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## 2003 GEORGIA BASIN/PUGET SOUND RESEARCH CONFERENCE

# Securing a sustainable future for the Georgia Basin / Puget Sound Region

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### Preface

This is a summary report—written by a veterinary scientist and a community planner. It conveys their perspectives on the content and meaning of the presentations made during the highly comprehensive 2003 Georgia Basin/Puget Sound Research Conference about the state of natural systems in the Georgia Basin/Puget Sound region and how these are being protected and managed. It addresses these human/natural systems relationships, comments on challenges and suggests directions needed to address these challenges. The title of the paper is intended as a call for action—action that builds on work done to date and that needs to be done in the coming years.

## Introduction

The 2003 Georgia Basin/Puget Sound Research Conference took place in Vancouver, B.C. on March 31 through April 3, 2003 to address challenges and directions associated with:

- ◆ Sharing science and solutions around ecosystem health issues facing the transboundary Georgia Basin/Puget Sound region.
- ◆ Applying science in support of decision-making, capacity-building, and effective dialogue across disciplines and community interests.

This was the sixth in a series of research conferences since 1988. For the first time it involved the convergence of a parallel series of sustainable growth management conferences and workshops that have been held since 1993. In addition, the development and use of decision-support tools, a topic that had emerged in both series, was a major theme of this year's conference.

The conference's 300 presentations informed the more than 800 participants from a wide range of disciplines, organizations and jurisdictions about the region's environmental and ecosystem health, and the state of scientific research, planning and management practices in the region.

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.

The conference also pointed out that the region is not in the best of health, and its ability to accept and recover from ongoing and increasing human impacts is finite.

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 use of this information for planning and management decisions to restore and maintain a healthy, abundant, living legacy—not a legacy of stories about what once was. It means taking action to make this place all that it can be by:

- ◆ Building on existing knowledge, tools and governance capacity.
- ◆ Working to improve on success in addressing known concern.
- ◆ Defining and dealing with emerging issues.

## Place-based/Place-making—Choosing and Securing Sustainability

### Keynote Speakers

Four keynote speakers—Liz Dowdeswell, Billy Frank Jr., Carl Safina, and Stephen Hume—gave participants outstanding insight and inspiration. They underlined the need to sustain the environmental health of each place as a foundation for its social and economic well-being. They called for stewardship of renewable resources while these are still abundant and still contributing to social and economic vitality—or face conditions where these cannot be brought back.

**Liz Dowdeswell** took a global perspective, noting the challenges where societies no longer have healthy environments and have either lost or never had a natural legacy of abundant resources. As a result these societies are pre-occupied, even overwhelmed, with basic survival. By contrast, the Georgia Basin/Puget Sound region has both relative environmental health and resource abundance as well as the social and economic capacity to ensure a sustainable future.

Dowdeswell also emphasized the importance of working at the boundaries of disciplines and institutions. This is where the action is: a perspective which conference organizers and participants were encouraged to hear, as this was one of the fundamental themes of the conference. And she called for a new science/society contract, where science was focused on place for the benefit of community—an approach already being pursued in this region.

**Billy Frank Jr.** spoke directly about this place, and about his lifelong commitment to protecting and restoring the resources that aboriginal people in this region have depended on for thousands of years. He pointed out that there is an unrelenting commitment of all Coast Salish peoples to act, when necessary, to ensure that these resources will be available to support their communities and culture for generations to come. He noted that scientists working in the region have made similar lifelong commitments to this place, and he encouraged the young scientists to make this commitment and continue to do things the “right way” —to describe, with integrity, the intrinsic value of what this region is – so that others can see what is going on and what needs attention.

**Carl Safina**, like Dowdeswell provided a global perspective, and like Billy Frank Jr. brought it home to the Pacific Northwest, and the Puget Sound/Georgia Basin region.

Safina’s sad story and dramatic images about the past abundance and current decimated remnants of several marine species in the world’s oceans was about needlessly wasteful harvesting practices and easily avoided highly destructive waste management practices. Only when he wrapped up did he offer hope. This came as useful lessons, amplifying Dowdeswell and Frank:

- ◆ Focus attention on stewardship of species when they are abundant and contributing to community well-being.
- ◆ It’s not about being optimistic or pessimistic; it’s about finding your role in achieving solutions.

With the inquiring and observant mind of a journalist, the insights and words of a poet, and the clarity and inspiration of a gifted teacher, **Stephen Hume** quietly and evocatively painted what this place once was and might never be again.

Using the words of those who had experienced and observed this region’s natural abundance Hume described a shoreline draped by a “necklace of lights” as “a signal of progress” to some and “a signal of impoverishment, dispossession, marginalization and pillaging of natural resources over the past two centuries” to others. Even more recently, reflecting on his childhood experiences of a “river and its fish [that] still run through my dreams.” He made a strong call to act now or lose the opportunity for children of the future to live with and learn from nature in this truly outstanding place. His word images challenged us to think—through the eyes and experiences of children who live here today—about what they value now—and could not imagine losing in the decades ahead.

### Messages from Government

Governments, although not alone in accountability for sustaining this region, are in a primary position to influence the shape—in all senses of the word—of the region’s future.

Fortunately our governments on both sides of the international boundary are taking actions towards ensuring that current and future residents of the region will live in a healthy environment and will share in the rich diversity of products of the region’s ecosystems, whether these be through resource harvesting or the simple peaceful enjoyment of protected areas we already have and those planned in the coming years.

The **Honourable David Anderson**, Canada's Minister of Environment noted that the environmental agenda in Canada is being driven by quality of life issues related to "air and water quality, the conservation of biological diversity, climate change, and creating and maintaining natural legacies," which—in this region—means reconciling "our complex urban systems into their larger ecosystems." He pointed out: "The way in which Vancouver and Seattle develop, whether sprawling further or becoming more transit oriented, will directly affect air quality, conservation of land and biodiversity, energy needs and the impact on climate."

Minister Anderson underlined the importance of partnerships, collaboration and communication, and called for this "conference to serve as the foundation for similar initiatives in the transboundary ecosystem, and serve as a model for collaborative efforts in other geographic areas."

Washington State's **Governor Gary Locke**, although not able to attend the conference, sent a video message conveying his commitment to ongoing collaboration with other governments in the region on critical environmental challenges including oil spill hazards, orca recovery and the protection of marine birds.

The **Honourable Joyce Murray**, British Columbia's Minister of Environment, Land and Water Protection also emphasized the need for a shared focus on urban growth issues. She described BC's science, results-based and partnership approaches as well as emphasized the need for accessible and transparent information and for innovation. "We are looking at a range of innovative tools and approaches that include: area-based environmental management, the use of economic instruments and new enforcement tools such as administrative monetary penalties to increase responsiveness and compliance."

Minister Murray reported on commitments in the Georgia Basin including the Georgia Basin Steelhead Recovery Program and the Gulf Islands National Park, and in closing, acknowledged the delegates' role as "explorers finding new routes to protect and restore environmental health, provide sustainable economic opportunities, and enhance human and social well-being" and thanked them for their vision and dedication to a sustainable future in the basin.

These messages from elected leaders reinforced points made by keynote and the importance of work done and needing attention to sustain this region.

**Brad Ack**, the new director of the **Puget Sound Action Team**, addressed his perspectives on his new job. He spoke to the need for rigorous, disciplined and integrated science-based understanding about what changes are happening and where best to focus limited resources. He called for applying the best available science "incrementally, using the concepts of adaptive management" rather than risking the higher consequences of not acting while waiting for "perfect or even near-perfect information."

In pointing out the need "to make sure we add the sociology, the economics, and the politics of conservation and restoration issues to the science in order to get 'the answer' that is going to work for us and be sustainable," Ack strongly encouraged scientists to be proactively and fully engaged, "There is a tremendous need for scientists to insist that they are at this larger table directly, to play in the messy and unscientific environment of policy and program development, to actively participate as full partners, and perhaps leaders, with the other key players who are needed to make conservation happen. I know from experience that for some scientists this can be uncomfortable but it is, in my own opinion, a moral and ethical imperative."

Ack used a medical triage analogy as the basis for—and then elaborated—a conservation strategy for Puget Sound. "We must first seek to **stop the bleeding**...end the ongoing losses and degradation that we are clearly aware of. Then we need to **heal the wounds**. This translates into clean-up and restoration. Then the patient needs to learn to **live a healthy lifestyle**. In the case of the Puget Sound region, this is about developing and adopting new practice. We do not want to simply slow the rate of decline, we need to reverse it and prevent future decline. At the same time, incremental progress is far better than stalemate; we cannot let the perfect be the enemy of the good. To end the analogy of the medical emergency: we cannot cure in a day the ill health it has taken a lifetime to acquire."

As described below, these points and messages from government officials are fully reflected in the approaches being undertaken by presenters from the research, planning and program delivery communities in the Georgia Basin/Puget Sound region. No doubt these messages will also be heeded in the coming years as these highly committed people, in their diverse roles, strive individually and together to define and implement more effective approaches to generating

knowledge about the environment and ecosystems in the region and to achieving results that will restore, protect and sustain the health and well-being of its natural systems and human communities.

## Topics covered at the conference

The 300 posters and oral presentations at the 2003 Georgia Basin / Puget Sound Research Conference addressed regional natural resources and system functions, threats and stressors to these resources, and solutions and strategies for ameliorating threats and stressors to secure the longterm sustainability of the regions natural resources.

## Resources and System Functions

### Single species biology and conservation

Many presentations covered the biology and conservation of single species and groups of species spanning the taxonomy of regional living marine and terrestrial resources. Research on a species-by-species or taxa-by-taxa basis has historically provided managers with information for single species management. While it still serves that function, it also is being used to grasp at the concept of managing resources at the ecosystem level.

In keeping with the historical marine focus of this conference, marine talks and posters outnumbered terrestrial at the single species level. Coastal marine seagrasses are a critical component of nearshore marine ecosystems. Talks were given on the physiographic controls, monitoring and conservation strategies of seagrasses. The status and natural history of marine fishes was also the subject of numerous posters and presentations. Although the Georgia Basin / Puget Sound marine ecosystem is really not bound by political borders, several talks illustrated that for some species, distinct patterns in transboundary distributions have been observed.

A session was devoted to the distribution and habitat of various species of Pacific salmon in the region. Posters and presentations addressed the status of marine and terrestrial bird populations. While longterm studies show some species appear stable, numerous species are in decline. In addition to talks on the status of marine birds, participants delivered presentations on new techniques for habitat assessment, continued monitoring of populations and mortality trends. At the top of the food chain, a session was held on the development of a recovery strategy for the southern resident killer whale (*Orcinus orca*) population.

### Resource identification and mapping

Going beyond the single-species approach, presenters from governmental agencies, tribes/First Nations, and non-profit organizations gave presentations that identified and mapped resources in regions throughout the Georgia Basin / Puget Sound region. Many of the presentations focused on the inventory and health assessment of nearshore marine habitats, while others focused on river basins, individual creeks, and communities. Assessments were made using cultural resources such as the Sto:lo Coast Salish Historical Atlas, citizen data collection, GIS, topography, bathymetry, algorithms, and existing information. Many of the presentations focused on mapping as a basis for prioritizing conservation and restoration.

### Ecological systems and ecosystem management

Numerous posters and presentations at the conference focused on understanding and managing natural resources at the ecosystem level. As discussed in presentations given at the conference, the Georgia Basin / Puget Sound Ecosystem as we now know it has been shaped by human intervention over thousands of years. Presentations suggested ways that knowledge about traditional ecosystem management methodologies could enhance current efforts to manage resources on this scale. Presentations also covered regional conservation strategies, initiatives, and approaches for ecosystem-level management and conservation. Additionally, contributors from the Florida Keys, the Gulf of Main, Labrador, Russia, and other areas reviewed their experiences with ecosystem-level management and discussed how they were relevant to the Georgia Basin / Puget Sound region.

### Oceanography

Posters and presentations also addressed physical and biological oceanography. Some focused on better understanding key processes such as near shore sediment transport, circulation, and forcing of regional waters. Other data demonstrated the importance of this fundamental science in understanding and measuring human impacts on the marine environment, studying connectivity of conservation areas, and predicting oil spill trajectories. New techniques for data collection and remote monitoring also were presented.

## Resource threats and stressors

Sustainable use of natural resources and maintenance of regional biodiversity depend on being able to mitigate resource threats and stressors. Many talks at the Georgia Basin / Puget Sound Research Conference delineated threats and stressors such as declining air quality, climate change, naturally occurring and man-made toxins, invasive species, and infectious diseases.

### Air Quality

Declining regional air quality can be expected to significantly influence a wide-range of factors ranging from marine sediment characteristics and infaunal communities to human health. Three sessions and one poster group at the conference addressed transboundary air quality. Data presented helped characterize the regional airshed, analyzed the economics of air pollution, and helped forecast changes in pollutant emissions. A suite of presentations addressed the long-range atmospheric transport and deposition of pollutants into the airshed.

### Climate Change

Conference presentations on climate change extracted information from past regional climatic shifts and evaluated the regional effects of current climate change. Data presented suggest that even short-term changes, such as the 2000 drought, have had an impact on oceanographic conditions that in turn have had profound implications for biological functions dependent upon such processes. Larger-scale trends in regional climate change, such as the expected regional warming of 1-2.5° C, are expected to have powerful impacts on snowpack and rainfall intensities, which will profoundly influence hydrologic conditions in many parts of the region. As discussed, these hydrological changes will consequently affect biological systems ranging from Douglas fir (*Pseudotsuga menziesii*) to sockeye salmon (*Oncorhynchus nerka*) production. Several presentations were given on involving and educating stakeholders in adapting to expected climate change.

### Toxins

Manmade contaminants exist throughout the Georgia Basin / Puget Sound ecosystem. Posters and presentations identified significant concentrations of persistent organohalogen pollutants in “pristine lakes,” polycyclic aromatic hydrocarbons in marine sediments and fishes, and polychlorinated biphenyls and other persistent organic pollutants in the region’s atmosphere, water column, plants, invertebrates, and vertebrates. Data showed concentrations in or the effects of contaminants on Pacific octopuses (*Enteroctopus dofleini*), early life history stages of marine fishes, fish-disease resistance, salmonid olfaction, amphibian development, terrestrial and marine birds, and specific indicator species such as English sole (*Pleuronectes vetulus*), mink (*Mustela vison*), river otter (*Lontra canadensis*), and harbor seals (*Phoca vitulina*).

A conference sessions addressed naturally occurring toxins produced by harmful algal blooms (HABs). Some presentations discussed new techniques for monitoring; others addressed changes in HAB spatial and temporal patterns; and some dealt with implications for shellfish harvest and aquaculture. In addition, the effects of algal toxins on microzooplankton as well as early fish development were covered.

### Invasive Species

Posters and presentations looked at the impacts of invasive species on terrestrial, freshwater, and marine ecosystems. Specifically, presenters discussed pathways of introduction, methods of removal, and inter-jurisdictional responses to invasive species.

### Infectious diseases

Infectious diseases have the potential to play a role in the decline of threatened fish and wildlife populations. A presentation on the potential impacts of infectious diseases on regional Pacific herring (*Clupea pallasii*) echoed this.

## **Solutions for long-term sustainability of resources**

The quality of the Georgia Basin / Puget Sound region's future depends on recovering declining populations, mitigating threats and stressors to resources, continual monitoring of ecosystem health, and managing natural resources for long term sustainability. Conference participants began to address these needs with posters, presentations and workshops on developing indicators of ecosystem sustainability, educating people about environmental stewardship, conservation planning at local and regional levels, ecologically-sensitive growth management, restoring altered habitat, and ecosystem-level management of resources.

### **Ecosystem Sustainability Indicators**

In sessions and panels on ecosystem sustainability indicators, presenters addressed developing a common set of indicators to adequately reflect regional resource use. In addition to being accurate, presentations suggested that indicators should be simple enough for the general public to understand to make informed decision making. Potential transboundary indicators addressed included water quality, water consumption, shellfish contamination, and land use.

### **Environmental Education**

Educating communities, policy makers, future scientists, and future leaders is a critical step in ensuring that decisions made today leave a healthy legacy for tomorrow. Conference presentations on environmental education ranged from examples of undergraduate research experiences, transboundary multi-university education programs, evaluating citizen and student involvement in research projects, and experiences from local education centers. Additionally, talks focusing on the benefits of citizen-based stewardship and monitoring of local resources were presented.

### **Behavioral Change**

Going beyond simply educating people to make environmentally sound choices, several presentations recommended using a tool kit of educational, regulatory and financial (incentives and disincentive) approaches to change the behaviour of individuals and organizations. Other presentations addressed the growing importance of "green" business and industrial strategies to lower costs, market products and generate profits.

### **Growth management**

Nearly 7 million people live in the Georgia Basin / Puget Sound region, and this number is expected to increase to more than 9 million by 2020. Numerous presentations at the conference focused on growth management ranging from marine and riparian buffers and setbacks and landscaping urban yards for wildlife to maintaining landscape connectivity and methods for low-impact development. Several presentations addressed mitigating stormwater runoff in urban watersheds and one presentation delineated how compact development limits the impacts placed on aquatic functions and integrity.

### **Regional / Transboundary Conservation Planning and Programs**

Numerous presentations described conservation efforts that transcend political borders and rely on collaboration among numerous agencies and organizations. Examples include incorporating traditional ecological knowledge and scientific data into resource management strategies and habitat restoration, regional resource management programs, and transboundary conservation planning and protected area strategies.

### **Habitat Restoration**

Habitat restoration is designed to improve function and productivity of human-altered ecosystems. Participants at the research conference presented examples of projects restoring rivers, forests, tidal sloughs, lake shorelines, and Garry oak (*Quercus garryana*) ecosystems.

### **Ecosystem-level management**

Conceptual models and computer models demonstrated how to assess and manage freshwater and marine resources at the ecosystem-level. Additionally, talks addressed ecosystem impacts of hatchery salmon as well as nearshore habitat restoration. Two sessions addressed the use of marine protected areas as a tool for resource management at the ecosystem-level.

### **Workshops within the conference**

In addition to presentation sessions workshops, the conference offered two “tracks”:

1. Connecting science, policy and decisions in indicator development and reporting.
2. Protecting landscape functions and reshaping development patterns.

These were coordinated by session chairs and attended by presenters and delegates interested in networking with each other, defining the nature of future work and seeking opportunities for follow-up collaboration.

## **Conference themes—lessons learned and future directions**

### **Keynote, Government, and other plenary speakers**

The keynote and government other plenary speakers gave us two sets of unifying themes:

1. Focus on the sustainability of the Georgia Basin/Puget Sound Region.
2. Do so through cooperation and collaboration.

### **Research needs**

The wide variety of research and research applications presented at the conference gave a broad overview of the work and findings being conducted regionally, and no doubt, much more is being conducted than was presented. Keeping that in mind, we still feel the conference provided a good foundation for evaluating what the science is saying about the region’s resources, how this is being applied and what research and applications are needed in the future.

Although we know more and more about the region’s natural resources and the natural processes governing these, we have more to learn. 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 our knowledge.

As discussed throughout the conference, and underlined in this paper, the region’s resources are limited and the threats and stressors on these are increasing. To outpace the human pressures on resources and to secure a sustainable region, we need new and better informed:

- Resource management and conservation strategies.
- “Smart growth” approaches to community and regional planning and the management of development.
- The use of improved technologies to curtail pollution.

While there will always be a need to continue basic science for knowledge sake, there is an urgent need now to focus the majority of research efforts on closing information gaps and applying research findings to support these initiatives.

The conference demonstrated that such a “science for the benefit of the benefit of the community” ethos has already emerged and is becoming fundamental to decision-making in the GB/PS region. Building on this, further research needs to address the following:

1. Lack of information on the distribution and natural history of some species is hindering recovery of these species. Basic research is needed on the natural history of individual species where that information is expected to enhance conservation or recovery of those species.
2. Incomplete information hinders current conservation planning efforts. Increased or enhanced data on resource distribution is needed to complete regional conservation planning efforts.
3. Single species management is the standard for resource management as well as for conservation. It is not working in many cases, yet very few alternatives exist. More research and pilot projects investigating resource management at the ecosystem level are needed. This includes basic research on species interactions, synthesis and analysis of existing information, and further investigation into the ecosystem benefits of using tools such as marine protected areas.
4. New technologies are needed to reduce pollution from automobile and diesel marine engines.
5. Currently climate change appears inevitable. More research is needed to mitigate or adapt to climate change. Where appropriate, research that may help prevent or retard climate change is warranted.

6. The region is impacted by man-made toxins (polychlorinated biphenyls, dioxins/furans, polyaromatic hydrocarbons, heavy metals, and pesticides). While we are just beginning to understand the impact of these toxins, we understand that they are detrimental. More research needs to be conducted on viable methods to stem toxin discharge into the environment and to remediate contaminated areas.
7. Although it is not a true research need, efforts should continue to develop region-wide coordinated management strategies for seagrasses, fisheries, and threatened or endangered species. The current transboundary effort to recover the southern resident killer whale population might serve as a model.

## Future Directions

Information that is not widely understood and used is of no value. If the above research needs are addressed and met, but the information is never translated into use, we will be no further ahead in securing a sustainable region. The conference provided many examples of scientific data being translated into usable formats, and more work is needed to put research findings into the hands of the people who will use it to better manage resources or to make better-informed personal decisions about the use of natural resources.

At the same time, to ensure ongoing improvements in the generation and use of scientific information, science-based information users need to seek the advice of scientists when interpreting and applying their information and provide feedback on its effectiveness in various applications.

The conference—through its keynote and government speakers, and through many of its presentations and workshops—has recorded a shift to merging the science and decision-making communities. This gives a sense of confidence that future research will focus on obtaining data and advancing knowledge with a view to the use of this for decision-making.

Given that researchers, policy and planning advisors, and program managers and practitioners, are in effect, working along a continuum that runs from data to action (described by Heidi Sieglebaum during the conference - Panel 3A), improving the science/decision-making interface is an important step. However, as one moves along this continuum, increasing attention needs to be given applied research on governance considerations: political, legal, financial and a full range of interest-based perspectives and advocacies.

Before closing, it is important to note that several panels at the conference addressed this interface from these social and economic perspectives. These pointed out the broad benefits of different levels of government working through a paradigm of partnerships instead of hierarchical top-down/bottom-up systems, about how businesses are finding it profitable to adopt “green” practices, about the use of triple bottom line approaches to integrating social, economic and environment considerations, and about using a toolkit of educational, regulatory and incentive approaches to encouraging resource and environmental stewardship.

### Future work along this continuum will involve:

1. **Data and Knowledge Generation:** To produce findings, such as those presented at this conference ranging from peer reviewed scientific information to local “citizen science”<sup>1</sup>.
2. **Transferring Knowledge to Decision-Making.** To build capacity and to influence policy and programs.
3. **Action Projects.** To deliver specific outcomes based on the use of data and knowledge and the application of decision-support tools and processes.

Our review of the conference has provided a list of specific items requiring the attention of the science community and the importance of merging the science/decision-making communities. We anticipate that the next Georgia Basin/Puget Sound research conference will report on the success (and challenges) arising from this convergence—that it will tell us about accomplishments in better understanding the ecosystems, how to protect and manage these, and about actually doing so as a result of the application of science-based information and other “governance” considerations used in making decisions.

In closing, we quote the following plain-language excerpt from an abstract:

“No person’s knowledge can go beyond their experience. On that same idea, no person cares for that which they are unaware of. The very root and spring of the conservation and stewardship ethic lies in experience.”

~ Rod MacVicar, Reed Point Marine Education Centre.

Keeping this basic perspective in mind, irrespective of one’s role as a scientist, educator, advisor, administrator or an elected official, securing healthy environments, ecosystems and communities in this region, requires:

- ◆ Focusing on people “where they live” in all senses of this phrase.
- ◆ Building their capacity—in the form of knowledge, experience and opportunity.
- ◆ Continuously striving to inform and support hour-to-hour, day-to-day and longer-range decision-making.

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<sup>1</sup> “Citizens Science” was a term used by Darryl Low Choy (from Griffith University in Australia) in Session 2F to describe data and information generated by local citizen’s.