B.C. FINFISH AQUACULTURE REGULATION:
AN INFORMATION REVIEW AND PROGRESS REPORT

January 2007
Executive Summary

British Columbia’s regulation of finfish aquaculture has evolved rapidly in recent years, particularly since the creation of the Salmon Aquaculture Review in 1995. Today’s regulatory system is complex and – for industry – costly. Yet it is poorly understood by most British Columbians and does not enjoy a high level of public trust. Consequently, many people do not believe that fish farming is being managed sustainably.

Because of this, 18 months ago the BC Pacific Salmon Forum began a review of the province’s regulatory regime with the goal of identifying possible areas of improvement.

This review will not be completed, and recommendations issued, until mid 2007. In the meantime, in the interest of public understanding and dialogue, the Forum is issuing this report as an interim step. This report includes:

- An overview of the regulatory responsibilities of various BC Government agencies;
- A detailed review of BC aquaculture regulation before 2002 – and how it has changed until the present;
- A review of salmon aquaculture during the provincial moratorium on new salmon farms, and since the moratorium was lifted; and
- An external assessment, by Mr. Gareth Porter, of the BC approach to regulation of salmon aquaculture compared to that of other jurisdictions.

The Forum believes that the regulatory environment for salmon aquaculture in British Columbia has improved significantly over the past six years and that regulators and industry have demonstrated a willingness to apply adaptive management techniques to ensure that regulations continue to address areas of concern as they emerge.

In coming months the Forum will be publishing the results of its work including the identification of potential regulatory and/or research gaps, and its review of current farm practices including the effectiveness of existing regulations in addressing concerns of fish health, waste management, pollution control, site selection, carrying capacity and escapes. Meanwhile the Forum is working with scientists, conservation organizations, industry and governments to clarify areas of regulatory importance including cumulative impacts, the effect of SLICE on the marine ecosystem, siting, and fish husbandry. The Forum hopes that this interim report clarifies some of the issues of effective regulation and welcomes comments and input from all parties.
Introduction

The BC Pacific Salmon Forum is an independent citizen body using science and stakeholder dialogue to advance the sustainable government of BC Pacific salmon. The Forum was created by the Government of British Columbia and began operation in April 2005 with a mandate to recommend measures to increase public confidence in fisheries management generally and aquaculture in particular.

While salmon aquaculture in BC is highly regulated, for a variety of reasons there is a low level of public understanding and trust in the regulatory process and farm operational practices. The Forum determined that a review of the regulatory regime by a neutral body could help address this problem and identify areas of possible improvement in BC aquaculture management. Thus, in 2005 the Forum began a review of BC’s finfish aquaculture regulatory regime.

Finfish aquaculture regulation has undergone significant changes in recent years. The system has been in continuous evolution since the commencement of a Salmon Aquaculture Review by the BC Environmental Assessment Office in 1995. That review enlisted a 10 member technical advisory team and a 45 member review committee in a massive effort and issued recommendations in 1997. In the years since, the system has evolved through many changes and amendments to regulations. The Forum believes that the adequacy of the BC regulatory regime can only be assessed on the basis of a holistic review that takes into account its complexity and scope.

In appreciation of this complexity and scope the Forum planned a five-step review process:

1. A review of current farm practices including the effectiveness of existing regulations in addressing concerns of fish health, waste management, pollution control, site selection, carrying capacity, and escapes;
2. Meetings with aquaculture and government representatives to ensure an understanding of the regulatory regime, auditing and compliance, and the process for new farm applications;
3. The commissioning of an independent audit of the BC regulatory system using a model that has been applied to jurisdictions that farm in ecosystems populated with wild Atlantic salmon;
4. Use the independent review of salmon aquaculture methods and regulations in other jurisdictions to provide a basis for appropriate comparison; and
5. The identification of potential regulatory and/or research gaps.

The four elements of this program are nearing completion and will be reported by the Forum in early 2007. The third element —the commissioning of Mr. Gareth Porter to carry out a review of BC’s regulatory regime – has been completed. Mr. Porter used a methodology developed for a review of salmon farming in the countries with wild Atlantic salmon based ecosystems. This methodology was employed in studies conducted by Mr. Porter in 2003 and 2005 for the Atlantic Salmon Federation and World Wildlife Fund. The text of Mr. Porter’s report is included herein.

The purpose of this Interim Report is to summarize information gathered to date and lay the groundwork for later analysis and discussion by describing the BC finfish aquaculture regulatory system as it now exists. The release of this Interim Report initiates a period of internal and
public dialogue that will culminate with the Forum making regulatory recommendations in mid-2007.

Review of Farm Practices and Present Regulatory System

Over the last 18 months the Forum has met with staff from the Ministry of Agriculture and Lands (Aquaculture Development, Licensing and Compliance and Animal Health Branch) to discuss various aspects of the regulatory regime under their jurisdiction.

The Forum also met with officials of the Ministry of Environment (Environmental Protection and Oceans Branches) in addition to Fisheries and Oceans Canada. Presentations were made and are under review and discussion. In addition the Forum met with other interested parties or read materials developed by them on the strengths and weaknesses of the current regulatory regime.

The complexity of the regulatory environment can be seen in the large number of provincial and federal agencies at work in this area.

In BC aquaculture is regulated by the primary Ministries of Agriculture and Lands and Environment. Legislation and policy that now guide the provincial regulatory framework include:

- Environmental Management Act
- Fisheries Act
- Fish Inspection Act
- Finfish Aquaculture Waste Control Regulation
- Fish Health Audit and Surveillance Program
- Water Act
- Wildlife Act
- BC Fire Code Regulation

Inspections of finfish aquaculture operations are conducted annually to monitor, review and/or verify the following:

**Ministry of Agriculture & Lands**
- Operation Description
- Terms and Conditions
  - Current License
- Escape Reports
- Inventory Records
- Inspection Records
- Best Management Practices Plan
- Escape Response Plan
- Therapeutants Use and Records
- Net Cage Inspections
- Boat Docking
- Fish Handling
- Predator Control
- Biosecurity Procedures
  - Multiple year classes

**Ministry of Environment**
- Operation Description
- Registration under FAWCR
- Best Management Practices Plan
  - Bloodwater Disposal
  - Net Treatment, Cleaning & Waste Disposal
  - Disinfectant Use & Disposal
  - Mortality Storage & Disposal
  - Refuse Storage & Disposal
  - Fuel/Product Use, Storage & Containment
- Waste Treatment and Disposal
- Environmental Management
- Water Use and Licensing
- Wildlife Predator Trapping
- Wildlife Hunting
Results of the annual inspections are made public through an Annual Report on Marine Finfish Inspections issued by the Ministry of Agriculture and Lands and Ministry of Environment.

All finfish operations must also have a Fish Health Management Plan as part of their license requirement. This is inspected and monitored on an annual basis through Provincial Fish Health Audit and Surveillance Program.

A first-ever report on the audit of this program was released on December 6, 2006 which reported on 339 random on-site inspections conducted between 2003 and 2005, health testing of over 1,900 fish that died from various causes and 5,500 fish tested as part of the sea lice audit. The report revealed that less than two percent of mortalities are caused by infectious disease that were previously reported in wild stocks, that there was no evidence of fish farms introducing new or exotic diseased and that stringent sea lice control has been followed by industry.

All of these documents can be viewed by visiting [www.al.gov.bc.ca/fisheries/Finfish_main.htm](http://www.al.gov.bc.ca/fisheries/Finfish_main.htm).

The primary Federal departments that regulate finfish aquaculture include Fisheries and Oceans Canada (DFO), Transport Canada, Health Canada and the Canadian Food Inspection Agency. The current regulatory focus is on siting and operation of salmon farms versus food safety, traceability, processing, etc., which is largely handled through DFO.

DFO is guided by the following legislation and policy:

- Fisheries Act
- Oceans Act
- Canadian Environmental Assessment Act
- Species at Risk Act
- Habitat Policy
- Aquaculture Policy Framework.
- Navigable Waters Protection Act

Unlike many other salmon farming jurisdictions, in Canada federal and provincial governments have jurisdiction in activity that takes place in the marine environment. This has caused some lack of clarity in the regulatory environment, although governments are becoming more focused on development of a coordinated and harmonized approach in recent years.

In addition, the BC salmon farming industry has its own management and internal codes of practice system.

**Evolution of the Regulatory System**

As noted earlier, in 1997 the Salmon Aquaculture Review developed a series of recommendations that addressed areas of concern including escapes, aquaculture waste management, fish health, aquaculture siting, predator control, First Nations consultation, risk management and alternative technology. From these recommendations regulatory changes were implemented. The system has continued to evolve since that time.

There are two important points to note about the BC regulatory system.
The first is that it is a mixture of “prescriptive” and “performance based” approaches. Sometimes regulations prescribe specific numerical environmental standards not to be exceeded during production, but how they are achieved is a management decision that is the responsibility of the farm operator and is, therefore, performance based such as the in the Finfish Aquaculture Waste Control Regulation. Another example is that while an aquaculture license regulates the maximum production on the specific farm site and fish health management plans regulate issues relating fish stress, the actual stocking density of the individual net pens on a site is not stipulated.

The second point is that the BC system imposes significant costs to industry for regulatory compliance and these costs have increased rapidly in recent years. In 2000 the costs of an individual salmon farm site application could reach $8,000. On-going regulatory costs would range from $972 to $5,630 for tenure rent, plus taxes of approximately $800. Today an individual site application costs between $100,000 and $300,000, plus annual compliance and environmental monitoring costs of approximately $60,000 per site. Annual required sea lice treatment can add a cost between $100,000 and $250,000 annually depending on the size of the fish on the farm site.

The following table indicates changes in BC’s regulatory environment in BC, and current regulations.
Aquaculture regulation in British Columbia is based on a mix of highly prescriptive regulation supported by a performance based approach that relies on setting standards, monitoring, auditing and adaptive management. In the following comparative chart prescriptive regulation has been highlighted in **bold**.

<table>
<thead>
<tr>
<th>REGULATION PRE 2002</th>
<th>CURRENT REGULATION</th>
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<tbody>
<tr>
<td>Escapes</td>
<td>Escape &amp; Release and Reporting Escape (April 2002)</td>
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<tr>
<td>- Provincial aquaculture regulations were established under the authority of the provincial Fisheries Act; the first version of these regulations was introduced in 1989; however, it was not until amendments in October 2000 that escape prevention standards were included; these standards were amended and improved in April 2002</td>
<td>- In 2002, the requirement to take reasonable precautions was expanded by defining it to include compliance with prescribed standards of practice for escape prevention</td>
</tr>
<tr>
<td>- Aquaculture Regulation required license holders to take all reasonable precautions to prevent escapes.</td>
<td>- Regulation sets a <strong>zero tolerance</strong> for all escapes and suspected escapes</td>
</tr>
<tr>
<td>- Atlantic Salmon Watch program was implemented.</td>
<td>- <strong>Specific minimum standards for design, installation and maintenance of net pens, and net mesh strength stated within regulation</strong></td>
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<tr>
<td></td>
<td>- <strong>New or experimental containment structure design requires field trials and performance analysis by professional engineers to ensure compatibility with the proposed site location</strong></td>
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<tr>
<td></td>
<td>- <strong>Testing is required for net pen strength</strong></td>
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<tr>
<td></td>
<td>- <strong>Underwater inspection is required every 60 days by divers and maintenance records must be kept</strong></td>
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<tr>
<td></td>
<td>- All license holders required to develop and follow a best management plan for prevention of escapes</td>
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<tr>
<td></td>
<td>- <strong>Escape response plans must be in place</strong> for all farms and training required to ensure all staff capable of performing required duties</td>
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<tr>
<td></td>
<td>- <strong>Time-frame stipulated</strong> for verbal and written reporting of any escape of evidence of suspected escape</td>
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<tr>
<td></td>
<td>- License holders must have management plans in place that ensure staff are trained to be able to take reasonable measures to recapture escaped fish in a way that is consistent with all applicable laws</td>
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</table>
Inspectors visit all aquaculture operations at least once each year to review and assess compliance with regulations.

**Charges may be laid** in the event of negligence causing escape.

**Records of escapes or suspected escapes are maintained** and are accessible by the public.

Implementation of a 24/7 hour toll-free escapes reporting line.

**ZZA license** is a special recapture license that pre-approves limited fishing operations to immediately capture lost fish within 1 km of farm sites and avoid delays in receiving approval from DFO.

Atlantic Salmon Watch Program (ASWP) operated by DFO for over 15 years in part with provincial funding.

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<tbody>
<tr>
<td>- No requirement for a waste permit where total feed usage at a farm does not exceed 630 tonnes dry weight per year</td>
<td>- <strong>Site data is required</strong> consisting of comprehensive suite of information regarding site characteristics of location, ocean current data, planned fish production stocking densities and rates of feed usage, baseline pre-operational monitoring for new sites, copies of other agency site approvals.</td>
</tr>
<tr>
<td>- Farms using more than 630 tonnes of feed per year require a permit that set out specific conditions governing waste discharges.</td>
<td>- <strong>Regulation provides specific schedules describing requirements for comprehensive seabed environmental monitoring program for Baseline Inventory, and Operational Monitoring</strong>.</td>
</tr>
<tr>
<td>- Use, storage and disposal of materials and wastes on or off the site is carried out in a manner that minimizes odor, risk of spillage and attraction of and impact on wildlife</td>
<td>- <strong>Requires underwater video to document seabed conditions in hard bottom areas</strong> where it is not feasible to collect samples.</td>
</tr>
<tr>
<td>- Operator complies with a monitoring program stipulated by the waste manager. This included determination of any environmental impacts, effects on wildlife, finfish, shellfish or their habitats, proper disposal of sewage, and that therapeutants, anesthetics, disinfectants, pesticides, or other similar materials are stored and applied in a manner not to cause pollution.</td>
<td>- <strong>Requires reporting of all farm production inputs including feed usage and medications</strong>.</td>
</tr>
<tr>
<td>- Limited water quality monitoring for salinity, dissolved oxygen, ammonia, nitrate and nitrite. Frequency based on annual amount of feed usage.</td>
<td>- <strong>Provides specific numerical environmental standards not to be exceeded during production, and chemical trigger values leading to additional chemical or biological monitoring</strong>.</td>
</tr>
<tr>
<td>- Reporting of any pollution incident, and taking appropriate remedial action to deal with pollution which does occur</td>
<td>- <strong>Provides specific chemical recovery levels for impacted sites which must be achieved before fish can be re-stocked at the site</strong> (how this is achieved, is through farm management practices).</td>
</tr>
<tr>
<td>- Preparation of a contingency plan for major fish kills including proper disposal of mortalities</td>
<td>- <strong>Requires implementation of Best Management Practices Plan (BMP) for a number of operational practices to manage potentially harmful materials (e.g., therapeutants, disinfectants, antifouling agents, bloodwater, net-cleaning wastes, boat fuel, etc.) to preclude spillage to the environment, and ensure capacity to respond appropriately in the event of a spill.</strong></td>
</tr>
<tr>
<td>- Specifications for treatment of domestic sewage from the farm site</td>
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<tr>
<td>- Provides for penalties for offences under the Regulation</td>
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*BC Finfish Aquaculture Regulation: Information Review and Progress Report 1/22/07*
<table>
<thead>
<tr>
<th>Fish Health Management Plan (June 2003)</th>
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</thead>
<tbody>
<tr>
<td>Requires a finfish fish kill contingency plan</td>
</tr>
<tr>
<td>Requirement of a statement that a BMP has been reviewed and endorsed by operator</td>
</tr>
<tr>
<td>Effluent regulations in place for hatcheries</td>
</tr>
<tr>
<td>Monitoring and reporting requirements and penalties for non-compliance are in place; inspections and field sampling to audit industry compliance are conducted annually</td>
</tr>
<tr>
<td>Annual waste management permit fee charged</td>
</tr>
<tr>
<td>Generation of annual Farm Aquaculture Waste Control Regulation compliance summary</td>
</tr>
<tr>
<td>Annual meetings with company representatives to review and promote compliance</td>
</tr>
<tr>
<td>Support and participate in research on aquaculture wastes</td>
</tr>
<tr>
<td>Regulation stipulates that FAWCR standards be reviewed by the end of 2007</td>
</tr>
<tr>
<td>A Fish Health Management Plan (FHMP), approved by the regulator, is required for all farm sites</td>
</tr>
<tr>
<td>FHMP requires that all operators regularly and systematically inspect fish and fish holding units for signs of disease and increase their monitoring for groups of fish showing unusual mortality rates, signs of morbidity or for fish subjected to stressful events that could predispose them to disease</td>
</tr>
<tr>
<td>Requires quarterly reporting on fish health issues; summary data is available to the public through the provincial website</td>
</tr>
<tr>
<td>Notification to the provincial and federal authorities in the event of an disease outbreak</td>
</tr>
<tr>
<td>Rapid response plans must be in place for disease outbreaks and this plan must include bio-security procedures for positive identification of disease and/or virus outbreaks</td>
</tr>
<tr>
<td>Immediate notification to the Provincial Fish Health Veterinarian required in the event of disease outbreak and approval required on best course of action to ensure the safety of the environment, wild fish populations and farmed fish</td>
</tr>
<tr>
<td>All antibiotics must be prescribed by licensed veterinarians and administered in feed</td>
</tr>
<tr>
<td>Therapeutant records must be maintained and are subject to</td>
</tr>
</tbody>
</table>
• Mandatory time period required between administration of antibiotics and fish harvest set by veterinarian or by legislation
• Audits and inspections to verify industry reporting is conducted; advance notice of inspection is not required
• Fish culture facilities must ensure that any actions taken to prevent, control or treat fish disease conform to existing provincial and federal regulations
• Fish Health Advisory Committee (established in 2001) provides evidence-based recommendations to government on fish health and emerging disease issues and makes recommendations on standards enforced through Fish Health Management Plans
• Fish products monitored to verify that they do not exceed Canadian Guidelines for Chemical Contaminants and Toxins in Fish and Fish Products
• Conformance to the Veterinary Drugs Directorate of Health Canada Policy on identifying and managing risks associated with using antimicrobial agents in aquaculture
• Development of Required Elements Document / Template for Fish Health Management Plan / Manual for Fish Health Practices
• Development of Bio-security Procedures for Fisheries Inspection of Marine Fish Farms
• Required industry reporting (Fish Health quarterly / Sea Lice monthly)
• Development of BC Salmon Farmers Association Fish Health Database / with quarterly reports required
• Fish Health Auditing and Surveillance Program (FHASP) / with quarterly reports
• Fish introduction and movement regulated through National Code on Introductions and Transfers of Aquatic Organisms which is overseen by a federal/provincial Introductions and Transfers Committee

<table>
<thead>
<tr>
<th>Sea Lice Management Plan</th>
<th>Sea Lice Management Plan (November 2003)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• No sea lice management plan existed prior to 2003</td>
<td>• Sea lice monitoring and action are treated separately within the framework of Fish Health Management Plan</td>
</tr>
<tr>
<td>• Interim sea lice monitoring program was established in February 2003 for farms within the Broughton Archipelago only; comprehensive BC plan established in November 2003</td>
<td>• Adherence to program is a requirement of license</td>
</tr>
<tr>
<td></td>
<td>• Standardized protocol for monitoring and sampling of farm</td>
</tr>
</tbody>
</table>
stock for sea lice established

- Sea lice monitoring required a minimum of once per month and reported to the province
- Statistics for lice counts are submitted to the Fish Health Data Base which are made public on the government’s website
- Action must be taken when motile lice levels reach 3 (all stages) at any time of year and monitoring must increase to twice monthly
- Action during the spring out-migration of juvenile salmon must include treatment or harvest if lice levels reach 3 motile lice per fish
- Provincial monitoring of active sites ongoing throughout the year, but increases during the 2nd quarter, coinciding with out-migration of juvenile wild stocks

### Aquaculture Siting

- Prior to 1997, siting of fish farms was adjudicated by Ministry of Agriculture Food and Fisheries biologists with referrals to appropriate federal and provincial agencies; review included use of *Salmon Farm Production Model* (Caine, 1988–1989 BCMAF)
- Siting criteria based on “Biophysical Criteria for Siting Salmon Farms in British Columbia” (Caine *et al.*, 1987 BCMAF)
- Coastal Capability Studies by BCMAF from 1987 to 1997, covering all coastal areas of BC in five volumes - e.g. *Biophysical Suitability of the Western Johnstone Strait, Queen Charlotte Strait and West Coast Vancouver Island Regions for Salmonid Farming in Net Cages* ESL Environmental Sciences Ltd. 1988
- Coastal Resource Inventory Mapping (CRIM) conducted by Ministry of Crown Lands then Ministry of Sustainable Resource Management identifying areas of opportunity for, and user conflicts with finfish farming
- A Fish Farm Review Committee was established in January of 2000 to adjudicate farm applications which identified 37 farms that must be moved or change operations to meet new siting criteria
- Integrated coastal zone management plans and/or land and

### Aquaculture Siting (March 2000)

- **Siting criteria based on Salmon Aquaculture Review recommendations adopted:**
  - At least 1 km in all directions from a First Nations reserve, unless consent is received from the First Nation
  - At least 1 km from the mouth of a salmonid spawning stream (stream assessment required for all streams within 1 km of proposed farm sites)
  - At least 1 km from herring spawning areas designated as having “vital”, “major” or “high” importance
  - At least 300 m from inter-tidal shellfish beds that are exposed to water flow from a salmon farm and which have regular or traditional use by First Nations, recreational, or commercial fisheries
  - At least 125 m from all other wild shellfish beds and commercial shellfish growing operations
  - An appropriate distance from the areas of “sensitive fish habitat” as determined by DFO and the province
  - An appropriate distance from areas used extensively by marine mammals, as determined by DFO and the province
  - At least 30 m from the edge of the approach channel to a small craft harbour federal wharf or dock
  - At least 1 km from ecological reserves smaller than 1000 ha or approved proposals for ecological reserves smaller than 1000 ha
<table>
<thead>
<tr>
<th>Condition</th>
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<tbody>
<tr>
<td>- No federal environmental assessments were required</td>
</tr>
<tr>
<td>- Not within a 1 km line of sight from existing federal, provincial or regional parks or marine protected areas (or approved proposals of these)</td>
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<tr>
<td>- In order to not infringe on the riparian rights of an upland owner, without consent, for the term of the tenure license</td>
</tr>
<tr>
<td>- Not in areas that would pre-empt important Aboriginal, commercial or recreational fisheries as determined by the province in consultation with First Nations and DFO</td>
</tr>
<tr>
<td>- Not in area of cultural or heritage significance as determined in the <em>Heritage Conservation Act</em></td>
</tr>
<tr>
<td>- Consistent with approved local government bylaws for land use planning and zoning</td>
</tr>
<tr>
<td>- At least 3 km from any existing finfish aquaculture site, or in accordance with local area plan or Coastal Zone Management Plan</td>
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</tbody>
</table>

### Project Review Team
- Established to conduct initial assessment of farm application before full government review is initiated
- First Nations consulted directly by government and by applicants when new farms proposed; local governments also involved through application referrals

### Canadian Environmental Assessment Act
- Promulgated in 1997 requires screening of all fish farm sites to assess all impacts to environment including a review of valued ecosystem components and a cumulative effects assessment for other projects in the area

### Detailed information for proposed site applications
- Required including: facility diagrams, professional review of mooring systems, other coastal uses, other environmental and social factors in the area

### Local consultation
- Must occur in addition to First Nations consultation

### Development and Implementation of Coastal Plans
- For North Island Straits, Kyquot Sound, Malaspina/Okeover, Johnstone Bute, Quatsino Sound, Nootka Sound, Baynes Sound, and Cortes Island, which define areas that are acceptable, conditionally acceptable, acceptable at existing levels or not acceptable for finfish aquaculture

### Siting farms
- Aided by use of the DEPOMOD depositional model that provides a footprint of the proposed farm to allow for siting away from areas of sensitive and critical habitat
- DEPOMOD output is used to assess the area that is likely to be...
### Predator Control

- **Compensation for impacted habitat is required** by the farm applicant; it is intended to replace productive capacity and monitoring and reporting is required to demonstrate that the compensatory habitat is functioning as intended

### Predator Control

- DFO license required to kill seals and sea lions (where other methods of predator control failed) under Marine Mammals Regulation of Fisheries Act (still in effect, but only as a last resort)
- DFO letter of authority to use acoustic deterrent devises
- Federal Migratory Bird Convention Act prohibits killing of listed species, including gulls and herons (still in effect)
- Provincial Aquaculture license requires predator control (still in effect)
- Killing or trapping provincial wildlife (bears, otters, and birds) prohibited without license issued under Wildlife Act (still in effect)
- BC siting policy requires establishing an appropriate distance from the areas used extensively by marine mammals, as determined by DFO and the province (still in effect)

### Other Regulations and Coordination

- **BC’s Fisheries Act Aquaculture (October 2002)** also regulates:
  - Inventory records for movement of fish to and from the site, finish mortalities, sales, and escapes
  - Staff training
  - Inspections
  - Fees
  - Boat operations in and around the farm site
- **DFO’s National Code on Introduction and Transfers (2001)** regulates movements of prescribed species; all fish movement is reviewed and licensed under Section 56 of the federal Fisheries Act
<table>
<thead>
<tr>
<th>Act</th>
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<tbody>
<tr>
<td>Development of Aquaculture and Commercial Fisheries Licensing</td>
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<tr>
<td>Policy and Procedures Manual which is a comprehensive licensing</td>
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<tr>
<td>document for Statutory Decision Makers intended to address:</td>
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<tr>
<td>• general principles guiding deliberations on salmon farm</td>
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<tr>
<td>applications include: fairness, transparency, efficiency and</td>
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<tr>
<td>accountability</td>
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<tr>
<td>• Key values applied and considered by officials include:</td>
</tr>
<tr>
<td>Protection of the environment; Sustainable economic</td>
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<tr>
<td>development, and Ensuring public health and safety values are</td>
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<tr>
<td>maintained</td>
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<tr>
<td>Development of Fisheries Inspectors Policy and Procedures Manual</td>
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<tr>
<td>with comprehensive manual for inspectors</td>
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<tr>
<td>High trained inspectors</td>
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<tr>
<td>100% of all active finfish farms inspected annually</td>
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<tr>
<td>Development of Licensing Decision Document for new site applications; increased public transparency (i.e. Bennett Point decision on web)</td>
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<tr>
<td>Annual Inspection Reports on Marine Finfish Aquaculture intended to</td>
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<tr>
<td>increase transparency in management and monitoring compliance</td>
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<tr>
<td>to regulation by industry</td>
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<tr>
<td>Implementation of MOU between Ministry of Agriculture and Lands</td>
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<tr>
<td>and Ministry of Environment conservation officer service, and</td>
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<tr>
<td>Integrated Land Management Board on coordination of compliance</td>
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<tr>
<td>and enforcement programs</td>
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<tr>
<td>Expanded working relationships and cross-compliance efforts with DFO, Ministry of Agriculture and Lands, Ministry of Environment and Integrated Land Management Bureau</td>
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<tr>
<td>Enhanced First Nations Consultation policy and processes</td>
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<tr>
<td>Regional processes and agreements to enable a harmonized</td>
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<tr>
<td>approach to aquaculture management</td>
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<tr>
<td>• Pacific Council of Fisheries and Aquaculture Ministers (PCFAM)</td>
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<tr>
<td>• Directors Aquaculture Committee (DAC)</td>
</tr>
<tr>
<td>• Canadian Council of Fisheries and Aquaculture Ministers (CCFAM)</td>
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Salmon Aquaculture During the Moratorium And After

What has happened to the salmon aquaculture industry since the lifting of the moratorium on new salmon farms? The following table shows both the expansion of the industry, the length of the application process and outstanding site applications.

<table>
<thead>
<tr>
<th>Marine Sites</th>
<th>Relocations</th>
<th>Exchange Site for Pilot Project or Species</th>
<th>New</th>
<th>Application Pending</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>4</td>
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<td>-</td>
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<td>2001</td>
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<td>2002</td>
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<td>2</td>
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Independent Audit of the Regulatory Regime


Although the criteria of these reviews did not include waste management issues, the Forum believed that the use of these criteria in an independent evaluation might highlight areas where a later, more in-depth review would be useful. The Forum hoped that Porter’s review would provide focus on areas of potential concern in aquaculture regulation, so as part of its broader review process the Forum contracted Mr. Porter to conduct an independent review of BC’s practices.

His review was conducted through telephone interviews, correspondence, email and website reviews. He prepared a draft report and requested that it be reviewed by provincial and federal regulators and the industry association, in order to enable them to identify gaps or inaccuracies in the report specific to the regulations and the industry code of practice.
The final report was provided to the Forum in May 2006. The Forum then provided the report to Fisheries and Oceans Canada and the BC Ministry of Agriculture and Lands to enable them to comment on Mr. Porter’s assumptions and conclusions. Their letters of response were appended to the report.

The Forum is releasing the Report at this time because it forms a part of the Forum’s overall analytical process and the Forum is committed to openness and transparency. Having said that, the Forum wishes to make it clear that Mr. Porter’s conclusions are his own and not necessarily those of the Forum.

In particular, the Forum believes that Mr. Porter’s report should be read with several considerations in mind:

- The report is based on indicators that Mr. Porter used in other reports. However, this is the first time these particular criteria have been applied to a jurisdiction where Pacific (and not Atlantic) salmon are the dominant wild salmon species.

- British Columbia currently uses a mix of “prescriptive” and “results based” regulations versus solely prescriptive regulation. Concern has been raised by provincial regulators that the criteria applied by Mr. Porter in his evaluation of BC did not acknowledge the benefits of a performance-based management system of setting standards, monitoring, auditing and adaptive management.

- Mr. Porter’s comparison of country by country scores may be confusing unless it is read alongside the full text of his earlier report, *Protecting Wild Atlantic Salmon from Impacts of Salmon Aquaculture, A Country-by-Country Progress Report 2nd Report 2005*. For example, it appears that Iceland received a score of 10 out of a possible 10 in three categories (consideration of cumulative environmental impacts in siting; adequacy of fish husbandry practices; and monitoring and enforcement of fish husbandry practices), when, in fact Iceland does not regulate these matters at all. This skews his comparative rating of BC practices. Mr. Porter’s US ratings were based on a single bay in the State of Maine.

- Mr. Porter raises concern about farm siting criteria in BC and fish husbandry codes of practice. The Forum will address these issues through our research agenda and through collaboration with regulators and industry during the coming months.

The Forum believes that the regulatory environment for salmon aquaculture in British Columbia has improved significantly over the past six years and regulators and industry have demonstrated a willingness to apply adaptive management techniques to ensure that regulations continue to address areas of concern as they emerge. An example of this can be found in the recent regulation regarding on-farm sea lice treatments which are administered to protect wild salmon within the marine ecosystem shared by the wild and farmed salmon and in the new research regarding measurement of waste on hard-bottom surfaces under fish farms.
Next Steps in Regulatory Review

The Forum is working with scientists, conservation organizations, industry and governments to clarify areas of regulatory importance such as cumulative impacts, impacts of SLICE on the marine ecosystem, siting, and fish husbandry. The Forum is seeking further information on these topics through scientific literature reviews, shaping appropriate scientific research agendas, etc.

In coming months the Forum will continue to discuss regulatory issues based on this report, as well as its scientific agenda, with all interested parties. The Forum welcomes comments and responses.

It is expected that the Forum will have final conclusions available in summer 2007.

ATTACHMENT TO REPORT:

An Audit of the Management of Salmon Aquaculture for the Protection of Wild Salmon in British Columbia for the BC Pacific Salmon Forum, May 9, 2006 by Gareth Porter
An Audit of the Management of Salmon Aquaculture for the Protection of Wild Salmon in British Columbia

Gareth Porter

For BC Pacific Salmon Forum

May 9, 2006
INTRODUCTION

This audit of the management of salmon aquaculture in British Columbia is based on a system of criteria and indicators that were developed in 2003 and revised in 2005 for the explicit purpose of gauging progress in seven member countries of the North Atlantic Salmon Conservation Organization (NASCO) in protecting wild salmon from the impacts of salmon aquaculture. The original scoring system consisted of ten criteria drawn from the 1994 Oslo Resolution (“The Convention for the Conservation of Salmon in the North Atlantic Ocean to Minimize Impacts from Salmon Aquaculture on the Wild Salmon Stocks”).


Two years later, I was asked by WWF and ASF to do a second report that would reflect further progress that had been made since the initial report. In preparing for the follow-up report, I revised the system of criteria and indicators in effort to make it more accurate and useful. The revised scoring system altered the language of three criteria to reflect the language of the broader Williamsburg resolution, which had supplanted the Oslo Resolution. The second report, which had the same name as the first, also took into account criticisms of the original system as containing two pairs of criteria that were substantially overlapping in character.

The result was a scoring system with eight criteria falling into three broad areas for regulation. The first two have to do with the siting of aquaculture operations; the next three relate to regulation of fish husbandry and fish health, and the last three cover containment of fish at aquaculture sites.

The revised scoring system used in the second progress report is the basis for this “audit” of the regulation of British Columbia’s salmon aquaculture industry in regard to protection of wild salmon. Obviously alternative systems of criteria and indicators could have been used to carry out such an audit. The advantage of this system, however, is that it does allow for comparison between the management of the salmon industry in British Columbia and that in other countries where Atlantic salmon is being farmed.

As with audits conducted on other jurisdictions, a draft of this report was shared with relevant officials of the federal government, the government of British Columbia and the salmon aquaculture industry, and the comments and suggestions of the Ministry of Agriculture and Lands (MAL) were considered and discussed before the final revision of the text. In response to that draft, MAL asserted that the situation of British Columbia’s salmon industry is substantially different from that of the industry in other countries which have been covered in previous studies using this framework.

The most obvious difference is that the wild salmon stocks are Pacific salmon species; whereas the bulk of the production of farmed salmon are Atlantic salmon. There are nine anadromous salmonids species in BC, compared with four species of anadromous salmonids in Atlantic
region, and most wild species in BC have much larger adult populations than other jurisdictions with salmon farming industries, because virtually all streams and rivers in B.C. support some species of anadromous salmon, and because Pacific salmon species have life history strategies that contribute to larger population. This situation contrasts with that in European (and North American) jurisdictions in which relatively few streams support such species and where relatively few smolts of larger size are produced.1

The MAL asserts that the significance of ecological interaction with wild fish in B.C. is very low and the significance of genetic interaction with wild fish is “nonexistent for Atlantic salmon” and “likely low for Chinook due to low numbers.”

The MAL also states that there were major differences between B.C. and other jurisdictions with Atlantic salmon aquaculture industries in regard to the risk of impacts of Infectious Hematopoietic Necrosis (IHN) and sea lice on wild fish. In a summary table the situation in regard to wild fish health is held to be minimal or nonexistent in B.C., in contrast to the situation in European jurisdictions. IHN in B.C. is said to move “to farms from wild fish, [but] does not transmit to wild fish.” In European jurisdictions, on the other hand, MAL says, “Disease could move to and from farms, could infect wild fish with devastation effects.”

MAL holds, in sum, that in B.C. sea lice “do not seriously affect farmed fish,” whereas in European jurisdictions they “adversely affect farmed fish”

Although it is true that genetic and ecological interactions between farmed Atlantic salmon and Pacific salmon can be disregarded as a risk for wild salmon, interactions between farmed Coho and Chinook salmon, which represent 25 percent of salmon production in B.C., and wild salmon cannot be disregarded.

The MAL submission implies that Pacific salmon stocks remain healthy, in contrast to European salmon stocks. In fact, however, Fisheries and Oceans Canada (FOC) conceded in 2000 that Pacific salmon stocks along the West Coast of Canada have been “in sharp decline since the early 1990s.” The decline of wild Coho and Chinook numbers has been particularly severe, and although the study by FOC scientists from the Pacific Biological Station does provide estimates, it appears that the decline in Chinook abundance from 1977 and 1999 was in the neighborhood of 90 percent.2

If Pacific salmon stocks, and especially the wild salmon species corresponding to the two Pacific salmon species being farmed in B.C., are in serious decline and suffering from a genetic contamination from hatchery fish that may have made it more vulnerable to various threats, then the contrast between B.C. and most European jurisdictions is far less dramatic. The numbers of Pacific and Atlantic salmon being produced, moreover, are of the same order of magnitude.3

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1 MAL, “Differences between BC and Other Jurisdictions in Wild Salmon Stocks and Their Need for Protection,” April 5, 2006.
The flat statement that IHN “does not transmit to wild fish” appears to go beyond what is known from scientific evidence. The Pacific Biological Station was planning to conduct experiments in spring 2004 on the susceptibility of all Pacific salmon species to IHNV and to “assess the risk of IHNV transfer from farmed Atlantic salmon to wild populations.” However, no data from such experiments was available for this review.

The comparison of sea lice in B.C. and in European jurisdictions avoids the central issue of transmission of sea lice from fish farms to wild salmon stocks. To compare the degree of impact of sea lice on the farmed salmon tells us nothing about the degree of risk to wild salmon stocks in B.C. and in other jurisdictions.

One study comparing the abundance of sea lice on adult wild Pacific salmon caught in Queen Charlotte Strait and Smith and Rivers Inlet in 2004 found little evidence of scale loss or skin damage. However it has long been understood that the real danger from sea lice is to out-migrating smolts, not to adult wild salmon.

This audit is based, therefore, on the premise that B.C. obviously differs from other jurisdictions on various dimensions in varying degrees, but that there are no geographical or other characteristics of B.C. salmon aquaculture that set it completely apart insofar as the applicability of the norms and standards forming the basis of the scoring system.

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4 E-mail from Garth Traxler, February 15, 2004.
THE SCORING SYSTEM

(Paragraph of the Williamsburg Resolution on which the criterion is based are indicated in brackets)

**Criterion 1**: Adoption of a siting policy aimed at keeping aquaculture at a safe distance from salmon rivers [Annex 2, paragraph 1.1 and 1.2; Article 8; Annex 6]

**Indicators and Results**

An adequate minimum distance or exclusion zone is adopted which will help protect more than one salmon river: 10 points

A minimum distance or exclusion zone is adopted which will help protect one salmon river: 5 points

A minimum distance or exclusion zone is adopted which may help reduce the risk to salmon in more than one salmon river: 3 points

A minimum distance or exclusion zone is adopted which may help reduce risk to salmon in one salmon river: 2 points

No minimum distance or exclusion zone has been adopted: 0 points

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**Criterion 2**: Degree to which cumulative environmental impacts of salmon farming on an entire bay or other ecosystem are considered in siting decisions [Annex 2, paragraph 1.4]

**Indicators and Results**

Siting approval regulations require that cumulative impacts of aquaculture operations on the entire ecosystem are taken into account, or policy decisions have been taken to limit or exclude aquaculture operations from a given area, based on scientific study of carrying capacity: 10 points

Siting approval regulations require that cumulative impacts of aquaculture operations on the entire ecosystem are taken into account, but not based on scientific study of carrying capacity: 5 points

Siting approval regulations provide for studies of cumulative impacts in the entire ecosystem under some circumstances, but do not require them: 3 points

No consideration has been given to cumulative impacts on aquaculture operations on the entire ecosystem in siting approval: 0 points
**Criterion 3**: Adequacy of standards for fish husbandry, including best industry practices in regard to year-class separation, fallowing of sites and maximum stocking densities [Annex 2, paragraph 1.4 and 2.1]

**Indicators and Results**

Regulations or industry codes of practice require best husbandry practices on year class separation, fallowing of sites and stocking densities: 10 points

Regulations or industry codes of practice do not require best husbandry practices on one of the three issues: 7 points

Regulations or industry codes of practice do not require best husbandry practices on two of the three issues: 4 points

Regulations or codes of practice do not require best husbandry practices on any of the three issues: 0 points

**Criterion 4**: Adequacy of monitoring and enforcement of best practices in fish husbandry [Annex 2, paragraph 1.4 and 2.1]

**Indicators and Results**

Authorities carry out on-site monitoring of compliance with requirements or industry codes of practice for fish husbandry and have appropriate and transparent penalties for non-compliance: 10 points

Authorities do not carry out on-site monitoring of compliance with requirements or industry codes of practice for fish husbandry, but do require industry reporting on compliance and have appropriate and transparent penalties for non-compliance: 5 points

Authorities carry out on-site monitoring or require industry reporting on compliance with requirements or industry codes of practice, but do not have appropriate and transparent penalties for non-compliance: 3 points

No system exists for regularly monitoring or industry reporting on fish husbandry: 0 points

**Criterion 5**: Adequacy of practices and procedures for early detection of an outbreak of any disease or parasitic infection likely to affect Atlantic salmon and rapid response to such an outbreak  [Annex 2, paragraphs 2.1-2.5]
**Indicators and Results**

Regulations include mandatory frequent testing/counting for ISA or other major fish disease and sea-lice by appropriate authorities using specified procedures, and mandatory, automatic disease or sea-lice control actions upon clinical identification of the ISA virus or other major fish disease or of sea-lice numbers exceeding the maximum: 10 points

Regulations include mandatory frequent testing for both the ISA virus or other major fish disease and parasites but not automatic, mandatory actions triggered by clinical detection of ISA virus or other major fish disease or of sea-lice counts above a specified level, or vice versa, or both mandatory testing and mandatory actions for major fish disease but not for sea-lice: 5 points

Regulations include only one of the two elements for either fish disease or other major fish disease sea-lice and neither for the other: 2.5 points

There are no mandatory requirements for detection or actions upon detection for either ISA virus or sea-lice: 0 points

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**Criterion 6**: Adequacy of national plans for minimizing escapes in regard to equipment and structures [Annex 3, sections 3 and 4, and 7]

**Indicators and Results**

Plans include technical standards for aquaculture systems regarding stock containment reflecting industry best practices, as outlined in Annex 3, section 4: 10 points

Plans provide standards for aquaculture systems regarding stock containment, but the standards do not reflect best industry practices: 3 points

Plan does not provide for any technical standards for aquaculture systems: 0 points

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**Criterion 7**: Adequacy of national plans for minimizing escapes in regard to management operations, site-specific contingency plans and notification of escapes [Annex 3, Sections 5 and 6 and 7]

**Indicators and Results**

Plans include standards for management systems and site-specific escape prevention plans reflecting best industry practices, site-specific escaped fish recovery plans and mandatory notification of complete details of escapes: 10 points

Plans include two of the three elements above: 7 points
Plans include one of the three elements above:  3 points

Plans do not include any of the three elements: 0 points

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**Criterion 8:** Adequacy of monitoring in order to assess compliance with the national plan and to verify the plan’s efficacy [From Williamsburg Annex 3, subparagraphs 7.2.3]

**Indicators and Results**

Authorities carry out on-site monitoring to verify compliance with all the containment measures in Criteria 6 and 7: 10 points

Authorities carry out on-site monitoring of most but not all containment measures in Criteria 6 and 7: 7 points

Authorities carry out on-site monitoring for only one or two of the containment measures in Criteria 6 and 7: 3 points

Authorities do no on-site monitoring of any of the containment measures in Criteria 6 and 7: 0 points
SCORING BY CRITERION

Criterion 1:

Adoption of a siting policy aimed at keeping aquaculture at a safe distance from salmon rivers.

B.C. regulations governing the siting of salmon aquaculture operations have long required that the fish farm must be “at least 1 km from the mouth of a salmonid-bearing stream determined as significant in consultation with DFO and the province.” That required distance was reviewed by the Salmon Aquaculture Review of 1997 and was considered to be inadequate. The Review recommended that the government “should prohibit farms with Pacific salmon from being located near streams with sensitive wild stocks.”

A workshop of the federal Department of Fisheries and Oceans habitat scientists in 1998 noted that siting criteria which had been adopted in B.C. to protect vulnerable wild fish stocks were not scientifically based. After reviewing the workshop’s findings, the Department’s Pacific Scientific Advice Review Committee confirmed that siting criteria should be based on scientific evidence. Although the Department undertook scientific studies on specific areas as the basis for more credible criteria, moreover, those studies did not consider the impacts on wild salmon in the vicinity of net pens.

The B.C. Ministry of Agriculture, Food and Fisheries (renamed Ministry of Agriculture and Lands MAL) pledged in 2002 to “determine an appropriate distance to locate farms from streams.” However, no change has been made in the regulations to increase the required distance. MAL indicated that “The Ministry review concluded that, lacking any evidence of negative impact, 1 km was adequate to protect streams.”

The argument that there is no evidence of impact on wild stocks from farmed salmon in B.C. depends on the validity of claims that there is no significant risk in B.C. salmon aquaculture of genetic or ecological interaction between farmed and wild salmon, or of any transmission of disease or of sea lice from farmed to wild salmon. As discussed in the introduction, however, some Pacific salmon stocks are in vulnerable a state and the degree of risk of each of these types of interaction is still incompletely understood.

MAL concedes that the BC regulation on minimum distance “was not determined strictly as a matter of scientific investigation,” but argues that no other jurisdictions have based their minimum distances or exclusion zone policies on scientific studies. However, as documented in the previous report on six Atlantic salmon aquaculture jurisdictions, both Norway and Scotland have, in different degrees, undertaken studies of siting in which additional protection of wild

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7 Salmon Aquaculture Review
10 Differences between BC and Other Jurisdictions in Wild Salmon Stocks and Their Need for Protection”.

Page 9 of 23
salmon was either the central consideration. In both cases, advocates for the wild salmon played roles in making decision on siting.\textsuperscript{11}

In the case of British Columbia, an additional siting issue is the location of fish farms in relation to suspected migration routes. The Broughton Archipelago, for example, has the greatest concentration of fish farms in British Columbia, with 27 sites in 2003, of which 16 are located in sheltered inlets directly on wild salmon migratory passages to and from the sea.\textsuperscript{12} (See Figure 1)

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{chart.png}
\caption{Location of Salmon Farms in British Columbia}
\end{figure}


These locations could increase the risk of transmission of sea lice from farmed salmon to juvenile wild Pacific salmon in their out-migration to the sea, as the B.C. government acknowledged in 2003 in adjusting its requirements for treatment of sea lice during the out-migration periods.

MAL officials assert that whereas in European salmon aquaculture countries there are is a single migration route to the sea from salmon streams, in B.C., there are always multiple channels leading to open water. Thus, the B.C. aquaculture industry cannot locate anywhere without being on a salmon migration corridor.

Critics have argued, however, that salmon farms could and should be located in less sheltered locations away from the relatively narrow channels through which wild pink salmon pass, and that alternatives are available. The Senate Standing Committee on Fisheries has called for new regulations that would prohibit fish farms for salmon near migratory routes as well as salmon-bearing rivers.\(^\text{13}\)

It is unclear whether requiring relocation of salmon farms to protect wild salmon would mean that the aquaculture industry in BC would suffer some contraction. In any case, some other jurisdictions, including the New Brunswick in Canada, also suffer from a shortage of sites with adequate physical characteristics which have resulted in concentration of fish farms in relatively small areas. BC is not alone, therefore, in having physical circumstances that imposes potentially high costs on conforming to the requirement of this criterion. The present regulation in BC does not reduce the risk to salmon in at least one river, so it does not fulfill the requirements for the lowest score for this criterion, but because there is a regulation, it is also different from the indicator for a zero score. Therefore, it is deemed to fall between a score of zero and the minimum score.

RESULTS FOR CRITERION ONE: 1 Point.

Criterion 2:

Degree to which cumulative environmental impacts of salmon farming on an entire bay or other ecosystem are considered in siting decisions.

The Canadian Environmental Assessment Act (CEAA) of 1992 requires the assessment in advance of any project in terms of the “cumulative environment effectives that are likely to result from the project in combination with other projects or activities that have been or will be carried out.” In the case of the salmon aquaculture industry and wild salmon stocks, that law provides an obvious basis for a siting policy that considers the cumulative effect of all salmon aquaculture operations in a given area.

The 2000 Report of the Auditor General of Canada noted that the federal Department of Fisheries and Oceans was “currently unable to assess the cumulative environmental effects of salmon farm operations, as required by CEAA,” and that the Department “recognizes that it needs to determine how to assess the effects of multiple salmon farms on wild salmon stocks.”

Four years later the Commissioner of the Environment and Sustainable Development criticized the Department of Fisheries and Oceans for having failed to fill “significant gaps…with respect to the needed research on the potential effects of salmon aquaculture on aquatic ecosystems.”

The MAL points out that most aquaculture projects undergo “screenings” under CEAA, which involve “a systematic approach to documenting the environmental effects of a project and determining the need to minimize or mitigate these effects, modify the project plan, or recommend further assessment through mediation of a panel review.” Section 16 of CEAA indicates that every screening of a project must include a consideration of the environmental effects of the project, including a consideration of “any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out”.

Fisheries and Oceans Canada (DFO) is now developing “scientific tools” to study and measure such cumulative effects, in order to help industry and provincial agencies better understand cumulative environmental effects, including impacts on wild salmon stocks. However, it appears that those who are responsible for carrying out studies of cumulative effects still lack the tools needed to address some key scientific issues.

B.C. does have a regulatory requirement for screening that includes cumulative effects, but the study of those effects does not yet have an adequate scientific basis. Therefore, B.C. qualifies for a score of 5 for this criterion.

RESULTS FOR CRITERION TWO: 5 Points

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Criterion 3:

**Adequacy of standards for fish husbandry, including best industry practices in regard to year-class separation, fallowing of sites and maximum stocking densities**

British Columbia has no formal regulations covering any of the major issues in fish husbandry aimed at minimizing the risk of disease. Fallowing of sites, maintaining year-class separation and limiting stocking densities are not required in order to maintain a license.

The “Total Maximum Production per Production Cycle” for each salmon aquaculture site is approved by the MAL as a condition of license on the basis of a review of the proposed management plan by a biologist. However, the production limit per site does not take into account the factor of risk to fish health. According to an official of the MAL's Aquaculture Development, the biologists look at modeling of expected feed and feces levels to derive estimates of the environmental impact of the proposed biomass level. Those impacts are determined to be low, medium or high. The relationship between stocking density, stress on the fish and susceptibility to fish diseases is not taken into account at any stage of decision-making.

Therefore the technical factors that go into recommending the approval of a given level of biomass on a site does not provide an alternative to a standard for stocking densities that is based on considerations of risk to fish health.

MAL suggested that stocking densities would be covered by the fish health veterinarian. An inquiry with the Office of Fish Health Veterinarian revealed that stocking densities, fallowing and year-class separation are not part of that office’s responsibility either.

Each salmon aquaculture site is required to have a Fish Health Management Plan, which should identify risk factors in regard to fish health and “minimize their effect on fish health and their role in predisposing fish to disease.” However, the 2003 “Required Elements” document on these factors does not make reference to any of the three fish husbandry issues. It does specify that operators will “minimize the time fish are exposed to stressful events such as anesthesia/sedation, crowding, and out of water events…. But this language offers no indication of what “best practice” is expected of operators in regard to stocking densities.

The “Manual of Fish Health Practices” issued in 2004 also fails to address stocking densities or fallowing.

The British Columbia Salmon Farmers Association (BCFSA) promulgated its own “Code of Practice” in February 2005, which does touch on stocking densities, providing in paragraph 14.2: “Companies will maintain densities, in consultation with qualified fish health professionals, to provide good health and prevent undue stress on farm stock.”

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17 Phone? Interview with Joanne Constantine, January 11, 2006.
However, the Code of Practice assumes that there can be no general guidelines for maximum stocking densities. The Chair of the Compliance Committee for BCFSA explains that the decisions on stocking density are up to operators on the basis of their own calculations and are not subject to review by the Committee.\(^{18}\)

The MAL requirements for fish health plans require the separation of year classes on site “by keeping them in different holding units, where possible.” It further calls for accounting for differences in disease or infection status of year-classes in management operations to “reduce the risk of cross contamination.”\(^ {19}\) This is a much weaker standard than best industry practice, which requires that different year classes not be held on the same site.

The BC Fish Health Veterinarian explained that the absence of stronger requirements for year class separation was because the document in question was intended to cover all producers, including those which are marginal to total production and cannot afford to practice year-class separation. She said she must balance the desirability of the standard against the fact that she would be putting people out of business whose production is too small to affect overall conditions for fish health.

The fact that small producers cannot afford to meet the requirements of best practices in the industry does not appear to be an adequate reason for having no formal requirement on such a critical issue of fish husbandry. There is a reason for having regulations rather than simply leaving it to the discretion of government officials. If there is a sound reason for making distinctions in regard to year class separation based on size of farm, those distinctions could be included in a regulation.

The BCFSA Code of Practice does not refer at all to year class separation or fallowing; BCFSA explains this omission as the result of the waste regulation that went into effect in 2003. They assert that a general requirement for fallowing would not make sense, because the need for fallowing depends on biophysical characteristics of a site, such as water temperature and current, and on whether the site is in an area that is exposed to disease pathogens or sea lice infestation.

However, there are clearly multiple adjacent sites which do share such biophysical characteristics and have been subject to disease pathogens and sea lice infestation over a period of years. These sites should be subject to fallowing requirements either through regulation or through a transparent process of ensuring compliance with a Code of Practice.

Because neither the regulations now in force nor the industry Code of Practice requires best industry practices for any of the three fish husbandry issues, B.C. does not fulfill the requirements for the minimum score for this criterion.

RESULTS FOR CRITERION THREE: 0 Points

\(^{18}\) Interview with Sean Burke, Marine Harvest, January 19, 2006.
Criterion 4:

Adequacy of monitoring and enforcement of best practices in fish husbandry

The BC Ministry of Agriculture and Lands does not monitor any of the fish husbandry practices. According to BC’s Fish Health Veterinarian, the surveillance audit done by the MAL fish health staff on finfish health at 25 percent of all active salmon sites each quarter on a random sample basis does not check on any of these fish husbandry practices. It is aimed at early detection of disease and sea lice by examining mortalities, taking diagnostic samples and sampling sea lice.20

The BCSFA Code of Practice is the subject of an internal audit by the BCSFA Compliance Committee—a collection of information on implementation of the Code by member companies through a detailed questionnaire filled out by each company. The information is then compiled in a “State of the Industry” report. But because the Code does not prescribe any concrete norms for any of the three fish husbandry issues, it does not provide any monitoring of fallowing, year class separation or stocking densities.

The Code of Practice calls for aquaculture operators to monitor salmon stocks on a daily basis for “signs of stress or other abnormalities as a preventive measure.” However, there are no guidelines for interpreting this language and no effort is made to enforce it.

The MAL does not monitor stocking densities, year class separation or fallowing, according to the Fish Health Veterinarian. 21

Thus no system of monitoring and enforcement now exists in regard to these fish husbandry issues, and B.C. does not fulfill the requirements for a minimum score for this criterion.

RESULTS FOR CRITERION FOUR: 0 Points

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20 Phone interview with Joanne Constantine, Fish Health Veterinarian, January 11, 2006.
21 Phone interview with Joanne Constantine, January 11, 2006.
**Criterion 5:**

**Adequacy of practices and procedures for early detection of an outbreak of any disease or parasitic infection likely to affect wild salmon and rapid response to such an outbreak**

Prior to 2001, British Columbia had no requirement for monitoring and reporting on fish diseases or sea lice, using a specified common protocol, nor did it have any mandatory actions for depopulation or treatment upon clinical identification of the disease or an appropriate triggering level of parasite abundance on the farmed fish.

On December 1, 2000, the MAFF established an Auditing and Disease Surveillance pilot program, which did an initial survey of fish health and served as an audit for a Fish Health Database Pilot Project which was developed by the BCSFA and began operating in September 2001. That industry-led initiative involved fish farm reporting to their own database, and there was no legal requirement to report to MAFF.

As of June 2003, a Fish Health Management Plan (FHMP) was required of all aquaculture operators to maintain their license and the required elements of an FHMP were issued. Disease surveillance by industry then became a requirement for license holders. The document required that fish farm operators “regularly and systematically inspect fish and fish holding units for signs of disease,” and increase their monitoring “for groups of fish showing unusual morality rates, signs of morbidity or subjected to stressful events that could predispose them to disease.”

Operators contributed their aggregate data on mortalities each quarter to the industry’s own fish health database or provided its sampling and test findings to the provincial Fish Health Veterinarian on a quarterly basis.

As for notification in the event of a disease outbreak, the language of the main FHMP document prescribing the elements of an FHMP limited the obligation of the fish farm owner: “Operators must…notify Provincial and Federal authorities in the event of outbreaks in accordance with existing regulations or surveillance agreements.” The Template Fish Health Management Plan issued in August 2004 said, “Where appropriate and/or in accordance with existent regulation, operator’s management will report the outbreak to Provincial or Federal authorities.” There are no reportable fish diseases in Canada, nor is there any other legal or regulatory requirement for such reporting by aquaculture operators.

MAL officials suggested that the World Organization for Animal Health (OIE), of which Canada is a member, lists IHN as a reportable disease. However, OIE is an international organization, and the requirement is at a national level. That reporting requirement does not translate into any additional regulatory requirement for aquaculture operators to report.

Operators were not required to act immediately to remove fish exposed to disease from the water in the event of an outbreak of the highly contagious IHVN. They were required to have a “rapid response plan to reduce the spread of disease and initiate when a disease outbreak is detected,” but not to carry out any specific actions for dealing with IHVN upon discovery of a fish disease. There are no mandatory steps regarding depopulation of cages or sites upon clinical verification of any disease found on the site. The Template Plan made it clear that any decisions about
whether to depopulate a site would be made by the company management without any involvement by authorities. “The Veterinarian, Fish Health Management and site management will work together to review fish health records and make further management decisions.” The official document on “biosecurity procedures” for sites found to be positive for IHN virus provides only “recommended procedures” for processing and harvesting IHN virus-infected fish.\textsuperscript{22}

Sea lice monitoring and actions are treated separately in the B.C. system of management. The first sea lice monitoring in the province began in February 2003, when provincial regulators established the Interim Sea Lice Monitoring program for 16 salmon farms in the Broughton Archipelago, of which 14 were surveyed for sea lice. The operators at the 14 sites examined lice on a sample of twenty fish per cage from three cages per site, and measured sea lice abundances and report at least once a monthly, and then to twice monthly. The MAL did its own monitoring of 25 percent of the sites (i.e., four fish farms) chosen at random every two weeks at the same time as the sampling by the farm operators, then increased the monitoring to 50 percent of the sites.\textsuperscript{23}

During the year beginning October 1, 2003, the requirements were extended for industry monitoring and reporting on lice abundances to the entire province. The requirement for sea lice sampling based on a standardized protocol was made part of the FHMP required as a condition of licensing as of November 1, 2003. The Ministry continued its own independent monitoring of lice levels on 25 percent of farms randomly selected to ensure industry compliance with reporting requirements and to verify the industry reporting.\textsuperscript{24}

Also during that year, a requirement was established to reduce lice levels through either harvesting of the fish or chemical treatment of stocks whenever the count of mobile lice reached 3 or 6, if it occurs during the period of pink salmon out-migration. If those triggering levels are reached, monitoring and reporting must also be increased to twice a month.\textsuperscript{25} In 2005, the trigger level for such actions was changed to 3 mobile lice per fish throughout the entire year, and the MAL increased its own monitoring program to 50 percent of active sites during the 2\textsuperscript{nd} quarter, which coincides with juvenile out-migration to the sea.\textsuperscript{26}

The combination of the formal requirement for Fish Health Management Plans, the specificity of the actions to be taken and the ability to monitor compliance through the MAL random sampling gives these treatment actions upon reaching a triggering level of sea lice regulatory force.

B.C. has in place a requirement for frequent industry monitoring and reporting on fish disease in general, including sea lice. The actions for treatment of sea lice at trigger levels are mandatory.

\textsuperscript{23} “Broughton Archipelago Sea Lice Action Plan,”
http://www.agf.gov.bc.ca/fisheries/health/science_BA_monitoring.htm
\textsuperscript{24} “Review of Sea Lice Management Oct. 1, 2003 thru Sept. 30, 2004,”
\textsuperscript{25} Ibid.
\textsuperscript{26} “Sea Lice Management 2005,” http://www.agf.gov.bc.ca/fisheries/health/Sealice/sealice_strategy_05.pdf
There are no mandatory actions to be taken upon clinical identification of IHN on salmon farms, however. Therefore B.C. fulfills the requirements for the second highest score for this criterion.

RESULTS FOR CRITERION FIVE: 5 Points
Criterion 6:

Adequacy of national plan for minimizing escapes in regard to equipment and structures

British Columbia adopted an Aquaculture Regulation in April 2002 (BC Reg. 78/2002) which provides rigorous standards for containment structures and cage support systems, including design, installation and maintenance of net cages and net cage mesh strength. The standards for containment structure design required field trials, and analysis of performance trial or review by professional engineer to ensure compatibility with the proposed location.

The standards for net cages called for minimum net cage mesh breaking strength, depending on net cage dimensions. It required testing of that breaking strength according to a specific BC testing procedure. A further requirement is for an underwater inspection on all containment structures before initial introduction of a new group of fish and every 60 days by divers or another comparable method.

These new regulations meet the requirements for highest score for this criterion.

RESULTS FOR CRITERION SIX: 10 Points
**Criterion 7: Adequacy of national plan for minimizing escapes in regard to management operations, site-specific contingency plans and notification of escapes.**

The new aquaculture regulation adopted requires that, within 180 days of the regulation coming into force, license holders must “develop and follow a best management practices plan” for the operation and maintenance of finfish aquaculture facilities to prevent escapes into the environment. The plan is to include the specific best practices and procedures used at the site to prevent escapes, must be reviewed and endorsed by the license holder and certify that the employees responsible for implementing the plan have received training in carrying it out.

The regulation requires that license holders report any escape events within 24 hours. They also require that the license holder must “take all reasonable measures” to prevent the escapes of fish into the environment.

A separate requirement is for escape response plans that include detailed procedures for preventing further escapes and reporting any escapes that have taken place. It further requires that “all reasonable measures” consistent with regulations be taken to “recapture a significant proportion of the lost stock.”

All escape incidents, even those which have not resulted in any loss of fish, are investigated by the MAL Licensing and Compliance Branch on site. Such investigations depend for the most part on the willing cooperation of the operator and the staff of the operation. Only in relatively rare cases of large escapes is evidence from fishermen used in the investigation. However, such investigations have become more sophisticated in recent years, as feeding records have been used to identify sudden changes in the number of fish on hand.

This regulation fulfills all the requirements for the highest score for this criterion.

RESULTS FOR CRITERION SEVEN: 10 Points.
**Criterion 8:**

**Adequacy of monitoring in order to assess compliance with the national plan and to verify the plan’s efficacy.**

Inspectors from the B.C. MAL Licensing and Compliance Branch visit all licensed aquaculture operations at least once a year to review and assess compliance with the regulations on escapes. Inspectors interview company officials and review on-site records relating to those regulations.

Inspectors also interview employees and examine log books to determine the requirement that escapes or suspected escapes must be reported within 24 hours. The limitations on this part of the monitoring process should be understood. If a company wishes to cover up an escape, they may do so simply by not making note of it in the log book. There is no effort by the inspectors to review inventory records with a view to verifying that no losses took place. The only inspection of such records is to assess the requirement that such records be kept on site.

Inspectors also review the Best Management Practices document detailing specific practices and procedures used to prevent fish escapes during phases of the operation where the risk of escapes is higher. They do not assess the quality or effectiveness of the plan but only whether a BMP exists, whether it includes all the components required, and whether a copy is located on-site, and whether the BMP was reviewed and endorsed by the holder. Thus the monitoring of that element of compliance with escape regulations is quantitative rather than qualitative in character.

The compliance visit may include examination of daily logs of required inspections of equipment and net maintenance records. These are apparently not examined beyond the most cursory viewing to ascertain that the records are indeed kept on site.

Inspectors assess whether the company has developed an escape response plan and, and on some occasions, at least, question staff members on their ability to describe the contents of the plans. Compliance with the requirement for training in carrying out the response plan does not appear to be systematically monitored or reported.

The on-site monitoring also includes an above-water inspection of net cages and supporting infrastructure by the inspector. However, an underwater dive audit of the system is also needed to verify that the system avoids problems that could result in tears in the net. Such dive audits are only carried out on a limited and random basis rather than on all sites. In 2003, for example, only five sites – about 6 percent of the 77 active sites that year – were subject to a dive audit.

Thus the on-site monitoring by the B.C. government covers all the necessary aspects of a national plan for preventing or minimizing escapes, even though it is limited to checking on the record-keeping requirements rather than assessing the effectiveness of required plans for responding to escapes, best management practices and equipment and regular on-site inspections. The monitoring system lacks a systematic underwater inspection of the containment system. Nevertheless, the system of inspection fulfills the requirements for the highest score for this criterion.

**RESULTS FOR CRITERION EIGHT: 10 Points.**
Overall B.C. and Comparative Results

Table 1: Overview of British Columbia’s Results

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Score</th>
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<tbody>
<tr>
<td>1. Minimum distance or exclusion zone</td>
<td>1</td>
</tr>
<tr>
<td>2. Cumulative impacts and siting decisions</td>
<td>5</td>
</tr>
<tr>
<td>3. Adequacy of standards for fish husbandry</td>
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</tr>
<tr>
<td>4. Monitoring and enforcement of standards for fish husbandry</td>
<td>0</td>
</tr>
<tr>
<td>5. Practices and procedures for disease detection and response</td>
<td>5</td>
</tr>
<tr>
<td>6. Containment: standards for equipment and structures</td>
<td>10</td>
</tr>
<tr>
<td>7. Containment: standards for management, contingency plans and notification.</td>
<td>10</td>
</tr>
<tr>
<td>8. Containment: monitoring for compliance and efficacy</td>
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<tr>
<td><strong>B.C. Average Score</strong></td>
<td><strong>5.1</strong></td>
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Table 2: Comparisons of Scores by Criterion

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<tr>
<th>Criterion</th>
<th>British Columbia</th>
<th>Atlantic Canada</th>
<th>Iceland</th>
<th>Ireland</th>
<th>Norway</th>
<th>Scotland</th>
<th>United States</th>
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<td><strong>9.6</strong></td>
<td><strong>4.4</strong></td>
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<td><strong>3.4</strong></td>
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<td><strong>5.8</strong></td>
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*The result for Scotland on Criterion 1 was erroneously published in the 2005 report as a 3; it should have been 0, based on the analysis provided. That reduces Scotland’s average score from 3.8 to 3.4.

Ms. Pamela Parker  
Managing Director  
BC Pacific Salmon Forum  
L - 427 Fitzwilliam Street  
Nanaimo, BC  
V9R 3A9

Dear Ms. Parker:

SUBJECT: FISHERIES AND OCEANS CANADA RESPONSE TO “AN AUDIT OF THE MANAGEMENT OF SALMON AQUACULTURE FOR THE PROTECTION OF WILD SALMON IN BRITISH COLUMBIA” BY GARETH PORTER

I am writing in response to the report entitled An Audit of the Management of Salmon Aquaculture for the Protection of Wild Salmon in British Columbia prepared for the Pacific Salmon Forum by Gareth Porter. I have reviewed the report after previously participating in providing material to the report’s author.

While I applaud the Pacific Salmon Forum for undertaking a review of the regulatory regime for salmon aquaculture in BC, I do have concerns over a number of the assessments in the report. In particular, I believe the scores reached for Criteria 1, 2, 3, 4, and 5 do not accurately reflect the level of regulatory control placed on the industry in BC. Criteria 1 & 2 are within the DFO mandate for aquaculture management in BC so I will address them in more detail. Criteria 3, 4 and 5 are within the purview of provincial agencies and I leave it to those agencies to address them in their response.

In response to the score reached for Criterion One:

Adoption of a siting policy aimed at keeping aquaculture at a safe distance from salmon rivers.

I am unsure of the reasoning behind the conclusion that the siting buffer does not protect a single salmon river. In my opinion the siting buffer of 1km as currently applied affords some measure of protection for all salmon rivers. Furthermore, I
would like to draw the attention of the Forum and readers of the report to the recently released DFO - Wild Salmon Policy that clearly states that if specific Conservation Units of wild salmon are threatened by aquaculture operations, corrective actions will be taken under the Fisheries Act or longer-term solutions will be pursued as part an integrated planning process. This confirms DFO’s policy that the long term viability of wild salmon will take precedence in aquaculture management and siting decisions.

In response to the score reached for Criterion Two.

**Degree to which cumulative environmental impacts of salmon farming on an entire bay or other ecosystem are considered in siting decisions**

I was pleased that the author took into account the mandated requirement under the Canadian Environmental Assessment Act (CEAA) to consider cumulative effects of a project. I would however argue that these assessments are based on science. Cumulative Effects Assessments for aquaculture sites consider those ecosystem components for which a determination of low or medium impact has been reached in the environmental assessment of the project. Those ecosystem components are assessed against the cumulative impacts of other projects in the area, both current and foreseeable, and then a determination is made as to the level of cumulative effect. The initial determination of those effects in the environmental assessment is based on the best scientific advice available.

The Forum and readers of the report should also be aware that in BC farms must located no less than one kilometer from each other if there are owned by the same company and no less than 3km from each other if they are owned by different companies. This mandated siting buffer reduces the likelihood and severity of cumulative effects by spacing farms out and reduces the likelihood that two farms would share a bay.

Thank-you for the opportunity to comment on the report.

Yours sincerely,

Andrew Thomson  
A/Director, Aquaculture Management Division

cc: P. Sprout  
D.D. Radford  
T. Davis
July 31, 2006

BC Pacific Salmon Forum
c/o Pam Parker
L - 427 Fitzwilliam St
Nanaimo BC  V9R 3A9

Re: Ministry of Agriculture and Lands Response to “An Audit of the Management of Salmon Aquaculture for the Protection of Wild Salmon in British Columbia” By Gareth Porter

The Ministry of Agriculture and Lands would like to acknowledge the BC Pacific Salmon Forum for undertaking this initiative and Mr. Porter’s effort, in a very short time, to try to understand management of salmon farming in British Columbia.

Audits and reviews can be informative and we are always seeking information that could lead to improvements in our management of salmon aquaculture.

As indicated in the report, there was contact with federal and provincial staff during its preparation. We do not want to re-iterate those discussions here. In general, we would have preferred to see an audit that focused on outcomes and not simply on whether or not a specific action was prescribed in regulation.

There are two main points that we would like to highlight for the BC Pacific Salmon Forum:

1. British Columbia has adopted primarily a performance-based and not a prescriptive-based approach to management of salmon aquaculture. The performance-based approach relies on setting standards, monitoring, auditing and adaptive management. This differs fundamentally from the other jurisdictions to which the consultant has previously applied his criteria, and

2. The criteria applied in the report did not acknowledge the benefits of a performance-based management system and of the Fish Health Management Program and how the Fish Health Management Plan has full regulatory force because it is a condition of licence.

We would be happy to work with the BC Pacific Salmon Forum to clarify how we believe that British Columbia’s regulatory regime meets the intent of the various criteria and indicators relied on by the consultant in his evaluation.
We would also encourage readers of this report to visit our website at: 
http://www.agf.gov.bc.ca/fisheries/index.htm to learn more about British Columbia salmon 
aquaculture, our aquaculture regulatory framework and our management of the industry.

Yours sincerely,

Dr. Al Castledine  
Director  
Aquaculture Development Branch

Ms. Jaclynn Hunter  
Director  
Licensing and Compliance Branch

Dr. Joanne Constantine  
Fish Health Veterinarian  
Animal Health Branch