Environmental Monitoring and Assessment (2006) **113:** 49–69
DOI: 10.1007/s10661-005-9096-2

COLLABORATIVE SCIENCE, POLICY DEVELOPMENT AND PROGRAM IMPLEMENTATION IN THE TRANSBOUNDARY GEORGIA BASIN/PUGET SOUND ECOSYSTEM

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Abstract. The transboundary Georgia Basin Puget Sound ecosystem is situated in the southwest corner of British Columbia and northwest comer of Washington State. While bountiful and beautiful, this international region is facing significant threats to its marine and freshwater resources, air quality, habitats and species. These environmental challenges are compounded by rapid population growth and attendant uiban sprawl. As ecosystem stresses amplified and partnerships formed around possible solutions, it became increasingly clear that the shared sustainability challenges in the Georgia Basin and Puget Sound required shared solutions. Federal, state and provincial institutional arrangements were made between jurisdictions, which formalized small scale interest in transboundary management of this ecosystem. Formal agreements, however, can only do so much to further management of an ecosystem that spans international boarders. A transboundary regional research meeting, the 2003 GB/PS Research Conference, opened the doors for large-scale informal cross-boarder cooperation and management. In addition to cooperation, continued efforts to stem toxic pollution, contain urban growth, and protect and restore ecosystems, require a commitment from scientists, educators and policy makers to better integrate research and science with decision-making.

Keywords: Georgia Basin, governance, population growth, puget sound, regional partnerships, science in support of decision-making, sustainability, transboundary institutions, urban sprawl

1. Introduction

The Georgia Basin-Puget Sound (GB/PS) transboundary region is an ecologically and culturally distinct marine ecosystem, arguably unrivaled in its beauty and bounty and the quality of life offered to its Canadian and American residents. The region is also one of the most diverse of North America; diverse in its ecology, its landscape, and its peoples. Protecting this ecosystem, its quality and livability is dependent upon recovering declining populations of fauna and flora, mitigating threats and stressors to resources, continual monitoring for ecosystem health, and managing natural resources for long term sustainability. Underlying this need for

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protection is rapid population growth, and past practices of unchecked urban sprawl with its negative effects on the health of the region's environment and prospects for sustainability.

Coinciding with the evolution of transboundary governance arrangements in the GB/PS was the recognition that sustainability would be more difficult to reach without scientists collaborating on all levels: between specialties, between species, and across borders, and translating the results of their collaborations into relevant information for use by government decision makers, policy makers, regulatory agencies, educators, communities and citizens. Much progress has been made in this regard, and many challenges remain.

This paper reviews the evolution of governance arrangements in the GB/PS region, discusses linkages between science and decision-making, considers the culmination of this convergence at the 2003 GB/PS Research Conference, and suggests that Environment Canada's (EC) Georgia Basin Action Plan, in partnership with other regionally-inspired programs and organizations, is well placed to support future trans-boundary collaboration.

2. Description of the Trans-Boundary Ecosystem

The Georgia Strait, Puget Sound and Strait of Juan de Fuca combine to form the marine, inland sea component of this ecosystem, which is characterized by a convoluted network of deep basins, long channels, narrow shallow tidal passages, and sheltered embayments connecting with the Pacific Ocean (British Columbia/Washington State Marine Science Panel, 1994). The terrestrial extent of the ecosystem is loosely defined by height of land, watersheds and local government jurisictional boundaries. The ecosystem is ringed by the crests of the Olympic Mountains, Vancouver Island Ranges, the Coast Ranges and the Cascades, that stretches from Olympia in the south to Campbell River and Powell River in the north (Puget Sound Action Team, 2000). Covering approximately 135,000 square kilometers, the area is one of the world's most active geological zones with shifting tectonic plates and active volcanoes. It is also a region characterized by strong prevailing winds and oceanic currents, extraordinary tidal currents (Dale *et al.*, 1997), and temperate weather patterns with significant precipitation during the winter months.

The shared GB/PS ecosystem is renowned for its high environmental values and prolific, yet sensitive, marine, estuarine and terrestrial habitats. Approximately 220 fish species live in the shared waters. There are 26 species of ducks, 10 species or sub-species of geese, three species of swans, four species of pinnipeds, and five species of cetaceans (British Columbia/Washington State Marine Science Panel, 1994). Cultural icons such as killer whales, also called orca (*Orcinus orca*), giant Pacific octopus (*Octopus dofleini*), great blue herons (*Aredea herodius*), bald eagles (*Haliaeetus leucocephalus*), and, of course, the anadromous Pacific salmon (*Oncorhynchus spp.*) are well embraced in history, in the arts and in residents'

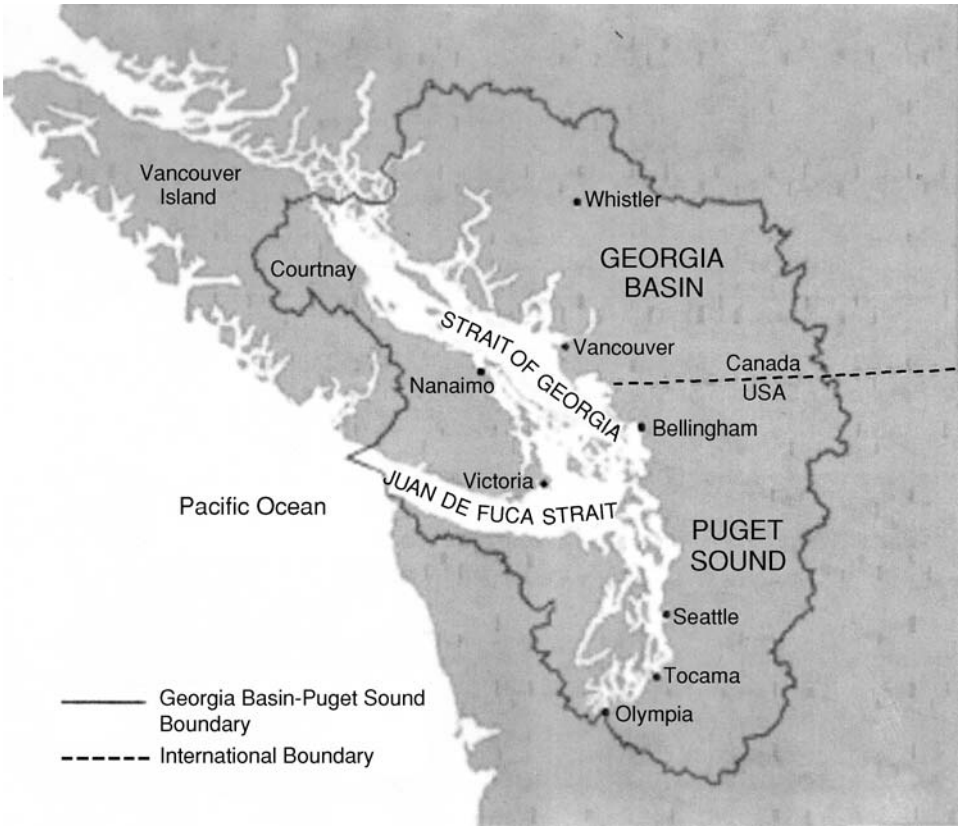

Figure 1.

consciousness, as are the mountain vistas and seascapes which ". . . lift the spirits of those who live here and attract visitors from afar." (Environment Canada-British Columbia Ministry of Environment, Lands and Parks, 1998a). Strategically located as a major gateway to the Asia and Pacific Rim economies, the GB/PS offers residents exceptional multicultural experiences and significant economic opportunities.

This region, commonly referred to as the *Salish Sea*, correspond for the most part with the ancestral home of the Coast Salish people, whose traditional knowledge continues to teach humans how to live in balance with ecosystems. The Coast Salish define themselves both as individuals and as communities with this region, and they are most affected by its continued degradation. According to Tom Sampson, an elder of the Tsartlip First Nation, "The Coast Salish people recognize the close relationship between land and sea. They have witnessed first hand the impacts of development on marine resources in the Strait of Georgia and Juan de Fuca. These impacts have altered traditional life,(Georgia Basin Ecosystem Initiative, 2003).

3. Environmental Concerns in the Region

Environmental concerns in this international ecosystem include the alteration and loss of natural habitats, numerous threatened species, increasing sewage discharges and contamination, high levels of persistent bioaccumulative toxins, localized implications of climate change, increasing concern over air pollution in the basin's airshed, oil spills and pollution from stormwater runoff, and other types of 'non-point' source pollution associated with various types of land-use practices (Washington Department of Natural Resources, 2000; Puget Sound Action team, 2002a; British Columbia Ministry of Water, Land and Air Protection, 2002; Northwest Environmental Watch, 2002 and 2004). Together, these concerns may very well challenge the long term viability and sustainability of the PS/GB ecosystem and the communities it supports. A compelling example is offered through the analysis of the status of salmon populations and ecosystem-level causes for their dramatic decline (Stouder *et al.*, 1997).

Some of the indices of habitat degradation and loss in the basin are staggering in their breadth: in the Fraser River delta, less than 1% of the original wet meadow areas remain from historic times (Environment Canada-British Columbia Ministry of Environment, Lands and Parks, 1992); only two of Vancouver's fifty original salmon bearing streams have survived (Environment Canada, Pacific and Yukon Region, 1998); most urban bays in the Puget Sound have lost over 98 percent of their original marsh habitat, and since 1850 more than 80 percent of tidal flats and intertidal areas in the Sound's major river deltas have been destroyed (Dunson, 2000); less than 5% of British Columbia's original Garry Oak (*Quercus garryana*) ecosystem remains (Georgia Basin Ecosystem Initiative, 2003); and, a 'dead zone' has been declared in southern Hood Canal (Puget Sound, WA), where low oxygen levels have caused extensive fish and invertebrate mortality (Dunagan, 2004).

There are substantial numbers of species at risk across all major taxa groups in the ecosystem (Transboundary Georgia Basin-Puget Sound Environmental Indicators Working Group, 2001). At least 60 species are listed as threatened, endangered, or of concern by one or more jurisdiction in the marine ecosystem alone (Gaydos and Gilardi, 2003). Declines in once abundant species span many taxa. Northern abalone (*Haliotis kamtschatkana*), a culturally and ecologically important marine invertebrate was completely closed for harvest in BC and WA in 1990 and 1994 respectively, yet despite closure species density at many index sites in Washington State continues to decline (Rothaus and Friedman, 2003; Sloan, 2004). Prior to the 1980's rockfish (*Sebastes* spp.) in the region were thought to be so plentiful that daily catch limits were commonly set at 15–20 (Mills and Rawson, 2004). However, as stock levels plummet a one fish' bag limit has been imposed. Equally worrisome is the proliferation and impact of invasive species such as the exotic cordgrass, *Spartina anglica*, and Japanese Seaweed, *Sargassum muticum*. Collectively, the bulk of evidence suggests that significant ecosystem changes are underway; changes

which scientists are only beginning to understand (Puget Sound Action Team, 2002a).

With respect to air quality, the Lower Fraser Valley is one of three regions in Canada that regularly exceeds national air quality guidelines for smog. The chief culprits are road vehicles and, increasingly, marine vessels. According to a recent study, in 2000 ships pumped three times as much sulphur oxides into the region's air than in 1993, 3.7 times more nitrogen compounds, 3.8 times more soot particles, double the amount of carbon dioxide, and nearly double the amount of volatile organic compounds (Boei, 2002). Also on the raise is the real and potential threat posed by marine oil discharges. From 1993 to 2001, the Washington State Department of Ecology recorded 191 spills totaling approximately 277 thousand liters of oil into Puget Sound waters (Puget Sound Action Team, 2002a). In October 2004, over 3,785 liters of oil were spilled south of Seattle disturbing approximately 10 kilometers of coastline and sensitive nearshore habitat (Department of Homeland Security, 2004).

4. Population Growth and Urban Sprawl

As early as 1974, resource managers recognized the interdependencies in the region and the similarities of the issues, "The Strait of Georgia, Puget Sound, and the Juan de Fuca Strait function as a single system – a characteristic that must be recognized if planning and management programs are to be effective" (Barker, 1974). This theme was picked up again almost twenty years later. "The signs of stress are evident – air and water pollution, traffic congestion, the elimination of farmland, wetland, and wildlife habitat, increasing rates of crime, poverty, and homelessness. All in one way or another, are a result of the region's rapid population growth, pattern of settlement, and our high level of material and resource consumption" (British Columbia Round Table on the Environment and the Economy, 1993). In 2000 nearly 7 million people were living in the GB/PS area with just under 4 million (57%) of these people living in the United States (U.S.) and an estimated 3 million (43%) living in Canada. By 2020 the region's population is projected to exceed five million people (31% growth) in Puget Sound and four million people (39% growth) in the Georgia Basin. This growth would bring the region's population to more than 9 million, over a third higher than 2000 and more than 1 1/2 times that of 1991 (Transboundary Georgia Basin/Puget Sound Environmental Indicators Working Group, 2001). The challenges of urban sprawl in the shared GB/PS region provide stakeholders with a mutual focal point for collective action.

Population growth in itself is not necessarily harmful on ecological health (Hulse *et al.*, 2002; Baker *et al.*, 2004' McHarg, 1969). What are harmful are poorly planned communities and the resulting patterns of settlement, such as urban sprawl. Urban sprawl consumes otherwise productive community and rural resource lands – lands that can be used for open space, for sustainable food and natural materials

production, and for maintaining important ecosystem functions which are required to ensure the health of current and future generations. These impacts of urban sprawl are long lasting if not permanent. Lands and watersheds covered with pavement or bisected with roads may permanently hinder or preclude other ecological or social uses (British Columbia Ministry of Water, Land and Air Protection, 2002; Northwest Environmental Watch, 2002). Such impacted lands are also likely to assume long-term infrastructure maintenance costs and obligations, many of which are not always anticipated – areas prone to land-slides or flooding or otherwise vulnerable to storm damage provide common examples. It is becoming more widely recognized that the social, economic, and ecosystem costs of sprawl-type urbanization can be very high, making land-use planning a critical step toward ensuring sustainable ecosystems and communities (Washington Department of Natural Resources, 2000; Northwest Environment Watch, 2002, 2004).

Better growth practices offers the region the possibilities of lighter, greener, cheaper, and smarter alternatives to managing community growth and public infrastructure investment while protecting both local and basin-wide ecosystems (Puget Sound Action Team, 2004b). While some local jurisdictions and communities are able to resist sprawl by having a long established vision of their community and sense of place – with strong bonds toward stewardship, other communities need greater access to information, assessment, and planning approaches to help gain some sense of control in guiding otherwise rapid and sprawling urbanization. The integration of science, traditional local knowledge, and community engagement processes into local watershed management, land-use planning and growth management efforts will be essential to the long-term sustainability of the GB/PS ecosystem (Puget Sound Action Team, 2004b). While federal, state/provincial, local and First Nation/Tribal orders of government operate under different governance systems in Canada and the U.S., there are remarkable similarities in how Washington State (WA) and BC have approached the management of growth and development. In both areas, local governments are established by and operate in accordance with state or provincial legislation. In response to concerns about the impacts of urban development, both BC and WA enacted legislation that called for local governments to address environmental protection, with WA calling for the use of best available science to achieve this. In 1990, WA enacted its *Growth Management Act* [1] and in 1996, BC enacted Regional Growth Strategies legislation with similar goals. WA's legislation provided for the designation of critical areas, and BC enabled local governments to designate development permit areas for similar purposes. In 1995, WA amended the *Growth Management Act* to require the use of best available science to be included in designating critical areas functions and values and protecting these through growth management policies and regulations. In 1997, British Columbia amended its development permit area legislation to specify that local governments could use their development permit powers for the 'preservation, protection, restoration and enhancement of the natural environment, its ecosystems and biological diversity' but did not take the step of requiring the use of best available science.

5. Institutional Responses

In the U.S., the National Estuary Program authorizes the U.S. EPA (under section 320 of the Clean Water Act) to designate Estuaries of National Significance. The National Estuary Program's approach is to convene a broad and representative management conference among managing agencies, stakeholders, and interested citizen groups; characterize the condition of the estuary; define the priority problems and causes; and develop a comprehensive conservation and management plan (CCMP).[2]

The first CCMP for Puget Sound was developed and approved by both the state of Washington and EPA in 1987. Since that time, technical studies, plan implementation, and monitoring oversight have been coordinated through the staff of the Puget Sound Action Team (PSAT) – an implementation partnership of state, federal, tribal and local interests. The PSAT partnership is responsible for putting into action the Puget Sound Water Quality Management Plan (PSWQMP) – a long term strategy to protect and restore Puget Sound and its diversity of life. While more protective upland watershed management is identified and briefly described within the overall PSWQMP, the current priorities are generally focused on local jurisdictions and watersheds within proximity to the nearshore areas of Puget Sound. Every two years, PSAT staff assists the partnership in developing a plan and budget to guide the state agencies' work for the respective upcoming two year budget. Federal, local, and tribal budgets are not requested through this collaborative state budget process, but are requested to match state funds or to implement more specific projects.

Similar to the threats facing the GB/PS ecosystem described above, the Fraser River Basin, which accounts for approximately 80% of the freshwater reaching the Georgia Strait has, and continues to face, significant environmental challenges. As a result, in 1990 the Fraser River Basin was identified as a significant Canadian freshwater system requiring priority attention. In 1991 the Canadian federal government established a joint Environment Canada/Fisheries and Oceans Canada sustainability program called the Fraser River Action Plan (FRAP) with three key objectives: work with partners and stakeholders to manage the Fraser Basin in a sustainable manner; improve fish and wildlife productivity in the Fraser Basin; and clean up pollution (FRAP, 1995). The Fraser River Action Plan's legacy included the achievement of environmental results such as the reduction by 95 percent of toxic releases from heavy duty wood preservation operations (Environment Canada, 1998b), and the protection of more than 12,400 hectares of vulnerable wetland areas (Environment Canada, 1998c). From a governance perspective, FRAP successfully advanced a cooperative, multi-organizational approach to restoring the environmental health of the watershed (Environment Canada, 1998a) through the establishment of the Fraser Basin Management Program in 1992, and subsequently, the Fraser Basin Council in 1997, an autonomous, not-for-profit organization designed to facilitate the application and coordination of existing authorities toward the achievement of sustainability.

In the spring of 1991, legislation was introduced in BC proposing a basin-wide, bioregional approach to growth management in the Georgia Basin. Although this legislation did not pass, in August 1992 the Premier requested the BC Round Table on the Environment and the Economy to ". . . engage in a consultative process to provide advice to the Provincial Government on how to manage the Georgia Basin as a whole, including ways of working with other levels of government – Canadian and American – to protect the quality of life in the Basin." (British Columbia Roundtable on the Environment and the Economy, 1993a). Following the Round Table's consultations the province launched the Georgia Basin Initiative in 1994 and regional growth strategy legislation (mentioned above) in 1996. Unfortunately, with the provincial election of 1996 programs were re-prioritized and the Georgia Basin Initiative was discontinued. However, the regional growth strategies legislation endured and remains a critical piece in the collective transboundary effort. In essence, the Georgia Basin Initiative also endured, as its key elements were incorporated into the EC-led Georgia Basin Ecosystem Initiative.

In 1998, the federal government and BC's provincial government jointly launched the Georgia Basin Ecosystem Initiative (GBEI). From 1998–2003, the GBEI was an adaptive, results and science-based program aimed at enhancing coordination and collaboration amongst government and non-government stakeholders while achieving measurable improvements in the conditions affecting environmental health and human well-being, and the capacity of First Nations, communities, businesses and organizations, and all orders of government to deal with the challenges inherent in achieving sustainability.

The GBEI vision, *Managing Growth to Achieve Healthy, Productive and Sustainable Ecosystems and Communities*, represented the priority partners placed on programs aimed at supporting community efforts in meeting their sustainability objectives, and providing local governments with information and support that would enable them to better incorporate important environmental values into regional district growth strategies and waste management plans, local government community plans, and day-to-day decision-making.

During the five-year implementation of the GBEI, significant progress was made in the development and delivery of collaborative programs in support of clean air, clean water, the protection of habitats and species, and the building of sustainable communities in the Georgia Basin ecosystem. More than 100 major projects were sponsored by the GBEI partnership including decision-support tools for sustainable planning such as the Smart Growth Toolkit[3], the Georgia Basin QUEST[4] and the Stewardship Center.[5] In addition to these and many other collaborative projects, the GBEI partnership established the Coast Salish Sea Initiative which has helped to advance the inclusion of traditional knowledge and First Nation participation into GBEI planning and program delivery activities. The GBEI also set the stage for future transboundary work in the shared GB/PS and a broader ecosystem-wide perspective on the issues facing both sides of the border.

6. Transboundary Collaboration

Federal, state and provincial scientists and managers have been working independently for decades to monitor and manage ecologically important values in the GB/PS region. Independent efforts on each side of the international boarder have achieved much, but also have failed to avert contention when resources actually were or were perceived to be limited, such as the case with the United States-Canadian Pacific 'salmon wars' (Twitchell, 1989). To work, solutions for combating the stressors faced by the GB/PS ecosystem must be based on good science, need popular support, and require cooperation of nations on both sides of the shared boarder. Further, these solutions will need to be integrated with broader sustainability challenges including achieving economically viable and socially healthy communities, managing for future energy requirements, and transportation planning.

Recognition of the need for scientists to increase collaboration across jurisdictions has grown and transboundary efforts are not only emerging at government levels, but also among non-governmental agencies and among Tribes and First Nations in the U.S. and Canada (Hildebrand *et al.*, 2002). Environmental health and ecosystem well-being – once the domains of research scientists and regulators – now receive community-wide attention in the GB/PS region. These partnerships are transforming the region's future by improving air and water quality, cleaning up contaminated sites and restoring biologically diverse and productive natural systems. Although much has been done to stem toxic pollution, contain urban growth, and protect and restore ecosystems in this region, many threats to environmental health and ecosystem function issues remain, and others are emerging.[6] More needs to be done to minimize the ongoing degradation and loss and to protect, recover, and restore the natural qualities of this international ecosystem. Many observers, stakeholders and advocates for regional sustainability, while frustrated with the slow progress and limited measurable results, remain optimistic that change will occur and the shared environment will improve with persistent effort.[7]

Since the early 1990's, GB/PS residents and political leaders began in earnest to take note of the fact that they shared an ecosystem with their neighbours, and they shared similar sustainable development and urban growth challenges. They also recognized that they would have to begin working more collaboratively on solutions. The result has been the establishment of partnership arrangements such as the BC/WA Environmental Cooperation Council (ECC), and the Canada-United States Joint Statement of Cooperation on the Georgia Basin-Puget Sound Ecosystem (SOC), amongst many others at the government, community and academic levels. As these continue to evolve and mature, recently announced programs such as the Washington State Governor Gary Locke's Puget Sound Agenda[8], a feasibility study for a National Marine Conservation Area in the Southern Gulf Islands[9] and a Border Air Quality Strategy[10] are surfacing and contributing to the collective transboundary effort.

In May 1992, BC and WA signed an *Environmental Cooperation Agreement Between the Province of British Columbia and the State of Washington* which acknowledged that ". . . environmental concerns and impacts respect neither physical nor political boundaries . . ." and that the province and state will ". . . promote and coordinate mutual efforts to ensure the protection, preservation and enhancement of our shared environment for the benefit of current and future generations".[11] The agreement established the BC/WA Environmental Cooperation Council (ECC)[12] with responsibility to address priority GB/PS transboundary issues including air quality, protection of the Abbotsford-Sumas Aquifer, Nooksack River flooding, and the health of the shared GB/PS marine environment. In 1993, the ECC called for the formation of both an International Task Force representing government agencies and the BC/WA Marine Science Panel to make recommendations for the management of the shared marine waters. Twelve recommendations were provided by the Marine Science Panel to the GB/PS International Task Force, which was subsequently directed by the ECC to develop actions to begin implementing the identified recommendations. While many of these recommendations directly addressed the marine and nearshore ecosystem, other recommendations recognized that upland pollution sources and watershed modifications also would continue to have substantial affects on the integrity of the downstream estuarine and marine ecosystems. Currently, the Task Force has active work groups on the issues of protecting marine life, habitat loss, marine protected areas, monitoring, toxics, non-indigenous species, and transboundary ecosystem indicators.[13]

In January 2000, Canada's Minister of the Environment and the U.S. EPA Administrator signed the *Canada-U.S. Joint Statement of Cooperation on the Georgia Basin Puget Sound Ecosystem*.[14] This SOC outlines common goals and objectives and serves as a framework for future sustainability initiatives in the GB/PS ecosystem. It represents an important step in the evolution of ecosystem-based partnerships in the region, and it promotes closer Canada-US collaboration in addressing the transboundary and global environmental challenges confronting the future of the ecosystem. Specifically, the SOC serves to: publicly confirm the commitment of the two federal governments; recognize the special interest of Coast Salish First Nations and Tribes; acknowledge and support the excellent efforts related to ecosystem management in the region; and establish a formal Canada-U.S. mechanism at the regional level to support action towards sustainability. It also commits EC and EPA to develop annual action plans and report to the public on progress. Priority collaborative areas under the SOC and Action Plans include: transboundary air quality; the engagement of First Nations and Tribes; and, sharing information and building consensus on better growth practices.

Taken together, these types of approaches, agreements and institutional arrangements are the foundation for cross-boundary environmental cooperation in the GB/PS region. Their success to date is due to their collaborative character, and their proclivity for addressing the common threats posed by population growth and urban sprawl, and the degradation of local watersheds. At the same time, a growing

number of researchers on both sides of the border are increasing awareness about the region's environmental and natural systems, and are sharing this knowledge with policy advisors, administrators, decision makers, and educators who, in turn, utilize this information to increase awareness and build capacity at all levels of the GB/PS community. This convening and sharing of information has been channeled through the formal arrangements discussed above, as well as through a series of conferences and workshops where the reporting on environmental and ecosystem research has occurred, and where the design and implementation options of new approaches to resolving sustainability issues have been proposed and examined. A sampling of these conferences and workshops include a series of five Puget Sound Research Conferences supported by PSAT,[15] the 1991 *State of the Strait Conference* hosted by the Georgia Strait Alliance (Save the Georgia Strait Alliance, 1991), the *BC/WA Symposium on the Marine Environment* in 1994 (Wilson *et al*., 1994), the *Nature Has No Borders* Conference convened by the U.S. National Parks and Conservation Program in 1994 (U.S. National Parks and Conservation Program, 1994), the 1996 *Our Living Estuary Conference* (People for Puget Sound, 1996) and the Fraser Basin Council's *State of the Basin Conferences* in 2000, 2003, and 2004.[16] In addition to these and many more gatherings of similarly interested researchers and decision makers, EC and EPA hosted a *Smart Growth Practitioners Forum* in 2001 to bring together a network of local land use planning and management practitioners from a breadth of disciplines to develop more common thinking on how to advance the design and use of smart growth concepts. A summary of the principles and related suggestions for enhancing activity and support on these issues was developed.[17]

7. The 2003 Georgia Basin/Puget Sound Research Conference

The culmination of transboundary partnership-building and science/decision-making interactions occurred during the 2003 GB/PS Research Conference in Vancouver, British Columbia on March 31-April 3, 2003. Co-hosted by EC PYR and PSAT, the 2003 Conference was the sixth in PSAT's series of conferences and was the largest and most visible effort to communicate research results among the region's scientists and natural resource managers. It provided a venue for the expression of ecosystem-based management approaches and an opportunity for cross-border scientists and decision makers from a wide range of disciplines to share knowledge and information on important issues such as climate change impacts and adaptation, marine resources, transboundary air quality, decision-support tools and procedures, growth management, indicator development and collaborative management approaches. It also provided a venue for scientists, urban planners, policy makers and educators to discuss opportunities for translating science into useful policy and educational tools.

The Conference program included over fifty technical sessions, as well as panel discussions, workshops, poster presentations and keynote speakers. Attendees in-

cluded an international and multidisciplinary group of over 800 university and government scientists, Coast Salish First Nations and Tribal representatives, regional politicians, students and community leaders. Approximately one-half of the attendees traveled across the border from the Puget Sound region to participate at a time when official Canadian/U.S. information sharing was at a low-point due to the Government of Canada's decision not to send personnel in support U.S. military efforts in Iraq.[18] In addition, the Conference supported an unprecedented number of Coast Salish speakers and attendees who provided valuable insights about the principles and practices needed to secure the region's future. An Advisory Group representing twentythree agencies from Canada and the U.S. and representatives of the Coast Salish First Nations and Tribes, and thirty-five Canadian and United States co-sponsors from the public and private sectors, universities and non-governmental organizations, supported the event.

Conference themes included *Sharing science and solutions on ecosystem health issues facing the transboundary GB/PS region, and Applying science in support of decision making, capacity-building, and effective dialogue across disciplines and community interests*. The goals of the conference were to: provide a venue for the latest, leading-edge marine research and scientific exchange; recognize and support integrated, ecosystem-based research and decision-making; enhance dialogue among scientists, decision-makers and the public; support First Nation and Tribal partnerships; report on and announce key programs such as the Puget Sound Ambient Monitoring Program, GBEI, and *Oceans Act* implementation; facilitate linkages among universities in the GB/PS region; learn from experiences in other transboundary regions; and, celebrate success and guide future directions. The BC/WA ECC met during the conference and discussed key transboundary issues such as climate change and transboundary airshed management, and the 2003 SOC Action Plan and Progress Report was signed by senior EC/EPA regional officials.

Conference participants agreed that the GB/PS region is not in the best of health and its ability to accept and recover from ongoing and increasing human impacts is finite. Although more and more is known about the region's natural resources and the natural processes governing these, there is undoubtedly more to be learned. The transboundary region has undergone change and will continue to experience change. The challenge is to understand the change and its impact on the overall health of the ecosystem and to develop measures to adapt to or manage the change. With the advent of new technologies and with greater appreciation of traditional ecological knowledge, the interconnectedness and complexity of the GB/PS regional ecosystem and sub-systems within it become ever more apparent as does the rudimentary nature of knowledge. Fortunately, unlike many other regions in the world the people of this region – as individuals and through their institutions – have the knowledge, tools and the capacity to secure long-term environmental health and ecosystem sustainability in association with population growth and improved social and economic well-being.

One of the important conclusions reached at the Conference was that land use patterns and environmental damage have reduced the productive capacity of the region's ecosystems and their resilience to further intrusive, invasive and degrading impacts. With more people, more land will be converted from resource production to urban development, there will be more intensive approaches to food production on land and in the water, more fresh water will be consumed, and more waste will be generated. As these trends continue, confidence about the quality of the region's future is shadowed by a sense of urgency – a narrowing window of opportunity to protect, restore and manage the ecosystem and community relationships that are essential to securing a sustainable future for this region. Emerging from this shadow will require more research about the relationship between human activities and natural systems plus the effective on-the-ground use of this information for planning and management decisions to restore and maintain a healthy, abundant, living legacy. This means taking action to make this region all that it can be by building on existing knowledge, tools and governance capacity, working to improve on success in addressing known concerns, and defining and dealing with emerging issues.

The 2003 GB/PS Research Conference proposed the following directions: continued basic scientific research, more integrated and applied scientific research, and the use of traditional and local knowledge to improve understanding about the complex environmental, cultural, social, and economic dynamics in the region; public education about these dynamics and the role individuals can take to protect and restore healthy environmental and ecological conditions; and, continued development and increasing application of decision support tools to help governments, the private sector, and individuals take the actions necessary to secure a sustainable region (Gaydos and Karlsen, 2003).

The Conference provided a forum to engage residents (through their governments, their places of work, their for-profit and not-for profit organizations, and as individuals) in a dialogue about the importance of environmental, ecosystem and species health to the region's social and economic well-being. It helped to increase regional awareness and identity, and substantiated a broad acceptance of the need for cross-jurisdictional and cross-disciplinary responses and solutions to shared concerns. The GB/PS region is a place where common concerns and responses must transcend jurisdictional boundaries and cross disciplines to secure regional sustainability – collaboration is continually improving, but there is still along way to go.

During the 2003 GB/PS Research Conference the GBEI was renewed as the Georgia Basin Action Plan (GBAP), a second five-year phase of collaborative program development and implementation in the Georgia Basin led by EC and supported by a broad partnership including two additional Canadian federal departments (Fisheries and Oceans Canada and Parks Canada), and two B.C. provincial ministries (Ministry of Water, Land and Air Protection, Ministry of Sustainable Resource Management).[19]

8. Thinking Ahead

The evolution from the GBEI to the GBAP represents another step forward in broad, ecosystem-based thinking and program delivery, and a more adaptive and integrated approach to science and to the linkages between science and the critical issues facing the transboundary region. For the years 2003–2008, the GBAP partners have agreed to four cross-cutting goals: promote shared and informed stewardship; influence and support sustainable land and aquatic use practices; enhance scientific knowledge to support decision-making; and, take action on targeted ecosystems at risk (GBAP, 2003). Partners will utilize the following strategies in support of these goals: integrate environmental, social and economic considerations; generate new knowledge and develop relevant tools for key decision makers and influencers; target knowledge transfer to support and influence decisions; optimize outreach and stewardship actions; optimize government programs and collaboration to take action; strengthen partnerships and strategic alliances; and, promote best practices (GBAP, 2003).

It is clear that the goals and strategies of the GBAP are consistent with the themes, results and challenges arising from the 2003 Research Conference, as they are with the efforts of existing programs and institutions working to protect the shared environment in aid of regional sustainability. GBAP is well-placed to support future transboundary collaboration in the shared GB/PS ecosystem, and as the initiative matures and attention focuses on the Initiative's renewal in 2008, vigorous efforts and investments ought to be placed on enhanced partnership diversity (focusing in particular on First Nation and Tribal partners, the business community, universities, and local governments), innovative forms of governance (including transboundary arrangements), mechanisms for identifying and sharing risks of new practices (such as better growth practices and the integration of science and expertise into regional and local watershed-planning approaches), collaborative knowledge management activities (including data sharing and web accessibility), and transboundary indicators (which are critical for understanding and reporting environmental threats, and developing, evaluating and tracking development or planning choices and alternative scenarios).

9. Conclusions

The GB/PS is a place where common concerns and responses can transcend jurisdictional boundaries and cross disciplines. Institutional arrangements such as the BC-WA Enviornmental Cooperation Council and the Canada – US Statement of Cooperation for the Georgia Basin Puget Sound Ecosystem formalized small scale interest in transboundary management of the Georgia Basin/Puget Sound Ecosystem. Formal agreements, however, can only do so much to further management of an ecosystem that spans international boarders. The 2003 GB/PS Research Conference

built upon federal, state and provincial formal agreements and opened the doors for large-scale transboundary cooperation and management. The organized gathering of nearly 1,000 academic scientists, policy makers, natural resource managers, Coast Salish and private citizens served to facilitate uncountable transboundary efforts that now underway. These informal collaborations are as essential as the formal ones for better understanding and managing the complex environmental, cultural, social, and economic dynamics of the region and ultimately ensuring its sustainable future.

Acknowledgements

We thank P. Dowdy, B. Kay, J. Newton, S. Redman and the advisory committee and sponsors of the 2003 Georgia Basin/Puget Sound Conference who helped to create such a successful event. Also we thank the scientists, activists, planners, and policy makers who are working to secure a sustainable future for the Georgia Basin/Puget Sound Region. This manuscript was produced with in-kind support from Environment Canada, Pacific and Yukon Region; the SeaDoc Society, a marine ecosystem health program of the UC Davis Wildlife Health Center; and the U.S. E.P.A. Region 10, Office of Ecosystems, Tribal, and Public Affairs.

Notes

1. For access to legislation noted in this paragraph go to http://access.wa.gov/for WA references and http://www.gov.bc.ca/bvprd/bc/home.do for BC references. For interpretative materials on local government legislation, follow the links to the department of Community, Economic Development and Trade through the WA homepage and the Ministry of Community, Aboriginal and Women's Services through the BC homepage.
2. The National Estuary Program's website can be found at http://www.epa.gov/nep/.
3. Visit the Smart Growth B.C. website at http://www.smartgrowth.bc.ca/index.cfm for a review of the Smart Growth Toolkit
4. Visit http://www.basinfutures.net/index.cfm to review QUEST.
5. The Stewardship Center website is located at http://www.stewardshipcentre.bc.ca/sc bc/main/index.asp?sProv=bc. Other notable projects included: an Integrated Data Management Initiative in the Cowichan Valley; the Galiano Island Wildlife Habitat Conservation Project; the Pacific 2001 Air Quality Study and subsequent scientific characterization of the Georgia Basin-Puget Sound Airshed; the Sensitive Habitat Inventory and Mapping Project; a Biodiversity Conservation Strategy for the Greater Vancouver Regional District; increased understanding of the sources, distribution and impacts of toxic substances; a Stormwater Management Planning Guidebook; and, the development and implementation of Best Management Practices to reduce impacts from agricultural and stormwater runoff (Georgia Basin Ecosystem Initiative, 2003).
6. Most notable are fine particulate emissions from marine vessels and increases in endocrine disrupting toxic chemicals.
7. Former Mayor of Vancouver and Premier of BC, Mike Harcourt continues to advocate for sustainability in the shared GB/PS region, "The shared waters of the Pacific, known as the Salish Sea, between British Columbia and Washington need our help. Designating the waters between

us special and sensitive seas worthy of the highest levels of protection requires immediate attention." (Nichols, 2002). According to Tom Campbell, former Chair of the Island County Marine Resource Committee in northern Puget Sound, "Nobody wants to see Puget Sound die. Although there has been an incredible collapsing of ecosystems around the world in the last 50 years, there is still time to save Puget Sound." (Northwest Straits Marine Conservation Initiative, 2002).

8. To view WA Governor Gary Locke's agenda for Puget Sound visit http://www.governor.wa.gov/speeches/speech-view.asp?SpeechSeq=397
9. To review progress on a National Marine Conservation Area in the Southern Gulf Islands visit http://www.pc.gc.ca/progs/amnc-nmca/plan/pac6__11_e.asp
10. To review the Canada-U.S. Air Quality Strategy announced on June 23,203 visit http://www.ec.gc.ca/canada_us/air/index_e.htm
11. To view a copy of the BC/WA Environmental Cooperation Agreement visit http://wlapwww.gov.bc.ca/cppl/ecc/documents/bcwaccord.pdf.
12. The BC/WA ECC's website can be found at http://wlapwww.gov.bc.ca/cppl/ecc/. To facilitate and further work under the ECC, federal counterparts from the United States Environmental Protection Agency (Region 10) and Environment Canada (Pacific and Yukon Region) were invited to join in Council meetings and to engage in designing and carrying out projects under the auspices of the Council.
13. For information on the Georgia Basin/Puget Sound International Task Force visit their website at http://www.psat.wa.gov/shared/backgrnd.html.
14. Readers interested in a copy of the Statement of Cooperation are encouraged to contact the Corresponding Author.
15. Conference proceedings are available on the Puget Sound Action Team's website at http://www.psat.wa.gov/.
16. To review these and other Fraser Basin Council sponsored events visit their website at http://www.fraserbasin.bc.ca/programs/conferences.html.
17. No proceedings were published for the *2001 Smart Growth Practitioner's Forum*. Readers interested in additional information on this event are encouraged to contact the Corresponding Author.
18. *Personal discussion with conference participant*.
19. Information on the GBAP can be found at the initiative's website at http://www.pyr.ec.gc.ca/georgiabasin.

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