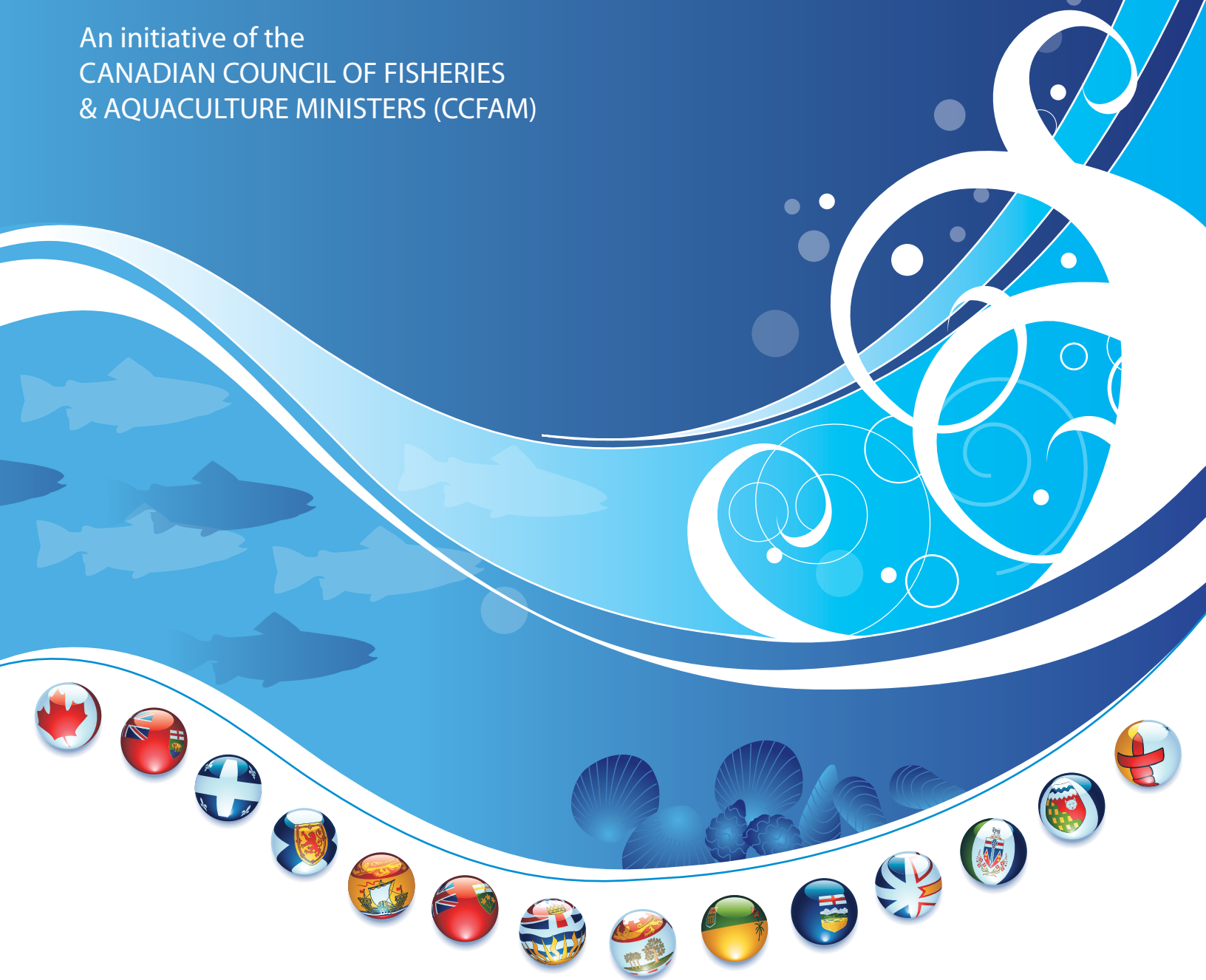


National Aquaculture Strategic Action Plan Initiative (NASAPI) 2011 - 2015

An initiative of the
CANADIAN COUNCIL OF FISHERIES
& AQUACULTURE MINISTERS (CCFAM)



East Coast Shellfish Sector Strategic Action Plan

Canada 

**NATIONAL AQUACULTURE STRATEGIC
ACTION PLAN INITIATIVE**

**EAST COAST SHELLFISH SECTOR
STRATEGIC ACTION PLAN**

2011–2015

November 9, 2010

TABLE OF CONTENTS

INTRODUCTION.....	1
GOVERNANCE.....	1
Environmental Management.....	2
Introductions and Transfers of Aquatic Organisms.....	3
Navigable Waters Protection Act.....	4
On-Site Inspection.....	5
Access to Wild Aquatic Resources for Aquaculture Purposes.....	5
Canadian Shellfish Sanitation Program.....	6
Other Regulatory and Governance Issues.....	8
SOCIAL LICENCE AND REPORTING.....	9
Public Engagement and Communications.....	9
FIRST NATIONS AND OTHER ABORIGINAL GROUPS.....	11
PRODUCTIVITY AND COMPETITIVENESS.....	13
Shellfish Health.....	13
Aquatic Invasive Species.....	15
Emerging Technologies.....	16
Alternative Species Development.....	18
Risk Management and Access to Financing.....	20
Infrastructure.....	22
Marketing and Certification.....	23
Labour and Skills Development.....	24
APPENDIX 1 — LIST OF ACRONYMS.....	25

INTRODUCTION

The National Aquaculture Strategic Action Plan Initiative (NASAPI) is a collaborative exercise led by the Canadian Council of Fisheries and Aquaculture Ministers (CCFAM) to enhance and advance economically, environmentally and socially sustainable aquaculture development in all regions of the country. For additional information regarding the initiative, refer to the overarching NASAPI Plan (<http://www.dfo-mpo.gc.ca/aquaculture/aquaculture-eng.htm>). The initiative includes five strategic action plans that pertain to the five regionally distinct aquaculture sectors in Canada: East Coast marine finfish, East Coast shellfish, national freshwater, West Coast marine finfish and West Coast shellfish. Although the action items outlined herein are specific to the shellfish aquaculture sector, implementation of this action plan should remain consistent with the vision, objectives and guiding principles of the initiative's overarching document.

The strategic action plans outline areas where efforts are required to improve public governance of aquaculture and private operations (although not all of the action items within the plans necessarily apply to all provinces and territories). Effective, well-communicated governance enhances public confidence in government oversight of industry activities, leading to an improved social licence—and in turn, to increased investor confidence in aquaculture, which will stimulate responsible and sustainable growth that creates economic prosperity.

Responsibility for the implementation of the strategic action plans lies principally with the bilateral Federal–Provincial Aquaculture MOU Management Committees. For those actions that are national in scope, the CCFAM Strategic Management Committee will assume a lead role in implementation. The following principles will guide the implementation process:

- Each government partner shall remain accountable to its jurisdiction.
- Using a collaborative decision-making process, the Federal–Provincial/Territorial Bilateral Aquaculture MOU Management Committees will prioritize actions, agree upon time frames and coordinate implementation efforts.
- Implementation will occur in accordance with the resources available within each jurisdiction where agreed upon—i.e., the process is intended to help direct resources toward areas of need and priority within each province/territory.
- Performance measurement will facilitate implementation by helping to keep the plan(s) current and by identifying constraints.

GOVERNANCE

Within the federal government, the Department of Fisheries and Oceans (DFO) is the lead agency for aquaculture development. As such, part of DFO's mandate is to create the conditions necessary to support a vibrant and innovative aquaculture sector. Several other federal departments and agencies are involved in the management of aquaculture in Canada. Most notably, these include the Canadian Food Inspection Agency, Environment Canada, Health Canada and Transport Canada. The provinces and territories also play substantive roles in the development and management of aquaculture.

Environmental Management

In shellfish aquaculture, the requirement to uphold environmental protection is enforced under several federal and provincial/territorial acts and regulations.

The NASAPI presents an opportunity for governments to introduce increased consistency and certainty to these processes by applying harmonized environmental standards, monitoring and reporting. This is expected to improve environmental management within the sector, leading to increased public confidence in both industry operations and government oversight of them.

Action Items—Environmental Management			
Potential Contributors	Actions	Suggested Timeframe ¹	Status
EM-1. Develop a consolidated environmental management framework governing aquaculture			
DFO, Provinces/Territories, Environment Canada, Industry & Other Stakeholders	- Identify and share insight regarding valued ecosystem components, ecosystem use and dynamics, cumulative impacts, etc.	Year 3	Ongoing
	- Review standards and benchmarks for biological performance & environmental management, and update where necessary	Year 3	Ongoing
	- Review management processes based on consistent use of appropriate science-based, predictive management tools	Year 3	Ongoing
	- Outline an adaptive management approach to decision-making	Year 3	
	- Improve participatory decision-making and communication mechanisms appropriate to each region and sector	Year 3	
	- Incorporate service standards into environmental review processes	Year 3	
EM-2. Establish fish habitat protocols consistent with the application of the <i>Fisheries Act</i> to be applied equitably across the country			
DFO, Provinces/Territories, Industry	- Review fish habitat protocols in consultation with stakeholders	Year 1	Ongoing
	- Identify mechanisms to allow reviewed and approved aquaculture applications to advance without contravening s.35 of the <i>Fisheries Act</i> while ensuring that proper measures are in place to conserve and protect fish and fish habitat	Year 2	

¹ Within the tables, a time frame has been suggested for completion of all action items within the strategic objective. Inevitably, some action items will be completed on a faster schedule than others, even within the same strategic objective. The final time frames will be reviewed and agreed upon by each of the MOU Management Committees.

EM-3a. Support R&D pertaining to environmental effects and management			
DFO, Provinces/Territories, Industry	- Prioritize R&D requirements for improved environmental management pertaining to on-bottom and suspension shellfish culture	Year 1	
EM-4a. Streamline and harmonize the site application and review process for on-bottom and suspension shellfish aquaculture			
DFO, Provinces/Territories, Industry	- Review the <i>Guide to Information Requirements for Environmental Assessment of Marine Aquaculture—Shellfish</i> developed in 2001, and update as necessary	Year 1	
	- Implement the class-type assessment protocol	Year 2	

Introductions and Transfers of Aquatic Organisms

In 2003, Canada’s provincial, territorial and federal governments jointly introduced *The National Code on Introductions and Transfers of Aquatic Organisms*, which establishes an objective decision-making framework regarding intentional introductions and transfers of live aquatic organisms in Canadian watersheds. The Introductions and Transfers (I&T) Code prescribes a consistent process for assessing and managing the potential risks associated with introducing and transferring aquatic organisms, thereby enabling governments to maximize the benefits associated with such introductions or transfers while avoiding harm to natural aquatic ecosystems, deleterious genetic impacts on feral fish populations, and risks to aquatic animal health from the spread of pathogens and/or parasites. (Note, however, that the I&T assessment process does not include diseases that are regulated under the NAAHP.)

The I&T Code is designed to protect aquatic ecosystems while encouraging the responsible use of aquatic resources for the benefit of Canadians. It is administered by a combination of federal and provincial agencies under the *Fisheries Act*; the Fisheries (General) Regulations authorize DFO to issue I&T licences in all provinces and territories except Québec (in freshwater), Ontario and the Prairies, where provincial regulations apply. The NASAPI presents an opportunity to introduce comprehensive policy and management guidelines to improve consistency and predictability for the aquaculture sector, particularly when routine transfers are involved.

Action Items—Introductions & Transfers			
Potential Contributors	Actions	Suggested Timeframe	Status
IT-1. Review and update the I&T management framework (pending implementation of the NAAHP) as appropriate			
DFO, Provinces/Territories, Industry	- Delineate roles and responsibilities, including delegation of administrative authorities where necessary	Year 1	
	- Establish a national electronic I&T database to facilitate information sharing regarding risk assessments & decisions	Year 2	
	- Review federal & provincial/territorial I&T information requirements, application procedures and service standards to facilitate consistency	Year 2	
	- Incorporate routine I&T matters related to fish transfers,		

	habitat, fish health, genetics, etc., as conditions of licence where applicable <input type="checkbox"/> identify zones / watersheds/bays having similar disease, genetic and ecological characteristics to facilitate shellfish transfers - Outline a protocol for “medium risk” factors (as defined in the code), taking into account additional factors such as other potential vectors for transfer of unwanted pathogens or organisms, socio-economic implications, mitigation measures, etc.	Year 2	
		Year 2	

Navigable Waters Protection Act

Most suspension (floating) aquaculture structures require approval under the *Navigable Water Protection Act* (NWPA) because they have the potential to interfere with navigation. The requirement for an NWPA approval may also trigger a federal environmental assessment under the *Canadian Environmental Assessment Act* if the project is considered likely to cause substantial navigational interference.

The NASAPI has identified an opportunity for Transport Canada to introduce a more standardized approach for site reviews and navigational marking requirements for aquaculture works. Renewed site review and operational guidelines will improve consistency and interpretation amongst regional reviewers and level the playing field for producers. Efforts should also be made to extend the approval period beyond five years, with longer approvals and simplified renewal procedures for compliant operators.

Action Items—Navigable Waters			
Potential Contributors	Actions	Suggested Timeframe	Status
NWPA–1. Review and renew national policies and guidelines for aquaculture site applications under the NWPA			
DFO, Transport Canada, Industry, Provinces/Territories	<ul style="list-style-type: none"> - Review and update Transport Canada's Application and Site Marking Requirements for Aquaculture Projects in Canada to meet federal, provincial/territorial and industry needs <ul style="list-style-type: none"> <input type="checkbox"/> specifically address needs within various classes of aquaculture <input type="checkbox"/> strive toward development of a streamlined review process <input type="checkbox"/> consistently apply navigational site marking requirements across Canada - Conduct a review of all current Transport Canada aquaculture approvals to determine the level of compliance and take measures to make all sites compliant - For sites where aquaculture gear is submerged during winter, develop protocols/technologies to minimize potential navigational risk and impact prior to ice-over and before the gear has been raised after ice-out - Identify policy and/or procedural means by which Transport 	Year 1	Ongoing
		Year 1	Ongoing
		Year 2	

	Canada can allow for 'works' to be realigned and/or modified within the boundaries of the leased area to facilitate improved site management without contravention of the NWPA	Year 2	Ongoing
	- Identify means to lengthen the duration of NWPA approvals and to simplify the approvals process for compliant operators	Year 3	

On-Site Inspection

Federal and provincial/territorial legislation and regulations make it necessary for government officers to conduct site inspections from time to time to ensure that legal requirements are being upheld. The NASAPI presents an opportunity to introduce clear and comprehensive guidelines that could consolidate and streamline federal–provincial/territorial inspection requirements. A renewed and consistent inspection and reporting protocol would increase operator compliance and enhance public confidence in governments' abilities to oversee the sector.

Action Items—On-Site Inspections			
Potential Contributors	Actions	Suggested Timeframe	Status
SIE-1. For each class of aquaculture operations, review site inspection requirements and protocols to improve operational efficiency as appropriate for the scope and scale of the sector			
DFO, Provinces/Territories, EC, TC, CFIA	- Outline a uniform site inspection and reporting protocol for all federal/provincial/territorial regulatory requirements	Year 2	
SIE-2. Foster development of a class of government "aquaculture officers" to conduct inspection activities as appropriate for the scope and scale of the sector			
DFO, Provinces/Territories, EC, TC, CFIA	- Train enforcement officers to work specifically in the aquaculture sector (full- or part-time as required in the area)	Year 3	

Access to Wild Aquatic Resources for Aquaculture Purposes

DFO's policy on Access to Wild Aquatic Resources for Aquaculture Purposes provides a framework and criteria to facilitate access to wild fish and aquatic plants for aquaculture in situations where access to wild stocks is essential to the development and expansion of the Canadian industry—for example, to collect organisms to establish or supplement captive broodstock populations. Since most fisheries are managed under limited entry rules—and recognizing that many fisheries are fully subscribed—the policy has been designed to ensure that the requirements of the aquaculture sector are factored into Integrated Fisheries Management Plans (IFMPs).

Because few participants in the Canadian aquaculture sector are aware of the policy, it is not routinely applied. The NASAPI presents an opportunity to enhance awareness of the policy and improve access to wild aquatic resources for aquaculture producers.

Action Items—Access to Wild Aquatic Resources for Aquaculture Purposes			
Potential Contributors	Actions	Suggested Timeframe	Status
AWR-1. Conduct the mandated review of the Access to Wild Aquatic Resources for Aquaculture Purposes Policy			
DFO, Provinces/Territories, Industry	- Review the existing policy and update as required	Year 1	
	- Communicate effectively during the review process to make aquaculture and wild fisheries communities and other stakeholders aware of the policy	Year 1	
AWR-2. Improve access to shellfish spat			
DFO, Provinces/Territories, Industry	- Conduct an assessment of spat collection requirements and constraints throughout Atlantic Canada and Québec	Year 1	
	- Develop a resource plan to allocate access to spat collection in a sustainable and equitable manner	Year 2	

Canadian Shellfish Sanitation Program

The Canadian Shellfish Sanitation Program (CSSP) was introduced in 1925 to protect the public from the consumption of contaminated shellfish (class *Mollusca*). A secondary objective is to ensure, where applicable, unencumbered trade in shellfish between Canada and the U.S. by maintaining standards consistent with the American National Shellfish Sanitation Program (NSSP) guidelines.

The CSSP is jointly administered by Fisheries and Oceans Canada (DFO), the Canadian Food Inspection Agency (CFIA) and Environment Canada (EC). EC conducts shoreline sanitary surveys, monitors growing water quality, and classifies harvesting and growing water areas. DFO opens and closes areas, enforces closures, and controls relaying, depuration and the harvesting of shellfish from classified areas under the authority of the *Fisheries Act* and regulations. The CFIA oversees the handling, processing, labelling, transportation and import/export of shellfish. The agency also provides liaison with foreign governments and manages the marine biotoxin monitoring program.

Historically, the CSSP focused primarily on the wild commercial harvest intended for export. Today, the program is facing growing pressures from expanding aquacultural, recreational and aboriginal (food/social/ceremonial and commercial) sectors, as well as deteriorating water quality from increasing urbanization, coastal development, point-source sewage outfalls and agricultural run-off. Tougher patrol standards from the U.S. Food and Drug Administration and the European Union—our principal markets—are additional challenges placing growing demands on the limited resources available for testing, regulation and enforcement.

The NASAPI presents an opportunity to renew key aspects of the CSSP to help producers and harvesters provide appropriate food safety assurances and maintain access to foreign markets.

Action Items—Canadian Shellfish Sanitation Program			
Potential Contributors	Actions	Suggested Timeframe	Status
CSSP–1. Contribute toward resolving the challenges imposed by point-source wastewater treatment plant outfalls or sewage outfall (raw wastewater) which could contaminate shellfish growing areas			
Provinces/Territories, DFO, CFIA, EC	- Creation of accurate marine charts overlaying existing waste outflows, current patterns and areas under lease	Year 2	Ongoing
Provinces/Territories, EC, DFO, CFIA, Industry	- Fully assess the situation and develop appropriate mitigation measures as required and such as: <input type="checkbox"/> improve wastewater treatment capacity (related to ability to harvest shellfish) <input type="checkbox"/> identify strategies to prevent the release of untreated municipal effluents close to shellfish growing areas, and optimize short-term monitoring	Year 3	
EC, Research Institutions	- Review DNA tracing and other new testing methods to better track sources of contamination and present results to EC for consideration	Year 3	
Provinces/Territories	- Identify and implement, when applicable, mitigation measures and standards to help address municipal wastewater and runoff issues	Year 5	
CSSP–2. Modernize the CSSP to make it more responsive to the needs of markets and producers			
DFO, CFIA, EC, Industry, Provinces/Territories	- Improve communications & information sharing related to the CSSP management process, especially with respect to area closures	Year 1	Ongoing
	- Review the CSSP and develop a plan and process to improve the program, for example: <input type="checkbox"/> develop means to enable aquaculturists to conduct prescribed routine work on leases during area closures <input type="checkbox"/> explore alternative methods to implement the CSSP (e.g., impose a fee-for-service schedule; authorize private, certified contractors; develop an industry-implemented water quality sampling program using CFIA’s QMP for fish processing as a guide) and establish pilot project(s) to evaluate the potential of such initiatives <input type="checkbox"/> identify opportunities to improve the turnover time for processing marine biotoxin tests by improving existing processes and/or evaluating new methodologies for testing <input type="checkbox"/> review and update water quality sampling standards as required to better reflect the needs of the sector; e.g., CSSP is based on surface-water testing, but mussels are increasingly harvested from deep-water sites	Year 2	Ongoing

Other Regulatory and Governance Issues

Other regulatory and governance issues exist within the aquaculture sector, as outlined in the following chart. Among these, the rights and obligations of aquaculturists under the existing legislative and regulatory regime should be better defined with respect to property rights, public rights of access to waters near aquaculture sites, First Nations and aboriginal rights, etc. The NASAPI presents an opportunity to address and resolve these matters as well.

Action Items—Other Regulatory and Governance Issues			
Contributing Partners	Actions	Suggested Timeframe	Status
ORI-1. Identify the rights, privileges and obligations of aquaculturists operating in public waters			
DFO, Provinces/Territories, Industry	<ul style="list-style-type: none"> - Conduct a comprehensive review of aquaculture rights, privileges and obligations vis-à-vis fisheries, riparian rights, agriculture, right-to-farm, etc., including: <ul style="list-style-type: none"> <input type="checkbox"/> control mechanisms <input type="checkbox"/> lease, tenure & licence rights <input type="checkbox"/> property rights (transferability, exclusivity, duration, flexibility, security) <input type="checkbox"/> economic externalities <input type="checkbox"/> remediation of retired and/or fallow sites <input type="checkbox"/> legality of shellfish as collateral under the <i>Canada Bank Act</i> 	Year 1	
Provinces/Territories, DFO	<ul style="list-style-type: none"> - Review and update shellfish leasing guidelines: <ul style="list-style-type: none"> <input type="checkbox"/> better define the rights of lease-holders and other resource users as appropriate <input type="checkbox"/> empower lease holders to manage and control activities more effectively on or near their leases 	Year 3	
ORI-2. Allow reintroduction of under-sized organisms to leased areas after grading/processing			
CFIA DFO, EC	<ul style="list-style-type: none"> - Review protocols to specify circumstances and requirements for reintroduction of live shellfish to leased areas 	Year 2	
ORI-3. Expand access to summer marketing program permits to enable producers in Atlantic Canada to maintain year-round market access			
CFIA Industry, DFO, EC	<ul style="list-style-type: none"> - Review summer harvest program to accommodate producers 	Year 2	

ORI-4. Enable multiple species to be listed on a single shellfish lease			
Provinces/Territories, DFO, CFIA, EC, Industry	<ul style="list-style-type: none"> - Review licensing protocols to enable more comprehensive management of shellfish leases, including: <ul style="list-style-type: none"> □ provisions for the culture and harvest of multiple species on a single lease □ the establishment of protocols (SOPs) for each species to be managed 	Year 2	
ORI-5 – Allow for routine operations on tenures / licences of occupation			
DFO, CFIA, EC, Provinces / Territories	<ul style="list-style-type: none"> - Include routine operations where movement of stock is involved and other operations required for good animal husbandry (such as predator management, etc.) as a condition of licence that does not require a permit or authorization, provided that the ability to provide full traceability of product is not compromised. 		

SOCIAL LICENCE AND REPORTING

Public Engagement and Communications

This action plan outlines means to improve private operations and public governance within the sector to advance the environmental and social sustainability, as well as the international competitiveness, of Canadian aquaculture. Assuming these action items are implemented effectively, the industry’s social licence should improve - but only if First Nations, aboriginal groups, community interests and the general public are aware of the progress within the sector. Therefore, timely and transparent communications as well as active community engagement are necessary to disseminate information about the economic, social and environmental sustainability of Canadian aquaculture. As part of the NASAPI, DFO, in collaboration with Statistics Canada and the provinces/territories, will compile an annual progress report entitled *Aquaculture Sustainability Reporting Initiative*, which will objectively present the economic, environmental and social sustainability of Canadian aquaculture.

Considering the broad array of user groups and the overlay of public and private interests in the aquatic environment, a broad policy perspective and public support are essential for effective aquaculture development planning. To be effective, planning initiatives must reflect an ecological perspective to spatial boundaries on a watershed basis, taking into consideration the interests of aquatic and upland users. The NASAPI presents an opportunity to develop and implement a cooperative planning approach to identify areas within Canada's coastal zone where aquaculture development can be optimized. Governments can play a variety of catalytic roles, including policy development, providing financial contributions to stimulate progress, and contributing to the science base required for aquatic resource mapping.

Action Items—Public Engagement & Communications				
Potential Contributors	Actions	Suggested Timeframe	Status	
SL-1. Establish a transparent information sharing system to facilitate aquaculture reporting				
DFO, Provinces/Territories, Industry	- Define information requirements and establish a standardized system for compiling, reporting and disseminating operational and compliance information that is respectful of the proprietary nature of some industry data	Year 1	Ongoing	
	- Incorporate information-sharing protocols into the federal-provincial/territorial aquaculture MOUs	Year 1		
	- Where appropriate, and within the scope of the <i>Privacy Act</i> and other pertinent regulations, incorporate information sharing requirements as a condition for securing an aquaculture licence <ul style="list-style-type: none"> <input type="checkbox"/> Identify the key issues related to the scope, timing and cost of the information requirements 	Year 1		
	- Implement the Sustainability Reporting Initiative; i.e., compile information and publish an annual, fact-based, objective report on the social, economic and environmental sustainability of the aquaculture sector that will: <ul style="list-style-type: none"> <input type="checkbox"/> report transparently on sustainability <input type="checkbox"/> demonstrate and reflect the performance & transparency of government and industry 	Year 1		
SL-2. Research and prepare regional aquatic resource maps to optimize aquaculture development in public waters in a manner that is respectful of the interests of other resource user groups				
DFO, EC, Provinces/Territories, Research Organizations, Industry	- Outline mechanisms to include local interests in informed dialogue, collaboration & communication <ul style="list-style-type: none"> <input type="checkbox"/> outline procedures for evaluating and communicating objective information about the social, economic and biological costs and benefits of aquaculture development to support informed decision-making 	Year 1	Ongoing	
	- Develop a resource-use geographical information system (mapping) tool to facilitate the identification of suitable areas for aquaculture development in public waters <ul style="list-style-type: none"> <input type="checkbox"/> incorporate traditional ecological knowledge amongst the parameters used to evaluate areas for aquaculture development <input type="checkbox"/> establish objectives for sector development on a regional (watershed) basis <input type="checkbox"/> utilize existing databases and knowledge repositories, where they exist 	Year 2		
	- Where Integrated Coastal Zone Management initiatives are underway, assure that regional aquaculture interests are appropriately represented	Year 3		Ongoing in some areas
		Year 4		

SL-3 – Continue to advance industry-led communications strategies to effectively disseminate objective information about aquaculture technologies and practices			
Industry	- Industry associations to develop and/or maintain proactive communications	Year 1	On-going

FIRST NATIONS AND OTHER ABORIGINAL GROUPS

Sustainable aquaculture development has proved beneficial to several First Nations communities. Aquaculture presents an opportunity to supplement limited harvest volumes from the food fishery, address nutrition and human health issues by providing a source of wholesome foods, and improve the social situation. Today, First Nations and aboriginal communities are engaged in aquaculture development throughout Canada. Several First Nations, such as KITASOO/XIAXIAS on the central coast of British Columbia, Aundeck Omni Kaning on Manitoulin Island, Ontario, Mi'kmaq in Nova Scotia, and Miawpukek in Newfoundland, have elected to become directly engaged in aquaculture production to generate employment and prosperity in their communities.

In contrast, some other First Nations have been more reluctant to become involved in aquaculture as they are uncertain about the effects of aquaculture development or do not have the capacity to evaluate and implement opportunities in aquaculture. Still other communities are vocally opposed to aquaculture development within their traditional territories. Nevertheless, First Nations and other aboriginal communities have access to some of the best sites for aquaculture development in Canada, and many have an undeniable need for sustainable economic development opportunities. Furthermore, the current participation of aboriginal communities in aquaculture is not commensurate with the opportunities available. Aboriginal aquaculture development is often precluded by insufficient awareness of potential opportunities, misinformation regarding the environmental effects of aquaculture, the lack of capacity to develop opportunities, and difficulty with accessing capital.

The NASAPI presents an opportunity to further engage First Nations and aboriginal communities in aquaculture development by making it easier to evaluate opportunities in the sector.

Action Items - Aboriginal Engagement in Aquaculture			
Potential Contributors	Actions	Suggested Timeframe	Status
AEA-1 - Explore mechanisms and strategies for engaging aboriginal peoples in the implementation of NASAPI and generate awareness of opportunities for expanded engagement in aquaculture development amongst First Nations and other aboriginal groups			
DFO First Nations, Other Aboriginal Groups, INAC, Provinces / Territories, Industry	- Encourage and support aboriginal engagement in aquaculture development through: <ul style="list-style-type: none"> <input type="checkbox"/> technological and managerial expertise <input type="checkbox"/> market information and analyses <input type="checkbox"/> food quality and safety initiatives <input type="checkbox"/> access to capital <input type="checkbox"/> partnership development <input type="checkbox"/> training, mentoring and internship <input type="checkbox"/> aboriginal communication and self-support networks for aquaculture <input type="checkbox"/> incorporation of local historical aboriginal knowledge along with conventional scientific knowledge in decision-making processes <input type="checkbox"/> selection and training of Aboriginal peoples to become DFO Fishery Officers to monitor, report and enforce aquaculture activities within aboriginal territories 	Year 4	
AEA-2. Help develop the capacity of First Nations and aboriginal communities to provide meaningful input into the aquaculture site review and assessment process			
DFO, First Nations, Other Aboriginal Groups	- Provide resources to support capacity development within regional/watershed management groups with appropriate training and expertise	Year 3	

PRODUCTIVITY AND COMPETITIVENESS

Shellfish Health

Shellfish health and animal welfare are pivotal concerns for the aquaculture industry. Poor health and disease increase the cost of production, decrease revenue (because of higher mortality rates, reduced growth and inferior product quality), and compromise public confidence. In some regions of Canada, the capacity to deliver effective fish health management programs is compromised by the small size of the aquaculture sector. Consequently, the capacity to diagnose disease events and administer appropriate treatment and/or management measures can be inadequate. In some regions, this has weakened controls governing potential vectors for pathogen transfer and compromised research into diseases of commercial relevance.

Under the leadership of the CFIA, in partnership with DFO and with the support of the CCFAM, the National Aquatic Animal Health Program (NAAHP) has been launched to better manage serious infectious diseases among aquatic animals in order to protect Canadian aquatic animal resources and to facilitate trade of aquatic animals along with their products and by-products, both nationally and internationally. Amendments to the Health of Animals Regulations and the Reportable Diseases Regulations, and to proposed and existing regulations under the *Fisheries Act*, are intended to streamline the regulatory management of fish diseases. The NAAHP has the mandate to prevent the introduction and spread of serious pathogens associated with live animals, products, by-products and other elements through (i) mandatory notification of disease; (ii) emergency disease response; (iii) import controls; (iv) zonation; and (v) national movement permits. The NAAHP also facilitates trade internationally through an export certification program for aquatic animal health, and will do so nationally through a voluntary Facility Recognition Program. Support activities for the NAAHP include surveillance, risk assessment, diagnostic laboratory services and regulatory research.

Clearly, shellfish health protection and management is a complex undertaking. The NASAPI presents an opportunity for industry and governments to cooperate more effectively to implement proposed changes to the federal and provincial shellfish health management regimens.

Action Items—Shellfish Health			
Potential Contributors	Actions	Suggested Timeframe	Status
FH-1. Evaluate the scope of health services available to industry in each province/territory, including the costs associated with these services			
Provinces/Territories, CFIA, DFO	<ul style="list-style-type: none"> - Within each province/territory, compile an inventory of shellfish health services available to the sector, the time required to effect diagnosis and treatment, the implied costs, and the extent of substantive limitations. Identify opportunities to improve shellfish health management. <ul style="list-style-type: none"> □ as part of this review, agencies involved in fish health management will evaluate their capacity to deliver their mandated roles and responsibilities 	Year 2	Ongoing by CFIA; DFO and CFIA to further refine this initiative
FH-2a. Prepare a regional or provincial/territorial shellfish health management strategy to coordinate shellfish health management procedures throughout the sector and provide a living compendium of the principal health issues in the sector			
DFO, Provinces/Territories, CFIA, HC, Industry	<ul style="list-style-type: none"> - Publish guidelines for aquaculture drug and pesticide submission requirements - Prepare biosecurity and shellfish health management plans for all industry sub-sectors where they do not presently exist, and ensure they are consistent with and complementary to NAAHP <ul style="list-style-type: none"> □ outline a plan to establish shellfish management zones □ engage industry to formulate practical, coordinated disease prevention protocols □ outline a plan to conduct additional research on oyster MSX to determine carriers, local resistance, etc. □ assess the requirement for shellfish health protection regulations under NAAHP □ develop a national shellfish health database 	Year 1 Year 3	
FH-3. Propose regulations under the <i>Fisheries Act</i> to enable the administration of drugs and pest control products in aquaculture for fish pathogen and pest treatment within the conservation & protection mandate of the Act			
DFO, EC, PMRA, VDD, CFIA	<ul style="list-style-type: none"> - Outline a regulatory process by which drugs and pest control products can be used for fish health management without contravening s. 32 or s.36 of the <i>Fisheries Act</i> while ensuring that proper measures are in place to conserve and protect fish and fish habitat 	Year 1	Ongoing

FH-5. ² Continue to develop and implement aquatic animal health measures through the NAAHP			
CFIA, DFO, Provinces/Territories, Industry	- Build relations with aquaculture clients, processors and other stakeholder representatives to ensure existing and new information on the NAAHP is distributed effectively □ develop a mechanism for clients to request that information sessions be held to ensure clear understanding of the program and its processes	Year 1	Ongoing
	- Implement mandatory reporting	Year 1	Ongoing
	- Discuss and develop aquatic animal health emergency response plans, including MOUs or other agreements, with provinces/territories and other affected partners and stakeholders	Year 1	
	- Implement import controls	Year 2	
	- Develop and implement zonation and movement permitting based on the health status of Eradication Areas or parts thereof.	Year 2	

Aquatic Invasive Species

Aquatic invasive species are defined as "fish, animal, and plant species that have been introduced into a new aquatic ecosystem and are having harmful consequences for the natural resources in the native aquatic ecosystem and/or the human use of the resource"³ and which have not become naturalized. Identified vectors for transferring invasive species in aquatic environments include attachment to ship/boat hulls, transfer through ballast water, the use of live bait, aquarium/water garden trade, live food fish, and the movement of fisheries and aquaculture gear and products.^{3,4}

Currently, many East Coast shellfish operations are afflicted by the Atlantic oyster drill, oyster thief, green crab, and multiple species of tunicates. Some of these species out-compete cultured organisms for habitat and resources while others prey directly upon the cultured species. Perhaps the most urgent situation concerns the PEI mussel industry, where four species of tunicate have imposed a significant increase in on-farm labour costs.

Once an invasive species has become established in an area, it becomes essential to develop innovative technologies and practices to effectively manage it. The NASAPI presents an opportunity to enhance measures to manage aquatic invasive species, which continue to be a nuisance to aquaculture operations and impose additional operating costs.

² The numbering of some strategic objectives will not be in order. This is deliberate to maintain consistency with the other NASAPI sector reports and to facilitate performance monitoring and management during implementation.

³ Canadian Council of Fisheries and Aquaculture Ministers (CCFAM) Aquatic Invasive Species Task Group (2004). *A Canadian Action Plan to Address the Threat of Aquatic Invasive Species*, 26 p.

⁴ Ramsay, A., J. Davidson, T. Landry and G. Arsenault (2008). *Process of invasiveness among exotic tunicates in Prince Edward Island, Canada*. *J. Biological Invasions* 10:1311–1316.

Action Items—Aquatic Invasive Species			
Potential Contributors	Actions	Suggested Timeframe	Status
AIS-1. Outline a regulation under the <i>Fisheries Act</i> to enable the administration of products and procedures for the prevention and management of aquatic invasive species in aquaculture			
DFO, HC, EC, CFIA, Provinces/Territories, Industry	– Outline a regulatory process by which pesticides, drugs, chemicals, anaesthetics and disinfectants can be used to control nuisance and invasive species without contravening s. 32 or s.36 of the <i>Fisheries Act</i> ; at the same time, ensure proper measures are in place to conserve and protect fish and fish habitat	Year 3	
AIS-2. Enhance research, communications and biosecurity related to aquatic invasive species			
Provinces/Territories, DFO, EC, Industry, Universities, Research Organizations	– Establish an Eastern Canada advisory group to identify research priorities and develop comprehensive protocols for the proactive management of aquatic invasive species	Year 1	Ongoing
	– Foster education amongst commercial and recreational users of the aquatic resource base regarding means to avoid the inadvertent transfer of invasive species	Year 1	
	– Invest in research to better understand and control vectors for the transfer of invasive species	Year 3	
AIS-3 - Adopt an approach for management of aquatic invasive species that have not become naturalized			
Provinces/Territories, DFO, EC, Industry, Universities, Research Organizations	– Promote investment in pest management technologies and practices	Year 1	Ongoing
	– Evaluate new production technologies and methods for effective pest management in shellfish aquaculture operations <ul style="list-style-type: none"> □ develop and implement a comprehensive strategy to specifically address tunicate infestation at shellfish farms using a pest management approach □ evaluate options to enable producers to harvest and/or cull nuisance species 	Year 3	Ongoing

Emerging Technologies

Measures to improve sustainability and prosperity in aquaculture are driven largely by the application of innovative technologies. Looking toward the future development and expansion of aquaculture, there are several areas that warrant additional investment in innovation. The NASAPI presents an opportunity to address the following needs within the East Coast shellfish aquaculture sector.

Action Items—Emerging Technologies			
Potential Contributors	Targeted Outcomes	Suggested Timeframe	Status
ET-2. Quantify the environmental footprint, (e.g. carbon footprint, water quality impacts, sediments, chemicals, antibiotics, pesticides, nutrient loading, escapes, disease, etc.) of aquaculture subsectors and identify areas where investment into green technologies is most pertinent			
DFO, Provinces/Territories Industry, Universities, Research Organizations, EC	<ul style="list-style-type: none"> - Review opportunities to adopt green technologies to improve waste management, energy use, water consumption, pest control, recycling in aquaculture 	Year 1	Ongoing
ET-5. Invest in research and development to advance suspension aquaculture in high-energy/off-shore areas			
DFO Provinces/Territories, Industry, NRC, Universities, Research Organizations	<ul style="list-style-type: none"> - Support development of new technologies and equipment for suspension aquaculture development in high-energy/off-shore areas <ul style="list-style-type: none"> □ identify opportunities for commercial-scale evaluation - Promote domestic use and export opportunities - Establish a pilot program to review all aspects of off-shore aquaculture development, including site access, policy and regulatory requirements, technology transfer, proof-of-concept/validation, etc. 	Year 3	Ongoing
ET-7. Improve market access for shellfish producers			
DFO, Provinces/Territories, CFIA, Industry,	<ul style="list-style-type: none"> - Evaluate technologies to enhance shellfish depuration in Atlantic Canada and Québec - Assess the requirement for improved access to relaying and depuration facilities throughout the sector to improve market access 	Year 1 Year 2	Ongoing
ET-8. Improve mechanization for shellfish handling and harvesting			
Industry, DFO, Provinces/Territories, NRC, Research Organizations	<ul style="list-style-type: none"> - Support innovation to address the need for mechanical shellfish handling (i.e., grading, resetting stock post-overwintering, etc.), harvesting and processing technologies 	Year 1	Ongoing

Alternative Species Development

An industry is loosely defined as a group of companies producing more or less the same product using more or less the same processes and generating a profit. While not all ventures are successful, collectively, the sector is generally profitable. By this measure, there are only a handful of industrial aquaculture sectors in Canada; salmon, trout, oysters, mussels and clams. On the other hand, there are many alternative species that are purported to have commercial potential. Successful commercialization of these alternative species for which the foundational research is complete requires a focused effort to overcome the last remaining challenges so that their production becomes commonplace.

Current fiscal challenges warrant a rational process to advance industry diversification on a regional basis. Therefore, targeting resources strategically toward a select number of emerging species with the greatest potential for economic viability is a practical strategy. The status of various species purported to be feasible for commercial aquaculture has been assessed, leading to a prioritized list of species for further development. The target of NASAPI is to advance commercial aquaculture development for these targeted species within a five-year horizon. The initiative does not preclude ongoing research into other potential species that are not yet sufficiently advanced for commercial-scale development. Specific action plans for the prioritized East Coast shellfish species follow.

Action Items—Alternative Species (East Coast Shellfish)			
Potential Contributors	Actions	Suggested Timeframe	Status
AS-5. Foster the development of commercially viable bay scallop aquaculture			
Industry, Universities, Research Organizations, DFO, Regional Development Agencies, NRC, Provinces/Territories	<ul style="list-style-type: none"> - Prepare a comprehensive business case and developmental plan for bay scallop aquaculture that includes a review of the following factors: <ul style="list-style-type: none"> □ market opportunities □ investment opportunities and challenges □ technological needs/obstacles/critical constraints □ realistic five- and 10-year projections for sector development The development plan could include the following: <ul style="list-style-type: none"> - Develop a wet holding system that provides the low-density stocking levels required by bay scallops - Determine the low temperature threshold at which the survival of bay scallops is affected, i.e., low-temperature physiology - Develop a brood-stock management program to improve growth and adductor muscle weight while maintaining genetic variability for long-term improvement - Conduct market analysis to understand the requirements/preferences of bay scallop consumers - Test modified atmosphere packaging technology for extending the shelf-life of live product - Improve hatchery and field nursery systems to augment 	Year 1	

	<p>production of large seed early in the spring</p> <ul style="list-style-type: none"> - Improve grow-out systems to lower the cost of production - Over-winter 20-mm bay scallop seed to produce a larger product the following fall and augment the marketing window - Develop flow-through larval and nursery systems to lower seed production costs - Integrate food demand meters in broodstock and nursery systems to promote more efficient food utilisation, controlled feeding regimes, and reduced costs 		
AS-6. Foster the development of commercially viable giant scallop aquaculture			
<p>Industry Universities, Research Organizations, DFO, Regional Development Agencies, NRC, Provinces/Territories</p>	<ul style="list-style-type: none"> - Prepare a comprehensive business case and developmental plan for giant scallop aquaculture that includes a review of the following factors: <ul style="list-style-type: none"> <input type="checkbox"/> market opportunities <input type="checkbox"/> investment opportunities and challenges <input type="checkbox"/> technological needs/obstacles/critical constraints <input type="checkbox"/> realistic five- and 10-year projections for sector development The development plan could include the following initiatives: <ul style="list-style-type: none"> - Launch an area management plan to harmonize off-shore aquaculture and commercial fishing to ear-marked locations for giant scallop aquaculture - Resolve challenges associated with short shelf life - Launch projects to stabilize the commercial spat collection, examining: <ul style="list-style-type: none"> <input type="checkbox"/> appropriate number of collectors <input type="checkbox"/> areas producing spat with high growth and survival <input type="checkbox"/> gear loss reduction and predation management - Improve husbandry practices to avoid temperature and salinity fluctuations - Investigate potential benefits of the temporary artificial reefs created by bottom giant scallop culture cages - Study fouling/invasive species on culture gear in relation to type of gear, depth, temperature and deployment date - Establish off-shore siting procedures - Develop value-added products - Develop techniques to distinguish cultured from wild-harvest scallops 	<p>Year 1</p>	

AS-7. Foster the development of commercially viable soft-shelled clam aquaculture			
Industry, Universities, Research Organizations, DFO, Regional Development Agencies, NRC, Provinces/Territories	<ul style="list-style-type: none"> - Prepare a comprehensive business case and developmental plan for soft-shelled clam aquaculture that includes a review of the following factors: <ul style="list-style-type: none"> <input type="checkbox"/> market opportunities <input type="checkbox"/> investment opportunities and challenges <input type="checkbox"/> technological needs/obstacles/critical constraints <input type="checkbox"/> realistic five- and 10-year projections for sector development The development plan could include the following: <ul style="list-style-type: none"> - Develop a dependable seed supply (wild and hatchery) - Research genetics to improve survival and growth - Improve culture technologies for: <ul style="list-style-type: none"> <input type="checkbox"/> seeding techniques <input type="checkbox"/> sediment quality criteria <input type="checkbox"/> predator management <input type="checkbox"/> mortality (disease) management 	Year 1	

Risk Management and Access to Financing

Aquaculture is often still perceived as a high-risk industry. Many investors lack confidence in the industry, so debt and equity financing can be difficult and expensive to attract. This is particularly true for smaller producers, such as those in the shellfish sector. Developing a more attractive investment climate for producers of all sizes is imperative, which is why it is important that both industry and governments define measures to quantify and reduce the risks inherent to aquaculture. For example, while many operations currently implement robust best management practices (BMPs) and standard operating procedures (SOPs) to mitigate risk, these practices are not yet universal. Moreover, until these and other practices, such as benchmarking,⁵ become routine in the sector, it will be difficult to secure more affordable insurance coverage. Consequently, producers are encumbered by high insurance premiums, inadequate insurance coverage, or no coverage at all.

⁵ Benchmarking is the process of comparing the operational performance of one company against the overall average performance of companies in a sector. Based on defined metrics (e.g., feed conversion, cumulative mortality, size at harvest, environmental performance, energy consumption, etc.), the process enables managers to identify where their own operations fall below industry norms, thus establishing a strategic process that enables all participants to identify where they are less efficient and/or competitive. In this way, benchmarking facilitates planning and decision-making for continuous process and performance improvement in a sector.

Action Items—Risk Management & Access to Financing			
Potential Contributors	Actions	Suggested Timeframe	Status
FIN-1a. Develop standardized operating procedures in all East Coast shellfish sectors			
Industry	- In sectors where BMPs/SOPs do exist, review the protocols and update as necessary	Year 1	
	- In sectors where they do not yet exist, develop risk management & mitigation strategies based on BMPs and accompanying SOPs for all aquaculture operations	Year 3	
	- Foster use of third-party audits to validate compliance with BMPs and SOPs	Year 4	
DFO/Provinces/Territories	- Review the potential to use BMPs and SOPs as tools to introduce elements of 'smart regulation' to the sector, perhaps through a pilot project	Year 5	
FIN-2. Implement aquaculture benchmarking programs			
Industry, DFO, AAFC, Provinces/Territories	- Review the potential to develop and implement a benchmarking system that will promote continuous improvement in the productivity and sustainability of aquaculture operations <ul style="list-style-type: none"> <input type="checkbox"/> establish a pilot project to demonstrate benchmarking <input type="checkbox"/> for each sub-sector, outline the scope of potential opportunities for productivity improvement 	Year 3	
FIN-3. Continue to invest in programming to overcome the challenges with the financing of scale-up and expansion projects in aquaculture			
Seafood Value-Chain Roundtable, Federal/Provincial-Territorial Governments, Financial Sector, Industry	- Assess the typical constraints involved in securing financing in the aquaculture sector <ul style="list-style-type: none"> <input type="checkbox"/> identify the scope of available financial instruments <input type="checkbox"/> identify principal gaps in financing, such as that needed to foster the transition from research to pilot-scale/commercial development; and develop a plan to implement solutions (e.g., increased duration and transferability of site tenure, acceptable collateral for loans, etc.) <input type="checkbox"/> establish a program to help young people become engaged as owner-operators in the aquaculture sector 	Year 1	Ongoing
FIN-4. Continue to evaluate options for stock insurance			
Industry	- Initiate a comprehensive program to collect the data necessary to evaluate and quantify risks and evaluate insurance options	Year 1	Ongoing
	- Compile background information to support insurance product development	Year 1	Ongoing

Infrastructure

Infrastructure comprises the core assets that support an economy by providing for communities' and industries' developmental and operational needs. It includes systems for water supply and treatment, energy, communications networks, transportation (roads, waterways, wharfs, ports), etc. Infrastructure is also required to support the generation of knowledge to advance sustainable development (e.g., R&D capacity).

Although there have been preliminary efforts to identify requirements for aquaculture-specific infrastructure (ASI), a formal planning process to identify ASI requirements has not occurred. As a result, aquaculture development relies largely on infrastructure established for other purposes. Furthermore, the rural and often remote locations of aquaculture operations sometimes leave producers without adequate basic infrastructure to develop and efficiently operate their businesses. Such limitations inhibit daily operations, increase production costs, and create barriers to development. The NASAPI presents an opportunity to target infrastructure needs within the aquaculture sector in an effort to secure investment to advance sustainable aquaculture across the country.

Action Items—Infrastructure			
Potential Contributors	Actions	Suggested Timeframe	Status
INF-1. Prioritize wharf infrastructure requirements in each Atlantic province and Quebec			
Industry, DFO, TC, Provinces/Territories	<ul style="list-style-type: none"> - Correlate wharf infrastructure with existing aquaculture and other requirements; consider future development needs - Conduct cost-benefit analysis to improve wharf infrastructure - Where warranted, seek investment to improve wharves - Outline a limited use/limited access policy for wharves to improve biosecurity 	Year 1 Year 1 Year 2 Year 2	
INF-2. Stimulate investment in other general infrastructure to support aquaculture development			
Industry, DFO, Provinces/Territories	<ul style="list-style-type: none"> - Foster the identification of aquaculture as a priority area for economic development and investment within federal and provincial infrastructure programs - Conduct regional (provincial) assessments of infrastructure requirements for existing and developing aquaculture sectors 	Year 1 Year 2	

Marketing and Certification

Demand for fish and seafood in domestic and international markets is driven largely by consumer perception of product quality, food safety and value. Assurances of environmentally sustainable production, socially acceptable resource use, adherence to stringent food safety protocols, and farm-to-market traceability for all products are increasingly sought by consumers and seafood buyers looking for independent verification of attributes beyond what would be certified by governments. As a result, and as evidenced by the emergence of high-profile eco-labelling and quality assurance programs, responsible certification systems with third-party compliance audits are increasingly important in the fish and seafood sector. Currently, however, the Canadian aquaculture industry operates under a variety of certification and product traceability systems. In the not-too-distant future, it is conceivable that one or more international certification programs will emerge to address marketplace demands.

For some Canadian aquaculture products, there has been insufficient effort directed toward generic market promotion. Producers and processors in some sectors are often unwilling to support such initiatives if they are not supported by all players. As a result, it has been difficult to increase demand and prices for aquaculture products. Additionally, some parts of the Canadian aquaculture sector are still largely focused on the production and sale of commodity products. Value-added products comprise only a small proportion of total output.

The NASAPI presents an opportunity for producers, with government support, to review emerging market certification programs. It is also believed that generic marketing efforts will help to improve prosperity and stability within the sector.

Action Items—Marketing & Certification			
Potential Contributors	Actions	Suggested Timeframe	Status
MC-1. Support industry to adopt international aquaculture certification programs			
Industry, DFO, Provinces/Territories	- Identify appropriate certification standards for the East Coast shellfish aquaculture sector(s)	Year 1	Ongoing
	- For each sector of the industry, conduct a mock audit at several farms to identify the potential challenges producers could encounter related to meeting the expected compliance criteria of certification programs	Year 2	Ongoing
	- Support industry with certification training and other efforts to facilitate entry into appropriate certification programs	Year 1	
	- Ascertain that BMPs and SOPs meet the requirements of emerging international certification standards	Year 3	
	- Governments to evaluate the potential to utilize certification as a streamlining tool in support of 'smart regulation' ⁶	Year 5	

⁶ Canada's External Advisory Committee on Smart Regulation (*Regulating in the 21st Century: Global Changes and Implications for Regulation*, 2003) defines 'smart regulation' as regulation that maintains its traditional protective role but also enables innovation and productivity growth. The CCFAM views 'smart regulation' as an opportunity to align the regulatory requirements of both levels of government to address consumer and public confidence through a renewed, more effective and more efficient framework.

MC-2. Develop and implement generic marketing programs for aquaculture commodity products			
Industry, DFO, Provinces/Territories, AAFC	- Conduct an interim review of the Mussel Industry Council to identify measures that could be implemented to enhance producer participation and overall effectiveness	Year 1	Ongoing
	- Launch a generic oyster marketing campaign (similar to the mussel program) <ul style="list-style-type: none"> <input type="checkbox"/> support intelligence gathering to further define new market opportunities <input type="checkbox"/> supply market research to focus limited resources on key opportunities 	Year 2	
	- Review the potential to establish a pilot program for generic marketing supported by an industry check-off system <ul style="list-style-type: none"> <input type="checkbox"/> after an initial three-year period, industry members will vote on continuation of the program 	Year 3	

Labour and Skills Development

Aquaculture is often cited as offering the potential to attract or retain youth within coastal and rural communities by providing meaningful, resource-based employment. This is the case in several areas of the country (e.g., Vancouver Island, southwest New Brunswick). In other areas, however, it is difficult for aquaculture operations to attract labour; the shellfish sector is one example. To stay competitive, aquaculture requires a trained skilled and semi-skilled workforce.

The NASAPI presents an opportunity to re-examine the sector’s labour needs as well as the training and skills development programs offered by community colleges and universities throughout the country.

Action Items—Labour & Skills Development			
Potential Contributors	Actions	Suggested Timeframe	Status
LSD-1. Outline human resource strategies and programs leading toward a well-trained and productive workforce			
Industry, Provinces/Territories, Academic Institutions, HRSDC, NRC-IRAP	- Evaluate technical skills requirements in the East Coast shellfish aquaculture sector; outline education, training and extension needs	Year 2	
	- Outline a labour market strategy to attract young people to aquaculture	Year 2	

APPENDIX 1 — LIST OF ACRONYMS

AAFC	Agriculture and Agri-Food Canada
ANAC	Animal Nutrition Association of Canada
ASI	Aquaculture-Specific Infrastructure
BKD	Bacterial Kidney Disease
BMP	Best Management Practice
CCFAM	Canadian Council of Fisheries and Aquaculture Ministers
CCFAM–SMC	CCFAM Strategic Management Committee
CFIA	Canada Food Inspection Agency
DFO	Department of Fisheries and Oceans
EC	Environment Canada
HC	Health Canada
NRSDC	Human Resources and Skills Development Canada
INAC	Indian and Northern Affairs Canada
I&T	Introduction and Transfer (of aquatic organisms)
MOU	Memorandum of Understanding
NAAHP	National Aquatic Animal Health Program
NASAPI	National Aquaculture Strategic Action Plan Initiative
NRC	National Research Council
NWPA	Navigable Waters Protection Act
PMRA	Pest Management Regulatory Agency (Health Canada)
R&D	Research and Development
RAS	Recirculating Aquaculture Systems
SOP	Standard Operating Procedure
TAC	Total Allowable Catch
TC	Transport Canada
VDD	Veterinary Drugs Directorate (Health Canada)