Fisheries and Oceans Canada
Pêches et Océans Canada

Science at Fisheries and Oceans Canada:

A Framework for the Future

Canada

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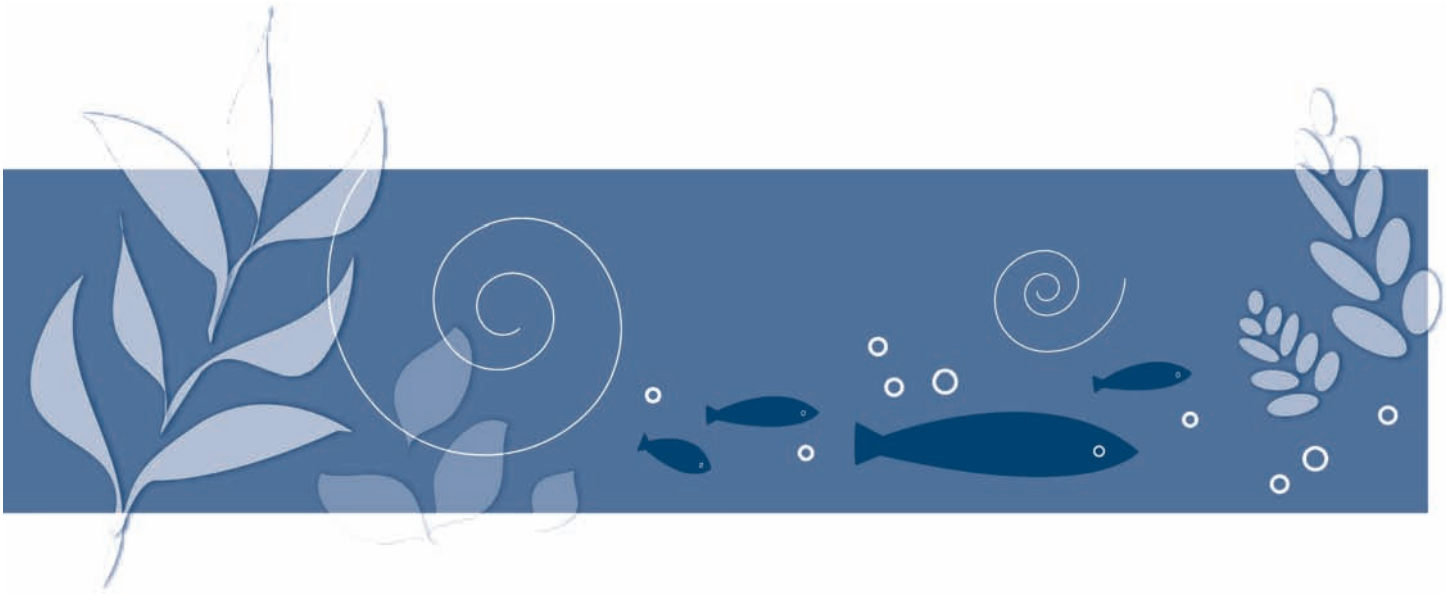
Table of Contents



1. Why a Science Framework?

The Department of Fisheries and Oceans Canada (DFO) has a very broad and encompassing mandate. Surrounded by the Arctic, Atlantic and Pacific Oceans, and home to a vast freshwater system, Canada is one of the foremost maritime nations on the planet boasting the world's:

- **longest coastline** (243,792 km) - stretched out as a continuous line, it would circle the equator more than six times (25% of world's coastline);
- **largest freshwater system** - Canada's two million lakes and rivers cover 7.6% of our landmass (755,000 square km);
- **longest inland waterway** (3,700 km) - from the Gulf of St. Lawrence to Lake Superior;
- **largest archipelago** - Canada's Arctic islands, including six of the world's 30 largest islands, cover 1.4 million square km;
- **greatest tidal range** - 16 metres in the Bay of Fundy; and
- **a large offshore exclusive economic zone** (200 nautical miles) - 3.7 million square km, equivalent to 37% of Canada's total landmass.

DFO has the lead for developing and implementing policies and programs in support of Canada's economic, ecological and scientific interests in oceans and inland waters.

As a science-based department, DFO relies on a vibrant Science program to provide qualitative and quantitative data and information combined with expert scientific analysis and advice to directly support decision-making as well as policy and program delivery for its operations across Canada and internationally.

Celebrating over a century of excellence in federal aquatic science, DFO's scientists and engineers have made significant contributions to the research, development and understanding of Canada's three oceans, freshwaters and coastlines. Canada enjoys a strong reputation in fisheries and aquaculture research, hydrography, oceanography and aquatic environmental science. With fifteen research facilities across Canada, DFO employs approximatly 1,700 world renowned scientists, technicians and hydrographers.

Sustainable management of the oceans is not only a matter of domestic concern but one of international concern as well. DFO Science is an influential party of many international bodies, treaties and conventions (e.g. International Council for the Exploration of the Sea, the North Pacific Marine Science Organization, the Pacific Salmon Treaty, the UNESCO Intergovernmental Oceanographic Commission, and the United Nations Convention on the Law of the Sea) established to protect the world's ocean resources, further our understanding of sustainable ocean management, and to establish sovereignty over Canada's exclusive economic zone beyond territorial marine boundaries.

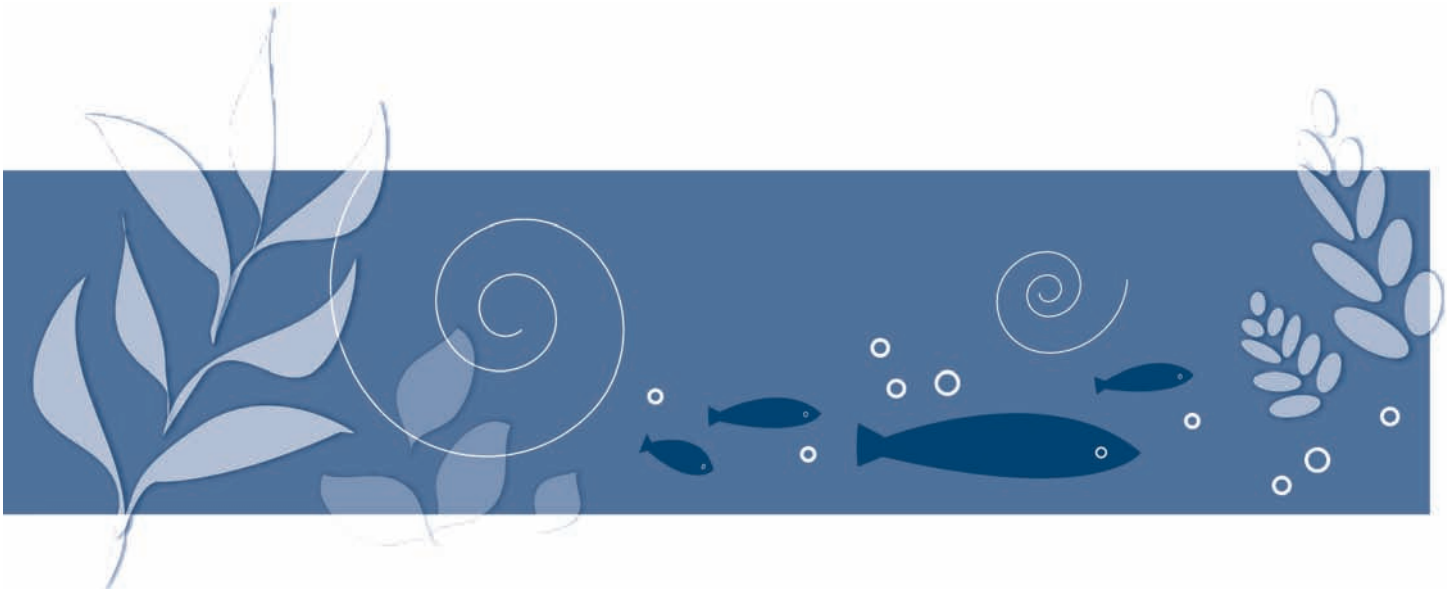
As the challenges facing Canada's marine and freshwater ecosystems are increasing and becoming more complex, a Science Framework was needed to adapt to new realities, maintain the robustness of the DFO Science Program and to ensure alignment with our federal partners under the recently released Federal Science and Technology (S&T) Strategy: ***Mobilizing Science and Technology to Canada's Advantage.***

The Science Framework was designed to provide the Science Program with a common direction for the future and to achieve a better balance between focussing on the long-term issues while maintaining flexibility to adapt and respond to priorities of the day. It will enable the Department to focus on evolving pressures (e.g. aquatic invasive species) and priority issues (e.g. oil sands development) that matter most to Canadians without jeopardizing our capacity to conduct long-term and forward looking science on a broader array of issues.

In recent years, new and increasing demands for scientific information and advice have often coincided with fixed or declining capacity in DFO's Science program. The Science Framework improves our ability to conduct effective strategic and operational planning in order to alleviate the pressure caused by competing demands for scientific advice and available resources. It helps the Science Program become more forward looking and as a result, better integrated throughout DFO, other government departments and other levels of government.

Given the broad mandate of the Department and the expanding role for the Science Program, the Science Framework for the Future identifies the need for the Science sector to leverage additional S&T expertise by working closely with other federal government departments and fostering enhanced collaboration with provinces, territories, and co-management boards as well as key partners in the private sector and academic communities.

In the end, the Science Framework for the Future positions the DFO Science Program to continue delivering timely, credible, responsive, valued and useful science and advice to support Canadians, policy and decision-makers within DFO and across all levels of government, the private sector, community-based organizations, and our international partners.



2. What does DFO Science Contribute?

A sound aquatic science program is rooted in the ability to make systematic observations over time and over large areas which are then objectively analyzed to produce meaningful information on the status, patterns and trends in the aquatic ecosystems.

In Canada, the ability to observe, understand, and make informed decisions concerning the management of our natural resources below the surface of the water is largely dependent on the science conducted by DFO and its partners.

DFO is both an objective performer of science and technology (S&T) - in areas where no one else is willing or able to do the work - and a leader that brings together partners and stakeholders from the private sector, nongovernmental organizations, and academia to work on S&T issues of shared interest.

Furthermore, S&T at DFO directly and indirectly supports decision-making concerning national priorities in energy, the environment, natural resources, health, the economy, security and defense.

As human uses of the oceans and our freshwater resources continue to expand, DFO Science is increasingly relied upon to support the efforts of all levels of government, the private sector, and non-governmental organizations in ensuring maritime safety and security as well as sustainable development of Canada's aquatic ecosystems.

Listed below are selected examples of the work that DFO Science carries out in the public interest.

Monitoring the State of the Ocean

In collaboration with many of its partners, DFO Science leads the monitoring of the oceans. Through the use of research vessels and state-of-the-art technologies (e.g. sensors mounted on marine mammals, instrumented gliders, and automated robotic driving drifters that transmit data via satellites) DFO Science furthers our understanding of ocean climate and variability.

Not only are sound monitoring programs critical for reporting on the current state of the ocean, our monitoring programs allow the Department to gather the data and information required to develop predictive models that enable us to forecast future states of the oceans and freshwater systems. Additionally, through its monitoring activities, DFO can more effectively detect, measure and differentiate between changes to aquatic environments caused by natural environmental phenomena and those caused by human activities.

Navigation and Transport

The Canadian Hydrographic Service (CHS) conducts a number of activities (provision of charts, water and tide level monitoring and prediction, and pre- and post-dredging surveys) that support economic development as well as safe commercial navigation and recreational boating in Canadian waters.

Fisheries Management and Aquaculture

DFO Science uses state of the art scientific research tools and methodologies to ensure the sustainability of Canada's fishing industry (commercial, recreational, Aboriginals). Canada's commercial fisheries are crucial to the economic and social well-being of many rural and Aboriginal, coastal communities across the country. The industry accounted for over $2 billion in landed values in 2005, $4.3 billion in export value (including aquaculture) and direct employment of over 100,000 people. The young and rapidly growing aquaculture industry is worth more than $500 million annually and employs more than 15,000 Canadians. DFO-led S&T is helping the industry to overcome technical hurdles and is also informing policy development, decision-making and regulations to foster sustainable industry growth in both marine and freshwater environments.

Aquatic Invasive Species

Aquatic invasive species have major impacts on native fish, fisheries and aquaculture in Canada and are costing millions of dollars annually in lost revenue and control measures. For example, the PEI mussel industry is experiencing significant problems with tunicates (or sea squirts), which are overgrowing mussels, hence reducing yields and increasing costs of harvesting and processing. DFO Science is working collaboratively with a range of stakeholders (e.g. other levels of government, communities, and industry stakeholders) in an effort to contain and control the spread of invasive species and reduce their negative economic and environmental impacts.

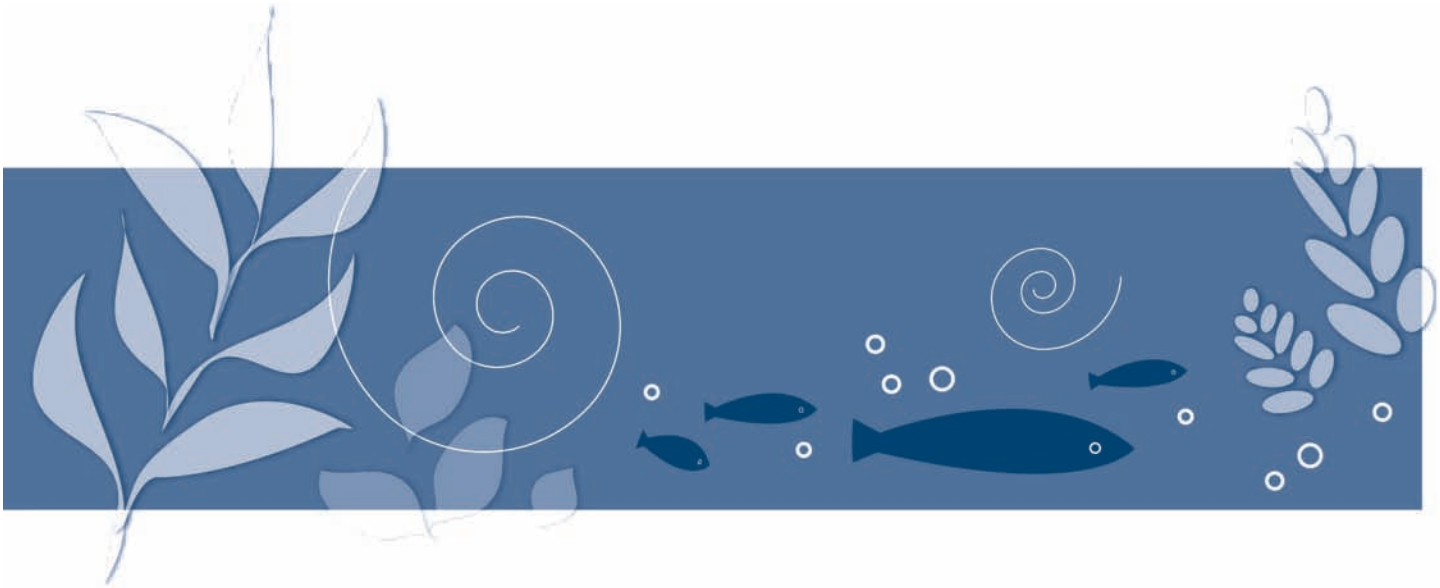
Energy Development

Canada is an energy rich country and DFO Science plays a vital role in coordinating and researching the impacts of energy exploration and exploitation projects on fish and fish habitat.

DFO is often involved in assessments of energy development projects that fall within its regulatory responsibilities such as oil sands development, but the Department also conducts proactive research on issues that are common to many oil and gas exploration projects. For example, DFO has worked in partnership with the oil sands industry and in collaboration with the University of Alberta to develop tools to determine habitat in-stream flow needs on the Athabasca River. This type of information is crucial to determining how oil sands development projects can proceed while maintaining a healthy aquatic ecosystem.

Recognizing the economic benefits of hydropower, DFO's Centre of Expertise on Hydropower Impacts on Fish and Fish habitat (CHIF) coordinates research efforts to find innovative solutions to mitigate potentially negative impacts that hydropower developments might have on the environment and fish habitat.

These examples merely scratch the surface of the work that DFO is involved with on a daily basis. As human uses of the oceans and aquatic ecosystems continue to expand, new challenges and opportunities emerge and generate new requirements for science-based advice, particularly advice on the cumulative effects of all activities. To this end, a number of initiatives are underway within DFO and across the federal government designed to enable increased and more effective interdepartmental collaborations and result in more complete science-based advice to support decision-making and policy development.



3. How was the Framework for the Future Developed?

In response to the rapidly evolving pressures, the Department undertook a full-scale assessment of its human and financial resources, priority-setting processes, and management practices from 2002 to 2004. Policy and decision-makers confirmed the need for an integrated science-based approach to managing aquatic resources and ecosystems and as a result, three strategic outcomes were established which all Departmental activities support:

1. Safe and accessible waterways – ensuring the overall safety and integrity of Canada's marine infrastructure.
2. Healthy and productive aquatic ecosystems – sustainable development and integrated management of resources in or around Canada's aquatic environment.
3. Sustainable fisheries and aquaculture – an integrated program contributing to sustainable wealth for Canadians.

Following the Departmental review in 2004, a comprehensive review of the Science Program was initiated to assess how science resources could be more efficiently allocated in order to further policy and decision-making in support of departmental strategic outcomes and priorities.

The review was completed in 2004-05 and led to the conclusion that the Science Program needed to establish a transparent priority-setting process based on integrated risk management. In doing so, strategic and operational planning would be improved and thus, funding pressures caused by an expanding mandate and emerging priorities could be alleviated. Finally, the review revealed the need to renew the Science Program workforce in order to offset retirement and attrition.

3.1 A Science Framework for the Future

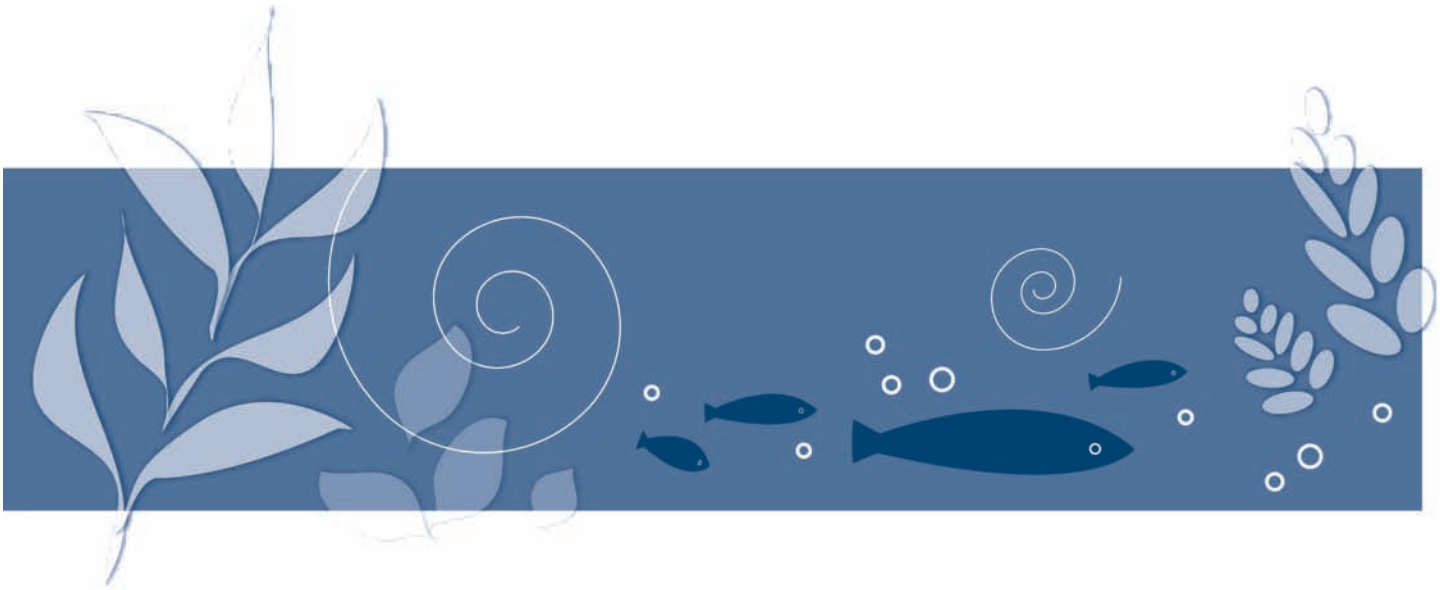
In response to the recommendations emanating from the review of the Science Program, the Science Framework for the Future was developed with a vision to ensure that DFO Science activities are:

- Relevant;
- Effective;
- Affordable; and
- Valued.

The new Framework better positions the Sector to deliver scientific information, advice and services in support of policy development and decision-making as well as the various services the Department provides to Canadians.

Vision of the Science Framework for the Future

A vibrant aquatic science program based on **excellence** that supports and informs DFO and Government needs and best serves Canadians.



4. Science Renewal in Action

4.1 Relevant Science

Effective and integrated business planning is needed to ensure that the DFO Science Program is relevant and responsive to current and future challenges and opportunities the Department must address.

DFO Science must support the Government of Canada's priorities, DFO's strategic objectives, and the needs of its client management sectors (Fisheries and Aquaculture Management, Oceans, Habitat, Species at Risk, and the Canadian Coast Guard). In 2005, the Science Management Board (SMB) was created specifically to provide strategic direction and leadership to Science.

The SMB is a decision-making body that is responsible for identifying issues of importance to the achievement of the mandated objectives of the Department, selecting and ranking departmental and government-wide priorities needing science support, and providing strategic direction on the work planning of DFO Science

Since its inception, the SMB has overseen several key initiatives including:

- An ***Ecosystem Science Framework in support of Integrated Management*** which provides the rationale for an ecosystem science approach and describes the approach for realigning the Science Program in support of an ecosystem approach to managing aquatic environments;
- A ***Five-Year Research Agenda*** that supports integrated management objectives and identifies current and emerging priorities requiring scientific input in the medium and long-term;
- A ***National Human Resource Strategy*** for the Science Program focussed on attracting and retaining balanced expertise needed to respond to issues within an integrated ecosystem approach;
- A ***Strategic Science Outreach Strategy*** to ensure that scientific advice is fully considered in policy development and decision-making and to provide direction on how to best disseminate information to general audiences so as to build public confidence and trust in DFO Science.

4.1.1 Ecosystem Science Approach

Major events, such as the collapse and non-recovery of the east coast ground fisheries and dramatic fluctuations in returns of west coast salmon stocks, have demonstrated that alternative fisheries management approaches were needed.

What is an Ecosystem?

An ecosystem is a specific geographic area consisting of all its living organisms and the physical, chemical, and climatic environments of this geographic area, and the processes that control its dynamics. The interaction of organisms in an ecosystem is dynamic and subject to internal and external disturbances resulting in fluctuations over time.

While aquatic ecosystems may be separated by geographical barriers, as in the case of lakes, watersheds, or enclosed bays, they often blend into one another because of porous boundaries set by currents, features of the seafloor, or water masses.

Traditionally, DFO Science has supported the management of human activities on an activity-by-activity basis and focused its effort primarily on the intended targets of each of these activities.

Given the evolving uses of the oceans and the increasing range and complexity of the issues requiring science support, there was less confidence that the traditional approach to science could produce the necessary information and advice required to enable integrated policy development and complex decision-making.

As a result, a new *Ecosystem Science Framework in support of Integrated* Management was developed to enable a more accurate account and a better understanding of the cumulative impacts of diverse human activities in aquatic environments and to provide an overall framework for integrating science activities.

An ecosystem approach allows early identification of emerging issues which might not be apparent if the focus is issue or species-specific. Furthermore, it will enable DFO Science to identify, monitor, and interpret trends in the features that are most important to an ecosystem's sustainability, and integrate existing knowledge about the effects of fisheries, aquaculture, habitat, and oceans and freshwater activities on these important features.

This approach requires increased horizontal collaboration with key partners across a number of sectors in order to provide decision-makers with integrated science advice.

4.2 Effective Science

The Science Program is delivered through five key functions: **Monitoring; Data and Information Management; Scientific Advice; Products and Services;** and, **Research.**

Effective and modern delivery of science activities is at the heart of DFO's Science mandate, focusing on:

- Achieving balance among the five functions; and
- Leveraging partnering and collaborative opportunities to further enhance the Science Program's capacity.

4.2.1 A Balanced Program

The Framework for the Future ensures that all science functions are supported, that there is a balance among the functions, and that each function contributes to the overall goals. The focus of the Framework is on bringing stability to the organization to ensure long-term sustainability of our monitoring program and integrity of our databases. While ensuring stability is a key objective of the Science Framework, it needs to be flexible to ensure that our research program, scientific advice and products and services respond to the evolving priorities of DFO and the Government of Canada.

Strengthening the core science functions enables the Department to combine information on physical, chemical, and biological aspects of aquatic environments, and to support ecosystem-based management including assessments of the cumulative effects of diverse human activities.

4.2.1.1 Monitoring

Regular and sustained monitoring of physical, chemical and biological conditions is needed to understand changes in aquatic environments and resources. Defining the patterns of natural variability in aquatic ecosystems and distinguishing natural variability from that which is due to human impacts is central to managing aquatic systems. Monitoring programs enable us to assess the state of Canada's aquatic resources and ecosystems against benchmarks. When done in a sustained and systematic manner, our monitoring capacity forms the basis by which DFO Science can inform public policy, support decisions in resource management and ensure health and safety for all Canadians.

The renewed Science Program will be anchored in an integrated set of ecosystem monitoring programs, operating from a combination of cost-effective fields and remote platforms. Five specific programs are being implemented, one for each of the Atlantic, the Pacific, the Arctic, freshwater and Salmon in the Pacific. To ensure DFO Science benefits from existing expertise and capabilities, it is actively working to establish partnering arrangements with other science-based departments and non-government groups such as universities and industry in order to involve them in field observations.

4.2.1.2 Data and Information Management

DFO Science collects and generates an enormous amount of scientific data and information each year, requiring good data management practices, without which it would be impossible to realize their true value and potential. In essence, data management protects our financial investment in data and information.

The renewed Science Program will benefit from a nationally integrated scientific data management system that provides a secure "home" for data in the long term; a wider access to basic data for research and advice; and, opportunity to build multi-disciplinary support products for decision-making. A comprehensive plan addressing Governance, Standards, Archives and Access is being implemented in collaboration with DFO Information Management, international partners, universities and the private sector.

4.2.1.3 Scientific advice

The rigours of scientific excellence must be applied to provide high quality, timely and relevant scientific advice in support of sound policy development and informed decision-making. Scientific advice is derived from a series of complex and systematic steps involving data collection and compilation followed by data synthesis and analysis. The data and the results of the analysis are then subjected to a critical review through an open, inclusive and transparent peer review process.

The DFO peer review process is anchored by scientific experts from various disciplines, both within and outside government, who critically assess findings, weigh risks and uncertainties, and contribute to Science advisory publications.

As the demand for advice on scientific issues is increasing both in terms of volume and complexity, the peer review process must continue meeting the needs of traditional business (e.g. stock assessment) while supporting emerging Departmental priorities (e.g. recovery of Species at Risk). As such, it has become essential to align the peer review process with well-defined priorities. The renewed Science Program relies on analytical skills and interdisciplinary expertise to provide relevant and robust advice in support of integrated management of human activities in aquatic ecosystems. Advice will continue to be provided through a rigorous peer review process built on the Government of Canada's Framework issued in 2000: Principles and Guidelines for the Effective Use of Science and Technology Advice in Government Decision Making.

Canada's Framework issued in 2000: ***Principles and Guidelines for the Effective Use of Science and Technology Advice in Government Decision Making.***

4.2.1.4 Products and Services

Scientific products and services have traditionally included hydrographic charts and nautical publications, but there is an increasing demand for new oceanographic products that are needed to support safe navigation, rescue operations, pollution prevention and control, storm surge prediction, etc.

The renewed Science Program will ensure that products needed to support DFO's overall objectives are available in a timely fashion and in a form that is easy to use. For example, mariners will have access to accurate nautical charts and current updates in both paper and electronic formats. This type of service helps the Canadian and international shipping community to operate effectively and safely. In addition, the Science Program is responsible for the production of detailed maps of Canada's continental shelf to support Canada's claim for extended jurisdiction under the United Nations Convention on the Law of the Sea. In short, operational oceanography products for use by those working on the sea will continue to be an increasingly important part of the Science Program.

4.2.1.5 Research

Excellent research is a vital component of a modern and cost-effective Science Program. A key objective of any research program is to create new knowledge and methods that will support the development of better advice required for policy and decision making. DFO's research program is multi-faceted and reflects the diverse demands for knowledge associated with existing science-based issues and emerging ones that are increasingly complex, involving a variety of ocean industries, technologies, and a multitude of aquatic applications. In recent years, the demand for new types of knowledge has challenged our research program's capacity to generate the data, information, and knowledge necessary to deliver effective advice, products, and services. At the same time, it has served as a catalyst for reassessing and prioritizing existing and future demands for scientific knowledge based on established and emerging priorities.

The ***Ecosystem Science Framework in support of Integrated Management*** provides the rationale for an ecosystem science approach and describes the approach for realigning the Science Program to support an ecosystem approach to management. A ***Five-Year Research Agenda,*** guided by this Framework, was developed to support integrated management objectives and to identify current and emerging priorities requiring scientific input in the medium and long-term. Ten research priorities for DFO Science were identified:

1. *Fish Population and Community Productivity*
2. *Habitat and Population Linkages*
3. *Climate Change and Variability*
4. *Ecosystem Assessment and Management Strategies*
5. *Aquatic Invasive Species*
6. *Aquatic Animal Health*
7. *Sustainability of Aquaculture*
8. *Ecosystem Effects of Energy Production*
9. *Operational Oceanography*
10. *Emerging and Enabling Technologies for Regulatory Responsibilities*

The ten research priorities are further defined in a detailed research plan which includes information on integrated Ecosystem Research Initiatives (ERIs) as well as targeted research on the specific issues identified under the priority research areas.

4.2.2 Modern delivery models

To meet existing needs while remaining responsive to emerging demands, DFO Science uses innovative delivery models to ensure that resources are used to their full potential. The shift to an ecosystem-based management approach requires collaboration with many partners to augment and support our activities and to build sufficient capacity to develop and retain the necessary expertise, experience, and resources to support integrated management. The realigned DFO Science Program effectively draws on the required expertise, whether from within the federal government or through collaborative arrangements with external partners.

4.2.2.1 Collaboration

In line with the Federal S&T Strategy, DFO Science will continue to work with existing partners and actively seek out new collaborative opportunities to push the frontiers of knowledge generation and to discover new innovations that will benefit Canadians.

Mobilizing Science and Technology to Canada's Advantage

The S&T Strategy aims to build a national competitive advantage based on science and technology and the skilled workers whose aspirations, ambitions, and talents bring innovations to life.

The strategic framework for S&T will guide the Government of Canada in how it approaches investments in S&T.

Source: Industry Canada. *Mobilizing Science and Technology to Canada's Advantage*. Ottawa: Industry Canada, 2007. Catalogue number lu4-105/2007E.

DFO Science is called upon to provide extensive knowledge, informed advice, and quality products and services to support policy development and decision making. To meet these demands, DFO Science has in the past relied upon, and must continue to rely and capitalise on, the collective expertise and experience of the scientific community.

As a means of facilitating the development of future collaborative arrangements, the ***DFO Science Collaboration Framework*** was developed to ensure transparency in our collaborations and to stimulate further S&T collaboration by raising awareness of our science priorities and research interests among DFO stakeholders including other federal and provincial / territorial S&T performers in Canada.

Ultimately, the new Framework supports the notion of continual dialogue with stakeholders; a necessary first step considering the various ways in which collaboration can occur (i.e. co-located research, visiting fellows, etc.) In moving forward, collaborations will form an important component in leveraging resources in order to maximize the effectiveness of the Science Program and deliver improved results for Canadians.

4.2.2.2 Centres of Expertise

DFO Science has established Centres of Expertise (COEs) to focus on high priority long-term research issues that could not be addressed by a single Region or a single DFO Science institute. COEs enable DFO to support unique research requirements in areas of the Science program where national delivery and co-ordination would be difficult due to the scope of the research requirements or the specific and unique nature of the expected outcomes.

COEs bring together diverse scientific expertise, either through a virtual network or in a geographic location, and rely upon collaboration with industry, academia, other federal departments, provincial, territorial and Aboriginal governments, and nongovernmental organizations to enhance their capacity for research.

DFO Science COEs include:

- Centre for Offshore Oil & Gas Environmental Research (COOGER)
- Centre of Expertise on Marine Mammals (CEMAM)
- National Centre for Arctic Aquatic Research Excellence (N-CAARE)
- Centre for Environmental Research on Pesticides (CERP)
- Centre of Expertise on Hydropower Impacts on Fish and Fish Habitat (CHIF)
- Centre for Ocean Model Development and Application (COMDA)
- Centre for Aquatic Animal Health and Research Diagnostics (CAAHRD)
- Centre of Expertise for Aquatic Risk Assessment (CEARA)
- Centre for Integrated Aquaculture Science (CIAS)
- Laboratories of Expertise in Aquatic Chemical Analysis (LEACA)
- Centre for Aquatic Biotechnology Regulatory Research (CABRR)
- Center for Aquatic Habitat Research (CAHR).

4.2.3 Highly Skilled Workforce

Effectiveness in Science and Technology depends on having a workforce that is devoted to excellence and that is knowledgeable, curious, motivated, team-based and adaptive.

The Science Framework for the Future is more than aligning the programs with DFO and Government-wide priorities; it also promotes a change of culture aimed at:

- Changing the way scientific activities are carried out by the DFO Science workforce;
- Improving the interaction among staff to achieve a better integration of our science work;
- Working in collaboration with partners in multidisciplinary teams to leverage our scientific capacity; and,
- Bringing out the excellence in our people.

DFO Science has developed a ***National Human Resource (HR) Strategy*** which aims to develop and maintain a highly skilled workforce, focus on scientific excellence, develop capacity to meet DFO and Government-wide priorities, develop expertise in multidisciplinary ecosystem science approaches, and to champion collaborative approaches.

4.3 Affordable Science

A comprehensive business planning framework that establishes clear accountability for resources and results has been implemented to ensure that the Science Program remains affordable in the future. Annual and long-term planning integrates the assessment of risks and impacts and is carried out in collaboration with clients and partners. Business and strategic planning are supported by national strategies for financial management, collaboration, at-sea science and scientific equipment life-cycle management.

Our ***Financial Strategy,*** completed in 2005, focuses on balancing salary, capital and operating expenditures. It governs the manner in which Science will manage its financial resources in the near and longer-term to ensure that there is stable funding and financial flexibility to undertake Science activities needed to support departmental and government needs. The strategy also aims at rebuilding and maintaining a healthy High Priority Fund envelope to support key priority areas of the Science Program.

Collaborative approaches and partners are critical in the delivery of the DFO Science program. The ***DFO Science Collaboration Framework*** completed in 2007, provides guidance on developing and managing partnering arrangements that are relevant and beneficial to the DFO Science Program.

An ***At-Sea Science Strategy*** was developed to encompass a long-term science vessel requirement consistent with the Science Sector's operational plan. The Strategy identifies the types and number of vessels to be replaced over the next 5 to 15 years and outlines an approach to bring the use and operation of vessels and expenditures in line with available funding.

Several major pieces of scientific equipment are nearing, have reached or have exceeded their operational lifetimes and need to be replaced. As well, new science equipment will be needed to support emerging scientific studies arising from new client demands. A ***Scientific Equipment Strategy*** for the acquisition and long-term maintenance of equipment will enable us to address those needs, and ensure that essential scientific activities such as monitoring, research, data management can be sustained on a long-term basis.

4.4 Valued Science

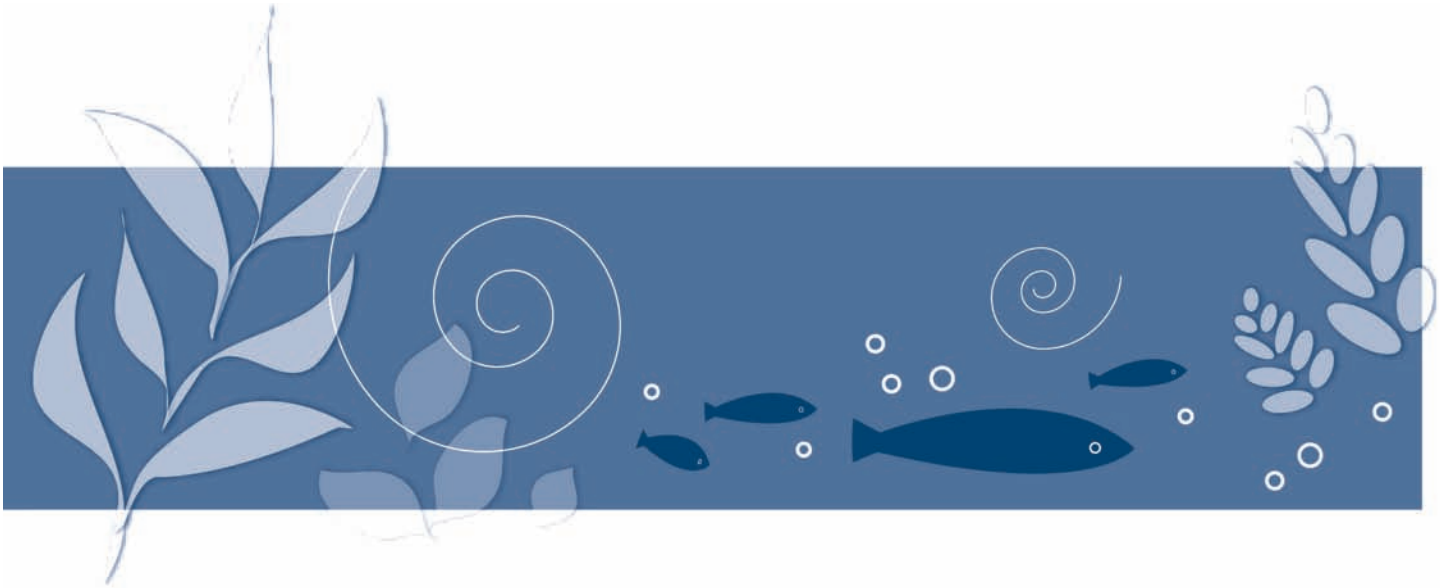
The degree to which DFO Science supports policy development and decision-making depends on the value and the benefit that our clients derive from our Science outputs. Producing volumes of science data and information alone is not enough. DFO clients and, more broadly, Canadians must be made aware of the information, products and services that are available to them.

A ***Strategic Science Outreach Strategy*** was developed to ensure that DFO Science proactively communicates with its clients. The key goals of the strategy are to:

- Ensure that scientific advice is fully considered in policy development and decision-making;
- Build public and stakeholders confidence and trust;
- Explain DFO Science and the benefits for Canadians.

The emphasis is placed on using modern communication methods to deliver information and advice to our clients and stakeholders, and to the general public as well.

Finally, an ***Integrated Science Risk and Performance Management Framework*** was developed to ensure that we continually monitor the success of the Science Program in an effort to ensure that science is appreciated at a Departmental and Government of Canada levels.



5. Conclusion

The aquatic sciences have been an area of excellence in Canada for more than a hundred years, and government science programs have been a key part of building knowledge of aquatic ecosystems. As human uses of the aquatic realm have evolved and intensified, DFO Science has adapted – but always with a focus on excellence in the provision of information and advice to Canadians.

Over the past decade, the number and complexity of demands on the DFO Science Program have increased dramatically. Faced with fixed and in some cases declining resources, a comprehensive science program management framework was needed to address these conflicting pressures.

Following the *Science Renewal* exercise, the Science Program is now better positioned to inform government decision-making and policy development, and to respond proactively to evolving priorities.

Under our DFO Science Framework for the Future, we have improved our strategic and operational planning, we are investing in research priority areas, we are building a diversified and knowledgeable workforce, and we have improved our overall contribution to the Canadian innovation system through our own expert science and through our collaboration with key partners across all levels of government, academia, and the private sector, both domestically and internationally.

Canadian society and the world at large depend on DFO's Aquatic Science Program. Many of the activities necessary to produce scientific information are little known to the public– data collection at sea or on remote rivers and lakes, compiling and ensuring the quality of data, working through uncertainties in peer review meetings – but the products we provide as a result of this work are highly visible and essential to its well being. Finally, DFO Science supports the Canadian economy and economic prosperity through our activities related to: charting and navigation, fishing, aquaculture, ocean industries, recreation and tourism as well as many other industries.

As human uses of the oceans and freshwater bodies continue to expand, science will continue to provide our window into the aquatic realm. Our Science Framework for the Future ensures that DFO will be able to continue a long tradition of providing advice and information to Canadians and the world, to ensure that we can collectively understand, manage and develop our aquatic resources on a sustainable basis.