oceans Canada, Kamloops**

Dean presented the results and findings of the actions taken to monitor and conserve aquatic habitats and fish in the Thompson – Nicola areas of the Southern Interior Region during the 2003 drought. The interagency work – spearheaded by DFO – focused on communication at various levels, stewardship, field flow monitoring and enforcement actions – where appropriate. The goals were to monitor impacts and recover water for instream flows where possible. The combined hydrological and biological study conducted during the drought will provide an excellent database to begin the process of understanding aquatic impacts. Success was measured by reduced irrigation and compliance with restrictive clauses, voluntary restriction of water use, increased awareness and interagency cooperation. The work highlights the effectiveness of pool agency resources and assistance.

**Topic 4: S.E. Kelowna Irrigation District – 2003 Experience
Toby Pike, SEKID, Kelowna**

Toby gave an excellent presentation on the SEKID water system and the actions put into place by it's managers to ensure reliability and supply during the 2003 drought. He stressed that updated water supply studies estimated reliable supply figures and led to improved monitoring of inflows. SEKID takes an overall watershed management approach that includes yield and water quality (recent fire impacts). Toby also stressed that long-term

management takes money and time, but relative to costs of system expansion the costs are justified and important for future growth issues in the region.

**Topic 5: Climate Change & Water Management in the Okanagan
Stuart Cohen and Tina Neale, Environment Canada/UBC**

Stuart presented the results of recent research into the impacts of potential climate change on the availability of water in the Okanagan Basin. Potential future impacts of climate change scenarios suggests that a warmer climate would lead to reduced water supply and increased demand in the Okanagan. Less water results through a shift in the percentage of snow to rain in the precipitation and timing of the precipitation. Increased demand results from increased temperatures and a longer growing season. Predictions indicate conditions similar to the 2003 drought will be the norm in 50 years. There are potential supply-side and demand-side options available, but they require economic, societal and cultural change. The solutions will come from within the basin, likely from an integrated water and land management planning process, but not without resources and support from all levels of government

**Topic 6: Provincial Drought Task Force Action Plan
Lynn Kriwoken, MWLAP, Victoria**

Lynn reviewed the provincial response to the 2003 drought, including the short, medium and long-term actions that were developed in the Action Plan from government. The clear message from government was both of economic and environmental impacts, concern over community water supplies and water quality. The Action Plan provided the stimulus for reports on community water supplies, increased concerns over groundwater and the potential for future droughts (2004 anyone?). Questions from the floor included the concerns of both climate change monitoring and groundwater management, and the obvious separation of water planning, protection and allocation within the current government.

**Topic 7: Focus Stream Designation
Ron Ptolemy, MWLAP, Victoria**

Ron provided a list of the *Fish Protection Act* flow sensitive streams currently listed for the Southern Interior Region. It covers all Okanagan streams as well as many Thompson-Nicola systems, and stream and rivers in the Kettle, Granby and Similkameen systems. He noted streams tagged as flow sensitive under the *Fish Protection Act* would encourage the development of plans to recover instream flows if applied.

**Topic 8: Drought and Water Temperature
Al Caverly, MWLAP, Kamloops**

Al produced temperature data from several monitoring sites on streams in the Thompson-Nicola area that illustrated the diurnal temperature fluctuations in response to air temperature. Many of these monitored systems had daily peak temperatures in excess of lethal temperatures for salmonids, which likely severely stressed fish populations. Droughts aggravate high temperature impacts by reducing available habitat (wetted width),

disconnecting habitats (local dewatering) and preventing migration to potential cool water refugia (groundwater). Riparian shading is a key element to reducing overall temperatures and related impacts.

Topic 9: Supply Forecasting – Provincial System
Dave Gooding, Provincial River Forecast Center, Victoria

Dave reviewed what role the River Forecast Center (RFC) provides and the additional information that was provided during the 2003 drought. Indications from snowpack information clearly identified reduced stream flows. Low early summer streamflows and much reduced summer precipitation confirmed drought conditions. Output and summaries from the RFC clearly show the extent of drought conditions and relative magnitudes. Dave noted that the RFC has limited resources but provides value-added analysis of data and could process additional data to improve reliability of forecasts from existing models. He noted that drought definition and classification is required, additional precipitation monitoring during summer is critical and notification or improved communications are required.

Topic 10: Supply Forecasting – Current Utility and Potential for Improvement
Phil Epp, MWLAP, Penticton

Phil reviewed the utility and correlations between snowpack and streamflows to attempt to provide in-season estimation of flows for planning purposes. Correlations were present but weak (approximately 50% accurate), and likely factors such as summer precipitation and soil moisture deficits (from previous water year) reduced the utility of snowpack monitoring alone. Phil reviewed in-season monitoring using the Trout and Camp Creek systems as a parent / sub watershed model. He showed that daily hydrographs from April 1 through to July 1 (or 30 days after the peak of freshet) is a good tool for in-season summer flow predictions. Aside from summer storm events, post-freshet basins exhibit a recessional decay curve (log_e based) of stream flows. An examination of other nearby watershed indicate the possibility of extending the analysis to other basins but requires additional study. Development of recessional factors for a basin could provide estimates of biweekly or monthly flows with a high reliability. Phil stressed the need more real-time streamflow gauges on un-regulated tributaries.

Topic 11: Water Supply Forecasting – Groundwater
Des Anderson, MWLAP Kamloops

Des reviewed the regional groundwater observation wells in the Southern Interior Region from 2003 – current. New historic lows groundwater levels were set in 2003 Aug in 63% of wells. Groundwater wells – with their unique inter water season memory – provide a valuable tool for tracking drought. The use and reliance on groundwater in certain areas of the Okanagan point to the need for better understanding of aquifer use. Issues of groundwater and climate change, equitable sharing of resource in long term (effective management) in the light of no regulation, resource monitoring and integration of surface water and groundwater. Des highlighted the potential partnership with Geological Survey

Canada (GSC) in developing a Groundwater Assessment of Okanagan Basin (GAOB). This included a comprehensive data base, hydrogeological models and aquifer mapping. It would provide a framework for resource management at a proper scale, but is limited by resources and mandate. In the interim, better data collection from existing wells and additional observation wells are key. In the long-term, legislation and active management is required over passive, reactive type currently used.

**Topic 12: Low Flow Monitoring in the Thompson Region
Bruce McFarlane, MWLAP, Kamloops
and Paul Doyle, Doyle Engineering, Kamloops**

Bruce and Paul detailed their streamflow monitoring system and data results for over 24 sites in the Thompson, Nicola and Shuswap systems. This included both stage and flow measurements conducted throughout the drought. Their monitoring program had both expected and unexpected results. Low flows were less than well established normals of low flow in the systems, but the severity was variable. Demand was increased and with reduced supply, variations in streamflows occurred as a result of irrigation practices and timing. Monitoring of systems with managed storage indicated that 2003 flow releases did benefit low flows. Unexpectedly, large losses occurred due to reduced return flows from irrigation and potential losses to exfiltrating reaches. Initial results of the monitoring suggest that storage and flow management systems should focus on minimum conditions, not averages.

**Topic 13: Agriculture and Water Use
Ted van der Gulick, MAFF, Abbotsford**

Ted provided insight into the technological changes that are increasing water efficiencies in agricultural production. Climate and soils monitoring systems combined with drip and metered irrigation systems have the potential to save significant volumes of water or defer additional demand from the agricultural sector. Ted demonstrated the various online resources available to the agricultural industry as well as the technology transfer promoted by MAFF and other industry associations.

**Topic 14: Crop Water Demand Modeling for Climate Change
Denise Neilson, AAFC, Summerland**

Denise presented the crop water demand modelling that forms part of the climate change-agriculture- water supply impacts study, partnered between UBC, AAFC and others. Her modelling indicates that demand will increase in relation to increased evaporation and transpiration due to an increased growing season length. Tests were based on measurements of soil moisture deficits in test sections with fruit crops, no comparable work for forage crops has been undertaken.

**Topic 15: Conservation Strategies – water purveyors experience
Toby Pike, SEKID, Kelowna**

SEKID supply management includes use of demand control through metering and escalating water rates for over use. SEKID is supply-limited therefore growth and

expansion can only be provided through conservation and efficient use. The management system uses a combination with communication / awareness to ensure soft compliance. As a result of good demand management, 2003 water use was only 2.5% above average volumes. Metering is a key element to the demand management plan, along with an irrigation scheduling program, but requires a long-term view to recoup effort and costs.

**Topic 16: LWBC – Planning & Water Act
Kevin Dickenson, LWBC Inc., Kamloops**

Kevin reviewed the mandate and objectives of the new corporation that provides allocation and licensing serviced for water and land resources. Emphasis was placed on the fact that LWBC is not a stewardship advocate but primarily to provide revenue for resource use. Any element of responsibility stops with minimum legal requirements – the water licence and the *Water Act*. LWBC do not do stewardship! He indicated that LWBC cannot make licensees stop/curtail diversions without fish clause (15 of 200 licences), but have limited resources to enforce any licence conditions. The current LWBC service plan is focused on time and resources dealing with backlog of license applications and amendments. There is a compliance and enforcement officer for each service area (including Kamloops). The mandate of LWBC was questioned regarding enforcement and coordination with other water resource planning and protection elements in the government as well as DFO. Kevin indicated that regional coordination was good but at higher levels considerable disconnect exists. While there is a focus on licensing, without monitoring and enforcement there was a question of why licence – the answer is simply revenues.

**Topic 17: Canada’s Fish Habitat Law
Dean Watts, Fisheries and Oceans Canada, Kamloops**

Dean reviewed the sections of the *Fisheries Act* that pertain to water flow and fish habitat. As written, the act is retroactive and contains very little proactive or enabling legislation that would assist in protection of the fisheries resource *a priori* use and impacts. Current resource limitations greatly reduce ability to utilize enforcement as a tool under the Act. As a result both Provincial and Federal agencies are promoting awareness / compliance, and less focus on enforcement which is seen as costly and less effective.

**Topic 18: Demand Management Planning Framework
Ron Smith, MSRM, Kamloops**

Ron provided an excellent presentation on the interconnection between sustainable co-dependant land and water use. He reviewed the current land planning initiatives underway and how – at a regional level – the issues were being developed in the context of a growth management strategy. Work on the Trepanier Landscape Unit is underway with a goal to set the template for solving these issues across the basin. He identified the common water planning issues and presented goals for the process. He commented that floods and droughts are important because they are extreme and have high social, economic and environmental costs, but relatively infrequent. Finally, Ron presented a framework for a model Drought Management Plan (DMP) – which he considers an important tool in the

overall planning objectives for the Southern Interior Region. Ron's presentation was well respected as it strove to find a balance of water use from many perspectives.

3.0 Break-out Session Summary Points

Break-out sessions were held in small groups to discuss several key issues. Results of the sessions were later presented back to the main group for deliberation and discussion. The topics were:

- Increasing Supply
- Managing Existing Supply
- Managing Water Demand.

3.1 Increasing Supply

- For human consumption, irrigation
- Sources: groundwater, tributary watersheds, Okanagan Lake
 - Need evaluation and comparison
 - Recognize limits to supply
 - Dams – small ones that are used only in dry years when flows are low
 - Lake source – high cost, concerns
 - Groundwater
 - poorly understood resource
 - aquifers in Okanagan known and used
 - not tracked actively
 - must be regulated
- Recycled treated water – irrigation use
- Watershed management → need to solve Okanagan Lake water problems within Okanagan Water Basin

3.2 Managing Existing Supply

- Better forecast → better management
 - Needs to be earlier and kept up to date
- Question of who pays – by area, joint government effort: fed, prov, region
- Liabilities of forecasting
- Operational Changes – *Water Act* Changes
 - Regulate water allotment as needed not as user see fit
 - Change end dates – not tied to calendar dates
 - Metering is required
 - Alternate licensing (eg. Spring licence, storage-based)
 - Scheduling – times to water...
 - Large regional issues
 - Compliance monitoring needs to be integral component
 - Need for improved supply forecasting – key to effective demand management

3.2.1 Resource and Information Needs

- Resources to collect info
 - Individual basins?
 - Each area may fund it differently
 - Start with pilot program and focus resources
 - Costs are mostly upfront (eg. Naturalizing hydrograph)
 - Focus on high risk streams
 - Collaborative effort with universities
- Risk of doing nothing is that costs will go up even with no action
- Research needs to be done
 - Eg. Role of Wetlands and groundwater processes
- Need high level support
- Require Southern Interior Flow Monitoring Methodology Standardization Workshop – instream session for everyone involved in flow monitoring

3.3 Managing Water Demand

3.3.1 Research needs/Conservation Strategies

- Water bill showing use, past use, comparative
- Research allocation vs available water
- Storage requirements
- Research user needs, water budgets, implementation
- Education, communication
- Bylaws, standards, conservation advocate
- Equitable distribution, understanding supply / minimum base flows
- Understanding natural hydrograph, impacts eg. Forestry
- Research appropriate base flow requirements – unaltered flow
- Develop model that accounts for climate change
- Research individual systems
- Relationship between stream habitat requirements and supply
- Need to estimate evapotranspiration on Ok lake

3.3.2 LWBC Role and Tools

- GIS mapping – licensing, fish values
 - Reduces referrals to agencies
 - screening tool
 - provide quick and efficient system
- Lemieux Cr. Plan – too onerous to do on every source
- Term licences – (instead of in perpetuity which does not account for change in environment. or social values etc.
- Change *Water Act*
- Reassess duties
- Stewardship – peer pressure re: monitoring

- Compliance monitoring – incentive for meters (eg: rebates, rates decrease, benefits for reporting)
 - Ability to review info collected
 - audit
- Farm planning improvements required
- Need education and pilot projects – see benefits
- Water resource under priced
- Business case built on compliance monitoring
 - Revenue lost re: unlicensed use
- Technology – measure moisture content remotely?

3.3.3 Water Act Options

- Ability to refuse application when alternate source available
- Licences tied to land not user – problem?
- Lack of water results in last person losing out
- Not shared
- Recognition that water for fish is a beneficial use
- Appeal process – cumbersome
- too easy to appeal (not expensive)
- Changes in rates that applies to all existing licences

3.3.4 Planning Processes

- Assume supply evaluation before planning process
- Benefits – estimating future demand
 - alternative. to crisis management (allow more choices)
 - opportunities for communication and dialogue
- Risks – plans aren't implemented
 - plan from avg. values / min values
 - disconnect between supply and demand
 - not based on semi-arid conditions eg. Don't encourage xeroscape
- Benefits – get by buy-in if all levels involved
 - acceptability – public faith in process
 - choices made from consensus
 - willingness to pay
 - timing and cost of plans vs cost of crisis management
 - knowledge up front
 - needs to be measurable
 - comparison to \$ is easier to understand
 - opportunity for choices
 - education
 - scale of implementation
- high level plans transfer to lower implementation level: support = leadership
- coordinated hierarchy
- responsibility
 - integrated approach from governments

- cost sharing opportunity
- reporting
- adaptability
- resources – focus on those implementing themselves
 - self – starters
 - compliance expenditure for others

4.0 Potential Drought Management Tools and Strategies

Results of the discussion and the break-out sessions confirmed that there were no “silver bullets” with respect to water management issues in the Southern Interior Region. Low cost water supplies have been developed, and hydrological variability is likely to increase along with demand. The critical issue is to find an economic and social balance between water supply and water demand management. In the time of drought, the measures used to reduce demand and conserve supplies must be clear, unequivocal and binding and at the same time be broadly supported and applied fairly.

The following issues were viewed collectively as key, positive actions that were beneficial now and have the potential to be integrated into an enhanced water management system.

4.1 Demand Side Management

(see presentation associated with each section for more details)

4.1.1 Improving Agricultural Water Use Efficiencies

- Lots of options to improve efficiency
- Good initiatives under way (MAFF Environmental Farm Planning)
- Funding sources – National Water Supply Expansion Program

4.1.2 Research – Crop Water Demand

- Considerable increase in crop water demand in future based on climate change model scenarios
- Good strategies for reducing crop demand are being developed

4.1.3 SEKID Conservation Strategy

- Excellent model for other Irrigation Districts / jurisdictions
- Drought no longer an issue based on conservation strategies

4.1.4 LWBC Issues

- Water Allocation Planning not on horizon
- Compliance Monitoring low priority
- One Compliance & Enforcement Officer per service area
- need to ensure this limited capacity is not lost to backlog
- look at stream specific focus (eg. Mission Creek)
- Need to look at additional revenue generation to support priority activities

4.1.5 Legislative Tools

- Limited applicability based on current focus on stewardship / compliance vs. enforcement
- Current tools are based on old legislation that is reactive – not proactive (*Water Act* and *Fisheries Act*)
- need potential tools in new legislation (*Fish Protection Act*), but need accountability

4.1.6 Planning Initiatives

- Large range of planning processes
- Require Public buy-In to be successful
- Need for groundwater management strategy
- Combined sustainable water and land-use planning underway
- Long-term drought management planning now needed

4.2 Supply Side Management Session

4.2.1 Supply Forecasting – Provincial Approach

- under utilizing useful tool for guiding demand management., but limited applicability in summer/fall
- Province beginning to look at expending to forecasting summer/fall flows

4.2.2 Integrating Supply Forecasting Into Operational Planning

- utilizing available flow data to project summer/fall flows
- need to incorporate useful tools into demand management

4.2.3 Flow Monitoring – Lessons Learned – Info Needs

- require senior level support for programs
- partnerships may be key: federal, provincial, regional, local and industry
- need to link all available info sources (websites), include river forecasting, climate, soils and groundwater

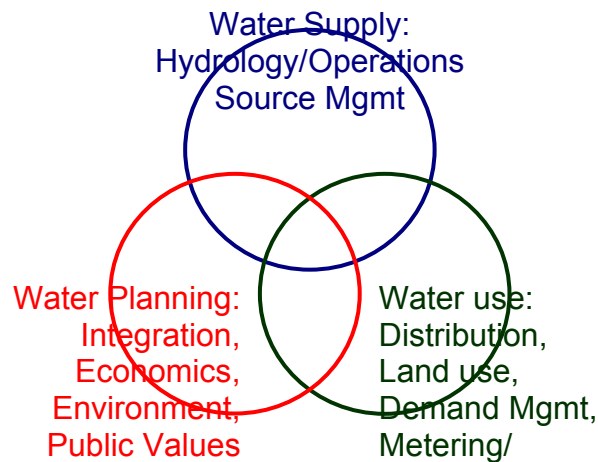
4.2.4 Supply Development

- Limited opportunities for developing new water supply
 - limited new reservoir opportunities
 - improving management of existing structures better option
 - lake supply reasonable option but costly and not unlimited source
 - Environmental and fisheries impacts must be assessed
- Groundwater management / legislation critical to controlling use of this source and potential impacts on surface source
- Good opportunities to improve management of existing supplies

4.3 Framework of a Drought Management Plan

Droughts are not planned events however the response to the event can be planned – and like First Aid – the actions can be practised, rehearsed and reviewed. Development of a drought management plan is a key activity in the ongoing work and information required in

the management of community water supplies. These plans involve integration of supply and demand management elements with core planning issues such as economic development, environmental protection, public safety and sustainable use. A drought management plan would be one element of a overall Water-Plan as would flood planning, Source hydrological studies, distribution systems analyses, etc. A comprehensive outline for a plan was presented by Ron Smith, MSRM Kamloops, and this should be adopted as a guide to development of local and regional plans in the Southern Interior Region.



Key elements for a drought management plan are:

1. Define the goals and objectives of the plan
2. Obtain the required data - water supply and use or demand information
3. Determine performance measures of drought
4. Develop a drought index based on the measures and an assessment process
5. Identify measures, mitigations and trade-offs along scale of drought index
6. Develop and maintain public involvement
7. Implement with public information and communication
8. Apply both the “carrot and the stick “ – reward compliance and water savings while penalizing waste and overuse

5.0 Workshop Recommendations

The workshop summary concluded that elements of improved planning, better resource information and improved water management systems are required, and that drought management will be a larger issue in the future in the Southern Interior Region. The current situation in 2003 underscored the requirement for more current water and fisheries resource information, but also a system for analysis and dissemination of the information to resources agency managers, water users and purveyors, and the public. Provincial drought management planning will likely provide key direction in this area.

Importantly, the experiences and outcomes discussed at the workshop on the 2003 drought led to the review of several situations in local watersheds of how the drought was actually managed. In the context of future regional or local drought management plans, these experiences provide potential examples of drought management models that could be broadly reviewed, improved and adapted for the future. It highlighted flexibility, communication, results-based monitoring and scaled responses or enforcement.

One model is a stewardship model, that emphasizes communication to individual water users through public contact and interaction. Fisheries resources and risks are identified and conservation goals are addressed through education and information. In the Salmon River basin, this model was used to address water conservation and fisheries resource needs over a wide area with many dispersed water users. Fisheries resource issues in the basin are relatively well known and valued, and stewardship is an important activity in fish and fish habitat management.

A second model might be considered the single supplier model, where water is supplied from a single purveyor or supply source to a water distribution system. The supplier controls and manages the supply and has the ability to modify water use and demand through management actions. In the SEKID supply system, the ability to modify demand through water rates proved key to reducing consumption and conserving water for the single source supply system. It highlighted the potential effectiveness of demand management on a larger scale – potentially to other licences.

A third model is based on the provincial Water Use Planning process. Largely a licensee-initiated exercise, the process provides a structured review and analysis of resource values, trade-off analysis and determination of potential benefits and costs through operational changes or other measures. In the Trout Creek watershed, this model is being used with MWLAP, DFO, MAFF, First Nations and the District of Summerland. The process will investigate longstanding water and fish resource conflicts and seek mutually acceptable conditions that could improve water flows for fish.

Each of these models have strengths and short comings: resource information and data, costs, flexibility, time requirements, adaptability, etc. However, they highlight the fact the practical issue of regional drought planning and management is underway – largely due to commitment and determination of individuals or small groups.

The framework for drought management plans was addressed, along with the elements of a plan to allow for flexibility in terms of the delivery and methods. The critical issue is that the plan is implemented, it is communicated and effectiveness monitoring is engaged to provide feedback. Action plans and management systems are paper exercises without implementation, feedback and modification. Plans need to evolve into process and systems in order to be truly effective. With improved resource information and management tools,

political support and resources, cooperation and flexibility, it is likely that watershed or supply system-based drought management plans can be developed.

6.0 Next Steps

The Southern Interior Drought Management Workshop was successful at addressing the goals and objectives established during the planning stages of this event. Many of the key players involved in water/fisheries management issues were in attendance, the presentations provided an excellent foundation for discussion, and the resulting discussions led to the development of comprehensive lists of potential actions and strategies for improving drought management in the future, and ultimately the reducing the impacts on fish and people. But for this workshop to be considered a success at affecting drought management in BC, it is critical every effort is made to implement the identified action points and strategies. As such, one of the most important workshop discussion sessions revolved around next steps. This section outlines the actions points considered a priority by workshop participants and focuses on the activities required for facilitating implementation of the key supply side and demand side management strategies discussed earlier in this report. This includes activities aimed at implementation within the year 2004 in anticipation of another drought, as well as those actions which are also considered priority components of a drought management strategy, but are realistically delivered over a longer time frame.

Short term action items (2004) with a focus on the Southern Interior Region include:

- Provide wide distribution of this report to appropriate government staff, purveyors and other water managers to achieve increased level of awareness of issues and potential drought management strategies,
- Present results from this workshop to Deputy Minister's Drought Management Task Force
- Utilize the information from this workshop and results from follow-up tasks for presentation at large conference directed toward an audience consisting of local governments, purveyors, large volume licensees, First Nations, and other stakeholders
- Development of a business case model with respect to impact of future droughts on Okanagan and Southern Interior regions, as well as strategies for proactively addressing those impacts. Utilize this model to secure senior level government support for proceeding with developing strategies identified in this report,
- Ensure limited resources are well focused, and interagency and Provincial/Regional cooperation and integration is maintained. Sufficient profile must be kept on this issue as long term effort is required. This would include a website which would integrate Provincial and Regional drought management information and activities,

- Undertake a flow monitoring workshop within the Southern Interior aimed at both government and non-government personnel to ensure standard methodology is utilized and data quality is assured.
- Identify flow/temperature sensitive streams for drought management focus to ensure benefits and manpower allocation efficiencies are maximized. This should be displayed on a GIS based map for viewing by a wide audience,
- Develop an integrated Provincial/Regional Stewardship Model for addressing education and awareness objectives, with an initial focus on 2004

Long term action items (2005 and beyond) include:

- Address data gaps on focus streams relating to flow conditions and fish flow requirements
- Improve supply forecasting (River Forecast Center) to extend through the typical interior low flow periods, utilizing both snow pack and hydrograph indicators. In addition, improve communication of forecasting information to all water users, with a focus on local governments, purveyors and large licensees.
- Direct primary demand management focus on agricultural users and large purveyors based on potential benefits, but ensure domestic users are also well informed. Buy-in from all sectors is critical,
- Develop an integrated Provincial/Regional Stewardship Model for addressing education and awareness objectives
- Promote a Purveyor Model based on the SEKID approach
- Consider utilizing a pilot watershed approach to assess effectiveness of various actions,
- Seek development of watershed and user-specific management/operational plans in sensitive areas for addressing current and future water supply limitations using existing models (SEKID, Trout Cr., Salmon R.) as well as looking at external drought management models from other areas,
- Continue to support research into the implications of potential climate change, water use and demographic changes - consideration of population and land-use controls,
- Explore regulatory options and potential flexibilities with the *Water Act* - think outside the box – comprehensive water use planning and management includes groundwater, and
- Work toward involving all appropriate agencies in delivery of key actions,
- LWBC expand role to include compliance monitoring and education/awareness,
- Promote and participate in water management planning processes. At a large scale, growth management and land/water use planning which incorporate long term water supply and demand estimates. At a more local level, operational plans specifying protocol under all water supply scenarios.

- Develop incentives aimed at improving planning and water conservation (er. Metering)
- Clearly identify funding opportunities aimed at long term sustainability of water supplies for all users.

7.0 Appendices

7.1 Agenda

DAY ONE – TUESDAY, MARCH 2, 2004

TIME	AGENDA TOPIC	DETAILS	PRESENTER
0930 – 1000 hrs		Coffee and Muffins	
1000 – 1015	Introductory Comments	Welcome, Introductions, Review of Workshop Goal, Objectives and Agenda	S.Matthews, MWLAP
1015 – 1030	2003 Experience	Review of provincial / regional flow conditions and impacts	R. Ptolemy, MWLAP
1030 - 1045	Discussion	Actions taken – success/failures	D.Watts, DFO / A.. Caverly, MWLAP
1045 - 1100		Water Purveyors Experience	T.Pike – South East Kelowna Irrigation District
1100 - 1115		Discussion	All
1115 - 1200	Climate Change	Implications - drought frequency and impacts	Stewart Cohen
1200 - 1245		Lunch (provided on-site)	
1245 – 1315	Provincial Drought Management Strategy	Review of provincial initiative – activities to date and future plans	Lynn Kriwoken, MWLAP
1315 - 1345	Focus Stream Designation	Prioritization of drought sensitive streams and identifying fish flow requirements	R. Ptolemy / A. Caverly, MWLAP
1345 - 1415	SUPPLY MANAGEMENT	Supply Forecasting – Provincial approach	D.Gooding, MWLAP
1415 - 1445	Review of Current and Potential Strategies	Supply Forecasting Current utility and potential improvements	P. Epp, MWLAP
1445 - 1500		Coffee Break	
1500 - 1530	SUPPLY MANAGEMENT	Ground Water Conditions - Applicability for supply forecasting	D. Anderson, MWLAP
1530 - 1600	Review of Current and Potential Strategies	Flow Monitoring in Region 3 - Lessons Learned	B.McFarlane MWLAP
1600 - 1700		Break out groups (Details provided at workshop)	All

DAY TWO – WEDNESDAY, MARCH 3, 2004

TIME	AGENDA TOPIC	DETAILS	PRESENTER
0830 – 0900 hrs	SUPPLY MANAGEMENT	Break-out Group Reports Discussion	All
	Review of Current and Potential Strategies		
0900 - 0930	DEMAND MANAGEMENT	Research – Water requirements for agriculture	Denise Neilson
0930 - 1000	Review of Current and Potential Strategies	Conservation Strategies – Reducing agricultural demand	T. van der Gulick, Min of Ag, Food and Fish
1000 - 1015		Coffee	
1015 - 1045	DEMAND MANAGEMENT	Conservation Strategies – Water purveyors experience	T. Pike - SEKI D
1045 - 1115	Review of Current and Potential Strategies	LWBC ➤ Planning – integrating supply and allocation ➤ Water Act – water use monitoring, legal options	K. Dickenson, LWBC
1115 - 1130	Integrating Supply and Demand Management	Other Legislation: Fisheries Act, FPA, Municipal Planning Processes	D. Watts. DFO
1130 - 1200		➤ Water Use Plans / Growth Mgt / Land Use Plans ➤ Operational Plans (written agreements)	MSRM rep
1200 - 1215		Demand Mgt Discussion	All
1215 - 1300		Lunch (provided on-site)	
1300 - 1400	DEMAND MANAGEMENT	Break out groups (Details provided at workshop)	All
	Review of Current and Potential Strategies		
1400 - 1430		Break-out Group Reports – Discussion	All
1430 - 1500	Next Steps	➤ Workshop Product ➤ Development of Action Plan ➤ Follow-up workshop/conference	S. Matthews - All
1500 - 1515	Wrap Up	Action Points	S. Matthews

7.2 Attendance List

NAME	AFFILIATION	ADDRESS	E-MAIL ADDRESS	PHONE
Ron Ptolemy	WLAP	Victoria	Ron.Ptolemy@gems2.gov.bc.ca	(250) 356-7054
Cindy Harlow	DFO	105 – 3547 Skaha Lake Rd, Penticton BC V2A 7K2	Harlowce@pac.dfo-mpo.gc.ca	(250) 770-4487
Dale Desrochers	DFO	310 A North Broadway, Williams Lake BC V2G 2Y7	desrochersd@pac.dfo-mpo.gc.ca	(250) 305-4019
Alan Davidson	WLAP	#401 333 Victoria St, Nelson BC V1L 4K3	Alan.davidson@gems2.gov.bc.ca	(250) 354-6390
Daniel Millar	Environment Canada	201 401 Burrard St, Vancouver BC	Daniel.millar@ec.gc.ca	(604) 664-8345
Mark Barton	Environment Canada	201 401 Burrard St, Vancouver BC	Mark-barton@ec.gc.ca	(604) 664-9098
Dave Smith	DFO	105 3547 Skaha Lake Road, Penticton BC V2A 7K2	Dave.smith@pac.dfo-mpo.gc.ca	(250) 770-4486
Des Anderson	WLAP	1259 Dalhousie Drive, Kamloops BC V2C 5Z5	Des.Anderson@gems5.gov.bc.ca	(250) 371-6323
Andrew Wilson	WLAP	102 Industrial Place, Penticton BC V2A 7C8	Andrew.wilson@gems5.gov.bc.ca	(250) 490-8267
Phil Belliveau	WLAP	1259 Dalhousie Dr, Kamloops BC V2C 5Z5	Phil.Belliveau@gems8.gov.bc.ca	(250) 371-6240
Toby Pike	SEKID	203 28064 RPO East KEL, Kelowna BC V1W 4A6	Pike@sekid.ca	(250) 861-4200
Michele-Lee Moore	LWBC	1175 Douglas Street Victoria, BC V8W 2E1	Michelelee.moore@gems7.gov.bc.ca	(250) 356-0265
Ted VanderGulik	MAFF	1767 Angus Campbell Rd, Abbotsford, BC	Ted.vandergulik@gems8.gov.bc.ca	(604) 556-3112
Ron Smith	MSRM	1259 Dalhousie Dr, Kamloops BC V2C 5Z5	Ron.smith@gems6.gov.bc.ca	(250) 371-6206
Phil Epp	WLAP	102 Industrial Place, Penticton BC V2A 78C	Phil.epp@gems5.gov.bc.ca	(250) 490-8274
Bob Brodie	LWBC	145 35d Ave, Kamloops BC V2C 2C6		

NAME	AFFILIATION	ADDRESS	E-MAIL ADDRESS	PHONE
Don McKee	LWBC	102 Industrial Place, Penticton BC V2A 7C8	Don.mckee@gems5.gov.bc.ca	(250) 490-8265
Denise Neilsen	AAFC	Pacific Agri-Food Research Centre, Summerland BC V0H 1Z0	neilsend@agr.gc.ca	(250) 494-6417
Stewart Cohen	EC	Institute for Sustainable Development of Resources ,2029 West Mall, Vancouver BC V6T 1Z2	scohen@sdri.ubc.ca	(604) 822-1635
Lynn Kriwoken	WLAP	Victoria	Lynn.kriwoken@gems8.gov.bc.ca	(250) 387-9446
Brian Ferguson	DFO	Nelson	fergusonbr@pac.dfo.mpo.gc.ca	(250) 352-0896
Mike Ramsay	WLAP	Williams Lake	Mike.ramsay@gems2.gov.bc.ca	(250) 398-4258
Jeptha Ball	MSRM	1259 Dalhousie Dr, Kamloops BC V2C 5Z5	Jeptha.ball@gems2.gov.bc.ca	(250) 371-5217
Al Caverly	WLAP	1259 Dalhousie Dr, Kamloops BC V2C 5Z5	Al.caverly@gems2.gov.bc.ca	(250)
Bruce McFarlane	WLAP	1259 Dalhousie Dr, Kamloops BC V2C 5Z5	Bruce.mcfarlane@gems3.gov.bc.ca	(250) 371-6314
Paul Doyle	Doyle Engineering	134 River Rd, Kamloops	Doyleng@telus.net	(250) 372-5925
David F. Scott	OUC	3333 University Way, Kelowna BC V1V 1V7	dscott@ouc.bc.ca	(250) 762-5445 or 762-7565
Barry Chilibeck	Northwest Hydraulic Consultants	30 Gostick Pl, N. Vancouver BC, V6M 3G2	bchilibeck@nhc-van.com	(604) 790-6780
Jandi Doyle	OUC	13002 Steven Ave, Summerland BC	bjdoyle@shaw.ca	(250) 494-8662
Carl Yong	DFO	200 401 Burrard, Vancouver	yong@pac.dfo-mpo.gc.ca	(604) 606-8278
Eero Karanka	DFO	100 419 Range Rd, Whitehorse YT Y1A 3V1	karankae@pac.dfo-mpo.gc.ca	(867) 393-6703
Tina Chestnut	DFO	985 McGill Place, Kamloops BC	chestnut@pac.dfo-mpo.gc.ca	(250) 851-4862
Darryl Hussey	DFO	985 McGill Place, Kamloops BC	husseyd@pac.dfo-mpo.gc.ca	(250) 851-4962
Steve Matthews	WLAP	102 Industrial Pl, Penticton	Steve.matthews@gems4.gov.bc.ca	(250) 490-8243

NAME	AFFILIATION	ADDRESS	E-MAIL ADDRESS	PHONE
Dean Watts	DFO	BC V2A 7C8 95 McGill Pl, Kamloops BC	wattsd@pac.dfo-mpo.gc.ca	(250) 851-4861
Steve Macfarlane	DFO	401 Burrard St, Vancouver BC	macfarlanes@pac.dfo-mpo.gc.ca	(604) 666-5529
Drew Carmichael	WLAP			(250) 490-8262
Kevin Dickenson	LWBC	145 3 RD Ave FL 3, Kamloops BC V2C 5M7	Kevin.dickenson@gems4.gov.bc.ca	(250) 319-8651
Brian Symonds	WLAP	102 Industrial Pl, Penticton BC V2A 7C8	Brian.symonds@gems9.gov.bc.ca	(250) 490-8255

7.3 Meeting Minutes

Day one – March 2, 2004

Topic 1: Introduction:

- Flow management / low flows is the single biggest limiting factor to fish production in the southern interior, and near the top of the list in other areas as well
- 2003 provided the impetus to generate initial support for tackling these issues
- The focus needs to be on water management, not just drought management based on the flow problems experienced in many systems on an annual basis
- High level of interest in attending this workshop, in and out of government – indicates this workshop is just a starting point
- Wide range of agencies and locations represented – MWLAP, DFO, MSRM, Min Ag, Food and Fish, Ag Canada, Env Canada, UBC, OUC, SEKID
- This workshop is aimed at agency staff initially so we all have a better understanding of the issues and can provide input to an Action Plan for addressing the problems
- The input provided by all participants is the key to the success of this workshop
- It is clear this is only a starting point to achieving improved flow management
 - We need to ensure a usable product is developed
 - An Action Plan is developed and implemented
 - All water users become part of the plan through active participation
- Long term support (funding and manpower) at the Executive level from within our Ministries will be the key to success.

Questions/Comments

- Impression that drought = fish kills but isn't always direct/immediate
- Fish impact has to be measured over longer term
- Impacts due to duration and magnitude of low flow

Topic 3: BC Southern Interior Drought Strategy 2003

- Actions Taken re: Drought – success / failures
- Focus on water recovery
- 4 areas
 - Communication
 - Stewardship Action
 - Flow Monitoring – Thompson Basin + Okanagan - data collection on ~ 40 streams
 - Enforcement action where appropriate

- Joint agency approach – DFO, WLAP, FBC, FN
- Reports expected for hydrology and success with media, voluntary compliance, documentation, possible allocation plan
- Challenge with funding, cumulative project error, \$ for water recovery

Questions/Comments

- Ground water test wells – 6 wells for measuring H₂O avail
- Reaction of those that received letters that requested compliance
 - Fish clause → no problem – complied 100%
 - Voluntary → no problem – complied
 - Documentation of flow reaction?
- Letters went out but no action or documentation of reaction or result
- Reduction in domestic water use change not known
- Reduction in industry (irrigation) made a difference

Topic 4: S.E. Kelowna Irrigation District – 2003 Experience:

- Water supply management studies done in 1979, 1984
- New ones in summer 2003 (re-establishing stations)
- Fire didn't have impact on water shed (except fire fighting)
- McCulloch reservoir main capture area (controlled flows)
- Works with City of Kelowna re: supply and demand and water use
- 2003 water use only 2.5% above average

Questions/Comments

- Climate data for area? – no, very little
- In the event of fire and ↓ infiltrates, can reservoir capture enough water?
 - YES, and is less sensitive to issues of water quality
 - Less able to control lower water shed where there is no flow control
- Preparing for ↓ water quality this spring
- Long term urban planning → switching to city water supply?
 - very expensive to “twin” water system
 - high density areas may get own treatment plant
 - studying this now
- Possibility of sharing info with other agencies – YES

RECOMMENDATIONS/ACTION ITEMS

- **Plan to establish hydrometric stations (2 stations already functional)**
- **Long term commitment to data collection**
- **Collect snow survey data**

Topic 5: Climate Change & Water Management in the Okanagan

- Shared learning to apply climate change predictions
- Provides information but does not give recommendations
- Lower and earlier peak flows
- Dialogue comes from info on crop demand, domestic demand.

Climatic / Water Use Research:

- A. Propose scenarios for climate change – based on modelling
 - there are no certainties
 - climate change – how will it superimpose on natural change such as PDO (Pacific Decadal Oscillation) ? unknown
 - a lot of variability in pp
- B. Population predictions
 - variable – some rapid, some not
- C. Water supply
 - UBC model correlated for use in Okanagan
 - Peak flow is earlier for each model
 - Season distribution changes
- D. Water demand
 - ↑ crop water demand
 - Unknown domestic use change
 - Depends on population and demographics
- E. Adaptation
 - case studies on historical adaptation measures
 - Stakeholders willing to adapt
 - Propose costs of adaptation options
- F. Dilemmas
 - case histories show slow response
 - Population growth increase
 - Target residential users but agriculture is largest user
 - Basin-wide implementation – need integration with local growth strategies
 - Options are available – need to be acceptable, affordable, available...
 - Reports available in June 2004 on website

Questions / Comments

- Which will be affected more – uncontrolled flows or managed flows (reservoirs)? – complicated
- Forestry component not included in this process
 - Changes in forestry could change predictions
 - Needs to be included
- Will impact be > in U.S.?

- Will feel impact 1st
- Will impact trans-boundary water storage management

Topic 6: Provincial Drought Task Force Action Plan

- Cross government representation
- Short term
 - communication
 - survey
 - PEP; drought consequence plan
- Medium term Actions
 - communication emergency response plan updates
 - monitoring
 - integrate water supply/demand into risk assessments
 - communicate conservation need
 - develop water save tool kit
 - develop provincial drought management plan
- Long term Actions
 - review policy on allocation and use
 - look at barriers
 - monitor and plan
- Key messages
 - drought affects everything
 - province not prepared for 2003
 - provincial drought management plan in place for this summer and future

Questions / Comments

- Why hasn't province reacted to previous droughts? What is different this time?
- Groundwater use for drought management
 - interest is there
 - aquifer protection
 - no groundwater legislation
- Is there recognition of climate change within government?
 - Branch: Water, air and climate change
 - Could be more done with adaptations

Topic 7: Focus Stream Designation

- List of flow sensitive streams
- Summer base flow reference

- Flagged all streams in Okanagan Lake basin
- Similkameen, Kettle – Granby

Questions / Comments

- Larger systems had low flows but higher M.A.D.
 - Larger systems adjusted better – more resilient
- No assessment of size of stream and response to drought

Topic 8: Drought and Water Temperature

- Droughts aggravate temperature impacts
- Provincial temperature thresholds have been developed
- Need to protect/restore riparian habitats and flows
- Streams were too warm for fish survival during drought
- Smaller streams cut off from larger ones during drought
 - Migrating fish had no access

Question/Comments

- Can count scales to age fish
- During drought scales come off and don't get as many new scales - complicates aging
- Study has been short term → require long term study
- Do not know cause of temperature difference between Coldwater & Lemieux Creeks

Supply Management Session

Topic 9: Supply Forecasting – Provincial Approach

- Flood and drought
- Quantitative and qualitative
- Seasonal and short-term

Questions/Comments

- Okanagan Lake releasing water – issues with conflicting users

RECOMMENDATIONS/ACTION ITEMS

- **Establish drought definition and classes**
- **More formal precipitation monitoring (forecasting?) June-Aug**
- **Notification procedures to purveyors, public**

Topic 10: Supply Forecasting – Current Utility and Potential for Improvement

- Summer flows have been low regardless of snowpack
- Snowpack indicates summer and fall flows 50% of the time

- There are other factors
 - Snowpack measurement doesn't include precipitation in April, May, June
 - Summer moisture deficits not considered
- Real-time hydrographs for Camp Creek
- Trend in June to July indicates summer trend
- Possible to extrapolate to other watersheds (w/o real time hydrographs)

Questions/Comments

- Ok basins similar (re: extrapolating)
- Hydrograph #'s after snowpack melt should be similar each year
- If different, look for cause

RECOMMENDATIONS/ACTION ITEMS

- **Need more real-time gauges on un-regulated tributaries**

Topic 11: Water Supply Forecasting – Groundwater

- Review of Regional well level logs for 2003 - current
- New lows set in 2003 Aug 63% of wells
- Issues of groundwater and climate change
 - Equitable sharing of resource in long term
 - Lack of government regulation / licensing
 - Develop a focus on quality not quantity
 - Need comprehensive groundwater database
 - Metered extraction
 - Regional integration of surface water and groundwater
- Potential WLAP partnership with GSC
- Groundwater assessment of Okanagan Basin (GAOB)
 - Comprehensive data base
 - Hydrogeological models
 - Aquifer mapping
 - Boundary conditions
- Benefits:
 - Framework for evaluation
 - Allow more detailed study @ watershed scale
- Limitations:
 - Inadequate data and uncertainties
 - Budget and time constraints
 - Multi-jurisdictional issues

RECOMMENDATIONS/ACTION ITEMS

- **Conversion to data loggers and upload to WDM**

- increase awareness of groundwater conditions
- additional drought index wells
- groundwater legislation / management is the key

Topic 12: Low Flow Monitoring in the Thompson Region

2003: Pointers for Drought Management

- drought severity varies
- less supply and more demand in droughts
- storage releases benefit low flow
- manage for min., not average
- efficiency gains from irrigation scheduling
- large decrease in flows due to irrigation loss (80%, 90%)

Questions/Comments

- Impact of public use changing stream flow

Day 2 – March 5, 2004

Demand Management Session

Topic 13: Agriculture and Water Use

- Technology is driving changes in water use

Questions/Comments

- Opportunity to link websites with other information providers
 - Eg. With river forecasting centre
 - Eg. Web portal
- How much water is diverted from streams for irrigation?
 - Every stream is different
 - Depends on efficiencies

Topic 14: Crop Water Demand Modeling for Climate Change

Questions/Comments

- Is information transferable to forage crops?
 - Scheduling is but Microsystems isn't
 - No comparable work for forage crops known

Topic 15: Conservation Strategies – water purveyors experience

- Metering has been very successful in combination with communication / awareness and price structuring
- Has required long term approach (10 years reach this level of success)

- 2003 water use 2.5 % above normal

Topic 16: LWBC – Planning & Water Act

- Do not do stewardship
- Cannot make licensees stop/curtail diversions without fish clause (15 of 200 licences)
- Success with requests to stop diversions
- Have limited resources to enforce
- Spending time and resources dealing with backlog of license applications and amendments
- Compliance and enforcement officer for each service area (including Kamloops)

Questions/Comments

- Selective on enforcing Water Act
- Can't respond to everything
- Disconnect at provincial scale of water management
- Interagency problem – who is responsible for what?
- Issues at political level
- Need report on cumulative effect
- Suggestions of generating revenue by issuing penalties for overuse
- C+E people should 'recover' revenue
- w/o knowing – how much water is being used, why do licences?
- Dealing with historic backlog on sources that aren't a concern with low flow
- Need to do monitoring on specific sources
- 7 day low flow is inadequate – why use it?
- Can't do an analysis on every source but referral process (to DFO) allows consideration
- Licensing established for protection of users, not for the protection of fish

Topic 17: Canada's Fish Habitat Law (see presentation)

- Severe limitations on utilizing enforcement as tool → Provincial and Federal agencies promoting awareness / compliance, and less focus on enforcement

Topic 18: Demand Management Planning Framework

- How can water resources sustain land uses?
- High unit demand in Okanagan because cost is low
- Growth Management Strategies – adopted by regional district
- Official Community Plans – Regional District of North Okanagan
 - Regional District of Central Okanagan
 - Regional District of Okanagan Similkameen
- Groundwater is not a solution to the surface water problem
- Model Drought Demand Management Plan

- 4 phases
- 3 steps to implement plan
 - o adopt plan
 - o public info and education programs
 - o enforce restrictions
- Planning needs to be adaptable

Questions/Comments

- Evaluation and redistribution of licences
Eg. Alberta re-evaluating large licences

RECOMMENDATIONS/ACTION ITEMS

- **Maximize benefits from and respect for the provincial water resource**

7.4 Break-out Session Notes

Notes from individual breakout session held March 2nd, 2004.

SUPPLY MANAGEMENT STRATEGIES

1. Increasing Supply

General Notes:

- For whom → Fish/People → Spectrum of Users
- Development of Supply sources requires strong direction from Plan addressing long term water demand
- Fine line between new supply and improving management of existing supply
- Need to set goal/objectives/priorities
 - o Where is water needed
 - o How much, etc.

Sources:

- Groundwater → YES NO
- Tributary WS → YES NO → Q (Flow) → Demand Management
- OK Lake → YES NO

Options:

- A. Increased Storage with new structures or expansion of existing facilities
 - High cost
 - Need to balance environmental impacts with benefits
 - Scale → how much water
 - Smaller dams to reduce costs and impacts? More acceptable?
 - Liability / ownership / operational issues
 - Social / political issues

- B. Lake Source
 - Pumping costs high
 - Direct and indirect benefits
 - Lake impacts vs stream impacts
 - Allocation requires strong direction from plan
 - Multi-jurisdictional issues

- C. Groundwater
 - Poor understanding re surface ground connection
 - Need more data
 - Is it a viable source → impacts on surface water
 - Potential for short term benefits (Middle Vernon Creek)
 - Unregulated – need to fast track more sensitive management of this source
 - Costs
 - Water Quality issues

- D. Recycle Treated Water
 - Limited applicability → benefits to Industry
 - Public perception limits utility
 - Health risks for domestic (+ agriculture)
 - Costs high

- E. Watershed Management (Protection)
 - Water Retention
 - Source Protection (eg. Wetlands)
 - Conservation licences / reserves

- F. Drainage Diversions
 - Too many issues to consider as viable option

2. Managing Existing Supply

A. **Supply Forecasting**

Anticipated Benefits

- Short term (i.e. annual/seasonal forecasts) allow for better planning as to how to manage supply during each season of use.
- Improved ability to plan for longer term land use decisions - i.e. relationships among population growth, agricultural changes and water supply.

Acceptability

- Generally acceptable because forecasting allows for better supply management – everyone benefits.

- Some risks associated with forecasting may deter acceptance in some areas – e.g. incorrect forecast could result in water restrictions (with economic implications) where not needed or could result in overly liberal water use early in season without adequate reserves for late season use – legal liabilities?
- Acceptability may depend on who is responsible and who provides the resources.

Scale of Implementation

- Scale of implementation varies from provincial & regional through to local level.
- Provincial forecasts (by region) based on snowpack readings, climatic data and trends in hydrographs. Bigger picture showing relationship to normals or averages
- Local forecasting needs to match actual usage to actual supply
- Snowpack accurate at predicting summer fall flows ~ 50% of time
- Useful tool, but need to develop additional tools to better reflect summer/fall flow conditions
- Subjective viewing of hydrographs June 1 + July 1 (may vary according to location and elevations) is valuable tool for projecting water supply in summer and fall

Responsibility

- Provincial/regional forecasts are senior gov't responsibility
- Local forecasts are responsibility of local water purveyor if applicable. Local water users may need to take joint responsibility if individual licences.
- Need leadership and standards from provincial/regional levels.

Required Resources

- Need dedicated staff time at provincial and regional levels to provide provincial/regional forecasts and provide standards
- Need \$ at local level to hire the expertise (typically consultants) required for measurements and data analyses
- Need more stream gauging stations to provide more accurate picture of how much water is available from streams each season as well as to monitor trends over time (i.e. are hydrographs changing in response to climate change). Particularly need gauges in unregulated streams that are representative of large areas.

B. Operational Changes

Anticipated Benefits

- More efficient use of water.

Acceptability

- General acceptance from everyone who benefits by improved access to water when they need/want it.
- Some operational changes (e.g. part season licensing or ability to licensed volume of water to alternate parcels of land) may require legislative changes which may not be easy to implement.

- Some operational changes (e.g. water meters) may be seen as restrictive by some users who will object to being more regulated.
- Other operational changes (e.g. irrigation scheduling) may have implementation costs which are prohibitive to some even though they can see the benefits of the change.

Scale of Implementation

- Scale of implementation ranges from provincial down to local levels.
- Water Act changes may be required to modernize licences and allow more flexibility - results based licensing.
- Water meters and irrigation scheduling would typically be implemented at a local level

Responsibility

- Varies from provincial down to local depending on whether making large scale changes like Water Act or requiring water meters on connections within a specified area.

Required Resources

- Need funding/cost sharing program to implement the infrastructures required for large scale irrigation scheduling
- Need access to expertise (e.g. Research Station, irrigation specialists) to set up scheduling and make it work.

3. **Information Needs – flow monitoring, fish flow requirements, fish stocks/habitat**

- Better predictors of low flow
- Share the pain in a dry year
- Start at natural flows
- Adjust streamflow lower limit threshold for natural timing of fish and other instream needs
- Upper flow limits primarily driven by non-fish values (i.e. flood impacts)
- Recommend undertaking a Southern Interior Flow Monitoring Methodology Standardization Workshop
 - Aimed at everyone involved in flow monitoring
 - Need to ensure methodology is standard in terms of data comparison and accuracy
 - Instream hands-on session

Basic Water Use Information

- input/output
- timing of flow
- how much water used
- how much water left
- Must have a pre-withdrawal (natural) hydrograph as a benchmark, retrieve long-term records or build a model (i.e. UBC watershed model).

Final Information Needs

- Need to monitor use (in-house or external if funds available)

- Natural hydrograph
- Fish/aquatic needs (minimum risk-averse fish flows)

Benefits

- reduce conflict
- economic incentives

- - user reality check
- - could increase efficiency and reduce cost
- - reduce waste, restore balanced use

Risk

- to unauthorized and over-users
- loss of market, a consequence for wasteful users ?

Acceptability

- initially low related to cost, then more acceptable if part of a larger planning framework to restore balance and promote sustainability

Scale

- pilots by water basin
- select more threatened watersheds with high values
- expand if pilots successful

Responsibility

- statutory authority over water?
- Must engage partners (i.e. water users, agencies, FN, universities, municipalities)

Resources

- senior level support
- best to have trained specialists, multi-discipline, ensure data quality
- financial, user pay, water revenues, federal funds, meter rebates
- dedicated resources, multi-year

DEMAND MANAGEMENT STRATEGIES

1. Research and Conservation Needs

- Research Needs (R)
- Conservation Strategy (CS)

Provincial Needs

- now/future?
- Agricultural demand
- New conservation methods = R
- More trained staff/researchers = CS
- Reasonable consumption rates – varies by ecoregion = CS
- Instantaneous demand and relative scheduling = R

- Reality between allocated and available water = R
- Storage requirements = R
- Data gathering → plan develop reasonable supply
- Education → monitoring enforcement
- Conservation strategy → has worked will for industry rate system →? = CS
- Need new public user
- Demand management → research of user needs = R
- Guideline development = R
- Better understanding of water budgets and risks = R
- Monitoring and implementation strategy for timely action = CS
- Education ~ communication ~ people may not understand the system = CS
- Are conservation flow standards adequate (often off old flow standards) = R
- Alternate irrigation systems → standards → by-laws, → landscape types = R
- Public knowledge and perception ~ hydro bill style to indicate use – strive for conservation = CS
- Acceptability – needs on a community by community basis
- Buy-in, once people understand they became more committed to the plans → equitable distribute all users in the same boat
 - Industrial ↔ Agricultural ↔ Domestic = CS
- Clear understanding of what supply consists of = R

Surface	ground	storage
%	%	%
- Understanding of minimum base flows to maintain all ecosystems and wetlands = R
- Understanding of flows / timing on a system basis = R
- Land use practices that can increase supply = R
- What are appropriate base flow requirements? = R
 - Unattested watershed – what does the ecosystem look like?
 - How tolerant is the ecosystem to variable flow. Historical vs realized
- Monitoring of systems showing various levels of use develop a model = CS
- Modeling of climate variables = CS
- Identify risk → level of comfort
 - Develop tools and allow flexibility within the system → standardize flow management with real needs → i.e. actual timing windows vs best management
- Flows – refine on individual systems to identify required conservation flows = R
- Other demand factors ~ evaporation out of large reservoirs
- What is the relationship between Total Available Water + Supply (ie. Losses + inefficiencies lake management) = R

Agriculture Water Efficiencies

- National Water Supply Expansion Program
 - Funding available to agencies
 - 5.2 million over 2 years
- Farmwest.com – combines weather information with predicted growing conditions

- Research – Crop Water Demand
 - Considerable increase in crop water demand based on climate change model scenarios
 - Cost strategies for reducing crop demand

SEKID Water Conservation

- 450 metres → \$600,000
 - Reduced supply/demand equation based on land use studies/crop demand studies
 - 10% reduction
 - specific allotment of waters based on # acres and supply/demand equation = 2.25 ac ft

2. LWBC - Land Water BC Inc.

Allocation Plans

- Kootenay: Overlay Layers
 - Water licensing info
 - Fish values
 - Red-fully recorded
 - Yellow – unknown
 - Green – okay
- Thompson: Known flow sensitive fish streams
- Allocation status
- LWBC (+ others) need quick efficient info exchange
- Lemieux Creek Plan
- Too onerous and time consuming
- Term Licences?
- Changes to Water Act / Policy?
- Climate change?
- Reassess duties
- Public / stewardship participation

Compliance Monitoring

- Incentive for meters
- Rebate?
- Rate reduction?
- Reporting
- Capacity to review info
 - Audit? (round table) peer pressure
- Environmental farm planning
 - MAFF
- Education
 - Pilot
- Resource under priced
- Business case for C & M

- New technologies

Water Act Options

- Refuse applications where reasonable alternate source is available
- Licences are tied to land
- Share the pain!

Appeal Process

- Cumbersome
- Needs streamlining/ change
- RWM can require reductions to preserve fish
- Changes in regs to apply to all licences

Available Tools

- Water allocation planning not on horizon
- Little or no compliance monitoring
- Opportunity to gain back flow in over subscribed system through licence cancellation upon abandonment
- One Compliance and Enforcement Officer in each service centre
- Cannot order shut down of diversion unless there is a Fish Flow Clause
- Current backlog 1300 licence applications and amendments in Kamloops and Penticton
 - * will limit focus outside of backlog
 - * Revenue generation could be developed through C&E / metering to pay for higher level C&E
- 17,000 Water licences in S. Interior
- Legislative Tools – focus more stewardship/compliance and away from enforcement

INTEGRATING SUPPLY AND DEMAND MANAGEMENT

1. Planning Processes

Land Use Plans and Growth Management Plans

- assume supply evaluation a given
- demand / use, some estimates at least

Benefits

- most plans recognize water value and use
- project growth demand people/agriculture
- identifies some limits to supply and future demand
- an alternative to crisis driven management
- still a chance to make choices
- tremendous opportunity for education and dialogue

Risks

- no will to implement water components
- work from “average” values
- disconnect with supply/demand
- current expectations not sustainable
- does not anticipate drought
- high level plan realities are not always transferred to OCP, local plans where land use decisions are made

Acceptability

- public faith
- should be accepted, choices made based on consensus
- willingness to pay for water?
- Time / costs for existing plans
- Alternative, crisis management again
- Trade-offs/balance inevitable
- Must be measurable
- # easy to understand
- opportunity for balanced decision while this is still possible (before you hit the wall)
- doing the plan is an education

Scale of Implementation

- transfer to (H.L.) OCP's, LRUP, Water Allocation, bylaws
- consistent hierarchy and senior leadership / support (integrated Federal / Provincial)
- local government role critical

Responsibility

- Senior Government → Municipal → Irrigation Districts / users
- Senior Government – leadership, support, information

Example:

MSRM Planning Initiatives and Connections to Water Management

- Large range of planning process → Prov → Region → Area Based
- Require public acceptance / participation / buy-in to be successful
- Need for groundwater management strategy
- Phased Drought Management Planning based on varying % shortage
- Municipal and Regional Government – implementation
 - Cost sharing
 - Audit / Report Cards periodically (3-5 years)

Resources

- Update, course correction, adapt plans, consistent lead with mandate, \$
- Dedicate resource support to leaders in plan implementation (Support positive change)