

PREPARED BY
Marc Nelitz, Carol Murray,
and Katherine Wieckowski
ESSA Technologies Ltd.

FOR
David Suzuki Foundation

Returning Salmon

INTEGRATED PLANNING AND THE
WILD SALMON POLICY IN B.C.



David
Suzuki
Foundation

SOLUTIONS ARE IN OUR NATURE

Returning Salmon: Integrated planning and the Wild Salmon Policy in B.C.

Prepared by:

Marc Nelitz, Carol Murray, and Katherine Wieckowski
ESSA Technologies Ltd.
Suite 300, 1765 West 8th Avenue
Vancouver, B.C. V6J 5C6

Report Coordinator:

Jeffery Young, Aquatic Biologist
David Suzuki Foundation
Suite 219, 2211 W. 4th Avenue
Vancouver, B.C. V6H 4E3

Review and editing provided by: Ian Hanington, Jay Ritchlin, and Bill Wareham

Special thanks to Craig Orr of Watershed Watch Salmon Society for comments

Cover Design: Arifin Graham, Alaris Design

March 10, 2008

Acknowledgements

It is our hope that this report will facilitate improved implementation of the Wild Salmon Policy. Given this intent, the project team worked with a variety of members of the Wild Salmon Policy Implementation Team, government-agency staff, and others involved with activities on the Central Coast to ensure our research findings and recommendations were of greatest benefit to Fisheries and Oceans Canada. It would not have been possible to prepare this report without time and contributions from these individuals. To these people we are extremely grateful:

Bonnie Antcliffe, Fisheries and Oceans Canada
Al Cass, Fisheries and Oceans Canada
Dave Einarson, Fisheries and Oceans Canada
Joy Hillier, Fisheries and Oceans Canada
Kim Hyatt, Fisheries and Oceans Canada
Jim Irvine, Fisheries and Oceans Canada
Doug Milek, Round River Conservation Studies
Jon O'Riordan, University of British Columbia
Dave Peacock, Fisheries and Oceans Canada
Marc Porter, ESSA Technologies Ltd.
Michael Price, Raincoast Conservation Foundation
Lars Reese-Hansen, Ministry of Environment
John Reynolds, Simon Fraser University
Brian Riddell, Fisheries and Oceans Canada
Mark Saunders, Fisheries and Oceans Canada
Bruce Shephard, Fisheries and Oceans Canada
Heather Stalberg, Fisheries and Oceans Canada

Though the knowledge and insights of these contributors helped us better understand the Wild Salmon Policy and on-the-ground activities on the Central Coast, any errors of omission, oversight, or misunderstanding resulting from these discussions remain ours. As well, the interpretations and recommendations presented here are those of the authors.

Table of Contents

List of Tables	iii
List of Figures.....	iii
Foreword by the David Suzuki Foundation.....	1
1. Introduction.....	4
1.1 Background.....	4
1.2 Work plan	5
2. Understanding Wild Salmon Policy Implementation	8
2.1 Policy overview	8
2.2 Policy commitments and implementation status.....	9
2.3 Implementation challenges	9
2.4 Implementation opportunities	10
3. Clarifying Emerging Issues	21
3.1 Integration.....	21
3.2 Decision-making	24
4. Identifying Opportunities for Integration on the Central Coast	26
4.1 Science integration.....	26
4.1.1 Relevant monitoring activities	26
4.1.2 Opportunities for integration.....	32
4.2 Management integration	33
4.2.1 Relevant planning initiatives.....	33
4.2.2 Opportunities for integration.....	35
5. Improving Integrated Strategic Planning	39
6. References	42

List of Tables

Table 1.	Summary of commitments, current status, and implementation opportunities/challenges underlying Strategy 1 (<i>Standardized monitoring of wild salmon status</i>), Strategy 2 (<i>Assessment of habitat status</i>), and Strategy 3 (<i>Inclusion of ecosystem values and monitoring</i>) of the Wild Salmon Policy. Note about table headings: “Process Elements” were extracted from Wild Salmon Policy’s description of each Action Step (pages 16-23). “Expected Outputs and Outcomes” were inferred from this text.	11
Table 2.	Synthesis of challenges (see Table 1) associated with implementing Strategies 1, 2, and 3.	19
Table 3.	Alignment of implementation opportunities from Table 1 against the challenge groupings from Table 2. Note the following abbreviations: DMA – Decision making authority, SoK – State of knowledge, Tech – Technical, Cap – Capacity, and C&A – Communication and awareness.	20
Table 4.	Dominant themes of integration relevant to Strategy 4 of the Wild Salmon Policy. Adapted from Grumbine (1994).	23
Table 5.	Some instruments guiding operational decisions on the Central Coast that are potentially relevant to the Wild Salmon Policy.	28
Table 6.	Groups of information needs and the regulatory, legal, or policy instruments reliant on those data.	33
Table 7.	A select list of objectives and indicators specified in Central Coast land-use planning instruments that relate to fish, fish habitats, and freshwater ecosystems.	37

List of Figures

Figure 1.	Boundaries of the Central Coast Land and Resource Management Plan (LRMP) and geographic focus for this report. Map extracted from Central Coast land and resource management planning materials.	7
Figure 2.	Overview of the Wild Salmon Policy’s goals, objectives, strategies, and guiding principles. Source: DFO 2005.	8
Figure 3.	Conceptual illustration of the different ways of aggregating data (left side) and different audiences relying on those data for decision making (right side). Adapted from State of Washington (2004).	25
Figure 4.	Geographic location and extent of the Pacific North Coast Integrated Management Area (PNCIMA).	35
Figure 5.	Important Fisheries Watersheds identified in 2007 Ministerial Order establishing South Central Coast Legal Land-Use Objectives.	38

Foreword by the David Suzuki Foundation

The David Suzuki Foundation has been working to conserve and restore Pacific salmon ecosystems since the early 1990s. Through research, education, and participation in government and non-government fisheries- and habitat-management forums, the Foundation has made the survival of these magnificent fish a central part of our mission.

While we continue to have successes, declines of certain Pacific salmon runs have become worse in recent years (e.g., *An Upstream Battle*, available at: www.davidsuzuki.org/oceans) and the need for better management is more urgent than ever.

The federal Wild Salmon Policy (WSP) is one of the main regulatory frameworks through which wild salmon populations can be protected and restored. The WSP identifies conservation as the first priority for salmon management and provides a science-based framework for protecting salmon diversity, habitat, and ecosystems. The David Suzuki Foundation worked hard to make the WSP better, and we continue to work for its effective implementation. The WSP provides an excellent opportunity to build effective models of sustainable, ecosystem-based management (EBM) in Canada. Wild Salmon Policy success will be to the benefit of salmon, as well as the people and ecosystems that depend on them.

This report considers the progress made in implementing the Wild Salmon Policy, released in June 2005, and identifies opportunities for real short-term benefits to wild salmon while a robust management system is built for the long-term. Our aim is to explore linkages with existing land- and water-use management processes and to offer practical Wild Salmon Policy implementation advice at a regional scale.

We take an in-depth look at the Central Coast region of B.C. This area is covered by the Great Bear Rainforest Agreement, a conservation and sustainable-development plan negotiated between First Nations, the Province of British Columbia, and conservation groups.

The Central Coast region has a wide range of freshwater, temperate rainforest, coastal, and marine ecosystems of incredible productivity and diversity. Salmon are integral components of all of these ecosystems. These features both lend themselves to, and call out for, strong efforts to integrate ecosystem values into salmon management. Success will require increased efforts to understand, monitor, and conserve salmon.

Other federal and provincial processes share the goal of well-managed ecosystems in this region. We explore the degree to which the Wild Salmon Policy is being integrated into these processes and applied as part of the B.C. government's commitment to an ecosystem-based approach in this region.

The Central Coast Land and Resource Management Plan (LRMP) identifies the need for consensus-based land-use strategies. Design and implementation of the Central Coast LRMP has included landscape-level considerations of salmon-ecosystem requirements, including identifying legal objectives for the protection of critical ecosystem components, such as riparian areas.

Canada's Oceans Strategy requires Fisheries and Oceans Canada (DFO) to lead development of integrated marine-use plans, including in the Pacific North Coast Integrated Management Area (PNCIMA).

To date, the PNCIMA planning process has not received necessary funding. This has had the unfortunate effect of undermining proactive marine-use planning in most of Western Canada and removing a crucial

opportunity to bring together the Wild Salmon Policy and Central Coast LRMP into a true example of effective ecosystem-based management.

The report recognizes that a lot of good quality scientific work has been done that could support effective on-the-ground application of the WSP. Research conducted for the report indicates a pressing need for improved integrated strategic planning and implementation efforts.

Identified areas requiring improvement include:

- Integration of internal Fisheries and Oceans Canada policy, science, and management efforts;
- Information sharing and decision making between governments and stakeholders; and,
- Management practices that better link decisions about salmon to their overall ecosystems.

Resource constraints on WSP implementation were clearly identified. These constraints need to be addressed by government funding and personnel assignments. The constraints also underscore the need to carefully plan integration approaches.

Full Wild Salmon Policy implementation requires Fisheries and Oceans to update essentially all salmon-related activities. Fulfilling the minimum habitat, ecosystem, and stock-status monitoring requirements of the WSP will require more resources than are currently available in the Pacific Region budget. Integration with the Central Coast land-use plan and PNCIMA become essential if resources are to be effectively utilized.

Recommendations

Based on this report, and others recently published by the David Suzuki Foundation (e.g., *An Upstream Battle* and *High and Dry*, see www.davidsuzuki.org/oceans), we make the following recommendations for Wild Salmon Policy implementation and improved ecosystem-based management of land and marine ecosystems in the Central Coast region:

The David Suzuki Foundation is asking the federal government to:

- Commit at least an additional \$5 million dollars a year for a minimum of five years to facilitate WSP implementation.
- Shift of existing salmon and salmon-ecosystem related expenditures to priority WSP activities
- Strengthen and support champions within Fisheries and Oceans Canada who will ensure effective WSP implementation.
- Hire at least 12 additional habitat-conservation enforcement officers in the Pacific region within the next year, and a further 16 within the next three years.
- Provide at least \$10 million per year for five years to develop a marine-use plan for PNCIMA that incorporates wild salmon conservation objectives and WSP principles.

In addition, the David Suzuki Foundation is asking the B.C. government to:

- Ratify the ecosystem-based management objectives, rules, and regulations for the Central and North Coast Land Use Plans
- Provide funding to develop an implementation structure that is coordinated with federal WSP and PNCIMA efforts.

Finally, while collaboration with stakeholders and other levels of government is a key to success for the WSP, Fisheries and Oceans Canada must maintain leadership and accountability to ensure success in the region and, critically, integration of the WSP's ecosystem-management practices throughout the federal government.

The WSP, Great Bear Rainforest Agreement, and the Pacific North Coast Integrated Management Area process are significant precedents along the path to effective ecosystem-based management in Canada. Their successful implementation will position Canada as a leader in coastal and marine integrated planning.

1. Introduction

1.1 Background

In June 2005, Fisheries and Oceans Canada (DFO) provided a “blueprint” for managing the five species of Pacific salmon, as detailed in Canada’s Policy for Conservation of Wild Pacific Salmon (a.k.a. the Wild Salmon Policy [the Policy or WSP], DFO 2005). The overarching goal of the Policy is to “*restore and maintain healthy and diverse salmon populations and their habitats*”, where “*conservation of wild salmon and their habitat is the highest priority for resource management decision making*”, as balanced against “*decisions about salmon stewardship consider social, economic, and biological consequences.*”

The Policy recognizes that environmental, regulatory, legal, cultural, and economic conditions for managing salmon have changed in recent decades and are becoming more complex in the Pacific Region. Climate-induced changes in ocean conditions and freshwater environments affect salmon productivity and, in some instances, are leading to increased vulnerability of individual populations and their habitats (e.g., Levy 1992; Mantua and Francis 2004; Battin et al. 2007; Nelitz et al. 2007c). First Nations are taking on a greater role in decision making with co-management of salmon fisheries, as evidenced through signing of the Nisga’a Final Agreement in 2000. Increasing levels of human development and demands for groundwater withdrawal are increasing pressures on freshwater survival (e.g., Roseneau and Angelo 2003; Douglas 2006; Nelitz et al. 2007a). Economic concerns associated with listing some populations under the Species at Risk Act have outweighed conservation concerns, as evidenced by recent decisions to not list Cultus and Sakinaw Lake sockeye¹. The current state of Pacific salmon populations in the region (e.g., Slaney et al. 1996) has led some scientists and policy makers to wonder “*What is it really going to take to have wild salmon populations in significant, sustainable numbers through 2100?*” (Lackey et al. 2006). In the context of these kinds of environmental, social, and economic conditions, resource-management decisions will likely become increasingly complex. A key requirement to cope with this complexity will be a need to clearly articulate the consequences of resource-management decisions on salmon and choose the most appropriate outcomes that balance society’s multiple values and interests. The Wild Salmon Policy provides a framework for improving such decision-making. The success of its implementation, however, will determine the success with which Pacific salmon and their habitats are maintained and restored in the Pacific Region.

Accompanying a strong need for the Policy and high expectations are non-trivial challenges. As one of its guiding principles, the Policy acknowledges the need for an “open process”. Correspondingly, Fisheries and Oceans Canada has consulted with a range of potentially disparate voices in helping design, review, and implement various strategies (e.g., other government agencies, First Nations, and non-governmental organizations, among others). Development of consistent management units (i.e., Conservation Units, or CUs), and habitat and ecosystem indicators, as well as benchmarks, will increase the Policy’s scientific credibility, yet that comes with an implied need for sufficient human capacity, financial resources, and calendar days to complete the work. As well, the Policy has tasked Fisheries and Oceans Canada with a responsibility to consider linkages among salmon and marine, freshwater, and terrestrial ecosystems. By necessity such considerations require greater integration and harmonization among federal and provincial government agencies, some of which are not directly responsible and have not been explicitly provided with resources for managing salmon and their habitats.

¹ Government of Canada. Species at Risk Act Public Registry. Search Results for sockeye, available at: http://www.sararegistry.gc.ca/search/advSearchResults_e.cfm?stype=species&advkeywords=sockeye

This report provides findings from independent research that was driven by an intention to help Fisheries and Oceans Canada navigate challenges and identify opportunities for successful implementation. Having recently worked with Fisheries and Oceans Canada and the Pacific Fisheries Resource Conservation Council on two elements of the Policy (Strategies 2 and 3 respectively, see Nelitz et al. 2006; Nelitz et al. 2007b; Nelitz et al. 2007d), the project team was well positioned to offer an informed perspective. Specific objectives of this work were to: 1) understand the current status of Policy implementation, 2) identify opportunities and challenges in implementing its Strategies on the ground and at the strategic level, and 3) develop recommendations to facilitate implementation.

This report is intended for a mix of audiences. Section 2.0 – *Understanding Wild Salmon Policy Implementation* – is intended for interested individuals (e.g., DFO staff, provincial staff, First Nations, academic researchers, stewardship groups, etc.) not involved or familiar with implementation, so they can gain a better understanding of DFO's recent efforts and planned next steps. Section 3.0 – *Clarifying Emerging Issues* – is intended, primarily, for DFO staff involved with strategic Policy implementation to highlight our understanding of the critical questions requiring further discussion and clarity. Others outside DFO may also be interested if they are directly involved in discussions about how to integrate with the Wild Salmon Policy. Section 4.0 – *Identifying Opportunities for Integration on the Central Coast* – is intended to help interested individuals not working on the Central Coast gain a general understanding of the local context for resource management and identify possibilities for integration with the Wild Salmon Policy. This section also serves as a template for how to start organizing information about potential opportunities for WSP integration in other parts of the province. Finally, Section 5.0 – *Improving Integrated Strategic Planning* – is mainly intended for DFO staff deciding upon strategic priorities around time, people, money, and tasks. For others, these recommendations can be used as a guide to ensure future tasks include the elements necessary for successful Policy implementation.

Although the Policy is currently focused on strategic implementation, this report is also focused on understanding issues around on-the-ground implementation, with the hope that any lessons learned could be used to inform implementation at both levels. The Central Coast (as defined by the provincial land-use plan; see Figure 1) was the focal geographic area for a variety of reasons. First, recent land- and marine-use planning initiatives promote the use of “ecosystem-based management”. Given the intention of the Wild Salmon Policy to consider ecosystem attributes, such a management framework was thought to provide opportunities for implementation that may be unique in British Columbia. Second, an emphasis on the Central Coast complements other Wild Salmon Policy initiatives that have focused on other geographic areas, such as the Fraser River (Fraser, Salmon, and Watersheds program), the Skeena River (science review and integrated planning pilot), and West Coast of Vancouver Island (WSP review by the Nuu-chah-nulth Aquatic Management Board, AMB 2006). Finally, the Central Coast is distinctly challenging in that it has: a diversity of salmon species and sizes of Conservation Units; a wide variation in quality of existing data; limited awareness beyond those involved about the many on-the-ground activities; few resources to conduct necessary outreach about these activities; and an interest by Fisheries and Oceans Canada to learn more about existing opportunities.

1.2 Work plan

This research was completed with the hope of facilitating Policy implementation. To ensure research findings and recommendations were of greatest benefit to DFO, the project team worked with a variety of members of the WSP Implementation Team, government-agency staff, and others involved with activities on the Central Coast to gather advice, guidance, and insights into relevant initiatives and activities. Beyond an agreed-upon endpoint of providing recommendations to facilitate implementation of the Policy, it wasn't clear at the onset what specific tasks would be required to complete this research. Thus, the project team began with a general work plan, which developed into the following five tasks:

Task 1: Summarize Wild Salmon Policy commitments. Understanding the current status of WSP implementation first required a clear understanding of the commitments under Strategy 1 (*Standardized monitoring of wild salmon status*), Strategy 2 (*Assessment of habitat status*), and Strategy 3 (*Inclusion of ecosystem values and monitoring*); specifically, the expected outputs and outcomes of each of the action steps. This task helped frame the context for subsequent tasks.

Task 2: Understand Wild Salmon Policy implementation. Fisheries and Oceans Canada's WSP Implementation Team has undertaken a number of activities to implement Strategies 1, 2, and 3 at a strategic level (e.g., drafting Conservation Units, benchmarks, and habitat / ecosystem indicators). Though related to the strategic level, implementation at the operational scale (e.g., on the ground in the Central Coast) has been more limited at this time. DFO leads for implementing these strategies were informally interviewed to acquire an updated understanding of implementation status. At the same time the project team inquired about DFO's perceived implementation opportunities and challenges, recognizing that others have commented on WSP needs and opportunities (AMB 2006).

Task 3: Clarify emerging issues. Findings from Tasks 1 and 2 were synthesized (see Section 2) to clarify emerging issues (see Section 3). Several insights emerged from this exercise that helped inform next stages of work, particularly the fact that the WSP doesn't provide sufficient guidance to help reduce the complexity or provide clarity around integration – which is key to Strategy 4. We then attempted to provide greater clarity around “integration” and what might be required to successfully implement this Strategy.

Task 4: Identify opportunities for integration on the Central Coast. Using a clarified understanding of “integration”, we then summarized operational decisions, planning initiatives, and relevant activities being undertaken by various organizations operating on the Central Coast to illustrate existing integration opportunities as related to salmon science and management (see Section 4).

Task 5: Develop recommendations. Findings from previous tasks were then used as the basis for developing recommendations on how to improve implementation of Strategy 4 – *Integrated Strategic Planning* – more broadly across the Pacific Region (see Section 5).

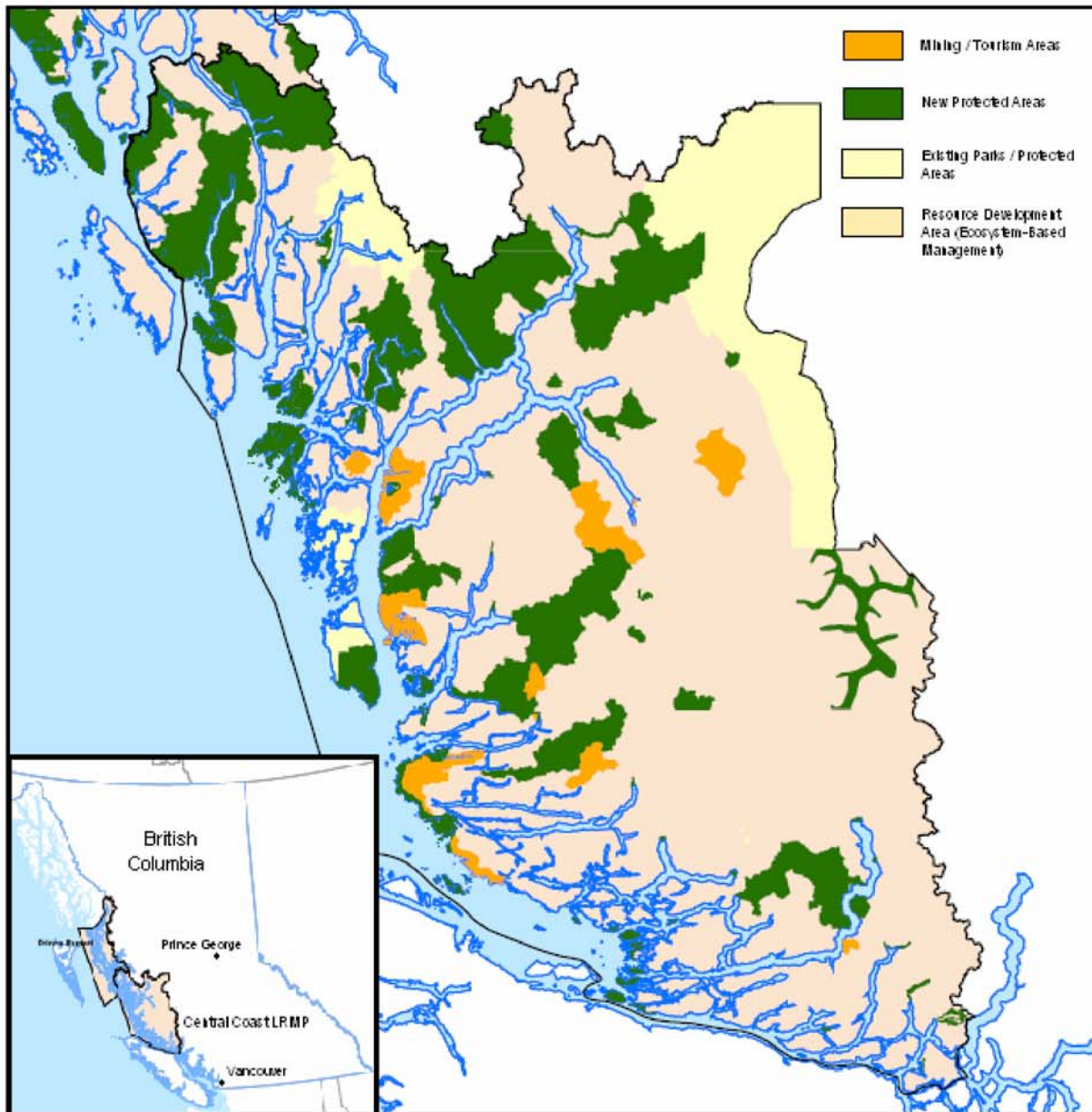


Figure 1. Boundaries of the Central Coast Land and Resource Management Plan (LRMP) and geographic focus for this report. Map extracted from Central Coast land and resource management planning materials, available at: ilmbwww.gov.bc.ca/lup/lrmp/coast/central_north_coast/index.html.

2. Understanding Wild Salmon Policy Implementation

2.1 Policy overview

The Wild Salmon Policy provides a proactive approach to improving management of salmon and their habitats in the Pacific Region. At a high level the Policy sets out a well-structured framework for implementation by articulating clear goals, objectives, strategies, and guiding principles (Figure 2). Its goal is to “*restore and maintain healthy and diverse salmon populations and their habitats for the benefit of the people of Canada in perpetuity*”, which must be achieved while fulfilling the following underlying objectives:

- (1) Safeguard the genetic diversity of wild Pacific salmon;
- (2) Maintain habitat and ecosystem integrity; and
- (3) Manage fisheries for sustainable benefits.

Next, the Policy outlines six Strategies that tactically describe how it will be implemented in the short and long term:

- | | |
|-------------------|------------------------------------------------|
| Strategy 1 | Standardized monitoring of wild salmon status; |
| Strategy 2 | Assessment of habitat status; |
| Strategy 3 | Inclusion of ecosystem values and monitoring; |
| Strategy 4 | Integrated strategic planning; |
| Strategy 5 | Annual program delivery; and |
| Strategy 6 | Performance review. |

As well, each Strategy has a set of associated Action Steps that further clarify the tasks necessary to implement the Policy. Finally, four principles provide an underlying foundation guiding implementation.

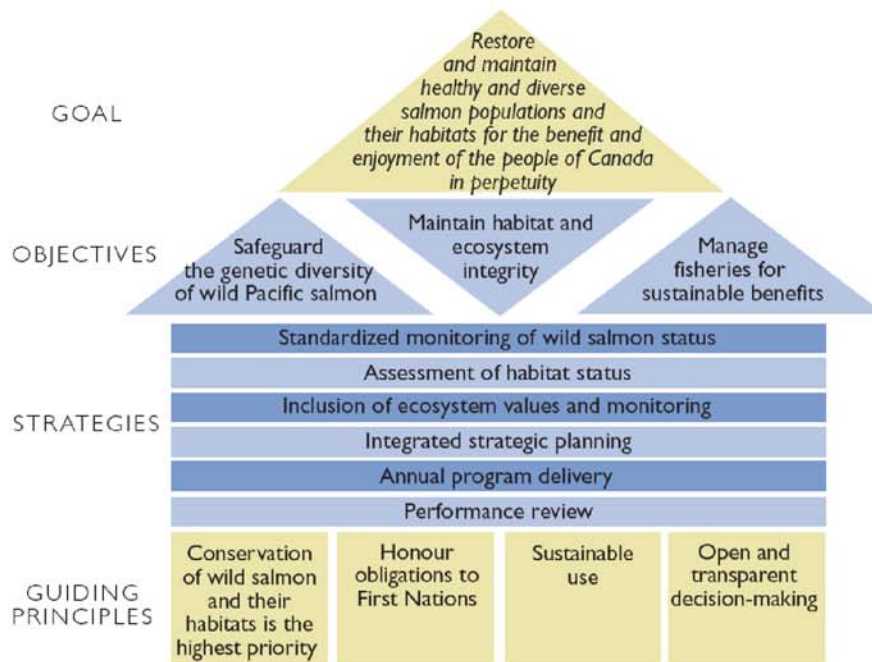


Figure 2. Overview of the Wild Salmon Policy’s goals, objectives, strategies, and guiding principles. Source: DFO 2005.

It is worth noting the Policy's Strategies involve a mix of science (objectivity) and social values (subjectivity). Strategies 1, 2, and 3 are focused on accurately representing the current state of scientific knowledge and collecting the appropriate data to represent this understanding. In simple terms, Strategy 1 is intended to reflect scientific understanding of salmon populations (e.g., considerations of diversity, distribution, and abundance), Strategy 2 represents scientific understanding of salmon habitats (e.g., relationships with water flow, water quality, and streamside shading), and Strategy 3 incorporates scientific understanding of marine, terrestrial, and freshwater ecosystems deriving benefits from salmon (e.g., linkages with bears, eagles, forest vegetation, other fish species). In contrast, Strategies 4, 5, and 6 are focused on designing and implementing a process for using those data and making decisions, where decisions are those that can directly or indirectly affect salmon and lead to outcomes that reflect society's value for Pacific salmon. A distinction between science and values is important so that these aspects are clear to all participants and lend to a greater chance of successful Policy implementation (e.g., Lackey et al. 2001).

2.2 Policy commitments and implementation status

In general, DFO is still engaged in *strategic* implementation of the Policy; on-the-ground implementation has yet to begin. Table 1 summarizes the implementation status of each action step within Strategies 1, 2 and 3. It is clear from these results that DFO has made progress toward a number of Policy commitments for each of these strategies as of late 2007. In cases where progress has not been made, there is a clear plan for next steps. We recognize, however, that additional progress has been made since this information was gathered. Thus, this table may not reflect DFO's most recent activities. DFO plans to update interested individuals at a meeting in late March 2008 on the status of WSP implementation.

One insight emerging from this task is that DFO's decisions to apply particular scientific methods to complete an Action Step imply a particular level of rigour and scientific understanding. Alternative technical approaches lie along a continuum, where methods of greatest rigour are more scientifically credible, yet require a greater level of effort, technical capacity, funding, available data, and/or time to complete relevant analyses. More rigorous approaches can always be justified, yet are not usually implemented because of established limits on resources (e.g., time, people, and money). The reality, however, is that natural resource decision making occurs in spite of having imperfect or incomplete scientific information. Thus, a critical challenge is not determining how to design and implement a process that is rigorous enough, but rather ensuring that decision-making processes adequately consider the level of scientific uncertainty. For example, a precautionary approach to decision making:

"...exercises prudent foresight to avoid unacceptable or undesirable situations, taking into account that changes in fisheries systems are only slowly reversible, difficult to control, not well understood, and subject to change in the environment and human values" (FAO 1996); or

"...recognizes that the absence of full scientific certainty shall not be used as a reason to postpone decisions when faced with the threat of serious or irreversible harm" (Government of Canada 2001).

2.3 Implementation challenges

A variety of challenges have been encountered during implementation of Strategies 1, 2, and 3 (also summarized in Table 1). Challenges can be grouped into five categories: i) decision-making authority; ii) state of knowledge; iii) technical; iv) capacity; and v) communication and awareness (see Table 2). Challenges around '*decision-making authority*' recognize that successful implementation of the Wild Salmon Policy will involve a variety government agencies, beyond DFO, who have legal authority over

decisions affecting salmon, yet are not obligated to adhere to DFO's Wild Salmon Policy. '*State of knowledge*' refers to limitations in scientific, local, and traditional knowledge available to inform the Policy's Action Steps (e.g., defining ecosystem values, integrating traditional knowledge, etc). '*Technical*' challenges refer to logistical or analytical difficulties related to accessing remote areas for monitoring, synthesizing disparate data sets, and/or conducting analyses that are technically credible in the face of large uncertainties, for instance. '*Capacity*' challenges refer to problems of having too few staff and other resources (e.g., funding) available to complete the Action Steps. Finally, '*Communication and awareness*' refers to difficulties of communicating the implementation process and intended outcomes, both internally within DFO and externally.

2.4 Implementation opportunities

A recurring theme was the need for DFO to better integrate the Wild Salmon Policy from a variety of perspectives. By leveraging integration opportunities, DFO would be better positioned to overcome some of the challenges identified above. Table 3 aligns implementation opportunities against implementation challenge categories. Such opportunities can be related to specific initiatives (e.g., Central Coast Ecosystem Based Management, B.C. Biodiversity Strategy, MOE Watershed Evaluation Tool, DFO risk-management framework, etc.) or more general activities (e.g., improve coordination of data collection, repository, and dissemination) across the Pacific Region.

Table 1. Summary of commitments, current status, and implementation opportunities/challenges underlying Strategy 1 (*Standardized monitoring of wild salmon status*), Strategy 2 (*Assessment of habitat status*), and Strategy 3 (*Inclusion of ecosystem values and monitoring*) of the Wild Salmon Policy. Note about table headings: “Process Elements” were extracted from Wild Salmon Policy’s description of each Action Step (pages 16-23). “Expected Outputs and Outcomes” were inferred from this text.

Action Step	Policy Commitments			Current Implementation Status
	Process Elements	Expected Outputs	Expected Outcomes	
1.1 Identify Conservation Units (CUs)	<p>Consult with First Nations</p> <p>Delineate geographic boundaries</p> <p>Peer review through PSARC</p> <p>Revise CUs based on peer review</p>	<p>Initial CUs within BC and the Yukon for all species of wild salmon (CUs may change over time as knowledge grows / data improves)</p> <p>Documentation of how CUs were delineated (methods and data used)</p>	<p>Clear understanding among DFO, other natural-resource management agencies, FNs, and stakeholders of what and where CUs are for each species, why they are important, and how to use them</p>	<p>DFO is admittedly behind on this strategy. Developing CU methodology has taken longer than anticipated and has held up other aspects of policy. Delay is partially due to insufficient resources (i.e., staff with the required expertise) as well as there being more CUs (~ 400) than previously suspected.</p> <p>The methodology for delineation of CUs was submitted to PSARC for peer review and was accepted pending a few minor revisions. As of September 20, 2007, those revisions had not been completed.</p> <p>PLANNED NEXT STEPS: Finalize list of CUs and allow for one week of internal review before releasing to public. A final list of CUs is expected to be released by the end of October 2007. The website that will host the list of CUs, including other pertinent information, is already up and running. DFO does not plan to hold a formal consultation of this final list. The list of CUs is viewed as an evolving list that will take into account better scientific knowledge and feedback through an ongoing process.</p>
1.2 Develop criteria to assess CUs and identify benchmarks to represent biological status	<p>Establish criteria to be used to set numerical benchmarks for each CU</p> <p>Consult with FNs and others regarding risk tolerance to help set benchmarks</p> <p>Apply criteria to set quantitative benchmarks that delimit Green, Amber, or Red status in each CU</p> <p>Prepare and publish operational guidelines for estimating the level within the Red zone at which further mortality would lead to further declines in spawner abundance and increase probability of extirpation</p>	<p>Two quantitative benchmarks (upper and lower) for each CU</p> <p>Published guidelines for how to estimate Red zone at which further mortality would lead to decline in spawner abundance and increase probability of extirpation</p>	<p>Clarity regarding the meaning behind status-assessment results for each CU</p> <p>Faster, consistent, and comprehensive assessment of status and trends in wild salmon across BC and the Yukon</p>	<p>A stock-assessment framework has been completed detailing the process by which existing data and information for a CU is gathered / collated, and subsequently used to identify priority CUs. Priorities will be a function of how a CU ranks against Wild Salmon Policy objectives and degree of certainty in knowing whether the objective is being met (i.e., if data are poor, level of certainty will be low). Indicators for each objective have been proposed and all indicators have been qualitatively ranked by importance. Document release was planned for November 2007. A second planned product is an interactive web site where the public can interact with data available for each CU and rank CUs using the same methodology, but with their own ranking of objectives (release date unknown).</p> <p>PLANNED NEXT STEPS: To develop appropriate monitoring design and suite of benchmarks, it is necessary to first identify what type of data / information are available for a given CU and what its priorities are.</p> <p>Once information types and priorities for a CU are known it will be possible to define benchmarks. It is not known how long it will take to complete this task for each CU.</p> <p>DFO will work with academics (e.g., Sean Cox, Randall Peterman, Carl Walters, etc.) to develop novel metrics to assess variation between populations within a CU (i.e., how is the total return to a CU distributed among populations?).</p> <p>DFO plans to author a white paper in collaboration with academia on how to assess minimum standards, appropriate benchmarks, and stresses for a given CU. The intention is to have this methods-orientated paper submitted to PSARC for peer review.</p>

Returning Salmon: Integrated planning and the Wild Salmon Policy in B.C.

Action Step	Process Elements	Expected Outputs	Expected Outcomes	Current Implementation Status
1.3 Monitor and assess status of CUs	<p>Establish monitoring plan to maintain long-term information fundamental to salmon management locally</p> <p>Design a statistically based and cost-effective monitoring plan for each CU that includes spawner abundance and distribution, measured in units consistent with benchmarks for that CU</p> <p>Obtain peer review of monitoring plan</p> <p>Apply monitoring program in each CU</p> <p>Document plan and report on results</p> <p>Conduct a detailed assessment of impacts and restoration potential as input to Strategies 2 & 3 if CU is in Red zone (maybe also if in Amber zone)</p>	<p>Assessment results for each CU compared with its two benchmarks</p> <p>Annual reports of the monitoring results for each CU</p> <p>Input to Strategies 2 and 3 if the CU is in the Red zone (and possibly also if it is in the Amber zone)</p>	<p>Improved understanding of status of wild salmon across BC and the Yukon</p> <p>Improved understanding of where management interventions are required</p> <p>More effective use of management efforts and resources</p> <p>Improved status of wild salmon</p>	<p>No progress on this action step to date; steps 1.1 and 1.2 must be completed first.</p> <p><u>PLANNED NEXT STEPS:</u> Develop a set of monitoring guidelines and protocols to be used across similar CUs (i.e., not all CUs can / will be assessed in the same manner; however, CUs with similar attributes should be assessed using the same framework). These guidelines will help develop appropriate monitoring and stock assessment design for each CU. This task will likely involve First Nations input.</p> <p>Intention is to roll out a pilot project in the spring for Fraser sockeye (all relevant sockeye CUs in Fraser River) to see how all elements in Strategy 1 work together on-the-ground.</p>
Potential Implementation Opportunities and Challenges for Action Step 1				
<p><u>OPPORTUNITY:</u> Partner with local First Nations, communities, and environmental NGO (ENGO) groups in a meaningful way to develop monitoring programs. If DFO is able to bring in groups to assist with developing the monitoring design and subsequently implement it, there will be great potential for buy-in and learning for all parties.</p> <p><u>CHALLENGE:</u> Data gaps, particularly for weaker / smaller stocks that have not been historically monitored. It is not known how these data gaps will be filled.</p> <p><u>CHALLENGE:</u> Defining lower benchmarks may be contentious for some CUs; it may be difficult to garner agreement.</p> <p><u>CHALLENGE:</u> Remoteness of the Central Coast makes it difficult and expensive for DFO staff to access; consequently, the department has not developed as strong a presence in the area with local groups and is not as familiar with local environment.</p> <p><u>CHALLENGE:</u> Lack of funds may be a substantial barrier to on the ground implementation of CU-specific monitoring and assessment. The department is financially constrained to meet current monitoring and stock-assessment needs, let alone what may be required under the Wild Salmon Policy.</p> <p><u>CHALLENGE:</u> Engaging First Nations, ENGOs, and community groups to participate in monitoring programs that satisfy Wild Salmon Policy needs will be a challenge, particularly when groups have pre-existing programs that are tailored to meeting their own specific needs. Working with other groups will, however, be essential for successful implementation.</p> <p><u>CHALLENGE:</u> Disseminating scientific information about CU status in a clear and meaningful way to the public and other interested parties. Adhering to DFO guidelines on how information is presented (e.g., French language requirements, etc.).</p>				

Action Step	Policy Commitments			Current Implementation Status
	Process Elements	Expected Outputs	Expected Outcomes	
2.1 Document habitat characteristics within CUs	<p>Assemble information from multiple sources at appropriate geographic scales</p> <p>Describe habitat conditions (including those supporting or limiting salmon production) in each CU</p> <p>For each CU, prepare an overview report providing sufficient information on key habitats to identify initial priorities for protection, rehabilitation, and restoration; information gaps; and factors that potentially threaten future health and productivity of habitats</p>	<p>Overview report on key habitat characteristics for each CU</p> <p>Initial guidance on habitat protection and planning priorities in Strategies 4 and 5</p>	<p>More effective use of management efforts and resources</p> <p>Better watershed planning with FN governments, industry, stewards, and other jurisdictions</p> <p>Improved understanding of salmon habitats</p>	<p>DFO has developed a template Habitat Status Report (HSR) forming the basis of reporting for CUs. Draft reports have been prepared for a subset of salmon species / watersheds (e.g., Englishman, Nicola, Harrison, Big Salmon, Nanaimo, Coldwater, Gold, and Kluane Rivers, as well as Trembleur Lake).</p> <p>Habitat data for HSRs can be provided by a variety of sources: DFO, provincial agencies, First Nations, NGOs, etc. Given limited data, DFO will not be able to prepare an overview of habitat characteristics for all CUs (expecting ~400 across region). Intention is to focus on a subset of priority areas. HSRs will be informed by habitat indicators and benchmarks (see step 2.2).</p> <p>DFO has developed and is testing an interactive database to compile quantitative data and expert opinion for watersheds across the region (see Watershed Prioritization System www.compassrm.com/wps). This data model allows for watershed prioritization based on subjective information from DFO staff and local stakeholders. Tool has been tested, but not populated with data from all areas.</p> <p>PLANNED NEXT STEPS: DFO is determining the best way to communicate technical habitat status information and indicator data to non-technical audiences.</p> <p>Looking to apply habitat status reporting and indicator data to pilot areas representing different geographic regions and salmon life history strategies. Intention is to work collaboratively with other organizations to implement pilot projects.</p>
2.2 Select indicators and develop benchmarks for habitat assessment	<p>Select indicators on a watershed scale to assess the quality and quantity of habitats identified in step 2.1</p> <p>Ask government agencies, FN governments, watershed-planning processes, and stewardship groups for advice in developing indicators for their watersheds</p> <p>Develop benchmarks to reflect desired values of each key indicator</p>	<p>A set of habitat indicators for each CU</p> <p>A benchmark for each indicator</p>	<p>Clarity regarding definition of good wild salmon habitat</p> <p>Clarity regarding the desired future state of wild salmon habitat</p>	<p>DFO has drafted a two-tier framework for using indicators in decision making. Intention is to apply pressure indicators (representing stressors on the habitats) broadly across the landscape to identify highly disturbed / stressed watersheds. Status indicators (representing habitat condition) would then be applied to inform decision makers about specific condition of habitats and to be a trigger for proactive DFO management.</p> <p>DFO developed an initial list of habitat indicators for streams, lakes, and estuaries. A practical assessment of indicators evaluated availability of existing data, temporal / spatial relevance, and cost of future data collection. An additional report reviewed appropriate metrics and benchmarks.</p> <p>PLANNED NEXT STEPS: OHEB and Science Branches are reviewing consultant's indicator recommendations to decide on appropriate indicators, metrics, and benchmarks.</p> <p>DFO intends to engage experts from the Pacific Northwest in a scientific review to finalize habitat indicators.</p>

Returning Salmon: Integrated planning and the Wild Salmon Policy in B.C.

Action Step	Process Elements	Expected Outputs	Expected Outcomes	Current Implementation Status
2.3 Monitor and assess habitat status	<p>Implement ongoing monitoring to identify changes in habitat condition over time</p> <p>Assess effectiveness of regulatory decisions and rehabilitation measures</p> <p>If declining habitat quality or quantity is detected, identify causes and appropriate response measures to consider as part of an integrated management plan for the CU</p>	<p>Regular determinations of CU habitat status</p> <p>Identification of (a) important habitat in need of protection to maintain salmon productivity; (b) habitat risks and constraints adversely affecting that productivity; (c) areas where habitat restoration or rehabilitation would be desirable; and (d) where investigations are needed to fill information gaps</p>	<p>Improved understanding of status and trends in wild salmon habitat across BC and Yukon</p> <p>Improved understanding of relationship between changes in habitat condition and changes in salmon production and distribution</p> <p>Responses to declining habitat quality or quantity</p> <p>More effective regulatory decisions and rehabilitation measures</p>	<p>South Thompson CU has been identified as a pilot area across which pressure indicators have been calculated for multiple time periods.</p> <p>Through Fraser Salmon Watersheds Program, DFO has asked for a review of potential governance models that could be used to oversee, design, and implement a harmonized monitoring program across organizations (see Day 2007). DFO likes the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) in the US as a model for collaborative monitoring (www.pnamp.org/web/Content.cfm?SectionID=8).</p> <p><u>PLANNED NEXT STEPS:</u> Contemplating application of indicators to Barkley and Clayoquot Sounds area using FISS information for sockeye. Looking at ways to better integrate habitat and ecosystem indicators. Developing a more detailed vision for a Harmonized Monitoring Committee that integrates information needs across organizations in the region.</p>
2.4 Establish linkages to develop an integrated data system for watershed management	<p>Promote the design, implementation, and maintenance of a linked, collaborative system to increase access to information on fish habitat status</p>	<p>A more unified salmon habitat data system</p>	<p>Improved information sharing</p> <p>Faster assessment and reporting of wild salmon habitat status</p> <p>Ability to identify and address cumulative changes in habitat and population status</p>	<p>Vision has been developed for how Wild Salmon Policy will integrate with OHEB business areas (e.g., watershed planning, risk-management framework, Species at Risk, habitat compensation and restoration priorities, project referrals, etc.).</p> <p>Lots of work remains. DFO recognizes there are many relevant data management systems; need to avoid redundancies. Generating paper habitat reports will not be practical for WSP. Intention is to develop a web-based and spatial system that stores and reports data products (e.g., maps of CUs or summary of watershed statistics).</p> <p>DFO has developed a web based mapping application currently undergoing testing.</p>

Potential Implementation Opportunities and Challenges for Action Step 2

OPPORTUNITY: Partnerships will be essential to successful implementation (i.e., on-the-ground monitoring and reporting of status and trends). Which other organizations are interested and able to be involved in habitat monitoring (SEHAB, MCC, FNs, federal / provincial agencies)? What funding resources available to support habitat monitoring (e.g., PSC, PSF, Fraser Salmon Watersheds, Moore Foundation)?

OPPORTUNITY: Link with other watershed prioritization systems / decision support tools (e.g., Environmental Process Modernization Plan (EPMP) / risk-management framework, Ministry of Environment Watershed Evaluation Tool, Nature Conservancy Canada's watershed threats assessment tool).

CHALLENGE: Coordinating with province to provide a central data warehouse / repository for region and sharing cost of data collection. For instance, many parties within provincial and federal government may benefit from having watershed statistics updated. Cost across all parties could be affordable, but it will be difficult to coordinate sharing. Limitations in funding will affect monitoring design (i.e., spatial / temporal extent and number of indicators for monitoring).

CHALLENGE: Determining approach to identify priority areas for conservation across entire region given limitations in funding and availability of habitat status data (require identifying areas with high values or limiting factors). Broad-scale watershed comparisons are necessary. Based on a fixed cost, is it better to apply a few pressure indicators across the entire region or more indicators across a smaller area? Are there logical groupings to assess CU habitat pressures and status (e.g., cluster of CUs, by ecoregion)?

Areas with few pressures (e.g., Central Coast) and good habitat condition may be missed as conservation opportunities if both pressure and status indicators are not applied broadly across the region. DFO may need to work through other avenues to prioritize efforts in these areas (e.g., work with province and industry to intervene in other ways to achieve no net loss policy). Data on population status (Strategy 1) will affect watershed prioritization. Watershed prioritization will affect Integrated Planning (Strategy 4).

CHALLENGE: Integrating WSP objectives within provincial regulatory framework. Province has regulatory control over land-use activities. Can DFO have an influence on these processes?

CHALLENGE: Gaining local knowledge about watershed (e.g., restoration priorities are typically determined using expert opinion and data from DFO science, habitat, NGOs, FNs, etc.). There is a need for a transparent and consistent process for integrating quantitative and qualitative data.

CHALLENGE: Testing habitat indicators on the ground. Are they cost-effective and operational? Does monitoring actually provide decision makers with the appropriate information?

CHALLENGE: Responding to indicators with management actions. Will DFO, or collaborative partners, respond to declining or low indicator status with management actions to reverse trends?

Action Step	Policy Commitments			Current Implementation Status
	Process Elements	Expected Outputs	Expected Outcomes	
3.1 Identify indicators to monitor status of freshwater ecosystems	<p>Use existing data and expert advice to identify key indicators of current and potential state of lake and stream ecosystems</p> <p>Develop an ecosystem monitoring and assessment approach</p> <p>Coordinate implementation of this approach with monitoring of CU status (step 1.3), habitats (step 2.3), and marine conditions (step 3.2)</p>	<p>Ecosystem indicators (biological, physical, chemical) of lake and stream ecosystems (diversity of organisms, rates of biological production, etc.)</p> <p>An approach for ecosystem monitoring and assessment</p> <p>A description of knowledge gaps and areas requiring further research</p>	<p>Improved understanding of status and trends in lake, stream, estuary, and marine ecosystems and how this changes with changes in status of salmon and salmon habitat</p> <p>Progressive consideration of ecosystem values in salmon management</p> <p>Improved ecosystem health in watersheds with wild salmon</p>	<p>DFO is admittedly behind on this strategy, which covers aspects not originally included in early versions of WSP (was uncertainty regarding how to include ecosystem aspect).</p> <p>Three workshops have been held pertaining to Strategy 3 over the past three years, the most recent of which were regional workshops, in Seattle and at UBC. While they validated Strategy 3 as an important part of the WSP and provided useful information (e.g., clarifying First Nations' values; identifying useful tools), significant progress on indicator identification has remained elusive. There is a growing realization of the reason for this: to identify meaningful indicators, it is necessary to first identify ecosystem objectives and values, and then identify how to achieve these objectives. This process would provide the context for determining the best indicators (i.e., it doesn't make sense to go straight to indicators without these other steps first).</p> <p>DFO is currently in the process of developing a White Paper that will: (a) identify ecosystem objectives and values, (b) identify how to achieve these objectives (i.e., management prescriptions), and (c) identify indicators. It is scheduled to be completed by early 2008.</p> <p><u>PLANNED NEXT STEPS:</u> Hold a "knowledgeable persons" workshop to review the White Paper and refine a list of objectives, prescriptions, indicators, and the means by which to measure indicators. A subset of workshop participants would then convene a Knowledgeable Persons Panel (KPP). Their goal would be to come up with a draft Ecosystem Assessment Framework for BC and Yukon, which would then be subject to wider consultation.</p> <p>At the workshop, participants would also try to work out a strategy for meeting with regional representatives, and identify a front person for the KPP who would be tasked with identifying and establishing a relationship with regional people.</p> <p>DFO is trying to set up "indicator areas"; ecosystems where they can initiate some work. Currently working on one in Strait of Georgia (not the Central Coast). This effort would be part of a bigger research strategy, but they are trying to link Strategy 3 into it.</p>

Returning Salmon: Integrated planning and the Wild Salmon Policy in B.C.

Action Step	Process Elements	Expected Outputs	Expected Outcomes	Current Implementation Status
3.2 Integrate climate and ocean information into annual salmon-management processes	<p>Integrate freshwater-monitoring programs (step 3.1) with programs investigating variability in climate and ocean conditions</p> <p>Participate in development of programs to monitor and study climate and ocean conditions, and programs to relate variations in freshwater and marine ecosystems</p> <p>Continue to contribute to State of the Ocean reports, and link these to assessments of marine survival of Pacific salmon</p>	<p>Testing of step-wise framework and selection criteria for evaluating proposed ecosystem indicators (part of a national ecosystem initiative)</p> <p>Identification of ecosystem objectives and values, and management prescriptions to achieve these objectives (as well as indicators to monitor status).</p>	<p>Improved understanding of production dynamics</p> <p>Better management of Pacific salmon</p> <p>Improved understanding of consequences of ocean and climate changes on salmon production</p> <p>Further implementation of Canada's Oceans Strategy, which recognizes the need to better understand ecosystem dynamics, including climate variability and impact of change on living marine resources</p>	<p>Progress is largely reflected in DFO's annual State of the Pacific Ocean report produced by the Fisheries and Oceanographic Working Group under the guidance of the Pacific Science Advisory Review Committee (PSARC). Previous years' reports had several contributions dealing with ocean climate indicators and inferences regarding the likely significance for salmon production in general and strength of returns expected in various years from 2007 to 2009. Dr. Kim Hyatt's group contributed a section summarizing multidecadal trends and what is currently known about cause-and-effect mechanisms driving return variations for sockeye index stocks associated with each of five distinct freshwater-ocean production domains along the BC coast. Based on both time-series trends and several biophysical indicators, they concluded that returns for sockeye throughout the South Coast would be strongly sub-average in 2007. They also noted the existence of a south-to-north cline in return strength over the past 20 years. Further development of the sockeye salmon and biophysical time-series data sets is currently underway and will be reflected in the next State of the Oceans Report. The State of the Oceans report is available on the Canadian Science Advisory Secretariat (CSAS) links found on DFO's national Internet site.</p> <p>Published the Salmon Chapter for the PNCIMA Overview. While DFO has largely focused its PNCIMA Overview work on marine and continental shelf areas – i.e., the Large Ocean Management Area (LOMA) – the overview chapter on status and trends of Pacific Salmon is a notable exception as it deals both with the LOMA and the Large Aquatic Management Area (LAMA) composed of the many coastal watersheds that various life-history stages of Pacific salmon also inhabit.</p> <p><u>PLANNED NEXT STEPS:</u> Begin a synthesis of multivariate data sets for other species (further to the first point above) as time and resources permit.</p>

Potential Implementation Opportunities and Challenges for Action Step 3

OPPORTUNITY: B.C.'s Biodiversity Strategy, currently being developed by B.C. Conservation Lands Forum Conservation Planning Tools Committee (CPTC), is proceeding in parallel with WSP implementation. DFO has been working informally with CPTC, but coordination has been minimal to-date (i.e., no harmonization). Since wild salmon make up one aspect of the broader biodiversity in B.C. (and a public profile), greater harmony / cooperation / coordination between WSP and B.C. Biodiversity Strategy may provide an excellent opportunity for implementation of Strategy 3. Greater harmonization might help address capacity shortfalls, and minimize consultation burnout.

OPPORTUNITY: Link with the Coast Implementation program, which is implementing the North and Central Coast land-use decision and agreements between the Province of B.C. and participating First Nations, using an ecosystem-based management (EBM) approach.

It would be very useful for DFO to know: What is unique on CC? What are appropriate ecosystem objectives? Which indicators are others looking at? With whom should they speak? What are the current agreements, collaborations, initiatives, and activities in the CC that are relevant to WSP?

OPPORTUNITY: Province is moving toward results-based outcomes, and B.C. Ministry of Environment is moving toward a more shared stewardship model; both should increase collaborative opportunities and facilitate cooperation.

OPPORTUNITY: Take a more integrated approach to dealing with LAMA and LOMA elements of PNCIMA ecosystem (as was done for salmon chapter). Includes developing a better understanding of interactions among natural and anthropogenic forces controlling ecosystem integrity in LOMA and LAMA.

OPPORTUNITY and CHALLENGE: Many federal / provincial initiatives trying to develop ecosystem indicators (e.g., national Ecosystem Status and Trends Assessment). DFO would like to build on what others have developed. Past efforts to collaborate with other federal agencies have had limited success.

CHALLENGE: Barriers to capitalizing on above opportunities (and barriers to making progress on a fixed schedule) include the lack of formal agreements (mentioned in the previous column) or, in the absence of such agreements, high-level direction to cooperate / coordinate; the logistical challenges of harmonizing schedules, budgets, etc.; and the lack of capacity and resources.

CHALLENGE: Strategies must be completed sequentially. Strategies 1 and 2 need to happen first, as they tie into 3 and 4. For example, CUs must be known before meaningful habitat and ecosystem objectives can be identified.

CHALLENGE: Ecosystems are complex, and different CUs will operate at different scales, adding another level of management complexity. Dealing with complexity takes time. This is exacerbated by the problems regarding the capacity to successfully implement the WSP.

CHALLENGE: Insufficient involvement early on with habitat management, harvest management, and stakeholder groups whose support is needed. Extremely challenging for an agency to implement policies entering areas outside of their authority (e.g., if other levels of government need to buy in), particularly if they were not involved in creating policy. While WSP states DFO's intent, and openly acknowledges cooperation with others is needed, it was not developed jointly with FNs or the Province of B.C. They were included in some of the dialogue, but this is different from agreement (e.g., through an MOU) or a joint commitment. This barrier is significant. Implementation of the WSP will require major engagement by B.C., which controls key elements of habitat (freshwater and forest resources). By its nature, Strategy 3 implies cooperation.

CHALLENGE: Strategy 3 objectives are high-level statements, and must be articulated more specifically before identifying performance indicators. WSP commits to managing salmon by acknowledging important ecosystem linkages. While extremes are easy to identify, it will be more challenging to find objectives that fall between extremes. Objectives, by nature, will be a further distance from body-politic thinking, making implementation a further challenge.

Table 2. Synthesis of challenges (see Table 1) associated with implementing Strategies 1, 2, and 3.

Challenge grouping	Description of challenges
Decision-making authority [DMA]	<p>Working with other government agencies, ENGOs, First Nations, and communities will be essential for successful WSP implementation, particularly in areas beyond DFO's jurisdiction. WSP was not developed in partnership with any of these groups, and there are no formal agreements to jointly implement the WSP (nor is there any high-level direction from these groups to cooperate / coordinate). This poses some of the largest challenges. For example:</p> <ul style="list-style-type: none"> • B.C. has regulatory control over land-use activities, and its own provincial regulatory framework. Can WSP objectives be integrated within this framework? Can DFO influence this? Implementation of the WSP will require major engagement by B.C., which controls key elements of habitat (freshwater and forest resources). • How to engage other groups in monitoring that satisfies WSP needs if they already have their own programs that are tailored to meet their own specific needs?
State of knowledge [SoK]	<p>The state of science is a challenge. For example:</p> <ul style="list-style-type: none"> • There are data gaps, particularly for weaker / smaller stocks that have not been historically monitored. It is uncertain how these data gaps will be filled. • WSP commits to managing salmon by acknowledging important ecosystem linkages. While extremes are easy to identify, identifying objectives falling between extremes will be difficult. Such objectives, by nature, will be further removed from body-politic thinking, making implementation a further challenge. <p>Clarifying societal values in the form of objectives is also a challenge. For example:</p> <ul style="list-style-type: none"> • Defining lower benchmarks may be contentious for some CUs, making it difficult to reach agreement. • Ecosystem objectives (necessary for identifying ecosystem indicators; see below) will be influenced by more than just the science, but also by social goals and values, which in most cases are not clear, or at least not yet clear enough to articulate as specific, measurable objectives. <p>Knowledge type is another issue: the WSP is western science approach and there is great uncertainty about how to bring in Traditional Knowledge in a meaningful way.</p>
Technical [Tech]	<p>There are technical challenges relating to geography. The remoteness of the Central Coast makes it difficult and expensive for DFO staff to access; consequently, the department has not developed as strong a presence in the area with local groups and is not as familiar with local environment.</p> <p>There are technical challenges relating to data acquisition, validation, and management. For example:</p> <ul style="list-style-type: none"> • As many parties within the provincial and federal government may benefit from having watershed statistics updated, it might be wise to coordinate with B.C. to provide a central data warehouse/repository for each region, and share the cost of data collection. However this will be difficult to coordinate. • A transparent and consistent process is needed for integrating quantitative and qualitative data to ensure incorporation of local knowledge about watershed. • Habitat indicators must be tested to determine if they are cost-effective and operational, and if they provide decision makers with the appropriate information. <p>There are challenges regarding watershed prioritization. Areas with few pressures (e.g., Central Coast) and good habitat condition may be missed as conservation opportunities if both pressure and status indicators are not applied broadly across the region. Determining the best approach to identify priority areas for conservation across entire region is a further challenge given limitations in availability of habitat status data (and funding limitations; see Capacity issues below).</p> <p>The WSP strategies are largely sequential: much of Strategies 1 and 2 needs to happen first, as they tie into 3 and 4.</p> <p>The WSP objectives are very high level, and must be articulated more specifically and prescriptively before performance indicators can be identified.</p> <p>The challenges of harmonizing schedules, budgets, etc. are a barrier to coordinating, collaborating, or partnering with others.</p>
Capacity [Cap]	<p>Capacity is a significant challenge. Few DFO staff are assigned to WSP. Policy implies new research, but there are no new funds. Limitations in funding will affect monitoring design, particularly CU-specific monitoring and assessment. Existing monitoring and stock-assessment efforts are already constrained. Limited funds also affect the approach to identifying priority areas for conservation, necessitating choices about whether to apply a few pressure indicators across the entire region or more indicators across a smaller area; or about whether to cluster CUs to assess habitat pressures and status.</p> <p>This lack of capacity is a barrier to coordinating, collaborating, or partnering with other organizations, and also exacerbates some of the other challenges listed above.</p>

Challenge grouping	Description of challenges
Communication and awareness [C&A]	<p>There has been more outreach regarding the WSP to outside groups than within DFO, resulting in a lack of clarity within the department about the WSP intent and content, and about how it will play out on the ground (e.g., what does the policy mean for general fishery exploitation levels?).</p> <p>Some communities may be experiencing consultation burnout, resulting from too many similar but separate initiatives.</p> <p>Expectations within DFO regarding implementation timelines may not be realistic. Skepticism exists within the department regarding the feasibility of implementing the WSP quickly. Ecosystems are complex, and different CUs will operate at different scales, adding another level of management complexity. Dealing with complexity takes time.</p> <p>There are logistical challenges with disseminating scientific information (e.g., about CU status) in a clear and meaningful way to the public and other interested parties, and adhering to DFO guidelines on how information is presented (e.g., French language requirements, etc.).</p>

Table 3. Alignment of implementation opportunities from Table 1 against the challenge groupings from Table 2. Note the following abbreviations: DMA – Decision making authority, SoK – State of knowledge, Tech – Technical, Cap – Capacity, and C&A – Communication and awareness.

Description of opportunity	Related challenge grouping				
	DMA	SoK	Tech	Cap	C&A
Provincial government is moving toward more results-based outcomes, and B.C. Ministry of Environment is moving toward a more shared stewardship model – both of which should increase interest in collaborative opportunities and facilitate cooperation among federal-provincial organizations.	✓				
Build on ecosystem indicator work by other federal / provincial initiatives.		✓		✓	
Partner with other government agencies, local First Nations, communities, and environmental NGO (ENGO) groups in a meaningful way to develop monitoring programs and leverage funding resources. If DFO is able to bring in groups to assist with developing the monitoring design and subsequently implement it, there will be great potential for buy-in and learning for all parties.	✓	✓	✓	✓	
Coordinate with the province to provide a central data warehouse / repository for the Central Coast region. This could provide two benefits: updating watershed statistics for a variety of uses, and cost-sharing (greater affordability) across all parties.	✓	✓		✓	
Link with other watershed prioritization systems / decision support tools (e.g., Environmental Process Modernization Plan (EPMP) / risk management framework, Ministry of Environment Watershed Evaluation Tool, Nature Conservancy Canada's watershed threats assessment tool).			✓	✓	
Cooperate with B.C.'s Biodiversity Strategy, currently being developed by the B.C. Conservation Lands Forum Conservation Planning Tools Committee (CPTC). May be a great fit, since wild salmon are one aspect of the broader biodiversity in B.C. (and have some degree of public profile), greater harmony / cooperation / coordination between WSP and B.C. Biodiversity Strategy may provide an excellent opportunity for implementation of Strategy 3. Greater harmonization between initiatives might also help address some capacity concerns, and minimize consultation burnout by communities.	✓			✓	✓
Link with the Coast Implementation program, which is implementing the North and Central Coast land-use decision and agreements between the Province of B.C. and participating First Nations, using an ecosystem-based (EBM) management approach.	✓			✓	

3. Clarifying Emerging Issues

3.1 Integration

Emerging from the summary and synthesis of information in Section 2 was a deeper understanding that the ability to overcome the five groups of challenges in Table 2 depends in large part on the success with which DFO is able to integrate the Wild Salmon Policy with other science and management activities across the Pacific Region.

Our understanding is that “integrated” implies a holistic approach to science and management, focusing on the big picture and interactions among many components rather than focusing on individual parts (as implied by the complementary nature of Strategies 1, 2, and 3). From a science perspective, integration might include greater consideration of linkages among salmon and marine, freshwater, and terrestrial ecosystems. From a management perspective, integration might include greater collaboration among government agencies when making regulatory decisions or collecting environmental data. Strategy 4 – *Integrated Strategic Planning* – provides guidance for developing these kinds of integration opportunities. Although the Policy outlines some expected outcomes (long-term strategic plans) and a process (five-step planning procedure) for Integrated Strategic Planning, it does not provide answers to two fundamental questions:

What does “integrated” mean?

What should be integrated?

Early clarity around the answers to these questions is crucial because successful implementation of Strategies 1, 2, and 3 relies on this information. Implementation of Strategy 4 can not follow or be developed independently of these earlier strategies. Thus, a first priority issue emerges: integration.

We believe the intent of Strategy 4 is for DFO to improve integration within existing science activities and decision-making processes, both internally and externally. In the near term, Action Step 4.1 – *Implement an interim process for management of priority CUs* – specifies that integration will build on existing processes, including Integrated Fisheries Management Plans². In the longer-term, Action Step 4.2 – *Design and implement a fully integrated strategic planning process for salmon conservation* – prescribes for the design and implementation of a fully integrated strategic planning process for salmon conservation, requiring inputs from Strategies 1, 2, and 3, specifically Action Steps 1.3, 2.3, 2.4, 3.1, and 3.2.

Insights can be drawn from several examples of managing salmon, fish, and water resources across British Columbia and Canada:

- (1) **Integrated Fisheries Management Plans (IFMP)** discuss allocations of salmon in consideration of alternative needs (conservation, First Nations, recreational, and commercial), gear types, species, and populations of interest (DFO 2007).
- (2) **Skeena Salmon Review** represents a recent joint effort involving Fisheries and Oceans Canada and the province of British Columbia, working in cooperation with the Skeena First Nations, harvest sectors, and other public interests, and drawing upon the advice of the Skeena Independent Science Review Panel (SISRP) to ensure best available science and traditional ecological knowledge are being

² Fisheries and Oceans Canada. See 2007 Salmon Management Plans available at: <http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/MPLANS/MPlans.htm#Salmon>

used to inform watershed governance, planning, and management for the Skeena River and its salmon (John Reynolds, Simon Fraser University, personal communication).

- (3) **Integrated Salmon Forum** provides a collaborative opportunity for all interests to work toward a fully integrated sustainable salmon fishery, while respecting the Wild Salmon Policy and serving both people and salmon. Priority topics include: a) compliance and monitoring, b) clarifying access / defining shares, c) integrated river and resource management, and d) clarifying objectives for regional / provincial discussions (Sigurdson and Stuart 2007).
- (4) **Watershed-Based Fish Sustainability Planning (WFSP)** provides a framework for bringing different interests (e.g., local stewardship groups, First Nations, government agencies) together and coordinating conservation and restoration of fish habitats in British Columbia (Greer 2001).
- (5) **Integrated Water Resource Management (IWRM)** provides a framework for water resource decision making that considers interdependencies among human (e.g., agriculture, power generation, human consumption) and ecosystem (e.g., fish, wildlife, riparian) needs (Shrubsole 2004).

Across these examples, integration commonly implies a need to consider multiple ecosystem components, achieve greater collaboration and cooperation among management organizations and stakeholders, decrease redundancies, ensure decision making is based on best available science, and improve efficiency and effectiveness so that policy actions achieve desired outcomes. Although there are many ways to integrate more holistically, common themes can be identified. One of the most thorough summaries emerges, not surprisingly, from the discipline of ecosystem management. Grumbine (1994) reviewed a variety of primary literature and identified 10 “Dominant Themes of Ecosystem Management”.

These themes are useful because they help define what integration means by providing clarity around what should be integrated (see Table 4). For instance, discussions about “*interagency cooperation*” might focus on opportunities for improving integration of information needs, monitoring resources, and decision-making authority among federal, provincial, and First Nations governments (i.e., what are the opportunities and resulting priorities for interagency cooperation?). Alternatively, discussions about “*monitoring*” integration might focus on priority questions and hypotheses, environmental indicators, available data, spatial and temporal sampling designs, and statistical approaches to analyzing data (i.e., what does a harmonized monitoring design look like technically?). For these two examples it would be helpful to separate discussions so that each involves the appropriate audience and focuses on issues over which participants have some influence. It is also important to recognize that integration discussions in one theme are dependent on results of discussions in others. For instance, discussions among senior managers about what types of interagency cooperation are most feasible or appropriate would likely need to happen before other managers and field biologists discuss collaborative opportunities for sampling across agencies. Likewise, it would be important for senior managers to know what collaborative opportunities exist on the ground prior to approving any specific interagency cooperation. Thus, a logical sequence (discuss *interagency cooperation* before *monitoring*), parallel processing (discuss *interagency cooperation* and *monitoring* independently at the same time), or iteration of discussions (iteratively discuss *interagency cooperation* and *monitoring*, where each discussion builds on past events) within and across themes may be necessary.

Without a clear definition of integration and clarity about the themes being integrated, a concern is that integration will happen in an ad hoc manner, resulting in outcomes that are marginally different than when applying a non-integrated approach. The success of integration should be measured both by its methods (i.e., actions, approach, or process) and its results (i.e., outcomes or products). Given the intended purpose and concerns around integration, the following questions are considerations for evaluating integration success and focusing on the best opportunities:

How many ecosystem components and linkages are being considered?
Have scientific understanding, institutional capacity, and available resources increased?
How many “themes of integration” have been considered?
How many opportunities for integration have been identified and acted upon?
What is the level of collaboration among scientists, planners, and decision makers?
How many redundancies have been avoided / remain?
What is the level of efficiency in implementing policy actions?
Are policy actions more effective in achieving desired outcomes?

Table 4. Dominant themes of integration relevant to Strategy 4 of the Wild Salmon Policy. Adapted from Grumbine (1994).

Domain of integration	Theme of integration	Description	Example of integration
Science integration	Hierarchical context	A natural system can be viewed as functioning at a range of nested biological scales (e.g., genes, individuals, populations, ecosystems, landscapes).	Evaluating the diversity, distribution, and abundance of salmon populations in the context of genetic diversity of a sample of individuals.
	Ecological boundaries	Spatial and temporal boundaries of a natural system vary depending on the species, populations, ecosystem, or administrative / political bodies of interest.	Developing monitoring designs that recognize unique spatial / temporal boundaries for multiple species of management interest.
	Ecological interactions	Natural systems function through a complex web of interactions among biophysical components. These interactions determine the diversity, distribution, abundance, composition, and functioning of its interacting parts. Humans influence natural systems through cause-effect pathways that are traceable through this web of interactions.	Managing salmon escapement in the context of its influence on reliant freshwater, terrestrial, and marine species.
	Monitoring	Collection of data through baseline, implementation, effectiveness, and validation monitoring improve our understanding of natural and human systems.	Collecting environmental data across different management agencies using consistent sampling procedures so data can easily be aggregated / analyzed across organizations.
	Disciplines	A natural system can be explained from a variety of academic disciplines / perspectives (e.g., natural science, social science, economics, or policy).	Using multi-disciplinary approaches to solve resource problems (e.g., economic analyses that incorporate biological limits to production).
Management integration	Interagency cooperation	A variety of actors (e.g., resource users, stakeholders, government agencies, and non-governmental organizations) play a role in managing a natural system. These actors have different roles and responsibilities at different levels of decision making (e.g., Figure 3).	Improving cooperation and sharing of data, staff, financial resources, and decision-making authority across federal, provincial, municipal, and First Nations governments.
	Social values	Values differ among actors / interests involved in resource management. Societal values recognize that humans are embedded in nature, being both reliant on healthy ecosystems and affecting ecosystem health.	Developing resource-management goals that are consistent with other potentially conflicting resource uses (e.g., salmon and forest management).

3.2 Decision-making

Given a need to clearly understand what *integrated* means and what should be integrated under Strategy 4, the next emerging question is:

Why are we integrating?

We believe a clear understanding of decisions – as directed by legislative, regulatory, legal, or policy instruments, among other sources – is fundamentally important to understanding motivations for integrating within and across domains of science and management. The U.S. Environmental Protection Agency explicitly recognizes the importance of using decisions to help design monitoring programs through its Data Quality Objective Process (see US EPA 2000; 2006). Thus, a second priority issue emerges: decision-making.

Within the domain of science, knowledge and data provide the basis to understanding the complex web of interactions among human activities (e.g., land-use activities) and valued ecosystem components (e.g., Pacific salmon habitats). This knowledge can be used to help provide a rationale for deciding upon appropriate environmental indicators, monitoring locations and sampling frequencies, or methods for analyzing environmental data. As well, such data are needed to inform many other on-the-ground decisions with which DFO is involved (e.g., setting salmon exploitation levels, approving development projects, enforcing penalties under the Fisheries Act, etc.). However, bringing data to decision making requires translating technical information in a way that can easily be understood by non-technical audiences. Data can be presented in a variety of ways, the form of which depends on the audience needing that information for decision making (Figure 3).

Within the Wild Salmon Policy, Strategies 1, 2, and 3 provide the scientific foundation to understanding salmon populations, their freshwater habitats, and reliant marine, freshwater, and terrestrial ecosystems. The intention is that these components of the Policy will provide the framework for collecting and reporting the data needed to inform “on-the-ground” decisions. Given the variety of decisions in which DFO is involved across the Pacific Region and the number of agencies and organizations participating in related decision making, the process of bringing scientific information to decision makers requires significant integration between scientists collecting raw data and decision makers relying on that information.

Strategy 4 provides the outline for how science in Strategies 1, 2, and 3 will be passed onto decision makers. To facilitate better integration, we believe that clarifying the context of decision making will help bring seemingly disparate interests together. In fact, Strategy 4 explicitly requires inputs from Strategies 1, 2, and 3, specifically Action Steps 1.3, 2.3, 2.4, 3.1, and 3.2. Thus, resource-management decisions provide a unifying link between science (i.e., collection of environmental data) and management (i.e., use of those data to make decisions). In particular, clarifying the context of decision making can help integrated planners understand:

Which legislative, regulatory, legal, or policy instruments are driving decision-making?

Which agencies and organizations are leading or participating in a decision?

Which scientific linkages need to be represented to decision makers (through data) and in what form?

What management objectives are these decisions intended to achieve (i.e., desirable social, economic, and/or biological conditions)?

Over which actions do decision makers have some level of control (i.e., actions having adverse ecosystem stressors) or beneficial influences (restoration options)?

What are the consequences of alternative decisions?

Having answers to these questions will then help identify areas of overlapping responsibility and similarities in data requirements, among other opportunities for science and management integration.

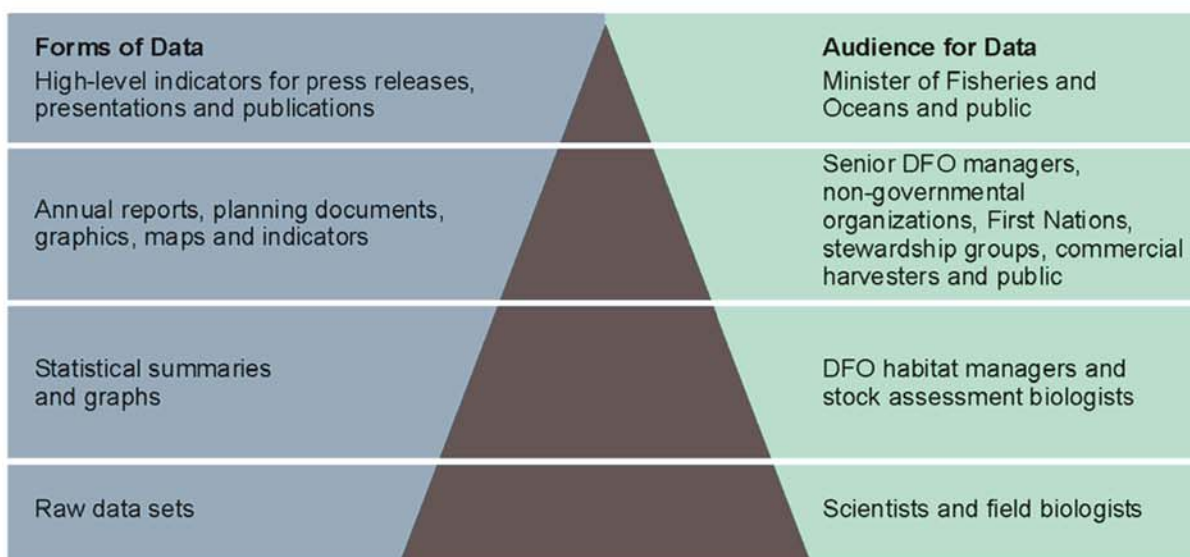


Figure 3. Conceptual illustration of the different ways of aggregating data (left side) and different audiences relying on those data for decision making (right side). Adapted from State of Washington (2004).

4. Identifying Opportunities for Integration on the Central Coast

On the Central Coast, a variety of monitoring initiatives are currently being undertaken by government agencies, non-governmental organizations, First Nations, and academia. Recent marine and land-use agreements have resulted in a number of planning initiatives, directing what happens on the ground. As well, a large number of relevant federal and provincial legal, regulatory, or policy instruments guide operational planning and decision making today.

Collectively, these activities provide a number of opportunities with which DFO could better integrate and implement the Wild Salmon Policy. Such opportunities relate to the two domains presented in Table 4: science and management integration. The domain of science integration relates to themes of understanding and monitoring natural systems, while management integration refers to themes representing the way people and governments make decisions affecting natural systems.

Below we (a) review relevant activities and operational decision on the Central Coast as organized under these two domains of integration, and (b) summarize opportunities for integration under one of the seven themes of integration. This section is intended to briefly describe examples and provide a high-level context for DFO and others not familiar with activities on the Central Coast to understand potential opportunities for integration. It is not our intention to prescribe how integration should occur, in part, due to large uncertainties behind future stages of Policy implementation, a lack of understanding about local relationships needed to support integration, and insufficient knowledge about what is feasible or practical on the ground.

4.1 Science integration

4.1.1 Relevant monitoring activities

Research on ecosystem indicators by Simon Fraser University (SFU) represents a potential opportunity to integrate with indicator development as part of Strategies 2 and 3 (Action Steps 2.2, 2.3, and 3.1), as well as setting population benchmarks under Strategy 1 (Action Step 1.2). Dr. John Reynolds and members of his lab are currently conducting a long-term study of 50 small streams on the Central Coast. The study involves carrying out extensive biodiversity surveys to examine the linkages between salmon abundance and biodiversity. Comparisons among streams will be combined with large-scale experiments on the effect of salmon nutrients on salmon populations, as well as on other fish species, aquatic and terrestrial insects, riparian vegetation, reptiles, amphibians, birds, and mammals. This research serves two purposes. First, it helps advance our general understanding of the role of trophic cascades and feedback loops in ecosystem dynamics. Second, it should help inform more holistic management of salmon and their habitats – an objective that has been underscored as a high priority by local communities and conservation organizations and set out in the Wild Salmon Policy.

The same group is conducting another relevant study in the Fraser River basin on 40 streams in the Takla Lake and Thompson River watersheds: 14 streams within the Shuswap / Thompson area; 26 streams around Takla Lake. This research involves examining a large number of reference streams representing a range of salmon densities and physical characteristics to test hypotheses for impacts of human activities on salmon populations and using a stable nitrogen isotope to trace salmon nutrients in the watershed. They are also undertaking a cost-benefit analysis of the effectiveness of using different various salmon

indicators for management, as well as developing simulation models to test current and future scenarios for land use and fisheries.

Population monitoring by Raincoast Conservation Foundation provides information that would directly benefit monitoring and assessment of Conservation Unit status under Strategy 1 (Action Step 1.3). From 2003 to 2006, the Raincoast Conservation Foundation led a small-streams survey on the Central Coast. The objective of the study was to document salmon presence in small streams in Heiltsuk Traditional Territory and other areas of the Central Coast. They hope to learn whether trends in abundance in individual small streams relate to overall catch in the area. Thus far, 121 streams previously undocumented for salmon and trout in DFO records have been identified as having salmonid presence. As well, 25 streams with known salmonid occurrence have been documented to have trout and salmon species that were previously unrecorded. Their surveys build on local knowledge and create an improved inventory of salmon resources. These surveys have also identified important components of salmonid diversity and nutrient movement in the ecosystem. Data are hosted by the State of the Salmon Program³.

Raincoast, in collaboration with Dr. John Reynolds of SFU, is also investigating the relationship between nutrient loads and returning spawner abundance. As part of this project, lake-core studies have been conducted on Owikeeno Lake, which was historically an important sockeye system. As well, Raincoast is involved in developing a migration mapping model for juvenile fish on the coast to identify valuable estuary habitats.

Monitoring and stewardship project by Round River Conservation Studies provides an example of how to improve integration linkages among local stewards, salmon populations, and their habitats as related to Strategy 4 (Action Step 4.2). Round River is currently involved in a monitoring and stewardship project on the Central Coast in collaboration with the Heiltsuk Nation⁴. This initiative complements the ecosystem-based management plans emerging from the Central Coast by addressing how these plans may be implemented and deployed on the ground. This project highlights the divide between high-level conceptual and on-the-ground application of EBM. Specifically, their conversations with the Heiltsuk have led them to conclude that a division exists between those working at the planning and policy scales of the Great Bear Rainforest initiative and those ultimately responsible for stewardship in the Great Bear – the coastal First Nations. Consequently, goals of the Round River project are to (a) support broader implementation of EBM by linking Heiltsuk efforts with GBR-wide EBM implementation and institutions, and (b) replicate systems and approaches using pilot projects with other First Nations. As part of this initiative, Round River will engage in the development of integrated monitoring and adaptive management in Heiltsuk land-use decision making and building the capacity with Heiltsuk community to undertake this work.

Operational decisions guided by federal and provincial agencies clarify the context and the reasons for management organizations to integrate under Strategy 4 (Action Steps 4.1 and 4.2). There are a host of relevant instruments guiding on-the-ground planning and decision making on the Central Coast, many of which also apply more broadly across the province. Table 5 describes these instruments with a summary of related decisions, lead and participating agencies, and key information requirements. Note this list is not exhaustive, having been developed to reflect a Central Coast context. For this reason some instruments have intentionally been excluded (e.g., riparian area regulations). This table can be used to identify opportunities for both science and management integration, though the summary of information requirements (last column in the table) is intended to help clarify opportunities for science integration.

³ State of Salmon. Raincoast Conservation Foundation: Small Stream Surveys. Available at: <http://www.stateofthesalmon.org/raincoastdb.asp>

⁴ Round River Conservation Studies. Coast Watch Program. Available at: <http://www.roundriver.org/coastwatch.html>

Table 5. Some instruments guiding operational decisions on the Central Coast that are potentially relevant to the Wild Salmon Policy.

Guiding regulatory, legal, or policy relevant to WSP	Lead jurisdiction	Operational decision(s)	Organizations involved in decision-making	Key information requirements and/or data sources for making operational decisions
Integrated Fisheries Management Plans for Salmon (Northern and Southern B.C.)	Federal	<p>Pre-season</p> <ul style="list-style-type: none"> Initial openings Escapement targets Exploitation ceilings Enforcement objectives <p>In-season</p> <ul style="list-style-type: none"> Opening and closure of fisheries Level of effort deemed acceptable Gear type restrictions Deployment of special projects Level of appropriate enforcement Decisions to open Excess Salmon to Spawning Requirements fisheries 	<p><u>Leading:</u> DFO</p> <p><u>Participating:</u> Salmon harvest-management advisory boards (North and South) comprising Area Harvest Committees, Commercial Salmon Advisory Board and Sport Fish Advisory Board, and the Pacific Marine Conservation Caucus</p>	<p>Forecast and actual numbers returning, as well as timing of return, co-migration with other stocks and strength of those stocks</p> <ul style="list-style-type: none"> <u>Pre-season:</u> Forecasted returns, planning, and fish observed to be schooling in front of systems. <u>In season:</u> Catch monitoring, escapement surveys, test fisheries, and forecasting of run sizes. Weather, capacity of fishery, and on-the-ground assets need to be known for in-season decisions. <u>Post season:</u> Post-season evaluations using indicators such as catches, escapement, fishing effort, and harvest rates to see if goals / targets were met.
<p>Pacific Salmon Treaty (PST)</p> <p>Directly affects Total Allowable Catch (TAC) DFO is managing in any given year</p>	International / Federal	<ul style="list-style-type: none"> Area, gear, and regional stock/species specific fishery opening and closure timing to meet Canadian fisheries TAC levels under the treaty. <p>On the Central and North coasts the treaty limits net pink salmon catch in portions of Area 3, troll pink catch along the AB line strip along international boundary with Alaska, and the northern troll / Queen Charlotte Island chinook sport fishery</p>	<p><u>Leading:</u> Pacific Salmon Commission (PSC) (advisory role to each country), Northern Panel (provides PSC with recommendations for fishery for salmon originating in rivers between Cape Suckling, AK, and Cape Caution, B.C.), Technical Committees (provide panels with timely scientific advice), and DFO (provides regulatory approval/implementation)</p>	<p>Canada's allocated quota share of stocks that fall under the jurisdiction of the PST, as well as catch levels of those stocks in season to ensure quota is not surpassed:</p> <ul style="list-style-type: none"> DNA samples obtained by troll test fisheries and dockside monitoring used to identify percentage component of the regional stock (e.g., West Coast Vancouver Island chinook) prior to, during, and after the fishery. Treaty obligations require catch accounting to ensure TAC for a given regional stock is not exceeded.
<p>An Allocation Policy for Pacific Salmon</p> <p>Order of priority: (1) conservation, (2) First Nations (FN), (3) sport and commercial fisheries</p>	Federal	<ul style="list-style-type: none"> Allocations to each user group in a specific fishery Guides decisions on when to open a fishery for each group (e.g., openings dependent on allocation priority) Guides decisions on species retention by different groups <p>Allocation decisions in order to meet first priority will likely need to change under WSP. For example allocation is now done based on aggregate abundance for a region and not stock-specific abundance</p>	<p><u>Leading:</u> Pacific Licensing and Allocation Board (advice and recommendations to the Minister); and DFO (ultimate discretion lies with the Minister of Fisheries to approve Board's decisions)</p>	<p>Percentage of allocation attained by each group:</p> <ul style="list-style-type: none"> <u>In-season:</u> Catch monitoring, escapement surveys, and re-forecasting of run sizes. <u>Post-season:</u> post-season evaluations utilizing indicators such as catches, escapement, fishing effort, and harvest rates to see if allocation priorities met.

Guiding regulatory, legal, or policy relevant to WSP	Lead jurisdiction	Operational decision(s)	Organizations involved in decision-making	Key information requirements and/or data sources for making operational decisions
A Framework for Improved Decision Making in the Pacific Salmon Fishery	Federal	Intention of the policy is to streamline, increase transparency and predictability, and coordinate operational decisions mentioned above under the Integrated Fisheries Management Plans – Salmon, Northern and Southern BC	<u>Leading:</u> DFO <u>Participating:</u> Salmon harvest management advisory boards (North and South)	
A Policy for Selective Fishing	Federal	<ul style="list-style-type: none"> When to implement requirements for selective fishing (gear type, retention, etc.) Classification of stock dictates level of catch monitoring and enforcement DFO is required to do 	<u>Leading:</u> DFO	Regional stock status, to inform appropriate classification <ul style="list-style-type: none"> <u>Pre-season:</u> Forecasted returns and planning. <u>In-season:</u> Catch monitoring, escapement surveys, test fisheries, and re-forecasting of run sizes. Weather, capacity of fishery, and on-the ground assets also affect in-season decisions. <u>Post-season:</u> post-season evaluations utilizing indicators such as catches, escapement, fishing effort, selective fishing reduced catch of regional stock in question.
Species at Risk Act (SARA)	Federal	<ul style="list-style-type: none"> Listing of species Where fishery openings and closures for commercial, sport, and First Nations (FN) would be tailored to prevent capture of listed stock(s) Issuance of special waivers to allow harvest Identification and protection of critical habitat 	<u>Leading:</u> Environment Canada <u>Participating:</u> DFO, Parks Canada, and BC Ministry of Environment (first opportunity for protection of critical habitat falls to province through a conservation agreement or provincial law).	Stock and habitat status, to inform listing decisions and recovery plans, recognition of impacts limiting recovery, and recovery strategies to improve population and habitat status.
Aboriginal Fisheries Strategy (AFS)	Federal / First Nations	<ul style="list-style-type: none"> Fishing plans for food, social, ceremonial fisheries Decisions related to administration, monitoring, and enforcement of fisheries Aboriginal fisheries openings Issuance of communal licence reflecting provisions in Comprehensive Fisheries Agreement 	<u>Leading:</u> DFO and local First Nations <u>Participating:</u> British Columbia Aboriginal Fisheries Commission	FN in-season monitoring and catch data, in areas where DFO manages the fishery and where land-claims settlements have not already put a fisheries-management regime in place.
First Nations Final Agreements (i.e., Treaty Agreements)	First Nations	<ul style="list-style-type: none"> Fishing plans for food, social, ceremonial fisheries Decisions related to administration, monitoring, and enforcement of fisheries Aboriginal fisheries openings 	<u>Leading:</u> Participatory First Nations (e.g., Nisga'a and Yukon) and DFO	FN in-season monitoring and collection of catch data.
Fisheries Act (<u>New Bill under review</u>) s 35.1 and 35.2 – HADD s 36.3 – Deposit of deleterious substances	Federal	<ul style="list-style-type: none"> Whether to authorize work to proceed as proposed, with modifications, or not at all Inspection and enforcement activities 	<u>Leading:</u> DFO (enforcement of s 35.1 and 35.2) and Environment Canada (enforcement of s 36.3)	<ul style="list-style-type: none"> Details of the proposed activities, including mitigations and habitat compensation. Characteristics of the fish habitat at risk. Results from compliance monitoring and effectiveness evaluations.

Guiding regulatory, legal, or policy relevant to WSP	Lead jurisdiction	Operational decision(s)	Organizations involved in decision-making	Key information requirements and/or data sources for making operational decisions
Policy for the Management of Fish Habitat	Federal	<ul style="list-style-type: none"> Determination of whether the proposed work will lead to HADD, and the anticipated severity Determination of habitat sensitivity, sufficiency of proposed mitigative or compensation measures, and achievement of no net loss guiding principles 	<u>Leading:</u> DFO	<ul style="list-style-type: none"> same as above.
Environmental Process Modernization Plan (EPMP): Operational Statements (OS) and Risk Management Framework (RMF)	Federal	<ul style="list-style-type: none"> Determination of whether the proposed work falls under an Operational Statement (OS) Determination of the risk rating of the proposed work (if not falling under an OS) 	<u>Leading:</u> DFO	<ul style="list-style-type: none"> If the work does not fall under an OS, sufficient information about the activity that is proposed around waterway(s) and the sensitivity of fish and fish habitat in order to classify the activity as low, medium, or high risk. Understanding of condition of habitats (e.g., by monitoring "results" of interest).
Canadian Environmental Assessment Act (CEAA)	Federal	<ul style="list-style-type: none"> Whether to provide support (funding, land, or approvals for licences, permits, etc.) to the project 	<u>Leading:</u> Canadian Environmental Assessment Agency administers the process; Responsible Authorities make decision.	<ul style="list-style-type: none"> Details of the proposed activities, including mitigations and habitat compensation. Characteristics of the environment in which the project will take place (e.g., by monitoring habitat condition). Potential environmental effects of the proposed activities (including HADD).
BC Environmental Assessment Act (BCEAA) May be harmonized with project review under CEAA if a project triggers both BC EAA and CEAA	Provincial	<ul style="list-style-type: none"> Whether the project is reviewable How the assessment will be conducted, and the terms of reference Whether an environmental assessment certificate should be issued 	<u>Leading:</u> Environmental Assessment Office leads EA, writes report, the Minister of Environment and the responsible Minister decide whether to issue a certificate <u>Participating:</u> Ministries with jurisdiction over potential impact areas	<ul style="list-style-type: none"> Details of the proposed activities, including mitigations. Characteristics of the environment in which the project will take place (e.g., by monitoring habitat condition). Potential environmental effects of the proposed activities.
BC Water Act, Water Regulation (currently being updated) Part 7 – Changes in and about a stream	Provincial	<ul style="list-style-type: none"> Whether to provide approval for changes 	<u>Leading:</u> BC Ministry of Environment, Environmental Stewardship Division (reviews applications) and Water Stewardship Division (gives final approval)	<p>Activity proposed around stream(s) and required protection measures</p> <ul style="list-style-type: none"> Information obtained from notification process and supporting documentation (i.e., habitat assessments, designs and plans for proposed works to determine effects of proposal on legal rights of downstream water licensees, channel stability, flood levels, as well as fish and wildlife resource values -- ecological flow needs).
Fish Protection Act s 6 – designation of sensitive streams s 7 – recovery plans s 9 – temporary reduction order	Provincial	<ul style="list-style-type: none"> If new licences, amendments, or work approvals for stream projects impact fish and fish habitat, water managers can deny application Does a temporary reduction order need to be issued? 	<u>Leading:</u> BC Ministry of Environment	Status of fish and fish habitat; past and expected future impacts, as well as an identification of sensitive streams.

Guiding regulatory, legal, or policy relevant to WSP	Lead jurisdiction	Operational decision(s)	Organizations involved in decision-making	Key information requirements and/or data sources for making operational decisions
Forest and Range Practices Act (FRPA) s 149 – objectives for resources including fish and fish habitat s 150 – regulations to protect watersheds and designate fisheries sensitive watersheds Forest Planning and Practices Regulation s 8 and 9 – Stewardship Plans	Provincial	<ul style="list-style-type: none"> Approval of Forest Stewardship Plans (FSPs, which describe, in part, intended location and area of harvest) Determination of the need to recommend a strategy or result to prevent adverse impacts on fish habitat 	<p><u>Leading:</u> BC Ministry of Forests and Range; and BC Ministry of Agriculture and Lands</p> <p><u>Participating:</u> Stakeholders (Industry, NGOs, First Nations, etc.).</p>	<p>Need to know fisheries values, degree of forestry, and potential effects on fish and fish habitat.</p> <ul style="list-style-type: none"> Reliance on information from professional experts. Industry, landowners, and professional experts prepare Forest Stewardship plans and strategies to provide the results set out in new legislation. Required to address objective if minister responsible for the Wildlife Act, the Minister of Environment, or delegate, notifies the person of the applicable species and indicators of the amount, distribution and attributes of the wildlife habitat applicable to the objective. Independent Forest Practices Board occasionally monitors/reports on the Forest Stewardship Plans.
Forest Planning and Practices Regulation (under FRPA) s 7 – Objectives set by government for wildlife (includes species at risk) s 8.1 – Objectives set by government for fish habitat in fisheries-sensitive watersheds	Provincial	<ul style="list-style-type: none"> Ensure that cumulative hydrological effects of primary forest activities in fisheries-sensitive watershed do not result in material adverse impacts on habitat and fish species of interest 	<p><u>Leading:</u> BC Ministry Forests and Range <u>Participating:</u> Minister responsible for Wildlife Act, Minister of the Environment</p>	as above.
Government Actions Regulation (under FRPA) s 14 – Fisheries sensitive watersheds (FSW) s 15 – Temperature sensitive streams (TSS)	Provincial	<ul style="list-style-type: none"> FSW designations are intended to ensure “special management” to (1) conserve natural hydrological conditions (quality, quantity, and timing of water flow), streambed dynamics, and stream-channel integrity, and (2) prevent cumulative hydrological effects that would have an adverse effect on fish TSS designations are intended to maintain streamside shading to manage temperatures for protection of fish 	<p><u>Leading:</u> BC Ministry Forests and Range (reviews / approves FSPs) and BC Ministry of Environment (proposes designations)</p>	<p>Need to know fisheries values and thresholds for acceptable disturbance, degree of forestry, and potential effects on fish and fish habitat.</p> <ul style="list-style-type: none"> Reliance on information from provincial scale information to understand above. Industry, landowners, and professional experts prepare Forest Stewardship plans and strategies to achieve established objectives for designated areas.
Land Act 2004 Amendments	Provincial	<p>Determine whether Forest Stewardship plans in North and Central Coast (amendments have not yet been signed off):</p> <ul style="list-style-type: none"> Maintain natural variation in water quality and quantity Maintain ecological function in high value streams Maintain ECA at < 20% Retain forest cover to maintain stream integrity Protect riparian zones Alter no more than 1% riparian area Have 90% retention of natural vegetation in riparian Maintain 70% forest cover in upland watersheds 	<p><u>Leading:</u> BC Ministry of Agriculture and Lands; Integrated Land Management Bureau</p>	<p>Fisheries values within a watershed, the degree of forestry activity, and potential effects on fish and fish habitat.</p> <ul style="list-style-type: none"> Reliance on information from professional experts. Industry, landowners, and professional experts prepare Forest Stewardship plans and strategies to provide the results set out in new legislation

4.1.2 Opportunities for integration

Monitoring: Traditionally, DFO has focused its attention on monitoring larger salmon stocks targeted by commercial and recreational fisheries. In contrast, the non-government community has focused on monitoring smaller streams and fish populations. Given this difference, it seems the small-stream focus, ongoing population-abundance surveys, and mapping of previously unknown salmon-bearing streams fill an existing gap in DFO's salmon-monitoring program on the Central Coast, which has historically focused on larger hydrological systems. In light of the conservation focus of the WSP and the need to protect genetic diversity within a Conservation Unit, population monitoring, such as those conducted by Raincoast, SFU, and Round River, are extremely valuable and can assist in the successful implementation of the policy through the provision of baseline abundance and species-composition data for systems not currently monitored by DFO.

For these data to be most useful for WSP purposes, a perceived opportunity is that a central data repository, with an allowance for unrestricted access, needs to be created. This idea is consistent with Strategy 2, Action Step 2.4 – *Establish linkages to develop an integrated data system for watershed management* – though this other data system focuses on storing habitat data, not population data. Two strong reasons support the need for an integrated population-data system. First, data accessibility and sharing among groups, including DFO, would gradually promote greater consistency in the types of data collected across the region. Currently, usefulness of existing disparate data sets depends on data compatibility and ease of access. An integrated population data set would encourage interested individuals to improve data compatibility and availability for alternative analyses. Second, knowing what data are available will provide DFO and other groups with an improved ability to plan and focus monitoring on priority areas to complement existing data sets, eliminate redundancies, and identify and fill gaps in current monitoring designs. Such changes would benefit everyone by improving the efficiency and effectiveness in using limited resources for monitoring.

An integrated population data system would facilitate science integration such that ecological interactions can also be better studied where previously it was not possible due to finite resources for monitoring and paucity of data contained by any one group. For instance, annual monitoring of run-timing for populations in small streams that were previously undocumented will provide DFO with the data needed to adjust fishery openings, thereby allowing sufficient escapement for smaller populations to meet ecosystem and conservation needs.

In addition to the specific monitoring activities described above, there may be other opportunities for integration when considering the various regulatory, legal, and policy instruments guiding operational decisions on the Central Coast (Table 5). By looking at the information needs across instruments, we see common requirements at a high level. Table 6 groups instruments with common information needs into six categories, even though overlaps do not align perfectly due to different reporting mechanisms, jurisdictional boundaries, spatial and temporal scales, and focal ecological issues. Such distinctions are important to acknowledge, however, as they will set limits on potential levels of harmonization.

Table 6. Groups of information needs and the regulatory, legal, or policy instruments reliant on those data.

Common information needs	Regulatory, legal, or policy instruments reliant on this information
Pre-season forecast in abundance of <u>salmon populations</u>	<ul style="list-style-type: none"> Integrated Fisheries Management Plans for Salmon Pacific Salmon Treaty A Policy for Selective Fishing
In-season estimate in abundance of <u>salmon populations</u>	<ul style="list-style-type: none"> Integrated Fisheries Management Plans for Salmon Pacific Salmon Treaty (PST) An Allocation Policy for Pacific Salmon A Policy for Selective Fishing Aboriginal Fisheries Strategy (AFS) First Nations Final Agreements (i.e., Treaty Agreements)
Status and trends in abundance of <u>salmon populations</u>	<ul style="list-style-type: none"> Integrated Fisheries Management Plans for Salmon An Allocation Policy for Pacific Salmon A Policy for Selective Fishing Species at Risk Act (SARA) Fish Protection Act
Status and trends in <u>salmon habitats</u>	<ul style="list-style-type: none"> Species at Risk Act (SARA) Environmental Process Modernization Plan (Operational Statement and Risk Management Framework) Canadian Environmental Assessment Act BC Environmental Assessment Act Fish Protection Act
Details of proposed activities (stressors, mitigation, and compensation) affecting <u>salmon populations and their habitats</u>	<ul style="list-style-type: none"> Fisheries Act Policy for the Management of Fish Habitat Environmental Process Modernization Plan (Operational Statement and Risk Management Framework) Canadian Environmental Assessment Act BC Water Act Fish Protection Act BC Environmental Assessment Act
Understanding of fisheries values, extent of existing / proposed forestry, and potential effects on <u>salmon populations and their habitats</u>	<ul style="list-style-type: none"> Forest and Range Practices Act Forest Planning and Practices Regulation Government Actions Regulation Land Act 2004 Amendments

4.2 Management integration

4.2.1 Relevant planning initiatives

Central Coast Land Use Planning: This comprises a collection of instruments created to guide land-use decisions and land- and resource-management planning on the Central Coast. These instruments include:

Central Coast Land and Resource Management Plan (LRMP): Recommends consensus-based land-use strategies for the Central Coast (Figure 1). It was crafted over the course of a decade by representatives of the Province of B.C., First Nations, timber harvesters, environmental groups, and other stakeholders.

First Nations–Provincial Agreements: Also called government-to-government agreements (G2Gs), which establish commitments and frameworks for implementing land-use decisions on the

Central and North Coasts. These include a *Land and Resource Protocol Agreement* with the Coastal First Nations (CFN)⁵, the *Homalco Land and Resource Protocol*, and an *Agreement-in-Principle* with Nanwakolas Council (NC)⁶, as well as *Strategic Land-use Planning Agreements* (SLUPAs) between each participating First Nation⁷ and the province. The G2G discussions that resulted in these agreements were informed by recommendations in the LRMP.

Ministerial Orders (MOs): Document the specific ecological and cultural-management decisions agreed to by G2G signatories. Examples include the recent Ministry of Agriculture and Lands South Central Coast Ministerial Order (Ministry of Agriculture and Lands 2007), which legally establishes the South Central Coast Legal Land-Use Objectives.

Coast Information Team Ecosystem-Based Management Planning Handbook (also called the EBM Handbook): Signatories to the G2Gs have agreed to implement ecosystem-based management (EBM), defined for this purpose as “an adaptive, systematic approach to managing human activities, guided by the Coast Information Team EBM Handbook, that seeks to ensure the co-existence of healthy, fully functioning ecosystems and human communities”⁸. This Handbook provides guidance on how to implement an ecosystem-based approach to land and resource management in the planning area across a range of scales – from First Nations territories or the Central sub-region, through landscapes and watersheds, to individual sites (Coast Information Team 2004). The *Scientific Basis of Ecosystem-Based Management* and the *Hydroriparian Planning Guide* are two additional relevant Coast Information Team (CIT) instruments that were developed concurrently with the Handbook. In addition, an adaptive management framework is currently being developed to guide EBM implementation.

Detailed Strategic Plans: Pursuant to the Strategic Land Use Planning Agreements, these plans are currently under development by each First Nation. These plans may include a Sustainable Resource Management Plan and other area specific plans for landscapes, watersheds, and cultural areas consistent with EBM.

Pacific Region Integrated Management (IM): Canada’s Oceans Strategy calls for DFO to lead the development and implementation of plans for the integrated management of all activities affecting marine waters, coastal areas, and estuaries. As part of Canada’s Oceans Action Plan, DFO has identified five priority ocean-management areas across the country in which IM activities will be coordinated. In the Pacific Region, the priority IM area is called the Pacific North Coast Integrated Management Area (PNCIMA), which as shown in Figure 4, encompasses both the North and Central Coasts. It includes both a Large Ocean Management Area (LOMA) comprising 107,000 km² of estuaries, fjords, and open continental shelf seascapes; and a Large Aquatic Management Area (LAMA) containing a complex of freshwater habitats over 118,000 km² (Hyatt et al. 2007). The goal of PNCIMA is the development of a framework for addressing issues relating to the multiple use of marine areas, sustainability, and conservation (Hillier and Gueret 2007). A chapter on Pacific salmon has recently been drafted (Hyatt et al. 2007) demonstrating the importance of considering the LAMA in broader management.

Routine planning and management by federal and provincial government agencies: There are a host of relevant instruments guiding on-the-ground planning and decision making on the Central Coast, many

⁵ A coalition of First Nations of central and north coast, includes: Homalco, Wuikinuxv, Gitga’at, Haisla, Heiltsuk, Kitasoo/Xaixais, and Metlakatla.

⁶ A coalition of First Nations of the southern portion of the Central Coast, includes the following First Nations: Mamalilikulla-Qwe’Qwa’Sot’Em, ‘Namgis, Tlowitsis, Da’naxda’xw Awaetlatla, Gwa’sala-Nakwaxda’xw, Kwiahah, and Comox. All of the members of NC were previously members of a coalition known as KNT.

⁷ Gitga’at, Gitxaala, Haisla, Heiltsuk, Homalco, Kitasoo/Xaixais, Kitselas, Kitsumkalum, Metlakatla, and Wuikinuxv.

⁸ [http://ilmbwww.gov.bc.ca/lup/lrmp/coast/central_north_coast/docs/Full_Implementation_\(Final%20July%2010%202007\).pdf](http://ilmbwww.gov.bc.ca/lup/lrmp/coast/central_north_coast/docs/Full_Implementation_(Final%20July%2010%202007).pdf)

of which apply more broadly across the province. Table 5 describes these instruments with a summary of related decisions, lead and participating agencies, and key information requirements.

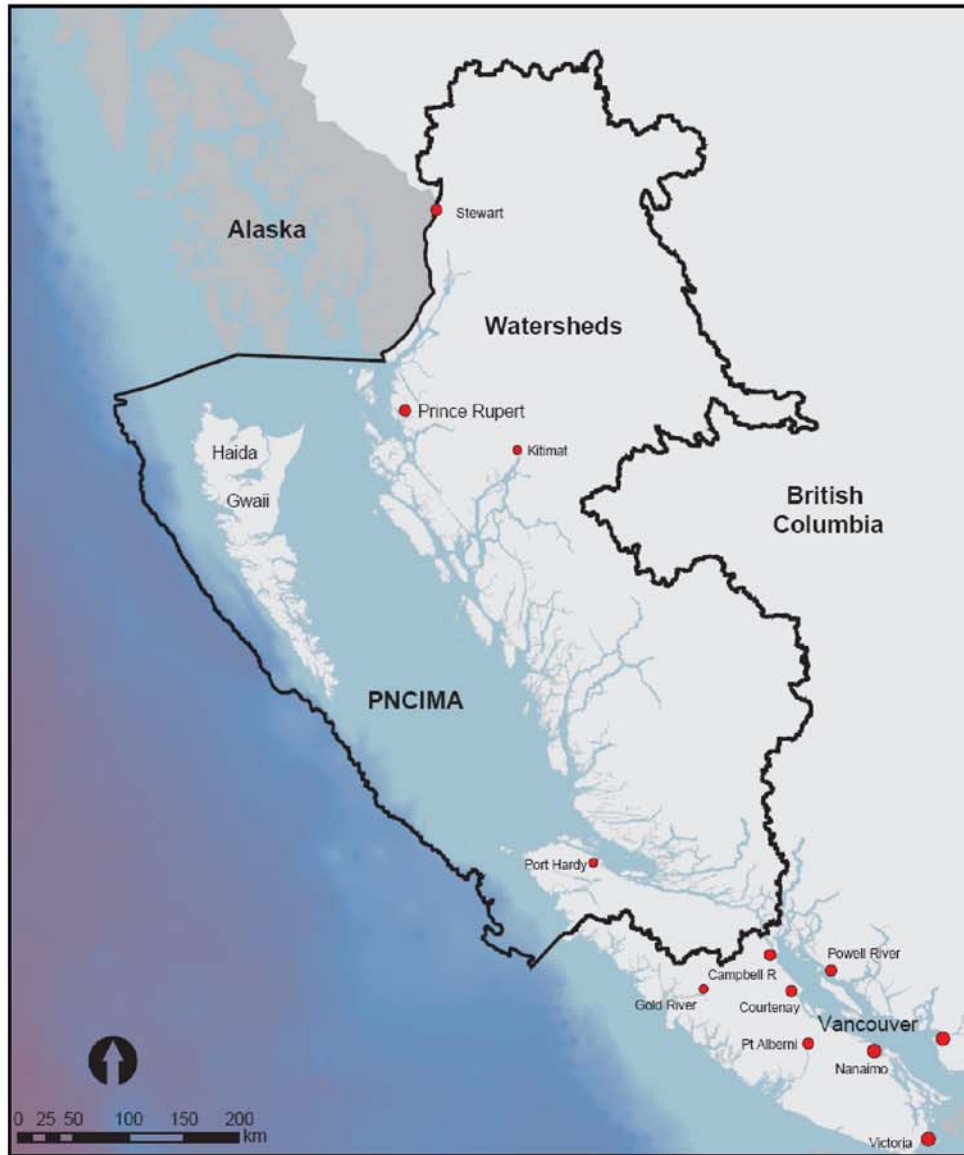


Figure 4. Geographic location and extent of the Pacific North Coast Integrated Management Area (PNCIMA).
Source: www.livingoceans.org/maps/pdfs/mp_pncima_nov06.pdf

4.2.2 Opportunities for integration

Interagency cooperation: The central coast land-use planning initiatives clearly call for cooperation and collaboration, given the number of instruments and participants and the commitment to EBM. They also have a pressing timeline, and may therefore provide the most immediate opportunity for collaboration. The G2G signatories have agreed to implement EBM by March 31, 2009. EBM implementation partners include the following groups:

Land and Resource Forums (LRF), comprising senior representatives of the G2G signatories, to ensure implementation of bilateral land and resource agreements and provide recommendations to

the participating First Nations and the province; specifically address land and resource management in the area covered by the Traditional Territories of the participating First Nations; and guide and monitor the implementation of the coastal land-use decisions, including further development and implementation of EBM. There are two LRFs for the Central Coast: the NC LRF for the southern portion, and the CFN LRF for the northern portion that extends into the North Coast. There is also a third, for the northern portion of the North Coast.

Central Coast Plan Implementation and Monitoring Committee (PIMC), comprising 12 to 15 members who can collectively represent all major resource-value perspectives in the Central Coast area, including local government and First Nations. Their purpose is to monitor and report progress toward implementation of the land-use plan and make recommendations on revising the plan to provincial and First Nation governments through the LRFs (Coastal First Nation and Nanwakolas Council Land and Resource Forums, or CFN and NC LRFs). The PIMCs report to the LRFs. There is also a PIMC for the North Coast.

Ecosystem-Based Management Working Group (EBM WG), comprising approximately 20 members representing First Nations and provincial government ministries, as well as industry, and economic and conservation interests. The WG develops recommendations on EBM research priorities and on the application of research results to the implementation of EBM, oversees research related to uncertainties or knowledge gaps in EBM implementation, and coordinates and manages data. The EBM WG reports to the LRFs. The EBM WG is currently developing an Adaptive Management Framework that will provide the main mechanism for implementing EBM in the Central and North Coasts.

The multi-organizational nature of these groups demonstrates the need for inter-agency cooperation to successfully implement EBM. There may be opportunities for DFO to engage and collaborate with partners involved in Central Coast EBM implementation by developing common goals both prior to and after the March 2009 deadline.

DFO's Integrated Management initiative, which includes PNCIMA, is defined as "*an ongoing and collaborative planning process that brings together interested stakeholders and regulators to reach general agreement on the best mix of conservation, sustainable use and economic development of marine areas for the benefit of all Canadians*".⁹ Therefore collaboration, and by inference integration, is an explicit part of the approach. However, PNCIMA unfortunately did not get subsequent funding under the Oceans Action Plan after the completion of the Ecosystem Overview, and attention is shifting instead to an Ecosystem Research Initiative in the Georgia Basin (Kim Hyatt, Fisheries and Oceans Canada, pers. comm.). Collaborative opportunities with this initiative depend on whether any further work will be done on PNCIMA in the future.

While we did not undertake an analysis of whether the instruments listed in Table 5 explicitly call for cooperation, the fact that most are federal or provincial and require multi-agency participation – all mandated to make decisions directly or indirectly relevant to salmon and salmon habitat – demonstrates the importance of cooperation and collaboration both within and among agencies at the provincial and federal levels. This supports observations made earlier in our research, regarding the need for cooperation between DFO and provincial agencies that have mandates over key components of salmon habitat.

Social values: The initiatives listed in Section 4.2.1 have objectives that, while not specifically mentioning salmon, directly pertain to fish, fish habitat, and freshwater ecosystems. Therefore, these initiatives are very relevant to the objectives of the WSP. Table 7 lists a sample of some relevant

⁹ http://www.pac.dfo-mpo.gc.ca/oceans/im/default_e.htm

objectives and indicators as identified in the Central Coast Land Use Planning instruments. In some cases these objectives represent overlapping or complimentary social values, which suggest there are obvious areas where collaboration would be beneficial, both for management and science integration.

Opportunities for integration with EBM initiatives on the Central Coast may be greatest where the EBM adaptive management (AM) framework and related monitoring intersects with objectives directly relevant to the WSP. Noteworthy are areas that have already been identified as Important Fisheries Watersheds (Figure 5), suggesting EBM and WSP values might best align in these geographic locations.

Finally, PNCIMA objectives not only align with the WSP goal and objectives; they explicitly call for cooperation and integration:

- Promote ocean management decisions based on shared understanding and appreciation of the ecological, cultural, and socio-economic characteristics of the PNCIMA;
- Design an integrated decision-making framework for management across sectors;
- Develop institutional arrangements that bring together governments, First Nations, user groups, and other interests, resource management, conservation, and economic development and enter into agreements on oceans management with specific responsibilities, powers, and obligations; and
- Contribute to social, cultural, and economic well-being for coastal communities and stakeholders (Hillier and Gueret 2007).

Table 7. A select list of objectives and indicators specified in Central Coast land-use planning instruments that relate to fish, fish habitats, and freshwater ecosystems.

Instrument	Objectives	Indicators
EBM Handbook	Territory / sub-regional scale: <ul style="list-style-type: none"> ▪ Protect and sustain freshwater and coastal zone aquatic ecosystems ▪ Protect and sustain high-value fish habitat 	<ul style="list-style-type: none"> ▪ Equivalent clearcut area (ECA) in all watersheds ▪ Salmon escapement ▪ % removal of riparian forest by ecosystem type
	Landscape / watershed scale: <ul style="list-style-type: none"> ▪ Protect critical and sensitive hydriparian ecosystems ▪ Maintain streamflow, channel characteristics, water quality within range of natural variability ▪ Maintain sustenance and recreational, hunting, fishing, and trapping opportunities 	<ul style="list-style-type: none"> ▪ ECA in watershed & initiation zone ▪ Index of road density/ECA in initiation zone ▪ % of riparian forest harvested in process zones ▪ % deviation from natural riparian forest by hydriparian ecosystem ▪ Streamflow, channel morphology, water quality ▪ Aquatic invertebrate diversity and abundance ▪ Fish harvest levels
	Site / stand scale: <ul style="list-style-type: none"> ▪ Protect sensitive hydriparian ecosystems ▪ Distribute stand-level retention as needed to meet hydriparian targets 	<ul style="list-style-type: none"> ▪ Process zone retention ▪ Channel morphology
MAL South Central Coast Ministerial Order (MO)	<ul style="list-style-type: none"> ▪ Protect important fisheries watersheds by maintaining an equivalent clearcut area of less than 20% in important fisheries watersheds (with exceptions noted in the MO) ▪ Protect high-value fish habitat¹⁰ by maintaining a reserve zone 1.5 times the height of the dominant trees 	None specified in the MO
CFN Land and Resource Protocol Agreement	Maintain water quality and quantity within the natural range of variability in identified anadromous fish-bearing and/or sensitive watersheds	ECA within the forested land base in each watershed
	Maintain the natural ecological function of streams, lakes, wetlands, and estuaries classified as high-value fish habitat	% reduction in the natural amount of old riparian forest within 1.5 tree lengths within streams, lakes, wetlands and estuaries classified as high-value fish habitat

¹⁰ Includes critical spawning / rearing areas for anadromous and non-anadromous fish, as well as estuaries, wet floodplains, and marine interface areas.

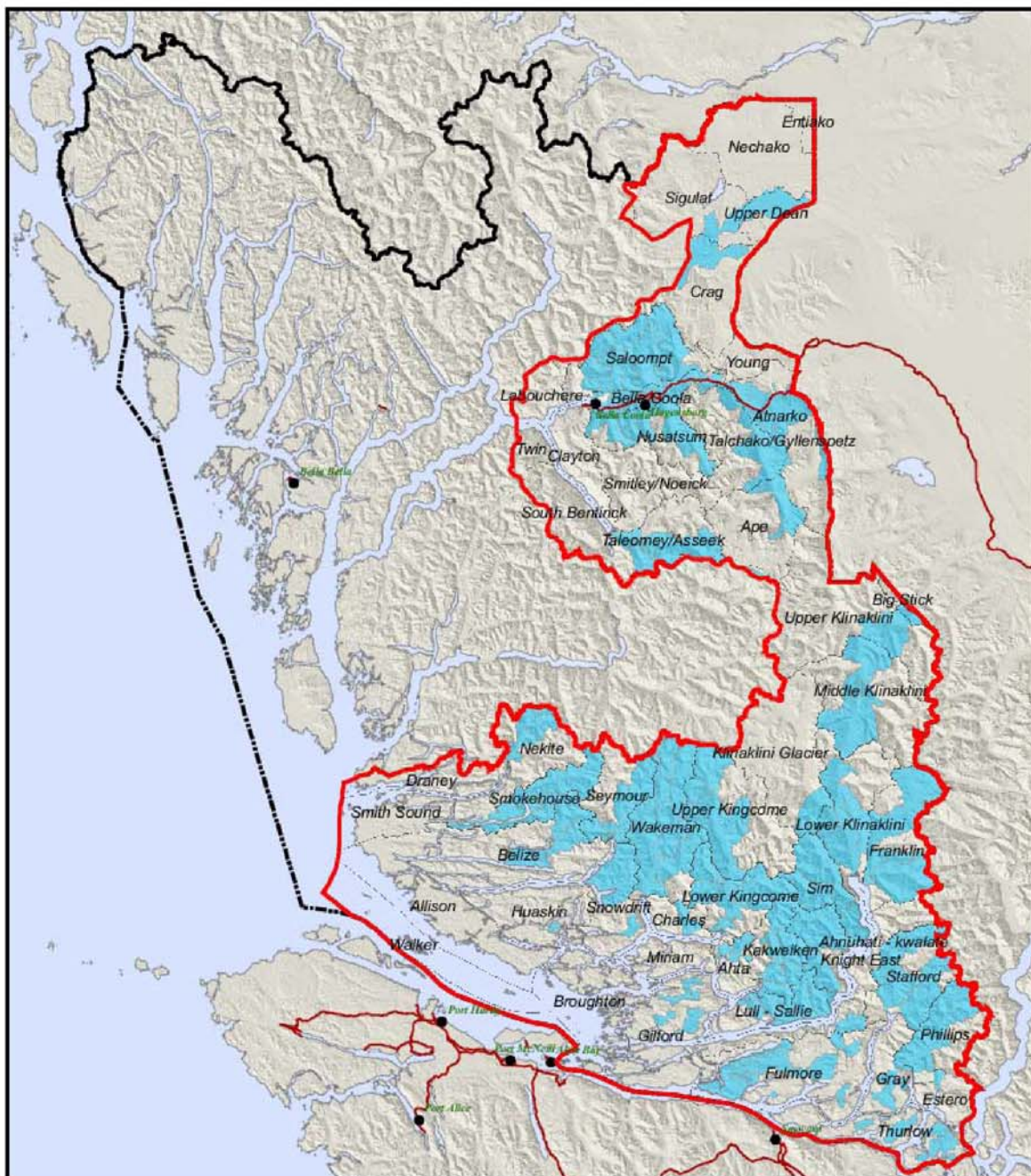


Figure 5. Important Fisheries Watersheds identified in 2007 Ministerial Order establishing South Central Coast Legal Land-Use Objectives (ilmbwww.gov.bc.ca/lup/lrmp/coast/cencoast/docs/schedule_2.pdf).

5. Improving Integrated Strategic Planning

The environmental, social, regulatory, and economic conditions facing salmon in the Pacific Region are changing rapidly. The Wild Salmon Policy provides a new proactive approach to managing salmon fisheries and the activities affecting their habitats. A hope implied by the Policy's goal is that it will help scientists and managers better cope with such changing conditions. Accompanying a strong need and high expectations are non-trivial challenges, however. Challenges emerge around "decision-making authority", given differences between those agencies having a direct regulatory responsibility over salmon and those agencies whose decisions affect salmon, but are not required to adhere to the Wild Salmon Policy. In some locations, the scientific, local, and traditional "states of knowledge" are limited, thus constraining the ability to implement specific action steps. "Technical" challenges refer to logistical difficulties in accessing remote areas for monitoring or conducting analyses that are technically credible in the face of large uncertainties and limited data. "Capacity" challenges refer to having too few staff or other resources to implement the necessary action steps. Finally, difficulties in "communication and awareness", both internally and externally, can lead to confusion about the implementation process and intended outcomes.

Emerging from our review of the current status of implementing Strategies 1, 2, and 3 was an understanding that the ability to overcome these types of challenges depends in large part on the success with which DFO is able to leverage opportunities and integrate the Wild Salmon Policy with other science and management activities across the Pacific Region. Strategy 4 – *Integrated Strategic Planning* – provides guidance for developing these kinds of integration opportunities. Early clarity around this Strategy is crucial because successful implementation of earlier Strategies relies on this information. To date, however, Wild Salmon Policy implementation has not provided answers to three fundamental questions that would provide the needed clarity:

What does "integrated" mean?

What should be integrated?

Why are we integrating?

In response to the first question, our understanding is that "integrated" implies a holistic approach to science and management, focusing on the big picture and interactions among many components rather than focusing on individual parts. Second, to help clarify what should be integrated, we identified two domains and seven themes of integration (Table 4). From a science perspective, integration could include greater consideration of linkages among salmon and marine, freshwater, and terrestrial ecosystems; greater coordination in developing monitoring designs across science agencies; greater recognition of the biological, spatial, and temporal scales at which different species function; or greater integration across disciplines of natural science, economics, and social policy. From a management perspective, integration could include greater coordination in the way social values are reflected by an agency's management objectives and related decisions, or greater collaboration among government agencies when making regulatory decisions. Third, we believe a clear understanding of decisions – as directed by legislative, regulatory, legal, or policy instruments, among other sources – is fundamentally important to understanding motivations for integrating within and across domains of science and management, and should be used as the basis for moving discussions forward.

With improved clarity around these questions, the feasibility of developing specific opportunities will depend on many factors: the types of resource-management decisions, specific organizations involved in discussions, and availability and compatibility of existing data, among others. Given the large number of

possible combinations of these factors, we believe there is no single best way of improving Integrated Strategic Planning; there are many pathways forward. Correspondingly, recommendations for improving integration cannot be prescriptive at this time. Thus, recommendations below emerge from our understanding of priority issues identified through this work specifically, and more generally through our experience working to improve integration around salmon and habitat management in the U.S. Columbia River Basin¹¹ and Trinity River, California¹². Although improved integration under Strategy 4 can contribute to resolving challenges identified in Table 2, it is not the only solution. Other actions, such as increasing number of staff dedicated to WSP implementation, improving communication and awareness within DFO, etc, may also be necessary. Moreover, implementing these other actions may be an essential first step to improving implementation of Strategy 4.

Recommendation 1: Uphold responsibility for facilitating integration. We believe success of the Policy, and ultimately in the conservation and restoration of Pacific salmon, will depend in part on the success with which integration occurs. Responsibility for successful integration is shared across interests affecting salmon and their habitats (e.g., federal and provincial agencies, First Nations, stewardship groups, industry, etc.). A shared responsibility for success, however, does not imply an equally shared responsibility for leading coordination or facilitating integration. A strong and identifiable champion is needed.

DFO's role in implementing Integrated Strategic Planning under the Wild Salmon Policy is unique among resource-management interests in B.C. Given directions under Strategy 4, DFO has the greatest responsibility among interests in leading Integrated Strategic Planning for the benefit of salmon. The effort required in taking a lead role will likely be offset by the benefit of it being more feasible to implement the Policy than DFO doing it on its own. Having DFO uphold its role as a leader and facilitator will be essential to: (a) improve clarity about what integrated means, what should be integrated, and why agencies are integrating; (b) coordinate across DFO's multiple responsibilities for managing salmon fisheries, habitats, and ecosystems, (c) bring interests together in a formal process so meaningful and action-oriented decisions can be made; (d) build trust among partners and get buy-in into an integrated process; and (e) ensure collaborators are accountable for following through on actions.

Recommendation 2: Clarify process for deciding on integration priorities. It will not be possible to pursue all opportunities for integration, implying the need to decide on integration priorities. Identifying priorities for Integrated Strategic Planning will not necessarily be trivial. It will take effort, resources, and a clear process to solicit ideas, build trust, develop partnerships, and select appropriate priorities. Given this need, we propose three alternative approaches to engaging different interests in setting priorities. A "top-down" approach would receive direction on priorities from senior managers across various organizations, a "bottom-up" approach would rely on consultation with scientists and field biologists, and a "hybrid" approach would rely on decisions being made through an iteration of priority setting between senior managers and scientists.

Recommendation 3: Focus on priority themes of integration. With DFO acting in a lead role and a process for priority-setting in place, a critical next task would be to clarify what, specifically, should be integrated. Improved clarity can be guided by the domains and themes listed in Table 4. An implied first priority relates to the theme "*monitoring*", given that discussions have taken place and a proposal for developing a B.C. Aquatic Monitoring Partnership has been submitted to the Fraser Salmon and Watersheds Program (e.g., Day 2007). Progress on this theme, however, may be delayed if discussions

¹¹ Collaborative Systemwide Monitoring and Evaluation Project (CSMEP) Snake River Basin Pilot Study: Volume 1. Document available at: <http://www.cbfwa.org/csmep/web/documents/general/Documents/Volume 1 FINAL.pdf>

¹² Trinity River Restoration Program: Integrated Assessment Plan. Document available at: http://www.trrp.net/documents/IAP/IAP Draft 0_9_Nov_1_06.pdf

include topics from other themes, or unproductive if clarity around other themes isn't provided first (e.g., what is the scope of "*interagency cooperation*" for sharing resources, integrating data collection, and coordinating decision-making authority).

Recommendation 4: Identify specific opportunities for integration. Within priority themes, there will be a need to focus on specific opportunities for integration. There are two types: opportunities can either help to (a) minimize redundancies, or (b) improve synergies among existing and proposed activities.

Opportunities to minimize redundancies can improve allocation of resources, reduce competition, and reduce overlap in work among federal and provincial agencies, non-governmental organizations, and First Nations. For instance, several recently related activities illustrate where greater collaboration and coordination may have been possible. Though tasked with somewhat different objectives, three independent efforts have reviewed suitability of existing data sources for use in Strategy 2 (G.A. Packman & Associates and Winsby Environmental Services. 2006; Day 2007; Nelitz et al. 2007d). As well, several similar but distinct watershed prioritization initiatives are currently being developed in parallel: B.C. Ministry of Environment's Watershed Evaluation Tool (MOE 2006), B.C. Ministry of Environment's hydrological risk assessment (Carver 2006), and Nature Conservancy Canada's watershed decision support tool (NCC 2006), all of which are independent of DFO's need to prioritize Conservation Units for conservation and restoration actions under the Wild Salmon Policy¹³.

Opportunities to improve synergies can increase overall benefits, achieving greater outcomes than if activities were implemented independently. Sections 4.1.2 and 4.2.2 discuss some opportunities for potential synergies on the Central Coast, though other examples exist. For instance, stewardship groups and non-governmental organizations (NGOs) believe their efforts lack sufficient acknowledgement and integration with existing processes, despite a strong appetite for contributing. Greater clarity around the role of stewardship groups and NGOs within related decision making would help leverage this opportunity.

In pursuing opportunities for integration, it will also be important to acknowledge meaningful distinctions. For instance, differences in geographic boundaries, decision-making authority, jurisdictional issues, and ecological values may separate interests or activities. Thus, when looking for opportunities for integration, solutions need to explicitly recognize the importance of such differences and that they don't necessarily need to be resolved for integration to occur.

Recommendation 5: Develop tools to facilitate integration. There are many potential pathways to implement Integrated Strategic Planning, and it would neither be appropriate nor constructive to propose a detailed process for how it should occur in this report. However, it is recommended that decision support tools be developed to help planners and managers decide on integration priorities and select among opportunities. For instance, a resource management board can provide a forum for making decisions and setting priorities for integration (e.g., Weinstein 2007), checklists can be used to track and compare benefits of integration among different opportunities, simulation models can help decision makers understand detectable effect sizes and related statistical power associated with hypothetical monitoring designs, and databases can be developed to explore the cost of alternative data collection procedures.

¹³ Fisheries and Oceans Canada. Watershed Prioritization System. Available at: <http://www.compassrm.com/wps>

6. References

- Aquatic Management Board (AMB).** 2006. West Coast of Vancouver Island / Nuuchah-nulth Ha-ha-houlthee Wild Salmon Strategy. Draft report.
- Battin, J., M.W. Wiley, M.H. Ruckelshaus, R.N. Palmer, E. Korb, K.K. Bartz, and H. Imaki.** 2007. Projected impacts of climate change on salmon habitat restoration. Proceedings of the National Academy of Sciences of the United States of America. 104 (16): 6720-6725.
- BC Ministry of Environment (MOE).** 2006. Evaluating and Designating Fisheries Sensitive Watersheds (FSW): An Overview of BC's New FSW Procedure. Available at: www.env.gov.bc.ca/wld/documents/fsw/FSW%202006%20Information%20Paper%20v1.1.pdf
- Carver, M.** 2006. Evaluating and comparing hydrologic risk in watersheds across British Columbia. Conference presentation given at "Water under the Bridge—Mitigating the effects of MPB attack and salvage harvesting on hydrologic functioning" in Kamloops, B.C. July 5, 2006.
- Coast Information Team.** 2004. Ecosystem-Based Management Handbook. Accessed on November 30, 2007 Available at: <http://www.citbc.org/c-cbm-hdbk-fin-22mar04.pdf>
- Day, A.** 2007. Harmonizing Salmon Habitat Monitoring. Report prepared for the Fraser Basin Council.
- Douglas, T.** 2006. Review of groundwater-salmon interactions in British Columbia. Prepared for Watershed Watch Salmon Society and Walter and Duncan Gordon Foundation
- Fisheries and Oceans Canada (DFO).** 2005. Canada's policy for conservation of wild Pacific salmon. Vancouver, BC. Cat. No. Fs23-476/2005E. 57 pp. Available at: http://www-comm.pac.dfo-mpo.gc.ca/publications/wsp/default_e.htm
- Fisheries and Oceans Canada (DFO).** 2007. Pacific Region Integrated Fisheries Management Plan, Salmon, Southern B.C., June 1, 2007 to May 31, 2008. Available at: <http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/MPLANS/plans07/salmon/southcoast/SCSalmon07IFMPcomplete.pdf>
- Food and Agriculture Organization of the United Nations (FAO).** 1996. Precautionary approach to capture fisheries and species introductions. Technical Consultation on the Precautionary Approach to Capture Fisheries (Including Species Introduction) Lysekil, Sweden 6-13 June 1995.
- G.A. Packman & Associates and Winsby Environmental Services.** 2006. Selection and use of indicators to measure habitat status of Wild Pacific Salmon. Vancouver, BC. Prepared for the Pacific Fisheries Resource Conservation Council.
- Government of Canada.** 2001. A Canadian Perspective on the Precautionary Approach/Principle: Discussion Document. Available at: http://www.ec.gc.ca/econom/discussion_e.htm
- Greer, D. (ed).** 2001. Watershed-based fish sustainability planning: Conserving B.C. fish populations and their habitat. Prepared by BC Ministry of Fisheries, BC Ministry of Environment, Lands and Parks, and Fisheries and Oceans Canada. Available from: http://wlapwww.gov.bc.ca/wld/documents/wrp/wfsp_guide.pdf
- Grumbine, R.E.** 1994. What is Ecosystem Management? Conservation Biology. 8 (1): 27-38.
- Hillier, J. and D. Gueret.** 2007. The Pacific Coast Integrated Management Area: Moving Towards Modern Ocean Management. CSEG Recorder, March 2007, pp. 30-31. Available from: <http://www.cseg.ca/recorder/pdf/2007/03mar/mar2007-08-modern-ocean-management.pdf>
- Hyatt, K., M.S. Johannes, and M. Stockwell.** 2007. Appendix I: Pacific Salmon. In Ecosystem overview: Pacific North Coast Integrated Management Area (PNCIMA). B.G. Lucas, S. Verrin, and R. Brown (eds). Can. Tech. Rep. Fish. Aquat. Sci. 2667. Available at: <http://www.dfo-mpo.gc.ca/Library/328842%20Appendix%20I.pdf>

- Lackey, R.T.** 2001. Values, Policy, and Ecosystem Health. *BioScience*. 51 (6): 437-443.
- Lackey, R.T., D.H. Lach, and S.L. Duncan.** 2006. Introduction: The Challenge of Restoring Wild Salmon. Pages 1-11 in R.T. Lackey, D.H. Lach, and S.L. Duncan. (eds). *Salmon 2100: The Future of Wild Pacific Salmon*. American Fisheries Society.
- Levy, D.A.** 1992. Potential impacts of global warming on salmon production in the Fraser River watershed. Canadian Technical Report of Fisheries and Aquatic Sciences. 1889.
- Mantua, N.J., and R.C. Francis.** 2004. Natural Climate Insurance for Pacific Northwest Salmon and Salmon Fisheries: Finding Our Way through the Entangled Web. In E.E. Knudsen and D. MacDonald (editors). *Sustainable Management of North American Fisheries*. American Fisheries Society Symposium 43:127-140.
- Ministry of Agriculture and Lands.** 2007. Ministerial Order South Central Coast Ministerial Order. Accessed on November 30, 2007. Available from: http://ilmbwww.gov.bc.ca/lup/lrmp/coast/cenocast/docs/south_central_coast_order.pdf
- Nature Conservancy Canada (NCC).** 2006. Watershed Assessment and Evaluation Decision Support Tool Fraser River Basin Pilot. Prepared for the Pacific Salmon Foundation.
- Nelitz, M., C. Murray, M. Porter, and D.R. Marmorek.** 2006. Managing Pacific salmon for ecosystem values: Ecosystem indicators and the Wild Salmon Policy. Final Report prepared by ESSA Technologies Ltd., Vancouver, B.C. for Pacific Fisheries Resource Conservation Council, Vancouver, B.C. 76 pp. Available from: http://www.fish.bc.ca/files/EcosystemIndicators_2006_0_Complete%20for%20web.pdf
- Nelitz, M., C.A.D. Alexander, and K. Wieckowski.** 2007a. Helping Pacific salmon survive the impacts of climate change on freshwater habitats: Case study perspectives from the Okanagan, Quesnel, Nicola, Cowichan, Nass, and Englishman River watersheds. Final report prepared by ESSA Technologies Ltd., Vancouver, B.C. for the Pacific Fisheries Resource Conservation Council, Vancouver, B.C. Available from: <http://fish.bc.ca/files/PFRCC-ClimateChange-Adaptation-CaseStudies.pdf>
- Nelitz, M., K. Wieckowski, and M. Porter.** 2007b. Refining habitat indicators for Strategy 2 of the Wild Salmon Policy: Identifying metrics and benchmarks. Final report prepared by ESSA Technologies Ltd. for Fisheries and Oceans Canada, Kamloops, B.C.
- Nelitz, M., K. Wieckowski, D. Pickard, K. Pawley, and D.R. Marmorek.** 2007c. Helping Pacific salmon survive the impacts of climate change on freshwater habitats: Pursuing proactive and reactive adaptation strategies. Final report prepared by ESSA Technologies Ltd., Vancouver, B.C. for the Pacific Fisheries Resource Conservation Council, Vancouver, B.C. Available from: <http://fish.bc.ca/files/PFRCC-ClimateChange-Adaptation.pdf>
- Nelitz, M., K. Wieckowski, M. Porter, and C. Perrin.** 2007d. Refining habitat indicators for Strategy 2 of the Wild Salmon Policy: Practical assessment of indicators. Final report prepared by ESSA Technologies Ltd. and Limnotek Research and Development, Vancouver, B.C. for Fisheries and Oceans Canada, Kamloops, B.C.
- Rosenau, M.L. and M. Angelo.** 2003. Conflicts between People and Fish for Water: Two British Columbia Salmon and Steelhead Rearing Streams in Need of Flows. Prepared for the Pacific Fisheries Resource Conservation Council.
- Shrubsole, D.** (ed). 2004. Canadian perspectives on integrated water resources management. Prepared by the Canadian Water Resources Association. Cambridge, On
- Sigurdson, G. and B. Stuart.** 2007. Framework for the Integrated Salmon Dialogue Forum. A work-in-process discussion document. Available at: <http://www.westcoastaquatic.ca/BC%20Salmon%20Forum%20Descriptor%20Apr%2007.pdf>
- Slaney, T. L., K. D. Hyatt, T. G. Northcote, and R. J. Fielden.** 1996. Status of anadromous salmon and trout in British Columbia and Yukon. *Fisheries*. 21(10): 20-35.

- State of Washington.** 2004. 2004 State of Salmon in Watersheds Report. Prepared by Governor's Salmon Recovery Office
- U.S. Environmental Protection Agency (US EPA).** 2000. Guidance for the Data Quality Objectives Process. Prepared by the Office of Environmental Information. Washington, D.C. EPA/600/R-96/055.
- U.S. Environmental Protection Agency (US EPA).** 2006. Guidance on systematic planning using the Data Quality Objectives Process. Prepared by the Office of Environmental Information. Washington, D.C. EPA/240/B-06/001.
- Weinstein, M.S.** 2007. Design possibilities for a regional resource management board for the implementation of the Wild Salmon Policy within the MTTC First Nations' Territories: Discussion Paper. Prepared for the Watershed Watch Salmon Society, Coquitlam, B.C.



David
Suzuki
Foundation

2211 West 4th Avenue, Suite 219
Vancouver, BC, Canada V6K 4S2
www.davidsuzuki.org
Tel 604.732.4228
Fax 604.732.0752



Printed on 100% post-consumer recycled paper, processed chlorine free
Design by Arifin Graham, Alaris Design • Cover photos by iStock.com