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REGIONAL SURFACE AND GROUND WATER MANAGEMENT AND GOVERNANCE STUDY: REVIEW OF NORTH AMERICAN CASE STUDIES

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Table of Contents

1	<u>INTRODUCTION</u>	3
2	<u>OKANAGAN BASIN WATER BOARD (BRITISH COLUMBIA)</u>	4
2.1	ORIGINS AND MANDATE OF THE OKANAGAN BASIN WATER BOARD	4
2.2	OVERVIEW OF THE OBWB'S GOVERNANCE STRUCTURE	4
2.3	GOVERNANCE ARRANGEMENTS OF THE OBWB	5
2.4	KEY INSIGHTS AND IMPLICATIONS FOR THE CVRD FROM THE OBWB	8
2.5	REFERENCES	9
3	<u>ALLIANCE OF ROUGE COMMUNITIES (MICHIGAN, USA)</u>	10
3.1	ORIGINS AND MANDATE OF THE ALLIANCE OF ROUGE COMMUNITIES (ARC)	10
3.2	OVERVIEW OF THE ARC'S GOVERNANCE STRUCTURE	10
3.3	GOVERNANCE ARRANGEMENTS OF THE ARC	12
3.4	KEY INSIGHTS AND IMPLICATIONS FOR THE CVRD FROM THE ARC	14
3.5	REFERENCES	16
4	<u>NISQUALLY RIVER WATERSHED PLANNING (WASHINGTON STATE, USA)</u>	17
4.1	ORIGINS AND MANDATE OF THE NISQUALLY RIVER WATERSHED MANAGEMENT PLAN	17
4.2	GOVERNANCE ARRANGEMENTS IN THE NISQUALLY RIVER BASIN	17
4.3	KEY INSIGHTS AND IMPLICATIONS FOR THE CVRD FROM THE NISQUALLY RIVER	21
4.4	REFERENCES	22
5	<u>SUMMARY OF CASE STUDY INSIGHTS</u>	23

This review was undertaken as a contribution to the Cowichan Valley Regional District's 2014 Regional Surface and Ground Water Management and Governance Study. The review is an output of the Res'Eau-WaterNet research project 3.4: Improving governance capacity of small and First Nations communities.

1 Introduction

This review of three North American water governance case studies is intended to complement the material presented by subject matter experts at the second workshop of the Regional Surface and Ground Water Management and Governance (RSGWMG) Study. The review adds to the broad range of perspectives and experience delivered through the workshop, identifying alternative governance arrangements and additional considerations for governance reform processes.

The case studies included in this review were selected based on their reputation as 'best practice' examples of watershed governance, and the insight they provided into key problem statements identified by the taskforce. The following case studies were approved by the CVRD staff and board committee:

1. The Okanagan Basin Water Board (British Columbia)
2. The Alliance of Rouge Communities (Michigan, USA)
3. Nisqually River Watershed Planning (Washington, USA)

For each case study, a literature review was compiled based on the same problem statements and questions that the subject matter experts have been asked to address. The literature review is based on information and documents available on the organization's website, the plan or strategy of interest, and any relevant reports. In two cases, the review was supplemented with an interview with the watershed organization's Executive Director. No response was received from the third organization.

Each case study begins with an overview of the historical and institutional context of the watershed management organization and process of interest. The organization's governance structure and arrangements are described, organized according to the four problem statements identified by the RGSWMG study taskforce:

1. Local governments, First Nations, and NGOs typically do not have adequate long-term funding (and often compete for it) to carry out water management and stewardship activities.
2. Decision-makers lack a coordinated set of strategies, mandates, information, and tools to make informed decisions around water, watershed health and land use.
3. Activities on private land that impact water quality, water quantity, and ecosystem health are often not enforced or enforceable under current law.
4. Our collective impact on watershed health is not measured, which limits our ability to adapt and improve as a region over time.

The described governance arrangements also highlight the six key result areas identified by the CVRD: Governance structure; delegated authority; coordination; funding; oversight; reporting. Each review concludes by identifying key insights and considerations from the case study 'experience' that may be of interest to the taskforce as they discuss governance and management options for the Cowichan region.

Key considerations emerging from the case studies are summarized in the final section.

Additional case study reviews will be posted on the 'Cowichan Water' webpage in the Program on Water Governance blog: <http://blogs.ubc.ca/powg/> (password: CVRDgov14). These additional case studies provide insights from regional water governance in the United Kingdom, Australia, and New Zealand, where significant reforms have occurred over the last twenty years.

2 Okanagan Basin Water Board (British Columbia)

2.1 Origins and mandate of the Okanagan Basin Water Board

The Okanagan Basin Water Board (OBWB) provides an example of basin-wide *funding*, years of experience working collaboratively with local and senior government, First Nations, and communities to undertake shared water management programs.

The OBWB was formed in 1969-1970 under the BC Municipalities Validating and Enabling Act as a basin-wide partnership to define and resolve water resource issues in the Okanagan Basin. It replaced the previous Okanagan Watershed Pollution Control Council, which was formed to address growing pollution problems in the lakes, but lacked a mechanism to share funds and meaningfully collaborate. The Board was intended to provide leadership on basin-wide water issues, including the sustainability of the water supply, source water quality, and the health of lakes and streams.

The Okanagan Basin Study (1974) recommended that the OBWB act as the coordinating regional authority for water resources management in the basin. However, the provincial government was reluctant to devolve power to the OBWB, and so the OBWB was initially focused on upgrading sewage treatment facilities and controlling an aquatic weed infestation. In 2006, population growth, climate change and drought concerns resulted in the OBWB renewing its broader water management mandate.

The OBWB is a unique local government agency, formed as a collaboration between the three Okanagan regional districts, with taxation powers to support its activities. The Board does not have regulatory power, but seeks to improve the integrated management of water resources by undertaking (and funding) research, education, infrastructure, and management programs that benefit the whole basin, and by improving communication between government agencies to reduce fragmentation in policy and planning.

The overall purpose of the OBWB is “to undertake strategic projects and programs at the Basin scale that meet the collective needs of Okanagan citizens for long-term sustainable water supplies while supporting the capacity of member jurisdictions to meet their own water management goals”.

2.2 Overview of the OBWB’s governance structure

The OBWB is an inter-regional governance authority whose jurisdiction is defined by the watershed boundaries. Table 1 summarizes the governance structure of the OBWB, based on information available on the OBWB’s website (1) and in its governance manual (2).

Table 1. Structure and composition of the OBWB

Board of Directors	<ul style="list-style-type: none"> • The main decision making body. • Comprised of three directors appointed from each of the three regional districts’ boards; and one director appointed from each of the Okanagan Nation Alliance, Water Supply Association of BC, and the Okanagan Water Stewardship Council.
Okanagan Water Stewardship	<ul style="list-style-type: none"> • A technical advisory committee established by the Board to provide independent advice and policy recommendations on water issues.

Council	<ul style="list-style-type: none"> Comprised of water stakeholders, including water experts and volunteers.
Committees	<ul style="list-style-type: none"> The OBWB has formed committees to address specific matters under its responsibility. Includes standing and program committees, and task forces. Committees may include board members and other stakeholders. Committees make recommendations to the full board.
OBWB staff	<ul style="list-style-type: none"> The Board is supported by seven full time staff that manage OBWB programs. The executive director works with the Board to develop long-term strategic plans.

2.3 Governance arrangements of the OBWB

This section describes the governance of the OBWB, including its funding, authority, coordination, and oversight arrangements. The analysis is organized according to the four problem statements identified from the first task force meeting. The information presented was primarily gathered from the OBWB’s website (1), its governance manual (2), and strategic plans (3, 4), verified and supplemented by a telephone interview with the Board’s executive director.

- 1. Local governments, First Nations, and NGOs typically do not have adequate long-term funding (and often compete for it) to carry out water management and stewardship activities.**

The OBWB was given taxation authority to support its projects under the BC Municipalities Validating and Enabling Act; every resident and business within the Okanagan Basin (excluding First Nation reserve lands) contributes at the same mill rate, on the basis that they share equitably in the benefits of basin-wide water management initiatives. The amount each landowner pays is based on a property value assessment; the 2014 mill rate is 5.8¢/\$1000 assessed value, which amounts to \$3,444,600 per year for the Board. The Board has set legal maximum annual contribution rates for each tax-funded program. New projects can be funded under this tax requisition (with the approval of the regional districts), so long as the project is consistent with the OBWB mandate and fits within the maximum contribution rate.

The Board’s funding and programs are organized around the Okanagan watershed as the integrating biophysical unit. Only those portions of regional districts that lie within the watershed boundaries contribute to and participate in the programs, while only those programs and projects that benefit the basin as a whole are funded by the OBWB. The rationale is that everyone pays, and everyone benefits. This has two key implications:

- while localized projects that have whole-of-basin benefits (e.g. source water protection) are funded through OBWB programs, initiatives with area-specific benefits (e.g. drinking water treatment) are not eligible for funding.
- because First Nations reserve lands are generally-speaking not taxed, they cannot contribute financially to the OBWB in the same way as local governments, and are not eligible for some projects on reserve lands (e.g. sewage facilities assistance grants). This has created some tensions over who can be involved in decision making over funding; at present only regional district representatives vote on financial decisions.

The tax income covers the basic costs of running the OBWB and its programs, and is identified as the key to the success of the organization. The tax provides a permanent source of income to hire permanent staff, carry out core programs and activities (e.g. monitoring), and leverage other funding opportunities (which typically require local group copayments).

The annual operating budget is approved by the OBWB, and by the boards of the regional districts through their budgeting process.

The OBWB receives senior government “partnership funding” for water management, research and planning projects. As a local government entity, the Board has also been able to apply for gas tax funding. There is a strong level of agency/government support because the OBWB is seen as a joint initiative. The OBWB maintains an ongoing relationship with senior government and funding agencies, so that agency staff can alert OBWB when relevant opportunities arise. In addition to directly entering into funding agreements, the OBWB supports the efforts of municipalities, improvement districts and First Nations to access grant funding (e.g. provincial infrastructure grants, Real Estate Foundation grants).

The combined funds are used by OBWB for program operations; subsidies for infrastructure upgrades; watershed research; and grants for water management projects with basin-wide significance. The OBWB maintains a ‘water conservation and quality improvement’ grant program, which provides funds to local governments, irrigation districts and NGOs for projects that conserve and protect water (e.g. water sensitive urban design). Grants range from \$3,000-30,000, and are prioritized based on their measurable outcomes, basin-wide significance, matching funding, and collaboration between jurisdictions.

When there are no external project funds available, the OBWB’s internal funding enables it to continue its basic functions while it focuses on relationship building and project development. The OBWB maintains a supply of project proposals that are ready to go when senior government partnership funding becomes available. Year-over-year financial carry over is also important to maintaining programs over time given the variability in external grants and funding needs. For example, gas tax funding requires communities to pay for projects up front, and be reimbursed later; having a financial reserve therefore enables the OBWB to take advantage of gas tax funding opportunities.

2. Decision-makers lack a coordinated set of strategies, mandates, information, and tools to make informed decisions around water, watershed health and land use.

The Board seeks to improve water management by providing a basin-wide perspective and improving inter-regional communication. The OBWB provides a mechanism for local governments to share resources, gather watershed information, and address basin-wide problems. The OBWB shapes local governments’ management of water resources through voluntary mechanisms such as grants, resources, information, and strategic plans; however it avoids undertaking projects that overlap with municipal jurisdiction. The 2008 Okanagan Sustainable Water Strategy identifies the 12 guiding principles for water management and policy, and specific actions to address the principles. The actions identify who will complete the action, over what timeframe. In addition, the strategy identifies previous research that was undertaken in the region, and the current state of knowledge on water issues. It therefore provides a central resource for knowledge on the basin, and is intended to promote connectivity between research projects and reduce duplication of effort. The 2008 strategy was recently updated with the 2014-2019 Strategic Plan, which sets out the goals that will guide the OBWB’s work over the next five years, and the activities it will undertake to achieve these goals. While the scheduling of activities remains dependent on funding and

changing circumstances, the strategic plan identifies the issues and areas of work of greatest strategic importance. The plan also signals the OBWB's priorities to its funders and partners.

The Stewardship Council has a particularly important role to play in coordinating the collection and communication of science based information to decision makers. The Council provides information and independent advice to the Board on proposed projects, policies, and actions. The Stewardship Council was responsible for compiling the information and recommendations contained in the Okanagan Sustainable Water Strategy. In addition, the Council develops programs that contribute to the local knowledge base and provide informational tools for the watershed community; it also acts as a communication channel to communities and stakeholders. The Council is supported by funds allocated under the OBWB's regional water management program. Additional research support is provided by the new UBC Okanagan LEEF chair in water resources, which is funded by the OBWB to support the coordination of research in the Okanagan by the OBWB, universities, and other agencies.

The water management program, which includes all OBWB activities beyond the sewage and aquatic weed control programs, has to be re-approved every few years (currently tied to the municipal election cycle). By requesting re-approval of the program on a regular basis, the OBWB ensures this program remains closely attuned to local government needs.

The Board also provides a link between the regional districts and other levels of government. Key elements of the OBWB's role are to advocate and represent local needs to senior government decision makers, and facilitate communication between levels of government. The Board communicates with the provincial and federal governments about inter-regional water issues; it coordinates and participates in provincial partnerships with local governments and stakeholders; it partners with federal agencies and the province on water management and research initiatives; and it coordinates provincial and federal partnership funding. The Board coordinates with First Nations through representation on the Board of Directors and on the Okanagan Water Stewardship Council.

Governance in the Okanagan was historically very fragmented, with fifteen local governments, over a hundred water utilities, and four First Nations. Getting all of these groups to work together is a significant challenge. The OBWB has addressed this issue through its use of the connected watershed as a rationale for coordinated effort; by investing in relationship building over decades; and through its role as a funding agency rather than an authority. The OBWB has found that it can achieve the most as a 'carrot' (rather than a 'stick') organization and through community building; local governments and community members voluntarily contribute their own resources and commitments to pursue common goals. In contrast there is noted to be substantial resistance to authorities in the region (e.g. Interior Health), who rely on enforcement of rules to achieve results.

3. Activities on private land that impact water quality, water quantity, and ecosystem health are often not enforced or enforceable under current law.

The OBWB was legislated under the Municipalities Enabling and Validating Act, and by Supplementary Letters Patent (SLP) to the Okanagan regional districts (official documents which authorize additional functions for the regional districts). Legislative approval was required for the taxation authority of the OBWB because it was creating a special service area across three regional districts. The SLPs establish the commitments and responsibilities of participating regional districts, and the mandate of the OBWB.

The OBWB is not a regulatory agency and does not enact or enforce law. It was given taxation authority to fund its programs, and is therefore at its essence a means of pooling and directing funds towards basin-wide projects. The OBWB also acts as a communication hub, and a centralized unit for the coordination and administration of projects. It promotes best practice by supplying scientific advice, information, grants, and other incentives to local government, businesses, and the public.

Decisions are made by votes of the Board of Directors. All directors have equal weighted votes, and are expected to represent the common interests of the whole basin. However only the regional district directors are allowed to vote on financial decisions.

The OBWB supports the efforts of municipalities and regional districts to regulate land and water use activities through the creation of bylaws. The OBWB has developed a number of bylaw toolkits for local governments, which set out guidelines for creating bylaws to protect water resources (e.g. groundwater). It has also helped local governments' access legal advice to develop environmental bylaws. The Board therefore enables the voluntary uptake of best practice by local authorities. In one case, they have incentivized these voluntary measures: sewage infrastructure grants are only available to local governments that do not allow small lot subdivision on septic. This practice has been effective, in part because it fits with provincial government rules for infrastructure grants.

4. Our collective impact on watershed health is not measured, which limits our ability to adapt and improve as a region over time.

The OBWB has built partnerships with provincial and federal governments, developed projects, and provided funds for monitoring, research and modeling within the Okanagan Basin. These activities have contributed significantly to understanding surface and ground water flows, and land and water use impacts on the basin as a whole. Several years ago the OBWB initiated a new tax requisition for a LEEF Innovation Chair in Water Resources at UBC Okanagan, to undertake and coordinate Okanagan Basin water studies, and bring in additional research grants that can only be accessed by universities. The OBWB also maintains an outreach and education strategy for improving communication of its research findings to the community and governments.

2.4 Key insights and implications for the CVRD from the OBWB

The OBWB case study highlights four key considerations for the CVRD as it investigates potential funding and devolved authority options. These considerations are drawn from analysis of the OBWB approach, and the recommendations of the Executive Director of the OBWB.

- There is the opportunity to establish a similar tax requisition for water management activities under current local government legislation. It is possible to create a regional district special service area with an earmarked requisition for water management under the BC Local Government Act (without requiring additional permissions from the province). The Local Government Act also sets the rules for amendments to the letters patent of a government agency. The Ministry of Community, Sport and Cultural Development would be able to provide advice on what financial and organizational arrangements are possible within the local government legislative framework.
- If the CVRD pursues a taxation approach, it will need to give careful consideration to funding arrangements with First Nations. In the Okanagan, one band contributed to infrastructure upgrades through taxes on leasehold properties. The Lower Similkameen

band, which has annual property taxes, is investigating options for a water mill rate on reserve properties. Non-property tax arrangements may also be possible.

- The geography of the CVRD, which contains multiple watersheds with varying scales of population and development, complicates the collection and distribution of tax funds. Unlike in the Okanagan, many water initiatives will have area-specific benefits, and therefore (some) funds will have to be allocated across the region. Different areas will also have different management needs, which may not be aligned with the capacity of the population to fund them. The balance of shared versus local funding will have to be carefully assessed in terms of its implications for equity and effectiveness.
- The OBWB demonstrates the importance of relationship building (within the region and with senior government agencies) for the effective coordination of and shared investment in improving water management. Such an approach takes time, and is based on the steady, incremental development of regional governance from existing arrangements and relationships to a desired future state. Wholesale changes in governance arrangements disrupt existing relationships, and are likely to require greater investment in community building to be effective in the long term.

2.5 References

(1) Okanagan Basin Water Board 2014 Okanagan Basin Water Board. Retrieved June 16 2014, from <http://www.obwb.ca/>

(2) Okanagan Basin Water Board 2010 *Okanagan Basin Water Board Governance Manual*. Available at http://obwb.ca/fileadmin/docs/obwb_governance_manual.pdf

(3) Okanagan Water Stewardship Council 2008 *Okanagan Sustainable Water Strategy: Action Plan 1.0*. Okanagan Basin Water Board. Available at http://www.obwb.ca/fileadmin/docs/osws_action_plan.pdf

(4) Okanagan Basin Water Board 2013 *Okanagan Basin Water Board Strategic Plan*. Available at http://www.obwb.ca/newsite/wp-content/uploads/obwb_strategic_plan.pdf

3 Alliance of Rouge Communities (Michigan, USA)

3.1 Origins and mandate of the Alliance of Rouge Communities (ARC)

The Alliance of Rouge Communities and their watershed management planning approach provide an example of senior and local government, and non-governmental stakeholders working together to improve watershed health. The Rouge River communities were the first in Michigan to adopt a watershed-based approach to stormwater management, and the first Michigan watershed alliance created; in both cases the Rouge approach was taken up in state legislation.

In the 1980s, the Rouge River was designated as among the most polluted areas in the Great Lakes. The Rouge flows through several large urban and industrial areas, and was being degraded by widespread wastewater and stormwater pollution. The US District Court urged local authorities to adopt a more comprehensive approach to pollution control; at the same time the US EPA was developing regulations to control stormwater discharges. A group of local agencies within the Rouge River watershed proposed a watershed-based approach to managing discharges, which was endorsed by state and federal government. The state government later adopted this watershed-based permit approach as an alternative to traditional stormwater permitting processes, and it has become a national model in the US.

While the Rouge Project was initially funded through significant federal government grants, reductions in federal funding over time resulted in the exploration of local funding options. Local government agencies within the Rouge watershed formed a partnership to address their stormwater permit requirements. The Memorandum of Agreement for this partnership became the model for the Watershed Alliance legislation, which was being developed by the state of Michigan to authorize the formation of watershed entities at the time. The bylaws forming the Alliance of Rouge Communities (ARC), a voluntary public watershed entity, were adopted by participating local government bodies in 2006.

The ARC is comprised of representatives of public agencies with water management responsibilities within the Rouge River watershed, including county and municipal governments. The purpose of the Alliance is to ‘provide an institutional mechanism to encourage watershed-wide cooperation and mutual support to meet water quality permit requirements and to restore beneficial uses of the Rouge River to the area residents’ (1). The ARC acts as a coordinating body, enabling the cooperative development of watershed plans, and supporting members to apply for stormwater permits; to implement plan actions; to identify remaining contaminant sources and solutions; and to undertake education, monitoring, and restoration projects.

3.2 Overview of the ARC’s governance structure

The ARC is voluntary public watershed entity whose jurisdiction is defined by the watershed boundaries. Table 1 summarises the membership of the ARC, while Table 2 summarises its governance structure, based on information provided on the ARC’s website (2) and in its bylaws (1).

Table 1. Membership of the ARC

Primary members	Representatives of each township, city, village and county whose jurisdiction is wholly or partially within the watershed boundaries,
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Regional Surface and Ground Water Management and Governance Study:
Review of North American Case Studies

	and whose governing body voluntarily adopts the bylaws.
Associate members	Representatives of any local or regional public agency (e.g. school) that has been issued a state permit for a water discharge into the Rouge River, and whose organization accepts the bylaws.
Cooperating partners	NGOs, public agencies, businesses, and residents who volunteer their time, services or other resources towards the protection of the river, and who comply with the ARC policy for cooperating partners.

Table 2. Structure and functions of the ARC

Full ARC	<p>Includes municipal governments, counties, associate members, and cooperating partners. Only primary and associate members vote on ARC decisions.</p> <p>The Full ARC meet twice a year, and is responsible for the election of senior officers, adoption of annual budgets and cost assessments to members, delegation of responsibilities, and development of ARC policies.</p>
Executive committee	<p>Comprised of 14 voting members, including the elected chair, vice chair and treasurer; one representative of each county; one representative of each of the seven subwatershed advisory groups; and the immediate past chair or vice chair.</p> <p>The executive committee oversees the expenditure and management of the ARC, and assisting other committees to meet their responsibilities.</p>
Standing committees	<p>The ARC has established a standing committee on technical issues, financial management, and public involvement and education. Participation on standing committees is open to ARC members, cooperating partners and other interested parties (including members of the public). The technical committee is responsible for the management of the watershed monitoring program, oversight of permit requirements, and recommendations on joint projects to develop best management practices.</p>
Special committees	<p>The ARC may establish special committees to consider specific issues. For example, the Organization Committee considers changes to ARC bylaws, develops and reviews policies and procedures, considers membership requests, and makes recommendations to the Full ARC.</p>
Subwatershed advisory groups	<p>Represent seven subwatersheds within the wider Rouge River watershed. The advisory groups are made up of public agencies, community members, local water groups, and other interested stakeholders. Member agencies within each subwatershed cooperate to develop a watershed management plan, which includes commitments from each agency to carry out the activities required to achieve the objectives of the plan.</p>
Executive director and staff	<p>The ARC currently has an executive director and four support staff. The Executive Director serves as an unofficial member on all committees, providing supporting information and recommendations.</p>

3.3 Governance arrangements of the ARC

This section describes the governance of the ARC, including its funding, coordination, reporting, and oversight arrangements. The analysis is organized according to the four problem statements identified from the first task force meeting. The information presented was primarily gathered from the ARC's website (2), its bylaws (1) and watershed management plan (3), and a USEPA report (4), verified and supplemented by a telephone interview with the ARC's executive director.

1. Local governments, First Nations, and NGOs typically do not have adequate long-term funding (and often compete for it) to carry out water management and stewardship activities.

The ARC total income for 2014 is \$691,000. Of this, participating communities contribute approximately \$297,000 through their membership dues, with the remainder made up of primarily federal grants. While the federal government invested millions of dollars in initial pollution management activities, grant funding has reduced significantly over time, and does not always match the needs of the communities at the time. The Watershed Alliance legislation and ARC were created to enable capture of local funding (through member assessments) for watershed based planning and restoration activities.

Assessments to members are set annually, based on annual budgeted costs. Counties currently contribute through in-kind contributions to the ARC, and are not assessed. The financial contribution of municipal government members is prorated based upon the population and land area of the municipality within the watershed, where areas with the greatest proportion of the land area and population are allocated the largest proportion of costs. Assessment for associate members is based upon the ARC membership benefits provided (i.e. participation in grant funded programs), and any in-kind contributions made by the member.

Member assessments are used to fund compliance with permit requirements, including public education, watershed monitoring, and elimination of sewage discharges into water bodies, as well as staff support for the ARC and its committees. Government grants are primarily directed towards restoration activities, including tree planting, river and lake restoration, dam removal and monitoring. ARC member assessment and grant money is pooled and directed towards subwatersheds and activities that are identified as being of strategic importance for water quality improvement. While this prioritization approach has met with some resistance from communities that wish to see their contributions spent locally, it has been successful in ensuring that funds are invested in activities that will make the greatest contribution to watershed health overall.

2. Decision-makers lack a coordinated set of strategies, mandates, information, and tools to make informed decisions around water, watershed health and land use.

The ARC enables the coordination of municipalities' pollution management activities through water discharge permitting based on watershed plans. Under the revised state legislation, public agencies can choose to submit either a standard permit or a watershed based permit for stormwater and wastewater discharges. Agencies that choose the watershed based permit are required to cooperate in the development of a (sub)Watershed Management Plan. The plan sets out objectives and long term goals for the subwatershed, actions required to achieve the objectives, commitments from each agency to implement the actions, and methods for evaluating progress. The ARC provided funding for technical

support and facilitation to produce these plans, and appoints a chair to each subwatershed to coordinate the permittees.

Each individual permittee is required to submit an Illicit Discharge Elimination Plan, a Stormwater Pollution Prevention Initiative, and a Public Education Plan, all of which are enforceable by the Michigan Department of Environmental Quality. The Stormwater Pollution Prevention Initiative is developed based on the agency's commitments in the Watershed Management Plan, and specifies the actions to be implemented during the term of the permit, a stormwater management program, and methods for assessing progress. Therefore, the ARC is able to coordinate the water quality improvement activities and strategies of multiple public agencies through voluntary, cooperative subwatershed planning, which are then enforced by the permitting authority (i.e. the State).

The Full ARC and Executive Committee oversee all subwatershed and member activities, ensuring coherence and coordination of improvement strategies and investment across the Rouge River watershed. While the Full ARC meet twice yearly to discuss and vote on important issues, the Executive Committee plays an important role in overseeing the ARC's day to day operations, including expenditure and management.

Stakeholder participation and agency cooperation within the watershed are key to the success of this approach. Most monitoring, management, education, and restoration activities are undertaken by the public agencies and partners themselves. The ARC supports the agencies by providing a mechanism for coordination of watershed planning; resources (e.g. educational materials, templates); expertise and support for permittees (e.g. training); and access to funding (pooled local contributions and grants). In addition to providing direct funding for agency activities, the ARC have reduced the cost of compliance for stormwater permits and pollution control activities by coordinating and streamlining activities (e.g. development of permit templates, educational materials).

The ARC has also supported an ongoing watershed wide monitoring program and improved data access, enabling water quality trend analysis and strategic decision making. The ARC Technical Committee manages the comprehensive monitoring program, which is undertaken by various county, municipal, state and federal departments, together with local groups. The annual budget funds the monitoring program as well as data analyses and reports. Over time, the ARC has also invested in the development of water quality and quantity modelling tools, geographic information systems, and publicly accessible information databases. The monitoring data and analyses tools have been significant in the detection of remaining pollutant sources, prioritizing management activities and investment, and evaluating outcomes for water quality and ecosystem health.

3. Activities on private land that impact water quality, water quantity, and ecosystem health are often not enforced or enforceable under current law.

The ARC is a coordinating body, based on voluntary membership, and does not have delegated authority to enforce watershed activities. Rather, by creating a legislated watershed-based permitting approach, the ARC enables public agencies to commit to best management practices and actions that are enforced by the State through the permit conditions. The ARC supports the public agencies to identify and undertake these activities through watershed planning processes, providing resources, and funding infrastructure improvements and restoration activities.

The ARC also supports infrastructure improvements and best management practices on private land through education and funding. Significant restoration activities, such as

riparian planting and the creation of rain gardens, is being undertaken by homeowners and businesses on their own properties. The ARC has been successful in convincing landowners that these practices improve their properties (e.g. through improved drainage), are economically efficient in the long term, and improve the brand of local businesses. A number of businesses and other organizations have signed on as cooperating partners to the ARC.

The ARC is developing a range of payment options for infrastructure improvements on private land to eliminate remaining sewage discharges (e.g. from septic tanks). In some cases, an assessment district is created to pay for the infrastructure, which may capture funding from a subset of houses or a whole city. Where individual houses are required to pay for the infrastructure upgrades, the ARC/public agency can offset initial costs by requiring payment at point of sale, offering no interest loans, or negative interest loans (i.e. subsidized loans). These techniques have been effective, with most people paying for the infrastructure within the time required.

4. Our collective impact on watershed health is not measured, which limits our ability to adapt and improve as a region over time.

The ARC monitors both the effects of land and water use, and water stewardship activities on watershed health. The watershed management plan outlines a five-year monitoring plan, identifying parameters to be collected throughout the watershed to measure patterns in water quality and quantity. Regular monitoring involves the collection of precipitation, streamflow, dissolved oxygen, water temperature, E. coli and freshwater ecology data. Other monitoring is undertaken on an intermittent basis to assess the state of the river (e.g. suspended sediments), and by individual permittees to assess the effectiveness of the pollution control strategies in their permits. Coordination of the permittees' monitoring and assessment activities is addressed through the watershed management plan. The monitoring data collected between 1994 and 2013 is stored in a county database; a subset of this data is accessed through the Rouge project's online database, which allows users to query the data from 1994-2011. The ARC have sought assistance from a university to continue to provide public access to this data.

Through the watershed planning process, water quality and quantity standards were set, along with other targets for watershed health. Monitoring data are used to identify progress towards these targets, and compliance with/exceedance of water quality standards. Geographic Information Systems and modelling tools are also used to analyze trends in water quality throughout the watershed and over time. Technical reports and maps of Rouge River monitoring and assessment are produced annually. Additional reporting of quality indicators and progress against targets is undertaken by permittees and submitted to the permitting authority on an annual basis.

3.4 Key insights and implications for the CVRD from the ARC

Four key considerations for the coordination and funding of a (sub)watershed based approach to water quality improvement emerge from the ARC case study. These considerations are based on a case study report published by the USEPA (4) and a telephone conversation with ARC's Executive Director.

1. Membership in the ARC and the use of the watershed-based permit are voluntary, yet have been taken up by the majority of communities within the Rouge watershed. Several explanations are advanced for this voluntary, cooperative investment in watershed protection. Firstly, the watershed based permitting approach was offered as

a desirable (but voluntary) alternative to a traditional regulatory approach. Secondly, the voluntary watershed alliance promotes a culture of cooperation. The subwatershed planning approach has been particularly effective at gaining local buy-in and ownership of improvement strategies, and has resulted in communities taking on additional activities like stream bank stabilization and habitat restoration. Finally, the ARC enables communities to access funding and resources to support their individual activities (including ARC funds and government grants). This institutional infrastructure and coordination of watershed activities improves the effectiveness of the individual agencies efforts, so that they are more likely to achieve their objectives.

2. An effective watershed based approach, which addresses cumulative impacts, will be built upon a strong understanding of the jurisdiction for water management. It is important to know who owns and regulates water at each point as it moves through the watershed (e.g. from a property, to a road, to a drain, to a river), in order to assess the potential for water management issues and solutions, responsible parties, and integrate the management of water across space and time. The Executive Director argues that this jurisdictional knowledge must be matched with an understanding of watershed hydrology, in order to look beyond effects (e.g. flooding, soil erosion) and identify the causes of 'broken hydrology' (e.g. deforestation), and the parties with the authority to address these causes. The ARC use watershed monitoring and modelling to identify the sources of freshwater contamination (e.g. leaking septic systems).
3. Regulations will not solve everything, and need to be matched by incentives and building of public support. Regulations are typically aimed at the management of effects, rather than causes, and tend to result in 'finger pointing' and minimum compliance, rather than the adoption of best management practices. The ARC is currently investigating a range of financial incentives, including subsidized loans; funding activities that prevent soil erosion and introduction of contaminants; incentivized rating schemes for improved runoff; and water quality trading¹. The private sector is also often more receptive to voluntary improvements rather than regulatory requirements; in many cases there is a business case for improvements in practices, and such initiatives contribute to positive branding for the company. Non-financial strategies, such as education and awareness raising activities, were also important in mobilizing Rouge communities and creating political pressure for municipalities to buy into the watershed approach. The Executive Director highlighted the use of water quality maps (showing pollutant levels across the watershed) and a letter challenging mayors to declare that they had no sewage leaks as two effective awareness raising strategies.
4. Consideration should be given to the alignment of communities and (sub)watersheds when developing watershed or regional based approaches. Dividing a region into (sub)watersheds can be an effective way of gaining community buy in and ownership of water management initiatives. However, because community/political and watershed boundaries are not always aligned, municipalities may be located within more than one watershed. The requirement to contribute to more than one watershed management plan imposes significant compliance costs on that community. Elsewhere this has been addressed by communities identifying a primary watershed to contribute to, and participating in other watershed initiatives at a lower level. Consideration should also

¹ Water quality trading involves strategic investment in water quality improvements to maximize the benefit to cost ratio. Investments in small improvements in water quality are redirected towards activities that will have greater effect, or will result in the same improvement at lower cost.

be given to how costs, votes, and expenditure will be allocated across (sub)watersheds. While area and population based allocation supports democratic representation, it also reifies existing power relationships, so that small communities have less input into decisions and are limited in their capacity to implement solutions. In the ARC, most decisions are based on equal member votes, and expenditure is allocated to where it is most needed.

3.5 References

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4 Nisqually River Watershed Planning (Washington State, USA)

4.1 Origins and mandate of the Nisqually River Watershed Management Plan

The Nisqually River case study provides an example of multiple stakeholder groups working together to create a watershed vision, and implementing a plan to achieve it. In particular, it provides an example of a collaboration between indigenous and local government; the Nisqually Tribe was the lead agency in the development of the Watershed Management Plan (WMP). The Nisqually River WMP was the first to be adopted in the state of Washington; it provides an example of integrated land use and water planning, water allocations, and plan implementation.

The WMP was adopted under the Watershed Management Act, which was passed by the Washington State legislature in 1998. The purpose of this Act was to set a framework for the development of local solutions to watershed issues; it enables the citizens of a watershed to cooperatively assess the state of water resources and determine how best to manage them on a watershed basis. Watershed management plans are required to balance competing resource demands, while protecting minimum instream flows and ensuring the provision of water for future needs. Watershed planning is funded by the state government over four phases (organization, watershed assessment, planning, and implementation) with set timeframes.

The Nisqually River WMP was developed by a watershed planning unit, comprising the Nisqually Tribe, counties, municipalities, water purveyors, citizens and river council representatives, agricultural interests, development interests, and the state Department of Ecology. The WMP was adopted in 2004, and was followed by a detailed implementation plan in 2007. The state watershed management planning process is now complete, with the last year of implementation funding in 2010. Ongoing watershed planning and management activities continue to be undertaken on a collaborative basis by the Nisqually River Council (NRC), which adopted a 15-year watershed stewardship plan in 2005. Many of the same stakeholders in the watershed planning unit are members of the NRC.

4.2 Governance arrangements in the Nisqually River Basin

This section describes the governance of the Nisqually River Watershed Management Plan process, including its funding, authority, coordination, and oversight arrangements. The analysis also describes the ongoing governance of watershed management through the Nisqually River Council. The analysis is organized according to the four problem statements identified from the first task force meeting. The information presented was primarily gathered from the Department of Ecology's website (1-3), the WMP and implementation plan (4-5), and the Nisqually River Council's website (6).

- 1. Local governments, First Nations, and NGOs typically do not have adequate long-term funding (and often compete for it) to carry out water management and stewardship activities.**

The water management planning process is funded by the state government. Targeted funds are provided for each stage in the planning process, including five years of implementation funding. The Nisqually planning unit received a total of \$930,000 for the development and implementation of its WMP.

Towards the end of the implementation period, the water planning unit investigated options for sustainable long-term funding of watershed planning and implementation. They noted that sustainable funding is needed to pursue plan actions and projects, and to pay for the administration of plan implementation (7). Key local funding options identified were the creation of a special purpose district to levy fees for specific services, or the collection of water-related revenues from existing special purpose districts (e.g. public water utilities) through an inter-local cooperation agreement. The Unit notes that while special purpose districts are targeted at providing necessary services, and have a strong cost to benefit ratio, they are also criticized for creating too many governmental units, and being less visible and accountable to citizens. Inter-local agreements between existing jurisdictions were therefore seen as a viable option.

Grants were identified as an important external source of revenue for watershed plan implementation. However it was noted that grants usually require matching funds, so some local funding arrangement would still be required. Further, some grants are available to governments only, while others are targeted to nonprofit organizations.

Private foundations also are a source of funding for nonprofit organizations, providing a grant option that may not be available to governmental entities. The planning unit investigated options for collaborating with the existing NRC and its funding organization, the Nisqually River Foundation, in a coalition that would enable the organizations to seek and share funding in an effective manner. Such a coalition would ensure the sustainability of these organizations and their work, while improving coordination of watershed management.

The Nisqually River Foundation provides staffing, funding and project-management support for the NRC. Originally, funding and staffing for the Council came from the Department of Ecology; when the department was unable to continue its support, the Council determined that a nonprofit corporation would provide the most flexibility in seeking new funding. The Foundation manages more than \$1 million worth of grants, including state, local, federal, and private grants, and private donations. Decisions on funding are made by a board of directors, based on the priorities in the NRC's water stewardship plan.

2. Decision-makers lack a coordinated set of strategies, mandates, information, and tools to make informed decisions around water, watershed health and land use.

Watershed planning was used as a vehicle to bring levels of government and stakeholders together to coordinate water use and management activities in the Nisqually watershed. Three key mechanisms were used to define and coordinate the roles of individual governance agencies in watershed management: a memorandum of agreement, watershed management plan, and implementation plan.

The initiating governments created a memorandum of agreement to enable broader participation in the planning process than is required under the Watershed Management Act. In addition to the Nisqually Tribe and state, county, and municipal governments, the planning unit also included representatives of the NRC, three water districts, a water purveyor, and hydroelectric utility. This broad representation supported the Unit's objective to 'develop a comprehensive strategy for balancing competing demands for water, while at the same time preserving and enhancing the future integrity of the watershed.' While the Nisqually watershed remains in relatively good condition, population growth has created concerns over the sustainability of water resources in the region. The unit therefore sought to collaboratively identify ways to manage water supply and demand through the planning process. Key informant interviews and planning unit workshops were used to

identify key watershed-wide issues and potential solutions. The WMP sets out recommended actions for the five priority issues in the form of policy statements, management strategies, and projects, as well as sub-basin action plans to address issues in areas facing immediate water shortages.

Following the adoption of the WMP by the county governments, a detailed implementation plan was developed by an expanded planning unit, which now included local agriculture and environmental representatives, and landowners in the watershed. A new memorandum of agreement established the roles and responsibilities of the expanded planning unit and its government entities in ongoing plan development and implementation.

The implementation plan provided a practical schedule for implementing the actions in the WMP, identifying the entity responsible for implementing specific actions, their funding source, and timeframe. The planning unit developed a set of criteria to prioritize projects for funding and implementation; the implementation schedule was based on the perceived importance of actions, statutory obligations, the resources available to complete particular tasks, and the sequence in which actions need to be implemented. While the state, tribe and participating counties are legally required to adopt the plan actions by rule or ordinance (according to the Watershed Management Act), municipalities and other organizations are not. The planning unit noted that strategies, actions, or obligations assigned to public agencies were contingent on securing funding, resources, and legislative authorizations. Voluntary commitments and agreements (e.g. cooperative agreements between public agencies) were therefore seen as the most effective way to coordinate implementation by members of the planning unit, as opposed to regulatory enforcement.

The planning unit sought to coordinate implementation of the WMP with other water management initiatives occurring within the watershed (e.g. the NRC, local shellfish protection projects). During the development of the implementation plan, the planning unit consulted with water management NGOs/initiatives in the watershed, and sought to identify and eliminate any duplicate or inconsistent policies. The planning unit committed to supporting the development and implementation of existing programs (e.g. NRC's watershed stewardship plan) through partnership and/or coordination with other entities.

The planning unit recommended additional coordination of efforts for groundwater management. The jurisdictional boundaries of the WMP are based on surface water divides, which do not always match groundwater divides. The WMP therefore required the implementing body to facilitate agreements with the planning units of adjacent watersheds to promote the consistency of policies and projects addressing groundwater that crosses watershed boundaries. Such agreements could cover water quality monitoring, groundwater recharge area policies, processing of water rights by groundwater divide, development of new groundwater supplies, and assessment of cumulative impacts.

Coordination of watershed and cross regional planning efforts was facilitated through the governance of the water management plan. The counties agreed to support the Nisqually Tribe to apply for a watershed-planning grant as the lead agency. The Tribe already played a significant role in water governance in the region; the leadership of the Nisqually Tribe therefore brought continuity and local legitimacy to the WMP process. Similarly, the inclusion of NRC representatives in the planning unit, and later other water stakeholders (including agriculture and hydropower), enabled coordination of parallel water management activities and provided for a broader range of implementation activities. Meaningful engagement of these authorities was promoted through consensus-based decision making in the WMP process. The inclusion of the NRC also promoted broader

public engagement and representation. The NRC includes a citizens advisory committee, an active body of citizens within the watershed who facilitate local input into NRC decision making. The planning unit sought opportunities to increase public outreach through exposure at NRC public events, updates to the NRC and its advisory committees, and working with the NRC to distribute informational materials to the public.

3. Activities on private land that impact water quality, water quantity, and ecosystem health are often not enforced or enforceable under current law.

The watershed management planning process did not create any new authority for the planning unit. Rather, member organizations took on authority or responsibility for additional tasks, and made changes to their existing policies and processes. Through the WMP process, the organizations worked together to identify how changes in the way in which each agency exercised its authority (e.g. permitting processes, policies) could address gaps in enforcement and coordinate regulatory approaches. For example, the planning unit identified the following changes in policy and processes as necessary for the improvement of watershed management:

- Department of Ecology: review and amend the Reclaimed Water Act to ensure consistency between water quality and water resource statutes. Members of the planning unit provided input to legislators on these changes.
- Department of Ecology: increase their enforcement of the exempt well statute and develop an action plan to achieve compliance with the intent of the statute.
- Counties: strengthen water system plans to provide a more direct link between land use planning and water supply availability.
- Municipalities and counties: approval of amendments to land use designations and urban growth area expansion to be dependent on proof of water availability.

The WMP process was therefore effective in improving the management of water and land uses by involving authorities from multiple levels of government in joint decisions on necessary changes and ‘obligations’ to fulfill the shared objectives of the plan. In particular the plan featured a focus on aligning agencies’ decision making processes over land and water use (e.g. permits, rights, designations) to balance competing demands.

The NRC is also a non-regulatory organization, focused on coordination, advocacy and education. Through public engagement, advisory activities, and incentives, the NRC have enabled private land owners and businesses to make changes that promote watershed health. For example, through the ‘Nisqually Sustainable’ project they assist and promote local businesses who implement sustainable practices, such as rain gardens. The NRC have developed a ‘resource review list’ to assist businesses in assessing their resource use and identifying opportunities for improvement. By participating in this program, businesses can access technical advice on sustainability, marketing, and NRC support.

4. Our collective impact on watershed health is not measured, which limits our ability to adapt and improve as a region over time.

The Watershed Management Act requires planning units to undertake a technical assessment phase prior to developing their watershed plan, and provides funding for watershed assessments. The purpose of this phase is to assess the physical state of the watershed under existing land and water use practices. The Nisqually planning unit first conducted a review of existing information, in order to identify gaps in the data and further assessments required. For example, the review found inconsistencies in information available on exempt well use, and the cumulative impacts of exempt wells on surface water

and instream flows. Consequently, the planning unit recommended a study on the cumulative impacts of exempt wells, in order to set basin standards for the number of exempt wells allowable.

The watershed assessment estimated surface and groundwater stocks and flows, water rights, actual water use, future water demand, and water available for future appropriation (taking into account minimum instream flows), as well as fish habitat, water quality and aquifer mapping. The recommendations and actions in the WMP were then developed based on the information gathered through this assessment. For example, the watershed based assessment of water supplies and current and future demand enabled counties and cities to consider water supply availability when making land use decisions. The planning unit developed an extensive information database to guide science-based decision making.

The planning unit undertook a number of additional studies to address information gaps for decision making (e.g. the instream flow needs of salmonids). They prepared a water quality monitoring plan to facilitate long term water quality monitoring, and a data management plan to provide a foundation for coordinated watershed data collection and decision making. Based on the baseline monitoring program, the planning unit was able to develop a numerical model to better understand groundwater-surface water interactions, and the potential for aquifer development as a drinking water source.

4.3 Key insights and implications for the CVRD from the Nisqually River

The Nisqually River watershed planning process suggests a number of points for consideration in establishing collaborative watershed governance arrangements. The following observations highlight key points of difference in the Nisqually river case study, as well as reflections from a feature article (8) and a report by the Nisqually Tribe (9):

1. Sustainable funding. This case study highlights that a significant amount of financial and staff resources were required up-front to complete the watershed assessment, planning, and initial implementation phases in a timely manner. However, both the NRC and planning unit highlight the limited and uncertain nature of senior government funding, and the need to establish a sustainable local funding basis to enable the implementation of long term strategies. Flexible funding is also required in order to maintain a 'living' plan that is adapted to reflect changes in circumstances and priorities over time.
2. Working together to address shared challenges. Elsewhere in Washington State (e.g. the Yakima Basin) collaborative efforts have been predicated on significant senior government funding of 'win-win' solutions for stakeholders. In contrast, the Nisqually planning unit recognized resource constraints and used the planning process to balance competing demands through investigation of supply options, prioritizing uses, restricting new uses based on availability, and improving water use efficiency. Outcomes were achieved through the wide representation of authorities and interests in the planning process, and a shared commitment to future water sustainability, exercised through voluntary commitments to changes in policies and practices. However, Pitre and Wilson (8) highlight the difficulties the planning unit faces in making political water decisions, and warn against putting them off by requesting more and more data. While evidence based decision making is important, significant time and budget can be spent on the collection of this data, reducing capacity for the development of strategies to address competing uses.
3. Indigenous leadership. The Nisqually planning unit is the only watershed in the state where a tribe served as the lead agency in the planning process. Robinson and Alesko

(9) note that most tribes opposed the Water Management Act because they believed that it would diminish the government-to-government relationship between tribes and senior government. However, the Nisqually Tribe, who already had a leadership role in water planning through the NRC, bought into the Watershed Management Act process. This was in part because they had already embraced the concept of the 'watershed community', and because the Act created the opportunity for the Tribe to lead the process. The new planning process therefore affirmed the Tribe's role in natural resource management, and brought additional resources into existing watershed management efforts. Robinson and Alesko (9) argue that this cooperative engagement with local government and stakeholders worked to achieve tribal natural resource protection goals.

4. Integration of land and water use. Recognition of water supply restrictions and the cumulative impacts of individual water intakes (e.g. exempt wells) led the planning unit to incorporate changes in land use policies and integrate land and water use decision making through their WMP. This approach enables improved demand side management and consideration of cumulative effects. Making changes in land use policies and decision making required actions by not only local government entities but also the state. The implementation plan identified a range of actions for the Department of Ecology and other state agencies, from localized practices (e.g. changes in the processing of water right applications in the watershed) through to amendments to an act. The development of these recommendations was based on the direct involvement of the state in the planning unit.

4.4 References

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5 Summary of case study insights

This section summarizes key insights and points of consideration from across the case studies. These points were drawn from common themes across the cases, as well as points of difference highlighted through comparison. Many of the points are also identified as factors that influence water governance outcomes in the academic literature. These insights are intended highlight some possible considerations for the workshop discussions and assessment of governance options.

- 1. Local governments, First Nations, and NGOs typically do not have adequate long-term funding (and often compete for it) to carry out water management and stewardship activities.**
- **Initial investment and sustainable funding.** A significant amount of financial and staff resources is likely to be required up-front to establish the organization, undertake public engagement activities, establish an evidence base, and develop plans and strategies. A long term, reliable funding source is important to maintain basic operations, leverage external funding, and enable the implementation of ongoing activities and programs.
 - **Grant funding.** Grants are available at both a provincial and federal government level, and enable investment in large projects. However the availability of grants varies between years, and many have set timeframes and objectives. Some grants may only be available to local government entities, while others are targeted at charities and non-governmental organizations. Many grants require a local matching contribution of 10-60%.
 - **Community based funding.** Given the limited and uncertain nature of government funding, many initiatives have found it necessary to establish a local funding base through taxation or membership funds. In British Columbia it is possible for local government entities to create a special service area with an earmarked requisition for water management. The Ministry of Community, Sport and Cultural Development should be able to provide advice on what financial arrangements are possible.
 - **First Nations funding.** Due to differences in taxation between reserve and non-reserve lands, it may be necessary to establish different contribution structures. Other bands (e.g. the Lower Similkameen) are currently investigating alternative funding structures that may be applicable in the CVRD. However it is also important to consider the specific characteristics and interests of each band when considering funding options.
 - **Flexible funding.** It is important to consider how the timing and objectives of funding arrangements influence capacity to maintain a 'living' plan that can be adapted to reflect changes in circumstances and priorities over time. The Okanagan experience highlights that roll-over funding is useful for creating such flexibility.
 - **Distribution of costs and expenditure.** Depending on the funding arrangements, costs may be distributed equally across individuals or organizations, or vary between areas based on population, land area, or land uses. Similarly, investments in water management may be attributed to whole-of-region benefits (i.e. directed to where they are most needed), distributed equally across areas, or vary based on area characteristics. It is important to consider the equity of the distribution of cost vs. expenditure vs. benefits, while also acknowledging that the need for investment is not

always aligned with the funding capacity of an area/population. It is also important to consider the relationship between funding and decision-making (e.g. vote share).

2. Decision-makers lack a coordinated set of strategies, mandates, information, and tools to make informed decisions around water, watershed health and land use.

- **Watershed based approaches.** Dividing a region into watersheds can be an effective way of gaining community buy-in and ownership of water management initiatives. However, misalignment between ground and surface water boundaries, and the spatial relationship between water takes and uses, may require different water management zones in order to effectively integrate land and water management. Designation of water management zones should consider hydrological, political, and economic (i.e. water use) boundaries.
- **Coordination across watersheds.** The CVRD contains multiple watersheds with varying populations, land uses, and water management issues. Neither the CVRD nor electoral boundaries align with watershed boundaries. This complicates the coordination of regional governance, including the collection and distribution of funds, community representation (especially for unincorporated areas), prioritization of projects, and development of region-wide initiatives. Furthermore, where community/political and watershed boundaries are not aligned, these divisions can also require communities or organizations to contribute to multiple watershed initiatives, imposing significant compliance costs. Cowichan entities may also wish to coordinate with neighbouring regions or organizations for effective watershed management.
- **Regional coordination and oversight.** Many initiatives include a regional oversight group that is responsible for liaising with senior government; facilitating cross-regional decision making; coordinating and resourcing watershed management initiatives; undertaking region-wide initiatives; and providing oversight of funding, expenditure and reporting. In many cases this group is linked to local government.
- **Relationship building.** The network governance literature highlights the importance of relationship building (within the region and with senior government agencies) for the effective coordination of and shared investment in water management. Such an approach takes time, and is based on the steady, incremental development of governance capacity from existing arrangements and relationships to a desired future state. Wholesale changes in governance arrangements may disrupt existing relationships (and capacity), and may be less stable in the long term.
- **Working together to address shared challenges.** Collaborative initiatives, based on the meaningful involvement of multiple interest groups is a widely advocated way of identifying common objectives, working through competing interests, and increasing governance capacity. Deliberative forums can help to identify trade-offs and opportunities to achieve shared goals. However, such processes do not remove differences in interests, goals, and stakes, and require careful facilitation to identify common objectives without silencing other interests.
- **Representation.** Consideration of meaningful and accountable representation in water governance may include four key elements: 1) Election versus appointment. Elected (government) officials are commonly included on water governance boards to ensure democratic accountability for board decisions. 2) Governance vs government representatives. In many cases a range of interest groups are involved in deliberations on management decisions, but only government officials vote on (investment) decisions. 3) Representation may involve inclusion of individuals to represent the range of

interests in an area, and/or it might involve individuals who act as two-way conduits to their respective communities. 4) Voting on decisions. Some groups advocate equal vote shares and consensus based decision making among representatives to support joint ownership of and responsibility for decisions. Others use population or area based vote shares and majority voting, in support of democratic representation.

- **Coordination with indigenous government.** Effective and equitable coordination will be sensitive to the effect of collaborative arrangements on the government-to-government relationship of indigenous groups, and unresolved land and water rights. While local initiatives provide opportunities and resources for indigenous leadership in water governance and the pursuit of indigenous objectives, they can also overlook self-governance and ownership concerns. Indigenous groups may also have varying capacity to contribute to collaborative initiatives because of these parallel processes.
- **Information management.** The development of shared databases of existing and new information about the region is important for evidence-based decision making, and the coordination of regional initiatives (e.g. prioritization of investments). Investing in data management helps to identify gaps in understanding, reduce the duplication of effort, and detect patterns across space and time. Other agencies have used online databases, report depositories, and GIS databases to coordinate the collection of information. However, it is also important to recognize that 'evidence' collection cannot overcome politics related to decision making.

3. Activities on private land that impact water quality, water quantity, and ecosystem health are often not enforced or enforceable under current law.

- **Regulatory authority.** Most watershed organizations in this review have minimal regulatory authority, and instead act as mechanisms to coordinate the efforts of participating government agencies who do have authority. The watershed organizations use memorandums of agreement with government agencies and other members to define member responsibilities, and the expectations for watershed decisions to be incorporated in agency policies and processes. Working effectively with existing authority requires a firm understanding of ownership and jurisdiction across the range of water management issues.
- **Voluntary approaches.** All three case studies rely on voluntary membership and participation in the watershed organization. In addition, many of the management strategies put in place are 'best practice' voluntary approaches. Organizations highlight that voluntary approaches promote a culture of cooperation, are effective at gaining local buy-in and ownership of improvement strategies, and encourage members to bring their own commitments and resources to initiatives.
- **Limits to regulatory approaches.** In contrast, enforcement based measures are often met with opposition by local actors, which reduces local buy-in to collaborative initiatives. Several organizations therefore recommend the separation of coordinating/collaborative and regulatory approaches across agencies. The US case studies also highlight that regulatory based approaches have limited effectiveness, as they tend to result in a focus on jurisdictional responsibility and compliance, rather than the adoption of best practice.
- **Incentive based approaches.** Regulatory and voluntary approaches may be supplemented with incentive mechanisms to encourage adoption of 'best practice' and buy-in to watershed planning. Incentives may include access to resources through participation in collaborative approaches (e.g. grant funding, expertise), reduced

compliance costs through coordination with other watershed agencies, access to loans or subsidies for green initiatives, and incentivized rating schemes. The private sector is noted to be particularly responsive to voluntary and incentive based initiatives, as this can create a business case for improvements in practice and contribute to positive branding.

- **Public education.** All case studies used public education campaigns and advisory services as part of their watershed strategy. Education is intended to promote the voluntary uptake of best management practices, support local stewardship initiatives, and raise awareness about key water issues. Such initiatives can help to create political pressure for various government entities and private sector organizations to adopt the watershed approach and recommendations.
- 4. Our collective impact on watershed health is not measured, which limits our ability to adapt and improve as a region over time.**
- **Knowledge of watershed hydrology and institutions.** It is widely accepted that assessment of cumulative effects requires a strong understanding of watershed hydrology, in order to identify how effects are transmitted through the watershed and between surface and ground water bodies. Tracing cumulative and diverse effects to the land and water management or governance processes responsible for generating them (e.g. policy siloes), enables identification of the root causes of 'broken hydrology' and the parties with the authority to address them. Reducing cumulative impacts therefore requires a strong understanding of the ownership of water and jurisdiction for water management at each point as it moves through the watershed.
 - **Tools for assessment of cumulative effects.** Watershed organizations have used a range of techniques to detect and manage cumulative effects, including: strategic monitoring to detect effects and trace their sources; collection and/or analysis of ecosystem health indicator data; collection of data on water allocations and other resource use; integrated data management to detect trends across space and over time; quantitative analysis of current and projected water use versus availability; calibrated watershed models to identify likely causes, as well as potential consequences of changes in resource uses; and GIS and systems analysis to analyze and communicate multi-scalar relationships.
 - **Integration of land and water management.** Increasing water security concerns (including available water quality and quantity, and ecosystem health) have resulted in increased attention the effects of current and projected land use change. Watershed organizations have consequently expanded their mandate to include future land use planning and growth policies. In water restricted areas watershed authorities have undertaken assessments of current and future water allocations and availability. Government agencies are using this information as an input into land use decision-making, including the approval of consents, and changes to growth policies or zoning.