

Water and salmon issues and options for conservation and governance improvements in the lower Fraser River

Prepared by Watershed Watch

For the

**Fraser Salmon and Watershed Program,
Pacific Salmon Foundation and Fraser Basin Council**

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Table of Contents

	Page
Introduction	1
Issues	1
I. Threats to Water	2
A. Pollution	2
B. Water Diversion and Overuse	3
C. Climate Change	4
D. Sectoral Effects on Fraser Water—Power and Fish	5
E. Agricultural Impact on Water	6
F. Urbanization—Integrated Land and Water Use Planning	8
II. Ecosystem Needs and Fish	10
A. Groundwater and Surface Water Interaction	10
B. Habitat (Fish, Wildlife and Endangered Species)	11
C. Wilderness Protection	12
D. Instream Flow Protection	12
III. Water Licensing and Allocation and Options for 'More' or 'New' Water	13
A. Allocation and Increasing Conflicts between Water Uses	13
B. Options to Satisfy New Demands for Water	15
IV. Water Law and Governance	23
A. Jurisdiction Over Water	23
B. Water Governance	25
C. Water Management Planning Innovations in BC	27
D. Public Involvement in Governance—Information and Participation	29
V. Opportunities for the FSWP in BC Water Governance	30
A. Advocacy and Preparation of a Policy Brief on Water	30
B. Participation in Provincial Consultations	31
C. Provide a Forum for NGOs and other Groups Active on Water Issues	31
D. Work with First Nations to Improve Water Management	31
E. Issue Fact Sheets on Water Policy Issues	31
F. Engage with Water Policy at the Federal Level	32
G. Moving the Research Agenda Forward	32
VI. Summary of Potential Priorities for Phase 2 and Beyond	32
A. Groundwater and Surface Water Interaction	32
B. Instream Flow Protection	33
C. Allocation and Increasing Conflicts between Water Uses	33
D. Payment for Ecosystem Services Research	33
E. Public Education	33
F. Enhance First Nations and General Stewardship Capacity	33
G. Projects that Explicitly Deal with Predicted Impacts of Climate Change	34
Appendix 1—Mapping and Information Programs	35

"Water has social, economic and environmental values and should therefore be managed so as to realize the most acceptable and sustainable combination of those values" (Protocol on Water and Health, 1999)

"Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such." (EU Water Framework Directive, 2000)

Introduction

The Pacific Salmon Foundation (PSF) contracted Watershed Watch Salmon Society to prepare an overview on water issues relevant for salmon conservation for the Fraser Salmon and Watershed Program (FSWP), which PSF runs with the Fraser Basin Council. Craig Orr, Stan Proboszcz, and Tanis Douglas of WWSS, and Linda Nowlan, an environmental lawyer and consultant, prepared this report.

The report provides an overview of current issues in water policy in BC, concentrating on areas where there are opportunities for the FSWP to:

- integrate water use with watershed and fish sustainability planning, as proposed in the FSWP planning framework;
- convene similarly interested groups to discuss programs, issues, shared concerns and possible solutions;
- influence legislation (i.e. upcoming revision of *Water Act*, proposed amendments to federal *Fisheries Act*);
- move the research agenda on 'water for fish' forward; and
- link with other ongoing processes.

The report describes several potential roles for the FSWP on water management and policy.

Issues

This scan of water issues relevant for Fraser River salmon is organized as follows:

First, there is a section on threats to water which includes pollution, diversion and overuse, and climate change. The report details some effects of three economic sectors on Fraser water: power generation, agriculture and urbanization. This latter section examines the interrelated topics of integrated land and water use planning and green design standards for water protection.

The next section sets out opportunities for greater attention to the ecosystem needs of fish and includes the topics of groundwater and surface water interaction, habitat of fish, wildlife and endangered species, wilderness protection, and instream flow protection.

Then the report discusses BC's current licensing and allocation system, and looks at a range of options to satisfy new demands for water, or to change existing water uses to different ones, such as reserving more water for salmon needs:

1. greater diversion and pumping;
2. expanding the supply through dams or other storage or desalination;
3. reuse of municipal water;

4. efficiency and demand management and the range of economic and financial incentives for conservation;
5. reallocation of current uses to new ones by water trading or water markets; and
6. reallocation of current uses to new ones by payment for ecosystem services.

The fourth section scans water law, planning and governance in BC, and the final section looks at opportunities for the FSWP in BC water conservation and governance.

I Threats to Water

A Pollution

Even as the value of water increases, pollution of waterways continues, furthering the degradation of freshwater and marine ecosystems worldwide. Cities such as Vancouver and Victoria continue to rely on minimal sewage treatment facilities, and discharge sewage directly into the marine and freshwater environment. Opportunities to minimize the pollution of BC's waterways include maintaining and strengthening habitat protection legislation and promoting various clean water initiatives.

Relevant Legislation

Trends in BC and Canadian environmental legislation have been shifting the duty of monitoring resource management and regulation enforcement from government to the user and hired environmental professionals ("Qualified Environmental Professionals"). Trends towards self-monitoring of potentially harmful projects have significant implications relative to water quality in BC. Maintaining current legislation protocols and strengthening others is a critical step towards improved water quality protection.

- *Fisheries Act* sections 34-37 (Fisheries and Oceans Canada). The Fisheries Act is currently undergoing "modernization" and its water quality protection capacity may be weakened through relaxing regulations regarding its habitat protection and pollution prevention provisions.
- *Environmental Management Act (EMA)* (BC Ministry of Environment). The recent introduction (in 2004) of the EMA has created a tiered approach to waste discharge authorization through the Waste Discharge Regulation. The old Waste Management Act (WMA) required some form of authorization for all introductions of waste into the environment. This new act eliminates the overall strict prohibition on the introduction of waste. Currently, only introductions of waste from "prescribed" industries, trades, businesses, operations and activities require authorization. This new act is an example of how environmental legislation has been relaxed to allow certain discharges go unchecked.
- *Waste Discharge Regulation (WDR)*, (BC, Ministry of Environment). The EMA prescribes through the WDR that only certain industries, trades, businesses, operations or activities are prohibited from discharging waste.

Water Quality Guidelines

Guidelines associated with water quality protection for fish and wildlife are rarely enforced strictly. Mandatory compliance with guidelines should be integrated into current legislation. Many proposed discharges into water bodies are approved on the basis of opinions and modeling of industry hired environmental professionals.

- *Canadian Council of Ministers of the Environment (CCME)*
science-based benchmarks developed as a set of national water quality guidelines to protect aquatic life and minimize effects of human activities on water
<http://www.waterquality.ec.gc.ca/EN/navigation/3297/3301/3307.htm>
- *Ministry of Environment*
Provincial water quality guideline criteria reports
http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html

Current Pollution Monitoring Initiatives and Future Direction and Opportunities

- *The Fraser River Estuary Management Program (FREMP)* A management initiative that coordinates development and conservation in the estuary. Water quality monitoring is conducted and reported. This initiative is primarily made up of government agencies and would benefit from strict conservation perspectives.
http://www.bieapfrempp.org/main_frempp.html
- *Pollution Probe* is an active non-profit organization based in Ontario and focused on defining environmental problems through research and promoting solutions through education and advocacy. They have produced many good reports and initiatives associated with progressive water quality management protection.
<http://www.pollutionprobe.org/Whoweare/Index.htm>.
- The Sierra Legal Defence Fund is continuing its efforts to clean up sewage affecting fish bearing waters in BC by bringing private prosecutions under the federal Fisheries Act against the GVRD and the province of BC for the operation of its Lions Gate plant, one of five that it operates in the GVRD area (the others are Annacis Island, Iona, Lulu Island and North West Langley, all with secondary treatment while both Lions Gate and Iona provide primary treatment). This fall a judge ruled that there was enough evidence that both the GVRD and the Province were permitting the discharge of toxic sewage from the Lions Gate sewage treatment plant into Burrard Inlet to allow the case to proceed.
http://www.sierralegal.org/m_archive/pr06_10_23.html
- It is difficult to obtain information on BC's worst polluters as the provincial government stopped releasing non-compliance reports in August 2001. Now excessive fees are being demanded for the release of this information.
http://www.sierralegal.org/m_archive/pr06_03_15.html In contrast in Ontario, full information is available on polluters through the MOE's Environmental Compliance website:
<http://www.ene.gov.on.ca/envision/compliance/compliance.htm>.

B Water Diversion and Overuse

Overuse of diverted water, or the inappropriate diversion of water from sensitive ecosystems, is a common problem in British Columbia and other jurisdictions, and often results in harm to fish and other components of aquatic ecosystems.

Until relatively recently, provincial water managers allocated rights to surface water (granting Water Licenses under the *BC Water Act*) without being accountable for fish or other ecosystem uses of the water. While this is still sometimes the case, the *Fish Protection Act* (1997) now provides legislative authority for water managers to consider

impacts on fish and fish habitat before approving new water licences, amendments to licences, or issuing approvals for work in or near streams. This applies particularly to certain Sensitive Streams (designated starting in 2000). For all streams, the *Fish Protection Act* allows for the ordering of a temporary reduction in licensed water use in cases of drought, and the Act also suggests that water management plans may reduce water rights to provide more water for fish and fish habitat.

Under the *Water Act*, the licensed water must be put to 'beneficial use'. To date, this provision means only that the water is used for the purpose in the license, and the determination of this beneficial use is left to a designated engineer. Actual water use is usually not metered or monitored by the provincial government. In an era where water is becoming scarcer, we suggest that the *Water Act* be amended such that 'beneficial use' means that water is valued enough to be put to efficient use. For example, some areas are unsuitable for growing certain crops or supporting certain businesses, and even when suitable, water is sometimes used beyond necessary levels. In some areas, 'beneficial use' could therefore mean an end to highly wasteful uses that deplete and damage fish streams.

Phase 2 Living Rivers' opportunities include: research to understand how surface water licenses are currently granted, and whether these licences take into account fish needs as per the *Fish Protection Act*, and the beneficial (efficient and wise) use of water. Additionally, we believe that there have been missed opportunities to order a temporary reduction in licensed water use in times of drought, and Phase 2 can investigate examples of where this provision has been used or examples of where its use would have been beneficial. Phase 2 might also include a summary of whether impending water management plans may in fact reduce water rights to provide more water for fish and fish habitat.

This issue of surface water extraction and overuse is intimately linked to policies related to groundwater extraction, discussed elsewhere in this document.

C Climate Change

Climate change impacts on water availability and supply is a critical issue. The full impact of climate change is unknown, but changes to water recharge patterns and depletion of groundwater supplies in shallow unconfined aquifers are potential results.¹ Recent research on the potential impacts of climate change on surface water and groundwater point to seasonal variability and shifting water resource patterns, which could ultimately lead to greater water shortages on some parts of the Fraser Basin.

There is compelling evidence that climate change is happening rapidly and is affecting the health of the Fraser River (fish and water). Low stream flow and low water levels, recorded for example this past year in the Thompson and Nicola basins, attributed to lower snow pack, earlier snowmelt, and persistent warm and dry weather, will affect fish.

Substantial attention, for instance, has been focused on the effects of high water temperature on Fraser sockeye (missing sockeye events; 2004 Williams' Review).

¹ "Water Resources." *Climate Change Impacts and Adaptation: A Canadian Perspective* (Ottawa: Natural Resources Canada, 2004.)

Climate change is a very broad subject, however, and also the focus of several detailed government initiatives, and a broad focus on climate change is needed in Phase 2 planning. Some initial Phase 2 initiatives to understand/ameliorate climate change impacts include:

- Synthesize ongoing research into environmental influences on Fraser River sockeye survival and migration (work of Scott Hinch of UBC, LGL, others funded through DFO, NSERC, PST); interview researchers for potential conservation opportunities and critical research gaps (e.g. life history and control of *Parvicapsula?*);
- Synthesize ongoing research into water source protection relative to climate change (e.g. de Loë, R.C. and A. Berg. 2006. Mainstreaming Climate Change in Drinking Water Source Protection in Ontario. Prepared for Pollution Probe and the Canadian Water Resources Association (Ontario Branch). Ottawa, ON: Pollution Probe);
- Link to Pacific Fisheries Resource Conservation Council project "Helping salmon to survive impacts of climate change" (Essa);
- Explore opportunities for water storage/conservation/release, including: partnerships with Ducks Unlimited; reservoir storage and release (in conjunction with or separate from current water use plans); smaller community-scale incentive-based programs.
- Construction/use of coldwater refugia for fish on Fraser First Nations land; currently being explored by Seabird Island Band (Clem Seymour), Soowahlie, possibly others. Ken Wilson is contact.
- Assess efficacy of current education programs (municipal, provincial, federal) on climate change, and what ordinary citizens might do (link to fact sheets/outreach objectives);
- Organize broader workshop to expand state of knowledge and conservation stewardship around climate change and fish/water;
- Promote the implementation of the Wild Salmon Policy provisions that will conserve and enhance adaptive capacity in wild salmon.
- The FSWP may wish to consider commissioning or partnering with senior government agencies and university researchers on more detailed site specific scientific research and assessment on the relationship between water and climate change, such as that conducted by the Columbia Basin Trust which this fall released *Climate Change in the Columbia Basin Starting the Dialogue* done in collaboration with the Pacific Climate Impacts Consortium at the University of Victoria or the *Climate Change and Water Management in the Okanagan Basin* project a collaborative involving multiple partners including the Adaptation and Impacts Research Division (AIRD), part of the Science and Technology Branch of Environment Canada, at IRES at UBC.

D Sectoral Effects on Fraser Water—Power and Fish

Fraser fish have been impacted in the past by human power needs. Numerous reports (e.g. Ward report, NAFTA Expert Opinion Decision) have documented such impacts, but happily, much of the present focus has been on enhancing instream flows (and related fisheries expertise) through BC Hydro's province-wide (\$25 M for the process and \$50 M/year systems operations fund) water use planning process. In addition, there is also an increasing focus provincially toward developing "green power" alternatives that may be far more fish friendly than other alternatives.

Water use plans have now been completed for several Fraser River tributary rivers. Flows have been increased (or soon will be) in several, and monitoring plans (with substantial budgets) have been approved and implemented, but much remains to be learned about the effectiveness of the overall WUP "experiment" in adaptive management (see also Watershed Watch's "Preliminary review of fish conservation gains within BC Hydro's water use planning process").

Phase 2 opportunities would be greatly informed by a further review/synthesis of the individual and collective outcomes of WUP operations on Fraser River tributaries. BC Hydro is a natural starting point. Many useful tools (transposable instream flow needs graphs, etc.) and much expertise (provincially, federally, within First Nations, etc.) also resulted from the WUP crucible, and this should also be documented and applied.

Non-hydro WUP opportunities also exist to design fish friendlier water use plans, particularly in urban areas where drinking and fish needs may potentially conflict (Seymour, Capilano, Coquitlam in particular). GVRD is an obvious start (Ken Ashley), as are lessons learned through Bridge-Coastal's Coquitlam Fish Passage Committee. Water licence amendments which are specific about fish are also a vital part of ensuring the process is enforceable at the level of the provincial water comptroller.

Phase 2 planning should also undertake a detailed assessment of fish needs and public support of so-called independent power projects. The public presently lacks the capacity to assess the "greenness" of proposed projects (e.g., as evidenced at recent public consultation meetings in Pitt Meadows over the Run of River Power Inc. plans to generate 150 MW from IPPs on the upper Pitt River). Watershed Watch is currently reviewing the green power criteria, potential conflicts, and permitting processes, and these issues should be assessed in phase 2 planning. A citizens' guide is also being produced to help the public understand IPPs.

E Agricultural Impact on Water

Though there have been some improvements in agricultural practices, as noted in the most recent State of the Fraser Basin report, such as an increase in organic production and greater participation in environmental farm plans as well as no overall conversion or loss in the region of ALR land in the Fraser region (unlike other regions), the impacts of agricultural activities on water and therefore on fish are still profound.

Excessive manure disposal on farmland is contaminating groundwater in the Basin. Research on the impact of agricultural activities on water/fish has been done by different groups like PFRCC (Conflicts between Agriculture and Salmon in the Eastern Fraser Valley, June 2005) and the Policy Research Initiative in Ottawa which did a series of reports and workshops on economic instruments for water policy as well as water quality trading.

Agriculture is a major user of water in BC. The Ministry of Agriculture is promoting water conservation in agriculture as a routine part of irrigation management, and advises farmers to check their irrigation flow rate against their licenced quantity even if a withdrawal rate is not on their licence. More could be done: the success of some local water conservation programs, and innovations in irrigation practices, such as those in the Southeast Kelowna Irrigation District which has had a successful metering program for a number of years (discussed in the section on efficiency and demand management) needs greater publicity and perhaps replication elsewhere in the Basin.

Reducing environmental impacts through good agricultural practices is usually less expensive than investing in technology for point source control. According to Agriculture Canada, about 47,000 producers have participated in EFPs and there are 30,000 plans across Canada covering 21% of the agricultural landscape. The top three beneficial management practices relate to water: manure storage, manure handling and riparian management.

The development of environmental farm planning is a step forward but their voluntary nature can be a source of concern. While the current trend in Canada is towards nonregulatory approaches, there is mounting evidence that purely voluntary programs are ineffective on their own. For example, Professor David Percy in a background paper for a recent UBC workshop on source protection, discusses agricultural best management practices to minimize groundwater degradation in both Alberta and BC which have been in use for over a decade, yet regional nitrate contamination appears to be worsening: "In the long run, there is little doubt that programmes of this nature cannot be a substitute for legislative or regulatory action."² A Policy Research Initiative (the Policy Research Initiative conducts research in support of the Government of Canada's medium term agenda) study on water quality trading cited similar evidence about the use of voluntary programs on their own to control nonpoint agricultural source pollution: "there is little evidence to suggest that voluntary approaches deliver the expected environmental benefits and much that they do not."³ In addition to the voluntary nature of the program, there are some concerns about the confidentiality of EFPs. The public lacks access to information about EFPs and is not able to determine whether or not a farm operator has produced an EFP.

As there does not appear to have been an independent comprehensive study to review how well the EFPs are working, this may be an issue for the FSWP to pursue as part of Phase 2 research.

Virtual water and the water footprint is another agricultural issue worthy of further investigation. Virtual water is the water that is needed to produce food or a commodity and is measured in m³ of water /ton crop or product. The authors of a new preliminary research study conclude that 'virtual water calculation is a new, innovative and useful tool in water management particularly in a watershed and river basin context. Livestock is by far the greatest virtual water consumer and dairy cows are the most water consumptive animals (Schreier, Lavkulich and Brown 2007). The topic was also canvassed in a recent Globe and Mail (January 26, 2007) report: "Swap water for food? It's a good deal" (Neil Reynolds).

The policy implications of virtual water and the food-based water deficit that Canada runs with the United States⁴ have not yet been studied, and are a possible subject for

² David Percy, "Approaches to the Protection of Water Sources" for the UBC *Watersheds and Source Protection: Governments, Science and Health*, an Exploratory Workshop, Nov. 24-25, 2006.

³ Can Water Quality Trading Help to Address Agricultural Sources of Pollution in Canada? Project Report 2005 www.policyresearch.gc.ca/page.asp?pagenm=pub_index

⁴ Excerpt from the Globe article: "In the first 10 months of 2006, we sold \$22.8-billion in agri-food products to the world and imported \$18.6-billion in agri-food products, giving us a solid trade surplus of \$4.2-billion. But more than two-thirds of our imports come from the U.S. -- and some of these foods are extraordinarily high in water content. Celery and lettuce, for example, are 97 per cent water by weight. Thus we buy more water from the United States than we sell to it.

Phase 2 investigation working with the UBC researchers and the agricultural policy community.

F Urbanization—Integrated Land and Water Use Planning

Connecting land use to water availability is a new and developing concept that has been called “wet growth” (Arnold 2005), a variation of smart growth.

Reducing municipal demands on water sources could be achieved through greater water efficiency and conservation measures, and increased attention to two of the major factors that influence water consumption: the cost of water and residential density.

Urban sprawl is a growing issue in Fraser Basin communities, and research demonstrates the links between aquifers and sprawl. Often the same aquifer will supply water both to municipal water systems and to individual private wells. Private incentives may push for scattered development over the aquifer, where one can sink a well and avoid connection fees to the municipal supply. However, such development may be costly for others, since concrete, asphalt, and other nonpermeable materials hinder the replenishment of the aquifer with rain water. In such a context, raising impact fees may only worsen the problem. This raises the intriguing possibility that groundwater regulation may provide an important avenue through which policy makers can influence the form of urban development.”⁵

Land uses affect water protection, and municipalities and regional governments have significant powers over water and the natural environment, which include the ability to (without any special ministerial approval) prohibit or regulate polluting, obstructing or impeding the flow of waterways. Regional districts have a similar power. Local governments also have powers to protect waterways using zoning bylaws, development permits and public health bylaws that protect drinking water sources. While these powers exist, the Province has maintained the authority to by order override bylaws respecting environmental management issues. Many BC municipalities have a range of policies in place to protect water and waterways. The West Coast Environmental Law “Smart Bylaws Guide”, an on-line resource, <http://www.wcel.org/issues/urban/sbg/Part2/>, collects many examples of cutting edge practices. The section on Integrated Stormwater Management bylaws has links to bylaws from Burnaby, CRD, Chilliwack, GVRD, Kelowna and Saanich as models.

Nonetheless, fully integrated land and water use planning is rare. Municipal planners create Official Community Plans while provincial Ministry of the Environment and federal fisheries employees work on water management.

In the Okanagan, there has been one in-depth effort from a partnership of NGOs, researchers, professional associations and different levels of government to treat water as an integral part of smart growth through implementation of the Smart Growth on the Ground land use concept plan which incorporates groundwater management. This SGOG project occurred in the Town of Oliver, and includes a number of strategies towards the

5 Marcy Burchfield & Henry G. Overman & Diego Puga & Matthew A. Turner, 2006. "Causes of Sprawl: A Portrait from Space," *The Quarterly Journal of Economics*, MIT Press, vol. 121(2), pages 587-633, May

reduction of outdoor water use, especially by demonstrating the use of xeriscaping in outdoor landscapes; low-flush toilet regulations; and rebate programs for efficient fixtures.

Another attempt to do more integrated land and water planning was the passage of the Streamside Protection Regulation (SPR) in 2001 under the *Fish Protection Act*. That same year the newly elected Provincial government revisited the Streamside Protection Regulation and appointed a task group to seek consensus on whether to abandon or amend the regulation, and when that failed, set up an internal federal provincial government working group. Eventually the SPR was replaced by the Riparian Areas Regulation (RAR). The RAR applies to the same geographic areas and the same activities as the repealed SPR, and directs local government to use as a minimum either inclusion of riparian area provisions in zoning bylaws in accordance with the direction in the RAR Section 4, or to use the tools available to them under section 26 of the *Local Government Act* that in the opinion of the local government provides a level of protection that 'meets or beats' the province's standard. As noted in the section on habitat protection, there is some concern among fisheries experts that the new version of the regulation is not preventing habitat destruction.

Potential Phase 2 topics – FSWP could examine how well the RAR is working in practice, act as an advocate for stronger riparian protection, and also advocate for and participate in the development of groundwater regulations.

The possibility of entering into a 'smart growth on the ground' process for another one of the rapidly growing Fraser Basin communities is another option for Phase 2 work for the FSWP, with a focus on protecting water for fish and other fish habitat.

Green Design Standards for Water Protection

A related topic is the role of green design in promoting water conservation. According to the GVRD's draft template for integrated stormwater management planning, the types of surfaces in a watershed and how they connect to watercourses are the single largest parameter contributing to the health of a watershed. Integrated stormwater management planning is designed to help facilitate development while protecting the environment. The GVRD has developed a template for this planning, and has also produced Stormwater Source Control Design Guidelines (2005), which compile best management practices related to stormwater source control, focusing on absorbent landscapes, including native soils and woods, compost-amended soils, planters and other treatments to reduce runoff from landscape areas; bioretention facilities, which can include rain gardens, sunken landscape areas, and infiltration areas, with or without an underdrain; vegetated swales, including bioswales and associated vegetated filter strips; pervious paving, including both vegetated and unvegetated types; infiltration trenches, sumps and drywells, including various underground infiltration devices; and extensive green roofs.

There is a range of green design standards in use in BC, including the Water Balance Model, water-centric planning, the Green Infrastructure Partnership, and the province's upcoming integrated community sustainability planning initiative, among others. A website for this latter initiative will soon be unveiled and will explain new funding opportunities for local governments who wish to undertake integrated community sustainability planning.

The extent to which green design features are easily implemented by local government bodies such as local Trust Councils, should be assessed, and is a topic for potential further Phase 2 investigation using resources such as the West Coast Environmental Law publications: *Cutting Green Tape: An Action Plan for Removing Regulatory Barriers to Green Innovations* (2002), the *Green Buildings Guide* (2006), and the *Smart Bylaws Guide* (2005) series.

II Ecosystem Needs and Fish

A Groundwater and Surface Water Interaction

BC lags behind almost all other jurisdictions in North America in its management of groundwater. While surface water use is regulated, the taking of groundwater remains unregulated. Furthermore, groundwater and surface water are usually treated as separate (not linked) entities, and when surface water becomes depleted or fully subscribed, water users often turn to groundwater as an alternative (with little regard to how this may influence surface water or salmon).

Substantial improvement is needed in how BC manages groundwater for salmon, and in links ground and surface water management. Groundwater directly affects surface water by sustaining stream base flows, providing stable-temperature habitat, and supplying nutrients and inorganic ions. Conversely, surface water replenishes and is always exchanging and mixing with groundwater. In many cases, groundwater extraction has a significant short-term though reversible effect on surface water flows. In other cases, groundwater over-extraction may result in long-term water table depletion that affects (and even eliminates) surface flows (for an overview, see Watershed Watch's review on the interaction between surface and groundwater).

Fortunately, substantial activity is underway to improve our understanding and protection of groundwater, to link the management of surface and groundwater, and to improve water management relative to the needs of salmon. Many of these initiatives are described in Watershed Watch's November 2006 review of groundwater and salmon. Studies are also underway in a few watersheds in the Okanagan Basin on groundwater-surface water interactions. This issue is also an area of focus for the Nicola WUMP and the Langley pilot project. Furthermore, the Provincial government is currently engaged in developing "Phase 2 and 3" of the Groundwater Protection Regulation.

Numerous opportunities may be worthy of support relative to Phase 2 Living Rivers' opportunities, including:

- Elevating the importance of ground and surface water interactions in provincial legislation and in local governance models;
- Enhancing communications, stewardship, and knowledge through the distribution of reports, and in workshops (with at least two planned in 2007, at SFU and UBC, on March 6 and May 14-15, respectively), and through lessons learned in other jurisdictions such as Connecticut;
- Applying the lessons of a legal review currently being produced for Watershed Watch by the Sierra Legal Defence Fund;
- Mapping critical "links" in the geographic focus area of Living Rivers.

B Habitat (Fish, Wildlife and Endangered Species)

Relevant Legislation and Policy

Current trends in the creation and enforcement of habitat and endangered species legislation are that they are being weakened and not strictly enforced due to many reasons such as short-term economic losses. However, current government economic evaluations refuse to include the monetary value of ecological services imparted by species and intact habitat. This important economic component should be integrated into all regulatory and legislative processes and decisions.

- *Fisheries Act* sections 34-37 (Fisheries and Oceans Canada). The *Fisheries Act* is currently undergoing "modernization" and its habitat protection capacity may be weakened through relaxing regulations regarding its habitat protection and pollution prevention provisions. The quality and amount of compensation habitat created in place of habitat destroyed by development projects is rarely evaluated. Deficiencies of habitat protection provisions outlined in a number of both government and NGO reports such as: David Suzuki Foundation 2006: *The will to protect: Preserving B.C.'s wild salmon*.
- *BC Fish Protection Act*. Recognition of the limitations of the federal *Fisheries Act* and problems with the urban referral system led to the provincial law, the *BC Fish Protection Act*. While this Act included a number of positive steps for water and fish, such as prohibiting new dams on listed rivers, and enhancing managers' ability to consider fish habitat needs in water licensing, some innovative provisions such as the 'streamflow protection licences' for in-stream or environmental flow protection were never brought into force.
- *Riparian Area Regulation (RAR)*. The most contentious section of the *BC Fish Protection Act* related to riparian protection, a topic which is critical for salmon for many reasons, not least of which in the coming changed climate is the ability of riparian vegetation to cool water. The RAR replaces the Streamside Protection Regulation which set minimum distances for developing near fish-bearing streams. The newer RAR gives the developer a choice in standards. The RAR is another example of new legislation that relies on the opinion of the developer's hired environmental professionals to evaluate whether projects will have significant negative effects on fish habitat.
- *Wild Salmon Policy (WSP)*. (Fisheries and Oceans Canada) Objective 2 of the WSP is to maintain marine, freshwater, and terrestrial habitat and ecosystem integrity. Fish production and harvest goals for wild salmon conservation units will be linked to conservation, restoration, and development of fish habitat. The WSP is a good initiative; however, its implementation has been progressing slowly and funding remains an issue that may impede full and effective implementation. http://www-comm.pac.dfo-mpo.gc.ca/publications/wsp/default_e.htm
- Gravel removal can physically alter the river affecting both water quality and quantity and has been a controversial issue for the Fraser. A five-year gravel removal plan for the lower Fraser River was developed through the collaborative efforts of Land and Water BC Inc. representing the Province of B.C., Fisheries and Oceans Canada and the Fraser Basin Council. The plan is for 2004-2008 and is meant to clarify the decision-making process for gravel removal proposals.

http://www.dfo-mpo.gc.ca/canwaters-eauxcan/infocentre/publications/fraser/index_e.asp

Gravel and salmon have also recently become a focus as a pilot project in the newly emerging and federally-sponsored "Integrated Fisheries Dialogue Forum."

- *Species at Risk Act (SARA)* The act was initiated in 2003 but has been weakened through ineffective federal implementation in several key areas: delayed listing decisions, refusal to list several endangered species due to potential socio-economic consequences, refusal to issue emergency orders to protect critical habitat on non-federal lands, increased burden put on stewardship for species recovery on non-federal land without equal support in mobilizing and funding potential stewards. Endangered species laws have been a critical component of fish protection in the US.

Local Initiatives and Programs

- *Salmon Habitat Restoration Program (SHaRP)* A program initiated by the City of Surrey focused on employing students to work on stream habitat restoration, public education (including industry), and stewardship development. Funding and promoting these types of programs in other municipalities would be valuable. <http://www.gvrd.bc.ca/sustainability/casestudies/salmonhabitat.htm>

C Wilderness Protection

- *Great Bear Rainforest Agreement* Ecosystem based management plan agreed upon by conservationists, government and industry for central coast forest protection. This initiative is far from complete and needs ongoing support for its completion. <http://www.savethegreatbear.org/>
- *Heart of the Fraser.* The goals are to identify, conserve, protect, and restore key portions of the Hope to Mission reach in order to sustain and secure the biological and ecological integrity of the area. <http://www.heartofthefraser.bcit.ca/>
- *Fraser Valley Conservancy.* This organization seeks to protect land and watercourses in the Abbotsford to Hope corridor. <http://www.abbotsfordlandtrust.ca/index.html>

D Instream Flow Protection

Instream flow protection is a well known fisheries and ecosystem management concept but is a more recent concept in water law in Canada. Pilot efforts to set such flows have been attempted in rivers in the South Saskatchewan River Basin in Alberta (Kwasniak, Klipperton), in select river basins in BC involved in BC Hydro's water use planning processes, and in numerous other jurisdictions (IUCN 2004). This aspect of water law has a longer history in the US (Water Science and Technology Board) and is beginning to receive more attention in Canada. For example, one of the objectives of the pilot water management plan currently under development in the Township of Langley, BC, is to "promote preservation of base flows in fish-bearing streams recharged by groundwater."

Provincial agencies, working in collaboration with the Department of Fisheries and Oceans, have developed two guideline documents related to the evaluation of instream flow needs for fish as they relate to proposals to develop small hydroelectric projects. The drivers for the development of the Instream Flow Guidelines were described by a provincial representative as sensitive stream designations under the Water Act, drought management in areas such as Trout Creek, Hydro's Water Use Planning processes, and the increasing number of applications for small hydro IPPs.

More guidance on this topic from the province would be useful for communities working to protect the Fraser. A PFRCC report on conflicts between people and fish for water (Rosenau and Angelo) noted the lack of provincial intervention in protecting water for fish through instream flow protection.

In Phase 2, the FSWP could examine the issue of environmental or instream flows throughout the Basin and research different legal and policy tools to protect these flows.

III Water Licensing and Allocation and Options for 'More' or 'New' Water

A Allocation and Increasing Conflicts between Water Uses

The BC *Water Act* sets up a system of water rights which are acquired through the issuance of licences. The rights are allocated on a 'first come first serve' basis except where water has been reserved or is subject to the existence of other rights such as aboriginal water rights or the vestiges of riparian rights.⁶ So, a licence obtained before another will always prevail over the other right. This model of water rights legislation which had historical advantages has obvious defects in today's world. First, there is the problem of over-allocation. Once all the rights have been distributed to licensees, there is no provision for granting water rights to new users. Secondly, the law does not adequately deal with the need to maintain in stream flows for conservation purposes, rather than dividing up rights to the water amongst residential, agricultural and industrial users. Thirdly, neither the BC *Water Act* nor regulations made under the *Act* deal with the problem of low flow periods, when not enough water is entering the stream or river to satisfy all the users, let alone for conservation purposes.

In 1993 there were about 40,000 surface water licences in BC, and about 200 new applications were then being received yearly. The province did not monitor these licences carefully, as a 1996 report by Dr. Peter Ward showed that BC Hydro routinely violated its licences, using more than its allocated share.

No comparable numbers are available for the present, though there has been an increase in water licence applications from independent power producers. Citizens for Public Power, an NGO, estimates that approximately 400 new water power licences have been awarded by the government over the past 4 years.

Information about water allocations and water restrictions is not available in a publicly accessible format. The Ministry has issued a 95 page document titled *Water Allocation Restrictions* registered in the Water Rights Information System - as at January 18, 2007

6 David R. Percy, *The Framework of Water Rights Legislation in Canada* (Calgary, Alberta: Canadian Institute of Resources Law, 1988) at 22.

http://www.env.gov.bc.ca/wsd/water_rights/reserves_restrictions/cabinet/restrictions.pdf which records the different types of restrictions:

- (i) refused no water (RNW) indicates insufficient water flow in the stream to grant a water license;
- (ii) possible water storage (PWS) indicates the stream is nearing being fully recorded, and potential exists for periods of no water;
- (iii) fully recorded (FR) indicates all available water in the stream is allocated for licensing; purposes, exceptions may be made for small domestic licenses;
- (iv) office reserve (OR) indicates special considerations regarding licensing on a particular stream should be taken into account before making allocation decisions.

An information resource which would be useful for the FSWP would be public education on the all the stream restrictions in the Basin area, as well as a summary of what the province is doing about these restrictions. The state-of-the-environment (SOER) reports which were issued by the province in the past had this type of overview information to calculate general trends in the environment. The BC SOER 2002 noted that: "The percent of licensed stream length that has water allocation restrictions is indicative of the intensity of water use in the province, pressures on water supply and the intensity of water management required to maintain water supply for human and non-human users. Approximately 28% of licensed stream length in British Columbia is currently restricted and has been since the 1990s. "The FSWP may wish to consider encouraging the province to compile a more up-to-date assessment of how this situation has changed over the past five years.

Competition for water will increase, and conflicts could take a variety of forms. If experience in the US is any guide to what may happen in the future in Canada, municipal competition with agricultural users for water will increase. This is starting to happen in the rapidly urbanizing Okanagan, also BC's chief productive agricultural area, where water resources are already heavily allocated. The Canadian Water Resources Association estimates that at present per capita usage rates, they will be fully allocated in less than 25 years.

Conflicts between water for power and water for fish, or between water for industry and aboriginal water rights, are other possible scenarios. As water demands grow, managers will need to reconcile competing claims of economically valuable uses as opposed to environmentally beneficial uses like leaving the water in the stream.

There have been many instances where federal fisheries jurisdiction and provincial water regulation jurisdiction have conflicted. The issue of determining priority between a BC water licence and the federal *Fisheries Act* has not been directly addressed by the Courts. However, the closest case on point the Kemano Completion Project (KCP), favours giving priority to fish habitat requirements over provincially regulated uses. It is likely that the federal powers related to Aboriginal peoples and Aboriginal rights themselves would prevail over a provincial water licence, should a dispute arise.

Possible Phase 2 topic - is it time for a complete overhaul of the allocation and licensing system? Alberta has stated that it is not possible to reserve enough water for environmental flows in the South Saskatchewan due to existing licenses (Saunders and Wenig in *Eau Canada*). Are there parts of the world that have revised their water laws to reconcile historical licences with modern environmental priorities?

B Options to Satisfy New Demands for Water

Perhaps the heart of the Fraser's water management challenge is reserving the right share of water for ecosystem and fish needs and managing water allocations within the ecological limits of availability. As the population in the Fraser Basin grows and as the demand for water increases, there are six main options for obtaining more water or changing water from its existing allocated uses⁷, each of which would impact salmon:

1. Divert more water and pump more groundwater

Greater human water use through increased withdrawals would affect the amount of water left for salmon.

Increased surface water extraction may be limited, as rivers may be fully allocated, and no new licences may be being issued. In BC there are numerous water allocation restrictions as noted above.

Increased groundwater withdrawals are a definite possibility, as groundwater is subject to only minimal controls. Water shortages are likely to be exacerbated by the potential for individuals to sink wells beside streams for their water supply (a licence is required to divert or extract surface water but there are only minimal restrictions on groundwater extraction in BC, mainly focused on large scale extractions). There is anecdotal evidence that this practice is increasing. The environmental consequences of over-extraction of groundwater may not be as immediately obvious as other environmental problems, yet they can be numerous and profound. Water shortage is one obvious consequence of excessive taking of water. In the extreme, streams disappear and wells run dry. Overwithdrawal can also harm wetlands, which are closely connected to groundwater systems. This also is an issue for new governance bodies, such as watershed councils, to address in water management plans.

2. Expand the supply through dams or other storage options; or through desalination

Some novel ideas are also emerging about storage and later release (i.e. during critical periods) of water for salmon—through BC Hydro's WUP process, through partnerships with Ducks Unlimited, and through private initiatives. These options should be explored in Phase 2.

Desalination is a costly and energy intensive process more likely to be considered in only extremely arid conditions, and is not a practical option for BC.

3. Reuse and recycle municipal water

"At present, water reuse and recycling in Canada is practiced on a relatively small scale and varies regionally depending on the availability of water supplies and regulatory flexibility. Typical examples include using treated municipal wastewater to irrigate agricultural non-food crops, urban parkland, landscaping and golf courses. Water recycling also exists in select industrial sectors and experimental grey water treatment and reuse for toilet flushing, irrigation or other non-potable uses at the scale of individual buildings. The interest in reuse will likely increase, driven to a large extent by

⁷ This list of options is adapted from Robert Glennon, "Water Scarcity, Marketing and Privatization" [2005] 83 Texas Law Rev. 1873.

steadily increasing water demands, conflict among users and opportunities to save on future expansion of water supply infrastructure."⁸

Communities in BC that are focusing on reclaimed rainwater or grey water include Oliver and Vernon.

Rainwater collection holds promise, but the volume available for use is relatively small in comparison to the projected population increases, and rainwater currently may only be used for non-potable uses. Rainwater collection is very complex. No licence is required for a catchment system in BC, but building permit restrictions mean that a permit will not be issued where rainwater is the sole source of supply. Rainwater can be an important part of a conservation plan, but has not yet received a high profile in BC.

Barriers to greater use of reused water and rainwater catchment systems include the increased cost of installing such systems. In the Town of Oliver, an upgrade of the rural water distribution system will involve construction of parallel pipes carrying potable water which will twin the existing reclaimed irrigation system at a cost of about \$8.8 million, funded in part through a provincial grant with a condition of demonstrating a commitment to water conservation (Brandes 2006). Rainwater system costs vary: in BC a simple rain barrel system can be installed for less than \$100 while a complex system designed to provide potable water to four-person household could cost more than \$35,000 including storage (Islands Trust Fund).

A possible role for the FSWP (which would require further Phase 2 investigation) is to advocate for provincial changes, which may be implemented at the local level. Greater use of reclaimed, recycled and rainwater for non-potable uses would ease the pressure to extract from the Fraser or its tributaries.

4. Make Water last longer by using it wisely and efficiently (Efficiency and Demand Management)

When the rainforest community of Tofino threatened to shut all businesses last August at the peak of the tourist season, many realized that water conservation is a serious issue even in rain-soaked BC. The province is emphasizing conservation and urging citizens not to be complacent about water supplies. www.env.gov.bc.ca/wsd/plan_protect_sustain/water_conservation/index.html." Whether the province's primarily voluntary conservation programs will be adequate to conserve enough water for fish remains to be seen.

If more water supplies are not likely, then managing the demand, or placing more emphasis on conservation, will be necessary. Water conservation can be prompted by regulations or price signals (often based on regulations) or a combination of legal and economic instruments or incentives. Conserving water will require strong regulations and incentives as BC residents, like most Canadians, are profligate water users, being among the highest consumers of water in the world in terms of per capita use, a recent

8 K. Schaefer, K. Exall, and J. Marsalek "Water Reuse and Recycling in Canada: A Status and Needs Assessment" 2004 Can Water Resource Journal 29 (3) 195-208

Statistics Canada study notes.⁹ Among member countries of the Organization for Economic Cooperation and Development (OECD), Canada ranks second in terms of per capita water consumption after the US, and is 65% above the OECD average.

In 1999, British Columbians used 678 litres per person per day, a 6% decrease from 1983. British Columbia's per capita water consumption is on par with the Canadian average (638 litres/day; BC SOER 2002).

Education Resources and Case Studies on Water Conservation, Demand Management

A number of recent resources on water conservation and demand management are available:

- [Water Use Efficiency Catalogue for BC](#) part of the 1998 Water Conservation Strategy
- 2004, Water \$ave Tool Kit for British Columbia
<http://www.waterbucket.ca/wuc/sites/wbcwuc/documents/media/4.pdf>
- Canadian Water and Wastewater Association (CWWA)'s *Water Efficiency Experiences Database (WEED)* on-line at http://www.cwwa.ca/weed/index_e.asp
- Canadian Council of Ministers of the Environment (CCME) commissioned research papers on [Analysis of Economic Instruments for Water Conservation](#) Marbek Resource Consultants in association with Steven Renzetti, Brock University - November 2005 and "Analysis of Economic Instruments for Water Conservation" [Water Conservation and Economics An Analysis of Canadian and Other Water Conservation Practices and Initiatives: Issues, Opportunities and Suggested Directions](#) May 2006
- City of Toronto water efficiency plan created an initial list of more than 70 water efficiency measures, then screened according to technical feasibility; applicability and social acceptability. A short list of 21 acceptable measures was the result.
<http://www.toronto.ca/watereff/plan.htm>
- Other leading Canadian municipalities in the area of water conservation include Ontario's Durham Region, the City of Calgary, the city of Barrie
- Case studies on good municipal programs for water conservation are also at the Federation of Canadian Municipalities Infraguide which also has best practices in the areas of potable water and storm and wastewater <http://www.infraguide.ca/>; at the CMHC website; and at Tools of Change, a social marketing/government of Canada initiative.
- Best practices for water management in urban areas being compiled by the organizers of the Sept.2006 "Water in the City" conference, Victoria, BC.

9 "Fresh Water Resources in Canada." Human Activity and The Environment: Annual Statistics. (Ottawa: Statistics Canada, 2003.)

Incentives and Programs for water Conservation in BC

The University of Victoria's POLIS Project on Ecological Governance's *Thinking Beyond Pipes and Pumps: Top 10 Ways Communities Can Save Water and Money*, released in December 2006, looks at conservation and demand management initiatives such as the following:

Programs to encourage low water use fixtures such as toilets, clothes and dish washers and fixture & appliance rebates:

Sunshine Coast Regional District, North Shore, Duncan are examples of these programs. Toronto has programs for residential, multi-unit and businesses who are buying new washers and a toilet rebate program. The BC provincial [Water Conservation Plumbing Regulation](#) was amended in September 2005 to include local governments who wished to require the installation of low consumption (6 litre) toilets in their jurisdictions. Effective January 1, 2005, all new toilets installed throughout the Capital Regional District must have a flush cycle no greater than 6 litres. Effective September 30, 2005, the Regulation applies to additional local governments.¹⁰

Free consultations to high water users to identify possible leaks or other cost effective reductions in use;

Reducing development cost charges to conserve water: the new Dockside Green community under construction in Victoria is the only known example in BC where DCCs have been lowered due to demonstrable water savings and conservation practices;

Linking provincial and federal funding to water conservation. For example, in BC water conservation plans are now a mandatory requirement for local governments receiving capital grant funds from the province for drinking water infrastructure;

Requirements for each house water connection to be turned off when the house is vacant (leak and fixture failure protection);

Restrictions or prohibitions of outdoor water use of well-fed piped water- the conservation surveys showed that this was the most common measure in use in BC.

Demand management and conservation can also be achieved through economic incentives. Metering and water pricing are the two most commonly used options.

Metering

The 2004 Water \$ave Tool Kit for British Columbia survey showed that overall relatively few utilities used economic or financial tools to promote water

10 Effective September 30, 2005, the Regulation included these local governments: All electoral areas of the Cowichan Valley Regional District; All electoral areas of the Regional District of Nanaimo; electoral areas C and D of the North Okanagan Regional District; Municipality of Bowen Island; City of Enderby; City of Kamloops; City of Vernon; District of Campbell River; District of Coldstream; District of North Cowichan; Greater Vancouver Water District; Town of Gibsons; Township of Spallumcheen; Village of Cumberland; Village of Lumby; Village of Sayward; Village of Telkwa.

conservation. Metering was used by just 1 in 3 utilities surveyed, and was being considered by just over 1 in 4.

Communities in BC that are currently metering include Victoria, Surrey, Richmond (some residential on a volunteer basis), Oliver, District of West Vancouver, Chilliwack, Kelowna, Nanaimo, Prince George (planned), and Vernon. The Greater Vancouver Regional District and Kamloops do not have mandatory metering for residential users. Universal metering was rejected by Kamloops city residents in an October 2001 referendum, contradicting a city Water Use Efficiency Committee conclusion that universal metering was "the single most cost effective method of achieving more efficient water use."

In 1999, total domestic water use by British Columbians that pay a flat rate (76% of the province) was 524 litres/person. This was 15% more water per day than was used by those who paid based on volume (455 litres/person). For all of Canada, flat-rate users consumed 70% more water (457 litres/person/day) than metered users (269 litres/person/day). The minimal impact of water metering in British Columbia compared to the rest of Canada may be due to metered rates being among the lowest in the country. (BC SOER 2002)

Water Pricing

Charging more for water is another option for conservation, especially for high volume users. Of all the resources, the lowest price is charged for water, and many believe that water should be a free good. A pricing chart in the chapter by Steven Renzetti in *Eau Canada* shows comparative figures for BC vs other provinces, and BC is at the low end of the water price spectrum.

The Province promised to introduce changes reflecting greater costs in its Water Sustainability strategy of the early 90s, and did increase water rental rates on January 1st, 2006 for water licences and supporting permits on Crown land as the last change in rental rates was in 1994.

Conservation based pricing in Southeast Kelowna Irrigation District (SEKID) is a success story. In 1994 SEKID implemented a progressive and often controversial demand management program directed at the agricultural community. Phase 1 of the program used an educational approach for water conservation resulting in a 10% reduction in drought year demand. Phase 2 of the program implemented a conservation strategy using water allotments and a metered rate penalty for excess water use. This resulted in a further 22% reduction in demand under drought year conditions, significantly reducing water use while maintaining adequate supply for agricultural use. Under average demand conditions water use was reduced 27.4% below the 29 year average annual consumption rate. A review of the program concluded that: "Clearly the regulatory approach of Phase 2 was more effective in conserving water than the educational method used in Phase 1. It is doubtful, however, that Phase 2 of the program could have been as successful had it not followed the educational efforts of Phase 1. The drought conditions of 2003 created very high demand conditions and the regulations required that users stay within the drought year allotment. The ability of landowners to comply with the regulations can, in part, be attributed to knowledge gained through Phase 1 of the program."

[Agricultural Water Conservation Program Review](http://www.sekid.ca/pdf/reports/SEKID%20Ag%20Prog%20Rpt%20Jan%202005.pdf) - January, 2005. Toby Pike
<http://www.sekid.ca/pdf/reports/SEKID%20Ag%20Prog%20Rpt%20Jan%202005.pdf>

Some water-short jurisdictions have adopted even more innovative and stringent programs for water than those used in BC, such as requiring developers to prove future water supplies before development approval is granted; mandatory consideration of water supplies and protection in Official Community Plans; requiring the use of reclaimed water prior to issuing groundwater extraction permits; and using water trusts. CMHC suggests that user-pay charges for stormwater based on lot size are a possibility in future.

Possible Phase 2 topics

Many reports have catalogued the range of available tools for water conservation, demand management, and water trading and have studied economic instruments, trading and water pricing reforms. Rather than compiling more information on this topic, FSWP could look at why some programs are more successful than others- is leadership from a higher level of government needed, for example? Is California a leader in water conservation because of the strict state controls? Another option would be to pinpoint those communities within the Fraser Basin that need to do more about water conservation and demand management, perhaps by a 'report card' approach.

5. Reallocate water from current uses to new ones- water markets, water trading

Water trading and the transfer of water rights are contentious issues in water governance and often result in litigation and disputes. The conflict reflects the debate between water as an economic commodity subject to private property rights as opposed to water as a free public good. The Alberta experience is often referred to – it is the only jurisdiction in Canada to have started water trading, though only a limited number of trades have occurred. As of February 1 2005 only 3 licence transfers had been authorized. The Alberta law requires protections that are not in the BC water law.

BC commentators who have researched water trading systems caution that: "Rather than proposing water rights transfers as the solution to our water allocation problems, we should focus on improving water and environmental governance before eventually considering water rights transfers as one potential- but limited- tool for water use management." (Christensen and Linter "Trading Our Common Heritage- The Debate over Water Rights Transfers in BC" in Karen Bakker, ed. Eau Canada – The Future of Canada's Water).

The PRI project, *Can Water Quality Trading Help to Address Agricultural Sources of Pollution in Canada?* recently wrapped up with a final report. This study examined the extent to which water quality trading (WQT) and variants of this policy instrument can be applied in the Canadian context. Based on practices around the world, the final report talked about design considerations for a water quality trading system. The project involved some regulatory analysis and found that while all provinces had the power to institute trading programs, some provinces' laws were better suited for this purpose than others. BC was well positioned to undertake water quality trading with its existing legislative base, although direct reference to this type of program is not in the legislation. An important conclusion from this report was that "WQT will be a useful instrument in Canada only when local stakeholders and other relevant parties have decided to invest time and energy in making it work, and after they have collectively agreed that the tool offers potential benefits." In other words, it's possible to introduce water trading; no barriers are in the way, other than the not inconsiderable factors of political will and public acceptance.

Water trading is more common in the US. In an example close to home, the Water Trust of Oregon attempts to remedy over-appropriation by acquiring water from consumptive users willing to sell, lease, or otherwise transfer part or all of their water right. The Trust

then transfers the water instream to restore or improve fish habitat and other instream uses.

Without clear provincial direction on starting a water trading program, this is not an area where FSWP can make any gains.

6. Payment for Ecosystem Services

Water purification and flood minimization are examples of valuable services provided by aquatic ecosystems such as wetlands. It has been estimated that the value of services (such as water filtration and carbon storage) provided by the Canadian boreal forest is 2.5 times greater than the net market value of forestry, hydro, mining, oil and gas extraction. Estimating the value of ecosystem services and integrating these costs into resource management and use are critical objectives in order to produce sustainable cities and ecosystems.

- *Natural Capital Project* The initiatives of this project are to: to develop accessible tools that capture the value of ecosystem services and integrate them into policy and finance opportunities; launch an international network of projects that incorporates the value of ecosystem services into resource use and investment decisions; and build constituencies to magnify the effects projects by educating and engaging all decision-makers.
<http://www.naturalcapitalproject.org/about.html>
- *Millennium Ecosystem Assessment* This international program focuses on ecosystem services, how changes in services have affected human well-being, and response options that might be adopted at local, national, or global scales to improve ecosystem management and human well-being. The Millennium Ecosystem Assessment defined ecosystem services as the benefits people obtain from ecosystems.
<http://www.millenniumassessment.org/en/index.aspx>
UNEP (2006) Marine and coastal ecosystems and human well being: A synthesis report based on the findings of the Millennium Ecosystem Assessment.

"Because watersheds connect and encompass terrestrial, freshwater and coastal ecosystems, they perform a wide variety of valuable services, including the supply and purification of fresh water, the provision of habitat that safeguards fisheries and biological diversity, the sequestering of carbon that helps mitigate climate change, and the support of recreation and tourism. In the parlance of ecological economics, watersheds are natural assets that deliver a stream of goods and services to society. Commercial markets, however, value these services only partially if at all."
Sandra Postel and Barton Thompson, "Watershed Protection: Capturing the benefits of nature's supply services" *Natural Resources Forum* 29 (2005) 98-108

Recently an intergovernmental body, the United Nations Economic Commission for Europe (UNECE, a UN grouping which, despite its name, includes Canada and the US) produced the UNECE Rules on Payments for Ecosystem Services in Integrated Water Resources Management. The non-binding Rules were developed under the UNECE *Convention on the Protection and Use of Transboundary Watercourses and International Lakes*. The Rules are the first example of international guidance for the establishment of payment for ecosystem services (PES), not only at the local and national levels but also at the transboundary level. PES have become popular because they "can generate additional resources, redirect funds to environmentally friendly technologies and

sustainable production patterns, create incentives for investment, and increase private-sector involvement in environmental protection.” (IISD MEA Bulletin).

The Rules set out steps to take in designing PES, including the legal and institutional capabilities needed for a successful system. The UNECE Rules also detail the types of PES, which can be:

1. Public schemes, in which a municipality or a local or national government acts as the sole or primary purchaser of a specified ecosystem service or, more commonly, a related land use or management practice. This type of scheme can operate at the local or national level.
2. Private (self-organized) schemes, in which both buyers and sellers are private entities (companies, NGOs, farmers' associations or cooperatives, private individuals), or
3. Trading schemes, in which markets of established rights (or permits) and/or quotas can be exchanged, sold or leased.

They also set out the financial arrangements in PES

- Direct compensation to sellers (i.e. ecosystem service providers) is the most common financial arrangement;
- Compensation (or incentive) rates are set for a specified land use or management practice, which is deemed to deliver the desired ecosystem service, per unit of hectare (e.g. US\$/ha);
- A PES scheme may adopt different rates for different classes of land use or management practices that are valued to provide different degrees of ecosystem services;
- Alternatively, the scheme may compensate specific practices (e.g. non-application of nitrates, restrictive mowing or draining) or ecosystem indicators (e.g. number of flora and fauna species per ha, provision of habitat for specified species).

Probably the most famous example is the New York City–Catskill watershed management programme in which the City of New York decided to invest US\$ 1.5 billion over 10 years in a watershed programme administered by the Catskill Watershed Corporation, a non-profit organization, focused on improvements in farm and forestry practices to significantly reduce the presence of microbial pathogens and phosphorus in the water, instead of building a filtration plant that would cost US\$ 6-8 billion, and US \$ 300 -500 million/year to operate. A BC government official suggested at a recent meeting that residents of the Okanagan may want to consider land purchases for drinking water protection – similar thought may be given to purchasing land around a watershed for fish habitat and water protection along key spawning and rearing grounds on the Fraser.

In the US the concepts of PES are better known than in Canada, though there are examples here in BC, both historic and recent. For example, the purchase of the watershed land surrounding the drinking water reservoirs in the GVRD is an early example of a PES. Payments for forestry ecosystem services are more common. The recent Great Bear Rainforest \$120 million program is an example of a PES. According to Forest Ethics: “Private funds will flow to a conservation endowment fund, dedicated solely to conservation management, science and stewardship jobs in First Nations' communities. Public funds will

be used for investments in ecologically-sustainable business ventures within First Nations' territories or communities.”

A variation of the PES concept are certification programs in which private sector operators both change their environmental practices and pay for the right to use a certification label. The Salmon-safe program which started in Oregon in 1995 is one example. Salmon-safe certification means that the land is managed according to standards that are verified independently, and the operation's impact upon the aquatic ecosystem is assessed and any negative impacts on water quality and fish habitat are minimized. The cost varies and can range from \$150 for a small vineyard to more than \$20,000 for a large municipal park system with several hundred sites, paid for by the operators. After starting with farmers and winemakers the program has now expanded to urban areas as well and is active in Oregon, Washington, and Idaho.

<http://www.salmonsafe.org/about/faq.cfm>

Organizations active on this issue in the Pacific Northwest include: the Katoomba group, Ecotrust, the Columbia Basin Water Transactions program, Wildlands Inc, and the Willamette Partnership as well as government agencies responsible for design and oversight such as the US Army Corps of Engineers, NOAA Fisheries, and state environmental agencies.

The concept is also receiving more attention in Canada. IISD is currently researching this issue as applied to water management on the prairies

Possible Phase 2 issue for further research – Investigate what programs now exist to pay for ecosystem services provided by Fraser River water. What are other possibilities of programs that have proved successful in other jurisdictions that could be adapted for use in BC? A research project on how PES could be used to improve water management in BC would be a valuable approach to a new cutting edge topic.

IV Water Law and Governance

A Jurisdiction Over Water

Water can be an almost bewilderingly complex topic when it comes to jurisdiction and management.

The primary role is provincial due to the province's proprietary rights and constitutional legislative jurisdiction. Provincial regulations for use, licensing and diversion are the major controls on freshwater in BC, as in all other provinces. This is overlain by federal laws and federal proprietary landowner responsibilities in the areas of fisheries, navigation, Indians, and transboundary issues, among others. At the same time, local governments play a role with their water abstractions and water delivery systems, land use planning processes, and specific water policies and bylaws, on topics such as water conservation and efficiency, riparian protection, rainwater management and collection. Both regional districts and municipal governments play this role in BC. First Nations have as yet undefined aboriginal rights to water as well as treaty settlements that will contain a water and fish component, such as the recent Tsawwassen First Nation treaty settlement.

The existing legislation is diverse, as this report demonstrates. A number of Acts and regulations at all these levels of government interact in the water governance process.

Some water legislation, such as the relatively underused federal *Canada Water Act*, explicitly recognizes the importance of working with other jurisdictions on watershed issues. Examples of this approach are the multi-jurisdictional monitoring agreements, the Georgia Basin Action Plan, the Fraser Basin Council, the Fraser River Estuary Management Program, and others.

Federal Role in Water

There is general agreement that the federal role has diminished over the past decade. For example, the Senate of Canada in its November 2005 study *Water in the West: Under Pressure*, says that Canada has suffered an “[erosion of the] ability of policymakers to analyze and respond to the water issues that affect the lives of millions of Canadians.” Pressure to resume a leadership role is increasing. The Federal Water Policy of 1987 called for a national approach.

There are signs that water may receive greater attention and resources from the federal government in the near future:

- both Conservative and Liberal parties have included water in their near-term policy objectives,
- federal government bodies like the Senate and the Commissioner of the Environment and Sustainable Development have issued reports critical of the current federal approach to water,
- nongovernmental bodies such as Pollution Probe, the Canada West Foundation and the Canadian Water Resources Association have held workshops or consultations and issued reports with a similar message – the need for Canada to have a national water plan,
- a coalition of major environmental groups will issue a call for a National Water Strategy action plan shortly, and
- the federal Policy Research Initiative will soon complete its three year study of fresh water, and will recommend the creation of a new federal watersheds agency.

Evolving BC Water Law

In 1993 the British Columbia Ministry of Environment, Lands and Parks issued “Stewardship of the water of British Columbia: a review of British Columbia's water management policy and legislation: a vision for new water management policy and legislation”, a series of ten discussion papers for a new water law for B.C. At that time water managers and the public alike recognized that the water law sorely needed revision, and eight of the discussion papers focused on subjects that the new law was meant to address: groundwater management; water pricing; managing activities in and about streams; water management planning; water allocation; floodplain management; water quality management; and water conservation. The other two papers discussed the historical background of the current regulatory scheme for water and the government's plans for consultation.

For various reasons the comprehensive amendment and rewrite of the law did not proceed as outlined in the papers. Amendments to various water laws have occurred, and in 1999 the province announced the Fresh Water Strategy for British Columbia which was meant to “consolidate provincial initiatives into one cohesive strategy”, and included designating sensitive streams under the *Fish Protection Act*; continuing the Water Conservation Strategy (1998) published in 2001, which includes education about low flow plumbing fixtures and use of drought tolerant plants in landscapes; and

implementing a three-year Drinking Water Strategy, based on the Drinking Water protection Act, which came into force in May 2003. Another recent provincial initiative is the Groundwater Protection Regulation, 2004, and the Drought Strategy.

It is likely the Province will update the history of changes when it unveils its new plans for water this year: the provincial government plans to overhaul the *Water Act*, and also to release a comprehensive provincial water strategy. Potential upcoming changes are outlined in the Ministry of the Environment's service plan, 2006-7 (see section on Opportunities for FSWP for more details).

The historic basis of water management was to encourage settlement and provide certainty for economic uses of water such as irrigation and mining. Protection of water for its role in nature, and for the ecological services it provides was not a priority, and amendments to water laws, policies and governance structures will likely place greater emphasis on these other roles for water in future amendments.

An important issue in any revision to the allocation system is whether or not compensation will be paid for cancelling licences, and what the criteria will be for cancellation or reallocation. Some jurisdictions, such as Australia and Spain have overhauled their allocation systems and dealt with these difficult questions, while others such as Alberta have introduced some changes but left the historical licences in place.

Possible Phase 2 topic- is it time for a complete overhaul of the allocation and licensing system? Where has this been done? What were the consequences? How did other governments deal with some of the vexed questions in a new water rights system such as compensation for historic licences?

B Water Governance

In particular, water governance, or the full range of decision-making procedures by which water is governed, is a topic which has recently captured public attention in BC. Events such as the recent hurricane conditions which forced residents to rely on their own collection efforts for days and even weeks, the boil-water advisory affecting two million people in the greater Vancouver area, and record low flows in rivers in the Interior are all pointing to the need for more sustainable ways of managing water.

Governance refers to the full range of processes that influence a topic. Many groups other than governments, such as businesses and NGOs, make decisions about and take actions that affect water management, as the FSWP partners are well aware. Using the term water governance reflects this reality.

Because of the complex jurisdictional issues, many provinces are experimenting with new governance models such as watershed councils. Some are voluntary groups with no direct role in management, some have authority to make recommendations on management decisions, and some are required to prepare watershed management plans.

In BC a number of groups are examining the different types of watershed council-type groups that are now operating, and are considering which type of model best suits their needs. The province is also thinking about adopting some sort of watershed planning component into its new water management strategy or in a new version of a *Water Act*.

There have been a number of different water planning exercises and water management bodies created in BC in the last twenty years, including sub-regional planning, integrated watershed management plans, water allocation plans, and floodplain management plans. More recently the province tasked BC Hydro to develop water use plans in areas where Hydro facilities were located (see section on WUPs under the heading "power and Fish" in this paper), and consequently a number of WUPs have now been completed, several of which concern Fraser tributaries.

The Nicola Water Use Management Plan commissioned a study which looks at nine types of governance models and compares their legal entities, mandates, types of decisions made; reporting requirements; user fee structure, staffing, and organizational structure. The groups differ in terms of the functions they fulfill. Some groups deliver water and remove wastewater, some approve both water and land use permits, and some that are mainly concerned with the state of a particular watershed.¹¹

Other studies have used different criteria to evaluate the effectiveness of governance structures in select watersheds. A forthcoming Conference Board of Canada report examines governance structures in five watersheds, including two BC examples: the Abbotsford-Sumas Aquifer and the Okanagan Basin. It looked at clarity, coordination, and stakeholder engagement in governance structures; and planning inputs, priorities and responsibilities, agency alignment, measurement and strategy in planning and management. Both the BC examples scored significantly lower than the three other examples of Ontario's Grand River watershed and Ottawa River basin and the Alberta-Saskatchewan South Saskatchewan River Basin (SSRB). (It is interesting to note that the August 2006 Approved Water Management Plan for the South Saskatchewan River Basin is considered a model integrated plan and cited as an example by the Alberta government of putting its 'Water for Life' strategy into practice, though the Plan does not consider a number of key issues such as groundwater, climate change, water storage infrastructure needs, non-point source pollution or fish and wildlife. In addition the water licences on portions of the SSRB contain conditions for minimum instream flows which are considerably lower than those needs recommended in an expert report prepared as background to the Plan.)

At the same time that BC is examining governance models, other provinces are also innovating in this area: Alberta has Watershed Planning and Advisory Councils (WPACs) which are regional organizations working on a watershed scale to raise awareness of the state of Alberta's major river basins. Manitoba has conservation districts. Quebec has watershed or basin organizations which develop a master water plan, along with an action plan to be implemented through the signing of basin contracts. Ontario has the longest experience with its watershed management bodies, with 36 Conservation Authorities, established by law in 1946. These Authorities are" local,

¹¹ The groups are Oldman Watershed Council, Alberta <http://www.oldmanbasin.org> Mackenzie Valley Land and Water Board, NWT <http://www.mvlwb.com>; Mount Werner Water District, Colorado <http://www.mwwater.com>; Manitoba Conservation Districts <http://www.gov.mb.ca/waterstewardship/mwsb/cd/index.html>; La Salle Redboine Conservation District, Manitoba <http://www.lasalleredboine.com> ; Turtle Mountain Conservation District, Manitoba <http://www.tmcld.ca>; Okanagan-Basin Water Board, BC <http://www.obwb.ca/>; Bow River Irrigation District, Alberta <http://www.brid.ab.ca> And the Bonaparte Water Users Group, BC No website. [A Study of Governance Models - September 20, 2006 - 34 pages http://www.nicolawump.ca/downloads/WUMP-GovernanceReportFinal.pdf](http://www.nicolawump.ca/downloads/WUMP-GovernanceReportFinal.pdf)

watershed management agencies that deliver services and programs that protect and manage water and other natural resources in partnership with government, landowners and other organizations." For example, the Grand River Watershed is the largest watershed in southern Ontario and has a population of over 925,000. It has 26 members from 22 municipal councils. There are other much smaller Conservation Authorities in Ontario. Ontario has also mandated the creation of source protection authorities under its new *Clean Water Act*. There are some watershed councils in the territories as well, such as the Yukon River Inter Tribal Watershed Council (YRITWC).

C Water Management Planning Innovations in BC

A number of water pilot water management planning exercises are now underway in BC.

The Township of Langley Pilot Water Management Plan

In July 2006 the BC Minister of the Environment designated the Township of Langley on the rural/urban interface in the Lower Mainland, as the first area in BC to undertake the preparation of a water management plan under the new (as of 2004) Part 4 of the BC *Water Act*. The plan is to be submitted to the Minister by Dec 31, 2007, and is subject to Cabinet approval. The plans are meant for critical areas of the province when the Minister considers that such a plan would assist in addressing or preventing identified problems. Approved plans can be made legally enforceable and are intended to help communities deal with conflicts between users, risks to water quality, or conflicts between water users and in-stream requirements.

The goals of the plan are to: "identify measures that promote

- i. Sustainable use of groundwater;
- ii. Environmental protection for ground water including protection for aquifer recharge areas and the adequacy of recharge; and
- iii. Preservation of base flows in fish bearing streams recharged by ground water."

Farmers and residents depend on groundwater in the Township of Langley. About three-quarters of the residents rely on the municipal water supply of which more than half is local groundwater, and the remaining residents rely on groundwater from approximately 5000 domestic wells. Groundwater levels are declining in some parts of the Township, primarily due to over-extraction. Pollution is also a problem: several aquifers in the Township are highly vulnerable to contamination and are being degraded by septic systems and agricultural activities. There are about 700 kilometres of streams and numerous wetlands that provide habitat for seven salmonids and two endangered species in the area of the proposed plan. Regulators know that groundwater over-extraction has caused declines in some base flows in perennial salmon-bearing streams.

The water management plan is the primary responsibility of the Township. However, as the Township has no authority to regulate private well development, groundwater extraction, or conflicts over water use, its' twenty year action plan on water and water shortage response bylaw are not sufficient to protect water. Provincial actions will likely be necessary, which is why the Township is collaborating with BC's Ministry of the Environment and Ministry of Agriculture and Lands.

This experience should continue to be monitored to see what lessons can be learned for other Fraser Basin communities, who face similar problems. The province intends to develop a guidebook for other communities based on the Langley pilot. FSWP may want to consider

development of an independent 'lessons learned' report based on the Langley experience, as part of Phase 2 activities.

The Nicola Water Use Management Plan

Given climate change and economic and population growth, escalating water conflicts were seen as inevitable in the semi-arid Nicola Valley. In response, the Nicola Water Use Management Plan (WUMP) was developed by a diverse group of residents and business interests. This planning process is seen as a potential model for other areas that are facing or will face similar water scarcity. The WUMP process was developed as a way to specifically address and manage issues related to water, fish flows and the Nicola dam, with a vision of having a sustainable supply of quality water. Initial planning (including community involvement and development of a committee structure) has been completed, and knowledge gaps will or are being addressed in three studies looking at: 1) present and future water demand, 2) additional storage sites, and 3) groundwater and surface water supply and interaction. Groundwater supply for fish is a critical issue, and irrigation and development-related groundwater depletion are already harming fish stocks. Not only does groundwater depletion affect stream flows, it also affects cold-water refugia that allow fish to survive. For example, the Chinook stock in the Nicola River depends on cooler groundwater, and is in significant jeopardy due to expanding groundwater extraction. Phase 2 opportunities include further technical support and involvement to represent fish interests in this process (for example supporting groundwater studies, or helping develop a Nicola Basin Water Management Tool based on the successful Okanagan Fish-Water Management Tool), and support for developing similar publicly driven processes in other watersheds.

The Okanagan Basin Water Board

This Board was established in 1969 as a unique form of local government by the three Okanagan regional districts with taxation powers to support its actions. The Board's jurisdiction includes the six main lakes – Okanagan, Kalamalka, Wood, Skaha, Vaseux and Osoyoos – and surrounding mountains. The Board does not have regulatory power, but seeks to improve water management by providing a basin-wide perspective and improving communications between regions to reduce fragmentation in policy and planning. The Board also works to improve links between local and senior governments. In 2006, the Board formed the Okanagan Water Stewardship Council, which acts in an advisory role to the Province, and is studying key water management issues such as governance, First Nations, source protection drought management planning, water quality, agricultural irrigation, water economics, and more. The Okanagan Partnership has called for the Board to be strengthened even further and be renamed as the Okanagan Basin Water Council with a mandate to implement and coordinate basin-wide Management Policies on a wide variety of topics including supply management and licensing of purveyors and private water users; management of upper level reservoirs, control works, and aquifers; conservation practices (i.e., flow restrictors, improved irrigation practices, low flush toilets and metering) to minimize water waste) etc.

The Columbia Basin Trust (CBT)

The CBT was created in recognition of the impacts associated with the management of water in this region by the Columbia Basin Trust Act. The Columbia Basin Trust has a water program derived from its mandate from the Binding agreement with the Province of BC, the Columbia Basin Management Plan and direction from Columbia Basin communities and residents. The Columbia Basin Trust Water Initiatives Strategy focuses on public education,

as well as support for community based water networks. It is guided by a Water Initiatives Advisory Panel. The program manager is confident that the CBT has increased public support for water issues as a result of its efforts.

D Public Involvement in Governance—Information and Participation

Public participation can help make better decisions on water management. Information is a key to enable this to occur.

As the World Bank notes specifically in relation to groundwater, “regulatory interventions (such as water rights or permits) and economic tools (such as abstraction tariffs and tradable water rights) become more effective if they are not only encoded in water law but implemented with a high degree of user participation.

In BC information on water is not as readily accessible to the public as it could be. The SOE reports have been discontinued. Data from the last 2002 BC SOE report was available on key indicators such as: For surface water

- [Percentage of licensed stream length that has water allocation restrictions per decade](#)
- [Stream allocation restrictions in British Columbia](#)
- [Per capita municipal water use](#)
- [Effect of metering on per capita domestic water use](#)
- [Volume of water licensed for bottling per year](#)

For groundwater

- [Percentage of observation wells that show declining water levels due primarily to human activity](#)
- [Number of heavily used aquifers](#)
- [Number of heavily used aquifers vulnerable to contamination](#)

BC also needs a return to non-compliance reporting: efforts to bring back the noncompliance report have been stymied by excessive fees charged to NGOs asking for this information (Sierra Legal).

Information on existing water laws should be prepared and released – section 4.1 of the Drinking Water Protection Act requires a report of the Act’s activities from the Provincial Health Officer to the Minister and Cabinet but no report has been issued to date.

A huge variety of tools exist to manage water more sustainably, such as demand side management tools, groundwater protection strategies, rainfall collection, integrated land and water management and green building techniques. Matching the tools to the problems and working with other levels of government to implement tools outside the sole jurisdiction of the Basin communities are both necessary. Though this phase of the report will not be able to answer the question of whether any of these initiatives are a model for improved water governance for the Fraser Basin, this may well be a subject for Phase 2 of this project.

Possible Phase 2 topic- The FSWP could consider preparing a paper discussing a continuum of water governance models, with about 5 or so examples of different models that illustrate different parts of the continuum, for example from a volunteer stewardship group to the delegated authority of a water board. This paper could include a catalogue of the existing BC legislative tools for water governance and attempt to find out why the existing tools aren’t being used; such as water management plans, protection for habitat of endangered species, riparian area protection and others. This

paper could compare all the water governance models now being used by the province of BC alone, or all the provinces, in a chart, or in a more in-depth narrative.

One model that should be looked at carefully is the “regional management board” process proposed under the Wild Salmon Policy. This process will make recommendations of benchmarks for conservation recovery planning of salmon.

Possible Phase 2 topic- to look at the pilot water management planning exercise, and make recommendations about its suitability for adoption province-wide or along the length of the Fraser. What would be needed? How have others managed with large rivers and watersheds, i.e. Alberta South Saskatchewan River Management Plan widely considered a good model yet also criticized for failing to adequately protect instream flow needs.

Possible Phase 2 topic: what can we learn from others about water planning structures? Which features seem to work and which do not? How much decision making power do watershed councils need? What factors should be taken into account in designing water governance models? What is the provincial role in oversight of sub-basin governance models and setting and maintaining provincial goals on water quality and quantity? What innovations exist in other areas to provide public oversight, such as an Environment Commissioner?

V Opportunities for the FSWP in BC Water Governance

The FSWP has a number of options for greater engagement in BC water issues, which include (and are not limited to) these possibilities:

A Advocacy and Preparation of a Policy Brief on Water

Engage in direct advocacy for water for fish – The PSF or the FBC could be advocates and may wish to consider issuing a policy paper on water for use in different consultative processes that will be happening over the coming year.

Other groups are engaged in similar exercises on provincial water policy such as the BC Real Estate Association and the Canadian Water Resources Association.

As part of a water policy brief, the FSWP could consider such issues as, for example, innovative tools for water management, options for better use of existing legal tools and governance models, protecting water for fish, integrating payments for ecosystem services into BC water management in a more comprehensive way; or any of the other topics outlined in this paper.

FSWP also may wish to consider adopting policy positions on more discrete water issues, such as development of Phases 2 and 3 of the Groundwater Protection Regulation, Further research could be conducted in preparation for this brief on potential permitting requirements and the factors to be considered in permitting decisions including, for example, requiring a licence for wells with an extraction capacity above a defined level and/or for wells for specific purposes (e.g., water bottling); requirements for hydrologic, environmental or other assessments to be prepared by the licence applicant; and prohibitions or restrictions on issuing licences likely to result in significant impacts on the environment or existing water uses. A particular focus could be on aquifer mapping and assessment and how these programs tie in with policy and legislation.

B Participation in Provincial Consultations

Participate in upcoming opportunities/events - The main opportunity lies with the water plans of the province. Long promised, a provincial water strategy and overhaul of the Water Act are under development and according to government sources, will be released for public discussion early in 2007.

C Provide a Forum for NGOs and other Groups Active on Water Issues

Another option would be for the FSWP to provide a forum for NGOs who work on water conservation and fisheries management to network and form an advocacy network. FBC and PSF would use their influence to convene water groups of all sorts so that those groups will weigh in on the water debate.

D Work with First Nations to Improve Water Management

It is premature to predict the future Aboriginal role in water management. However, looking at the first modern treaty between an Aboriginal group and the provincial and federal governments gives some clues about possible roles. The 2000 *Nisga'a Final Agreement*, in relation to water, provides that:

- The province retains full ownership and regulatory authority over water.
- Existing water licences remain in place.
- The Nisga'a have a water allocation equal to one percent of the annual average flow from the Nass Valley watershed for their domestic, industrial, and agricultural needs.
- The Nisga'a also have a reservation for the purpose of conducting studies to determine the suitability of streams for hydropower purposes. Any hydro development will be subject to provincial approval and regulation.

The Tsawwassen First Nation treaty settlement is also critical. Under the treaty, the Tsawwassen First Nation will have the right to harvest fish and aquatic plants for food, social and ceremonial purposes, subject to conservation, public health and public safety.

At least two significant lawsuits regarding aboriginal water rights in Canada are also in progress in Haida Gwaii and in Lake Huron and Georgian Bay. The final resolution of these or other upcoming aboriginal water rights cases could have a dramatic impact on water management in the Fraser Basin. The government's duties of consultation and accommodation with First Nations over resource use, confirmed by the Supreme Court of Canada, will also be a major factor in new governance structures.

Outside of treaties, other First Nations in the lower Fraser are engaged in numerous restoration and water use issues that may help salmon, some of which are directly concerned (e.g. Coquitlam Fish Passage Committee) with potential conflicts between fish and humans for water.

E Issue Fact Sheets on Water Policy Issues

The FSWP could consider preparing a series of fact sheets on water issues to distribute at FBC and other meetings (NGOS, municipal council, government consultations). For example, a fact sheet could discuss water needs for fish and how improved governance can meet those needs. Fact sheets on all the topics in this report would be useful.

F Engage with Water Policy at the Federal Level

There are also opportunities for engagement on water policy at the federal level. The idea of forming a National Water Council has been around for several years and was discussed at a 2002 SFU conference. A precedent for such a Council exists in Australia. The idea has resurfaced in the past year as it was proposed in the Senate's 'Water in the West' report, echoed in the Pollution Probe report following its' national workshop series, taken up by the Canada West Foundation, and most recently Stephane Dion's Clean Water Plan proposes to "Create a National Water Council, as recommended by the Senate committee, to be composed of representatives from industry, research institutes, community stakeholders and all orders of government, and tasked with identifying the key water issues that require attention from policy makers and industry;" Currently, a loose coalition of groups Sierra Club of Canada; POLIS Project; WWF; is working on a draft National Water Strategy which echoes the calls for more federal water leadership, and also advocates for a National Water Council. This may be a coalition that the PSF or FBC would like to join.

The Council of Canadian Academies, a new not-for-profit organization, was formed to act as a source of independent, expert assessment of the science underlying pressing issues and matters of public interest. The Council is considering a proposal from the federal Minister of Natural Resources asking for an assessment on the status of Canada's groundwater and associated issues. If the Council decides to proceed, it will seek out scientific expertise on pressing groundwater science issues, and will potentially hold public meetings across the country to obtain input. This could be an opportunity for the FSWP partners to raise the issue of groundwater/surface water interactions and their importance for salmon, especially as this is a federal fisheries management issue.

G Moving the research agenda forward

Many academic and agency scientists are working on water issues. As a starting point, the FSWP should compile a list of current research that may help advance the conservation of water and salmon.

VI Summary of Potential Priorities for Phase 2 and Beyond

The province of BC is contemplating certain water governance tools and processes, some described earlier in this overview. Given the importance of governance issues, it's sensible for the Pacific Salmon and Watershed Program to coordinate closely with the Province to: 1) ensure appropriate support is available to foster improved water governance, and 2) expeditiously undertake an overdue overhaul of the Water Act.

Likewise, coordination may improve the likelihood that the FSWP can maximize the effectiveness of its funding by focusing on other important environmental priorities and avoiding duplication.

Beyond important governance issues, the FSWP might also focus on:

A Groundwater and Surface Water Interaction

Elevating the importance of ground and surface water interactions in provincial legislation and in local governance models is a critical priority.

B Instream Flow Protection

The FSWP could examine the issue of environmental or instream flows throughout the Basin and research different legal and policy tools to protect these flows.

C Allocation and Increasing Conflicts between Water Uses

Possible Phase 2 topic - is it time for a complete overhaul of the allocation and licensing system? Alberta has stated that it is not possible to reserve enough water for environmental flows in the South Saskatchewan due to existing licenses (Saunders and Wenig in *Eau Canada*). Are there parts of the world that have revised their water laws to reconcile historical licences with modern environmental priorities?

On another level, what lessons are we learning from local stakeholder dialogues? A review of the successes and challenges facing those developing the Nicola Water Use Management Plan would be very instructive.

D Payment for Ecosystem Services Research

Possible Phase 2 issue for further research – Investigate what programs now exist to pay for ecosystem services provided by Fraser River water. What programs that have proved successful elsewhere could be adapted for use in BC? A research project on how payment for ecosystem services approaches could be used to improve water management in BC would be valuable.

E Public Education

There is a glaring need to spend more time educating the public (and gaining public support) for water conservation and governance. Efforts should focus on learning from others (e.g. Langley's water outreach; the Fraser River Sturgeon Society's education program), fostering dialogue (e.g. hosting meetings), and the development of tools and programs such as publications that address the importance of groundwater for Fraser salmon. (Trout Unlimited's report "The Importance of Ground Water to Rivers in the West: A Report by Trout Unlimited's Western Water Project" is an example.) Plain language publications and other thoughtful tools that help promote stewardship, understanding, and ecosystem-based approaches are critical, and should be a priority.

F Enhance First Nations and General Stewardship Capacity

First Nations throughout the Fraser are intricately involved in fisheries conservation and management programs, and fisheries issues remain important in unresolved treaty negotiations. Recent downturns in salmon stewardship funding levels have likely limited the capacity and involvement of First Nations (and stewardship groups as well) to focus on water stewardship, and a systematic approach is needed to elevate capacity, partnering, and effectiveness of all involved. Some support could come from educational tools (E above), but other lingering capacity challenges must be faced squarely to meet the substantial challenges to saving salmon.

G Projects that Explicitly Deal with Predicted Impacts of Climate Change

It would be enormously helpful to enhance means in which decision-makers and ordinary citizens might improve stewardship of water and salmon, particularly relative to the predicted impacts of climate change. Some ideas have been suggested in this review, such as improved water conservation (through metering, etc.), support for the wild salmon policy (which is intended to conserve genetic diversity and adaptive capacity within salmon populations), support for climate-change research (e.g. assessing stock-specific vulnerabilities of salmon), educational tools, and the protection of resources critical to salmon, including riparian areas, estuaries, and temperature-moderating sources of unprotected groundwater (e.g. critical relative to Interior spawning tributaries). This list is preliminary and not prioritized, and furthering these activities should be an important Phase 2 project.

Appendix 1- Mapping and Information Programs

Objective: Incorporation of fish conservation needs in water use and watershed plans

Outputs: documentation of watershed models and tools

Information and Opportunities: There are a number of existing mapping and information data bases that should be reviewed relative to this objective

1. Community Mapping Network

<http://www.shim.bc.ca/>

Valuable tool for government, First Nations, NGOs and the public to find up-to-date maps and information on BC wetlands, BC Watershed statistics, detailed watershed atlases for many rivers and watersheds (Abbotsford watershed map, Chilliwack River Habitat Atlas, etc.), estuaries, riparian management guidelines, etc.

2. Pacific Streamkeepers Federation's watershed profiles

<http://www.pskf.ca/ecology/watershed/index.html>

provides detailed information on geography, biota, ongoing/past projects, and other information on 49 watersheds in Port Moody, North Vancouver, and West Vancouver.

Example assessment on water: "Water quality may be slightly affected by future development: impervious (i.e. developed) area is predicted to increase from 4.8% in 1996 to 6.8% in 2036, with a resulting drop in watershed health from 'excellent' to 'good'."

3. The Fisheries Information Summary System (FISS)

Provides spatially represented summary level fish and fish habitat data for water bodies throughout British Columbia and the Yukon. The information is in database format and can be displayed on the 1:50,000 Watershed Atlas.

<http://www.bcfisheries.gov.bc.ca/fishinv/fiss.html>

4. Fish Wizard, Fisheries Project Registry, SHIM Data with Orthophotos, Wild Threatened, Endangered and Lost Streams of the Lower Fraser Valley

http://www-heb.pac.dfo-mpo.gc.ca/maps/maps-data_e.htm

5. Planning and assessment of restoration and rehabilitation objectives for the Como Creek watershed: The Lowlands. (2005. Adamah Consultants. 148 p.)

Extensive assessment (large scale maps and color photos) of land cover types (21 classes, of which only 37% is vegetated), indicator species, and restoration (fish and wildlife) activities (and investments to date) in Coquitlam's Como Creek watershed

(includes Fraser Mills and Pacific Reach areas bordering Fraser River). Undoubtedly one of the most detailed assessments for any municipality in lower Fraser and potentially useful model for water conservation, restoration, water dynamics (e.g. effective impervious area) and stormwater management, other planning issues.