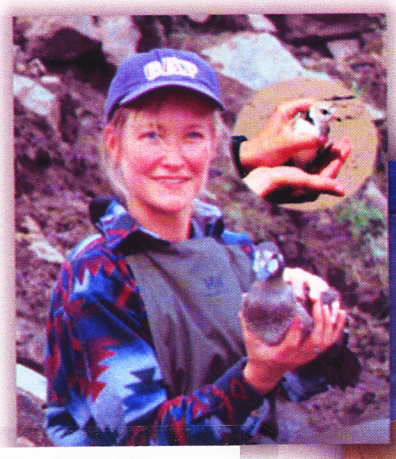
Environment Canada -Atlantic Region

2004 Science and Technology Strategy and Action Plan



prepared by:

the Regional Science Coordinating Committee of Environment Canada - Atlantic Region

Environment Canada -Atlantic Region

Science & Technology Strategy and Action Plan

prepared by:

Regional Science Coordinating Committee
Environment Canada - Atlantic Region

September 2004

Foreword

Environment Canada -Atlantic Region
Science & Technology Strategy

Environment Canada – Atlantic Region has had a long history of innovative approaches to addressing environmental issues that not only cross organizational lines but also recognize and fully engage stakeholders and communities. In 1996 the Regional Science Coordinating Committee (RSCC), a committee of science managers, prepared a Regional Science Strategy. It was the first formal document that described how regional scientific capacity contributes to regional and national priorities. That science strategy was quickly followed by an Action Plan which provided a path forward, and three Science Scans to examine and update regional science issues and priorities. All were presented to Regional Management Committee and approved as a foundation for regional planning.

RSCC evolved to become a community of science managers that provided consolidated comment and input to numerous national Science and Technology (S&T) initiatives, recognized the importance of social science and economics, coordinated knowledge sharing events, assisted in hosting EMAN National Science Meetings, and expanded its membership to include NWRI scientists stationed in the Region.

Regional Science and Technology (S&T) capacity is applied to numerous projects with the objectives of conserving and protecting our environment, and in ensuring that Canadians are alerted to high impact weather events and air quality hazards and understand the impacts of climate change. The result is science-based informed decision making and informed risk management. This revised Science and Technology Strategy maintains the horizontal coordination aspects of the first strategy, but more strongly recognizes the importance of Technology as part of science delivery, and the role of S&T in influencing economic decision making. The linkage to national S&T initiatives and to national institutes has also been strengthened. The strategic directions presented by the Region reflect the principles of excellence in science, the value of partnerships and networks, and public-good value of federal science.

Regional S&T continues to be delivered through traditional partnerships with universities, industry and other government agencies, and more importantly, in non-traditional ways with community groups, non-governmental environment groups, and Aboriginal peoples. It is the community engagement aspect of S&T that the Region is most proud of as it truly is in the service of Canadians.

I am pleased to present the "*Environment Canada -Atlantic Region Science & Technology Strategy and Action Plan*"

Garth Bangay
Regional Director General
Environment Canada – Atlantic Region

"AT A GLANCE: Executive Summary"

The Environment Canada - Atlantic Region Science and Technology Strategy and Action Plan

Guiding Principles

The Atlantic Region Science and Technology Strategy recognizes that:

S&T is the basis of policy formulation and informed decision making;
S&T serves Canadians at the national, regional, and community scales;
S&T must be coordinated and relevant to be effective;
S&T knowledge must be shared and well communicated; and
S&T capacity (human and infrastructure) must be continually rejuvenated.

Strategic Directions and Actions

Issues and Priorities - Strategic Direction:

EC-AR S&T will address key issues and priorities. To do that requires both a clear understanding of national and regional policy objectives, the departmental roles in addressing them, and ongoing project evaluation, to focus and effectively utilize S&T capacity.

Actions

- Confirm the commitment by EC-AR to a strong and focused S&T basis for its activities by adopting, sharing, supporting, implementing, evaluating and revising the S&T Strategy and Action Plan on a regular basis.
- Develop a list of anticipated or extant priority issues (Science Scan) of concern to EC-AR to be revised on a regular basis.
- Assess science requirements of priority issues annually, to ensure that resources are effectively focused to address them. That includes examining inter-branch and inter-regional collaboration on horizontal issues.

Science Capacity - Strategic Direction:

EC-AR will meet the workplace demand for skilled S&T workers by making the best use of and support existing professional and technical staff, capitalizing on the flow of trained individuals from post-secondary institutions, participating in programs which provide experience for recently graduated scientists and technologists, and training new and existing staff for specialist areas.

Actions

- Encourage current S&T staff to apply their skills differently to address emerging priorities in new fields, and to gain new expertise through formal training, assignments, staff inter-changes and university appointments.
- Encourage the acquisition of specific new skills, and flexibility in their application, in the recruitment of new scientific and technical staff.
- Encourage flexible working arrangements which enable S&T practitioners to maintain expertise and critical mass, including exchanges with internal and external partners, while working closely with others in EC-AR who use the results of scientific investigations.
- Access S&T recruitment pools to find qualified S&T employees for the future.
- Enhance the application of emerging information technology to ensure library-based scientific information is readily available to EC-AR scientists.
- Evaluate and augment present scientific facilities and equipment to ensure that current and anticipated priorities are effectively accommodated.
- Actively support the ACAP Science Linkages and HRDC Science Horizons programs.

S&T Delivery - Strategic Direction:

EC-AR will ensure that its S&T capacity is relevant to Canadians, by continuing to develop traditional and non-traditional inter-disciplinary partnerships, and further developing the ACAP model for community participation in S&T activities.

Actions

- RSCC should serve as the primary body for coordinating S&T activities, and facilitating S&T communication and information sharing.
- Focus EC-AR's research and monitoring at locations where maximum synergies can be attained consistent with research priorities, and ensure that S&T directed towards environmental issues is done on a coordinated and integrated basis that cuts across organizational "stovepipes" and focuses on results.
- Maximize the use of collaborative research opportunities with universities, national EC institutes, and other natural resource departments in addressing regional and national science-based priorities.
- Actively support the Atlantic Environmental Sciences Network (AESN) as a mechanism to coordinate federal S&T efforts in the Region.
- Strengthen working relationships between EC-AR scientists and non-traditional partners, to ensure that concerned sectors of industry and the public, including native people, are involved in collecting, understanding and using scientific information for informed decision making.
- Ensure that all major scientific projects include: clear objectives, goals, targets; clearly identified milestones to reach those targets; a learning and knowledge transfer element; a communication strategy; and the associated budgets and other resources required.

Communication and Use of S&T - Strategic Direction:

EC-AR will continue to place a high priority on effective communication and transfer of its scientific findings to multiple users by: ensuring that communications planning is built into overall planning and management of scientific work, seeking innovative approaches to outreach with partners, using various channels for communication, developing targeted products, and by responding to feedback from decision-makers and clients.

Actions

- Ensure that all major scientific projects include, as part of the planning process, a communication strategy that identifies communication objectives, goals, target audiences, potential activities to reach those audiences and the budget and other resources required.
- Seek management commitment for more effective internal communication, both among branches to better share information, expertise and resources, and between scientists and operational sections to ensure that results are considered in taking decisions.
- Ensure that communications strategies are designed to communicate with target audiences, instead of "to" target audiences. Incorporate feedback from clients, partners and external reviewers into the design of scientific projects, evaluations, and communication of scientific results.
- Adopt a the appropriate 'language' as needed to communicate the relevance of S&T to environmental quality, health and well-being of Canadians, the conservation of natural resources and economic competitiveness.

I. Strategic Directions for Regional Science and Technology: Using Science and Technology to Address Environmental Concerns

> *Science and Technology serves as the essential basis for informed decision making with respect to the protection and conservation of natural environments and in adaptation to or mitigation of the effects of environmental conditions upon the social and economic well being of Atlantic Canada*

1.1 The Objectives of a Science and Technology Strategy for Environment Canada - Atlantic Region

Science and Technology must have a purpose. For EC-AR that purpose is to provide a basis for policy formulation, science-informed decision making, risk management, and provision of relevant information to Canadians. To do that, the S&T components of EC-AR must be operated and managed in a manner to respond to changes in priorities. That necessitates that periodic strategic reviews and adjustments be undertaken. Moreover the strategic direction of EC science must also recognize the reality of departmental demographics and the need for rejuvenation of the S&T workforce. The Action Plan, which follows, identifies specific action items to be undertaken to ensure that this is accomplished.

This S&T Strategy describes the roles of science and technology in EC-AR, including *why* scientific and technological activities are undertaken and how they relate to other departmental functions and responsibilities, *what* our S&T priorities are, *who* is involved in the conduct of S&T, both within the department and amongst our partners, and *how* S&T activities are developed, undertaken and communicated to those who use the resulting information, and *when* they are undertaken to be most effective in supporting decision-making. It is intended that as the Region addresses key national and regional issues, it makes the most effective use of its scientific and technical resources and those of its partners and networks.

This revision is intended to refresh the 1996 regional science strategy, present a revised action plan, and recognize the "Technology" aspect of Science and Technology (S&T). The concepts and principles of the 1996 strategy remain valid. The major changes have been in the situational environment such as the focus nationally on S&T, the presence of National Water Research Institute (NWRI) and Meteorological Research Branch (MRB) research personnel in the Region, and the increased funding to university-based research programs.

Guiding Principles

The Atlantic Region Science and Technology Strategy recognize that:

S&T is the basis of policy formulation and informed decision making;
S&T serves Canadians at the national, regional, and community scales;
S&T must be coordinated and relevant to be effective;
S&T knowledge must be shared and well communicated; and
S&T capacity (human and infrastructure) must be continually rejuvenated.

1.2 Definition of Science and Technology (Based on OECD and UNESCO)

Science refers to a body of knowledge about the natural world and the changes made to it through human activity. Technology refers to the state of knowledge concerning ways of converting resources into outputs. Both science and technology can be used to refer to the body of knowledge itself—or in the case of technology, particular artefacts (goods or tools)--or to the activities undertaken to advance or apply it (services). More specifically, scientific and technological activities comprise systematic activities which are closely concerned with the generation, advancement, dissemination and application of scientific and technical knowledge in all fields of science and technology.

Within the federal government, scientific and technological activities are divided into two categories. Research and development (R&D) comprise creative work undertaken on a systemic basis in order to increase the stock of scientific and technical knowledge and to use this knowledge in new applications. Related scientific activities (RSA) are conducted in support of R&D and the application and dissemination of science and technology. They include such activities as data collection, monitoring, education support, scientific information services, and support for innovation.

Key National S&T Documents That Guide Regional Strategic Directions

- **SAGE**: Science Advice for Government Effectiveness (May 1999)
- **BEST**: Building Excellence in Science and Technology - The Federal Roles in Performing Science and Technology (March 2000)
- **READ**: Reinforcing External Advice To Departments (May 2001)
- **STEPS**: Science and Technology Excellence in the Public Service - A Framework for Excellence in Federally Performed Science and Technology (August 2001)
- **EDGE**: Employees Driving Government Excellence - Renewing S&T Human Resources in the Federal Public Service (November 2002)
- **SCOPE**: Science Communications and Opportunities for Public Engagement (April 2003)

EC-AR science and technology is conducted and interpreted in the context of a broader knowledge base, that includes economic, cultural and societal considerations. This is consistent with the federal perspective of S&T. Additionally, EC-AR uses key national S&T documents as guideposts to influence how we deliver S&T. Conversely, EC-AR provides inputs to the development of such documents so that regional best practices are shared nationally.

Definitions

Research: the focussed investigation of specific questions of function, impact or interactions
Monitoring: the repeated measurement of variables to determine spatial or temporal differences
Related Scientific Activities: complements research by contributing to the generation, dissemination and application of scientific and technological knowledge.
Science and Technology: includes research, monitoring and related scientific activities

1.3 The Role of Environment Canada - Atlantic Region's Science (Why)

The S&T activities of Environment Canada are conducted to support the department's mandate in protecting and conserving the natural environments of Atlantic Canada, and to support environmental prediction to reduce risks to human health and safety. Scientific knowledge forms the essential basis of most departmental management and conservation decisions and actions, and most of the department's science and technology activity is applied towards addressing specific challenges. Due to the complex and often uncertain character of interactions among stressors and natural systems, scientific prediction is often imprecise. However, information is usually required by decision-makers before scientists can collect sufficient data to predict outcomes with statistical confidence. By necessity then, it is recognised that many scientific results are provisional, and that science-based management must be a continuous and iterative process that results in decision making that is based on partially- or best available information. A

crucial role for Regional S&T is in support of science-informed decision making and science-informed risk management.

Regional S&T supports the departmental mandate of sustainable development and includes the following, which mirror the business lines of prediction, conservation and protection:

- social and economic well being - contributing to the health, safety and economic well-being of Atlantic Canadians through the prediction of high impact weather, air quality, and climate and the provision of that information to Canadians for informed decision making.
- resource management and conservation - providing scientifically-sound advice on operational activities undertaken by the department to ensure the effective protection and conservation of species, habitats and ecosystems, and identifying processes, species or other ecosystem components particularly susceptible to impacts of human activities and natural change.
- regulatory activities - understanding the impacts of human activities which the department regulates, such as hunting of migratory birds or releasing pollutants, setting science-based limits on these activities, and assessing the effectiveness of regulations at protecting components of environmental quality and human and ecosystem health.

1.4 Science Issues and Priorities for Environment Canada - Atlantic Region (What)

Regional S&T activities must address specific ongoing regulatory and jurisdictional management requirements that stem from obligations under specific federal legislation, and related conservation and regulatory activities. This is the first test of relevance; public good. Activities must also address key national departmental priorities, many of which reflect international commitments undertaken by Canada, such as the Convention on Biological Diversity, the Kyoto Accord, the Convention on Climate Change, the Montreal Protocol, the Canada-United States Air Quality Agreement, Agenda 21, and the Washington Protocol on Marine Pollution. Current national priorities include:

Examples of Legislation EC Administers:
The Canadian Environmental Protection Act (1999)
The Species at Risk Act (2002)
The Migratory Birds Convention Act
The Wildlife Trade Act (WAPPRIITA)
The Canada Wildlife Act
The Canada Water Act
The Canadian Environmental Assessment Act
The Fisheries Act - Section 36(3)

- Clean Air,
- Clean Water,
- Species At Risk, and
- Climate Change.

In addition to addressing these national concerns, EC-AR S&T activities also deal with many priorities which are of particular regional importance in Atlantic Canada. Additional regional priorities include:

- forecasting high impact weather including hurricanes, and sea level and storm surge events which affect human safety, well-being and economic livelihood,
- adaptation to climate change and sea-level rise in coastal and near shore areas.
- impacts of coastal and marine resource use (e.g. aquaculture, oil/gas exploration,),
- impacts of industrial and municipal wastewater on freshwater and coastal systems,
- ecosystem impacts (eutrophication and pesticide contamination) from agricultural activities on soils, groundwater, and wildlife and fish habitat,
- impacts of heavy metals and toxic substances on ecosystems,
- forecasting and communicating air quality conditions,
- long range transport of atmospheric pollutants,
- the conservation of endangered species and critical habitats,
- ecosystem impacts of forest management activities,
- ship-sourced marine pollution, especially oily wastes,

- awareness of Aboriginal Traditional Ecological Knowledge and Aboriginal capacity building for co-management of natural resources,
- understanding socio-economic implications of environmental stressors and events,
- remediation of contaminated sites,
- management of waste from seafood processing facilities.

While framed as environmental issues, the activities identified above have a larger dimension that influence Canada's ability to compete in global economies, and have impacts on human health, well being and safety. It will be difficult to compete in the world market if Canada is carrying a large ecological deficit (eg contaminated sites) and industry continues to employ technologies or practices that are not sustainable or have high environmental risk.

Issues and Priorities - Strategic Direction:
EC-AR S&T will address key issues and priorities. To do that requires both a clear understanding of national and regional policy objectives, the departmental roles in addressing them, and ongoing project evaluation, to focus and effectively utilize S&T capacity.

1.5 The Science and Technology Capacity of Environment Canada - Atlantic Region (Who)

A range of scientists, technologists, and other scientific support staff is active in the operational branches of the Region. S&T capabilities include; research scientists, biologists, chemists, engineers, meteorologists, physical scientists, social scientists, economists, computer scientists, and technologists. However, the department itself effectively functions as a science-based team, as many other staff, including a high proportion of middle and senior managers, have a variety of S&T training and expertise, and almost all staff contribute to the gathering, dissemination, and use of S&T information. Science Policy Branch reported that 68% of departmental expenditures nationally in 2002-2003 related to Science & Technology.

Regional S&T Infrastructure

- Canadian Hurricane Centre in Dartmouth, N.S.
- Atlantic Storm Prediction Centre in Dartmouth, N.S.
- Environmental Science Centre in Moncton, N.B. housing environmental chemistry, toxicology, and micro-biology laboratories
- Micro-biology laboratory at Bedford Institute of Oceanography
- GIS & Digital Video labs in Dartmouth N.S.
- National Lab for Marine and Coastal Meteorology in Dartmouth, N.S.
- National Marine Service Office in Gander, NL
- Two libraries linked to national systems
- Field research camps
- Over 14,000 ha of protected areas that include Migratory Bird Sanctuaries and National Wildlife Areas
- Doppler Radar and Lightning Network stations
- Computer networks and data base holdings
- Hydrometric, atmospheric, climate and buoy monitoring networks
- Offices in each Atlantic Province

EC-AR S&T practitioners must maintain their expertise and continue acquiring new knowledge through ongoing familiarity with the current published literature, and by their active involvement in research and monitoring studies. In addition to collaborative research projects with national institutes, universities and other Canadian and international agencies, many EC-AR science-based staff maintain formal mutually-beneficial links with universities as research fellows or adjunct professors, often co-supervising students or contributing to courses, or acquiring formal training through educational leave. Additional important exposure to evolving scientific themes at the national and international level is gained from attendance and participation at workshops and conferences.

In addition to traditional expertise such as the monitoring and interpretation of changes in water quality/quantity parameters, weather data or biological populations, EC-AR staff have valuable expertise in a range of emerging and expanding fields. These include digital remote sensing, on-line mapping, modelling of wildlife populations, ecosystem functions and hydrological patterns, data manipulation using GIS platforms, environmental analytical chemistry, toxicology, industrial ecology, and predictive modelling of high impact weather, climate change, sea level rise and oil spills. EC-AR scientists have specialist knowledge on impacts of acid precipitation, ecotoxicology,

ecological risk assessment, environmental effects monitoring, marine oil pollution, seabird conservation, geo-thermal energy storage, and hurricane forecasting to name a few. In addition to in-house expertise of Regional staff, the skills of outside individuals involved in science networks are accessible through a range of partnership agreements and exchanges.

Our S&T staff, like much of the public service, will see a major exodus of staff over the next five to seven years due to changing demographics of the workforce. This necessitates consideration being given to rejuvenation of the S&T community through strategic hiring, training, and mentoring of staff. It is also a reality that in some subject areas, knowledge resides with a single individual or very few staff. New programs such as Species at Risk and science-based issues on the horizon such as genetically modified organisms necessitate recruiting individuals with skills and knowledge that have not traditionally been prevalent in department. The Region will have to capitalize on the flow of trained personnel from universities and programs such as Science Horizons.

Human Dimension of S&T

The Region has four retired scientists who are scientist emeritus or departmental associates who provide not only corporate memory, but also mentor existing employees.

On the other end of the spectrum, nine Science Horizons youth interns have been hired by the Region after their work terms with the private sector. Science Horizons has proven to be valuable to the intern by providing a science-based work experience and to EC-AR by providing a source of trained enthusiastic individuals.

Science Capacity - Strategic Direction:
EC-AR will meet the workplace demand for skilled S&T workers by making the best use of and support existing professional and technical staff, capitalizing on the flow of trained individuals from post-secondary institutions, participating in programs which provide experience for recently graduated scientists and technologists, and training new and existing staff for specialist areas.

1.6 Regional Approaches to Conducting Science Activities (How)

The delivery of EC-AR S&T programs is routinely based on partnerships, collaboration, and cross-branch integration through numerous project teams. EC-AR scientists bring their expertise to numerous projects either as leaders or collaborators in mutually beneficial initiatives. Some partners rely on EC-AR for this expertise, in turn providing other resources such as funding or expertise that EC-AR does not possess. In 1996 only one notable university collaboration existed (the Atlantic Cooperative Wildlife Ecology Network). Today there are many collaborative projects and networks with the university community (see highlight box).

Partnerships approaches have expanded to working with community stakeholder groups as well. As an example; in 1994 only 5 Atlantic Coastal Action Program (ACAP) sites participated in community-based environmental monitoring and only a handful of EC-AR scientists were active with ACAP community groups. In 2004 all 14 sites had some form of community-based monitoring and 20 EC-AR S&T staff were involved with research and monitoring at ACAP sites. Some of this work included: roseate tern recovery; relationships between migratory waterfowl eelgrass and green crab; environmental health assessment of the L'Etang estuary; aquatic biodiversity monitoring, an evaluation of the industrial ecology of Saint John, NB, pesticide runoff from agricultural areas, and the analysis of mercury and heavy metals in the Madawaska River.

Through these numerous partnerships EC-AR is ensuring that the S&T delivered in the region is relevant to Atlantic Canadians and supports national objectives associated with sustainability and competitiveness. For example, the Pesticide Science fund and Agriculture, the Pockwock Watershed Project and Forestry, Innovation in Environmental Technology and Business Development in NS, or the Sea Level Rise Project and Coastal Planning, contribute to innovation and providing competitive advantage to particular sectors. The Atlantic Canada Opportunities

Agency (ACOA) financially supported some of the development activities associated with the Atlantic Environmental Science Network (AESN). These partnerships and collaborative efforts with agencies that have an economic mandate should be continued as a means to ensure EC-AR S&T contributes to the economic health of the Region and that we influence regional and national economic policy direction.

Environment Canada – Atlantic Region Networks and Collaborations

- **Atlantic Environmental Science Network (AESN):** AESN is a network of networks (thematic cooperatives) with partners from the Region's universities, governments, industry, and NGOs. The intent of AESN is to facilitate excellence in cooperative and strategic environmental research, development and training to enhance environmentally sustainable economic development. Two thematic areas have been launched (Environment and Human Health and Climate Change), and support has been secured from ACOA to assist with proposal preparation to granting agencies.
- **National Lab for Marine and Coastal Meteorology:** This centre of excellence works closely with Dalhousie University to develop a modelling capability for an integrated regional environmental prediction system focusing on maritime environmental aspects such as coupling atmospheric, oceanic, and ice conditions.
- **Atlantic Cooperative Wildlife Ecology Network (ACWERN):** ACWERN is a regional science-based partnership involving a network of Research Chairs at University of New Brunswick, Acadia University N.S. and, Memorial University NL. It is an important success, with over 100 students having "graduated" from Bachelors, Masters, PhD or Post Doctoral studies, all of which have specific or indirect application to Environment Canada's interests in forest-wildlife interactions, seabird and marine conservation concerns, and landscape-level assessments of habitat use.
- **Gulf of Maine Initiative (GoM) and Bay of Fundy Ecosystem Project (BoFEP):** EC-AR is involved in initiatives to address concerns over environmental degradation in the Bay of Fundy-Gulf of Maine, serving on the GoM council (with representatives from two provinces and three American States), monitoring impacts of environmental toxic chemicals through the Mussel Watch program, and conducting its own research projects.

A growing proportion of projects now integrate the activities of multiple partners. Increasingly, EC-AR works in collaborative partnerships with the academic, community, industry, other government departments, provincial agencies, Aboriginal groups and ENGOs. Many activities are undertaken through formal arrangements with partners from other federal or provincial agencies, universities and environmental non-government groups. In similar manner, other research and monitoring activities will take place through less formal arrangements or as a result of agreements where science is not the main focus but plays a critical role in influencing public understanding. The Atlantic Coastal Action Program (ACAP), a community-based watershed-level EC-AR initiative, results in many science-based projects, usually conducted by volunteers to high standards of quality-control. The Atlantic Region Conservation Data Centre, currently being operated with provincial partners manages databases of species and habitats at risk, and provides access to community ecologists and botanists.

Partnerships in Action: Sea Level Rise Project

Meteorological Service of Canada (Atlantic Region) is managing a multi-partner study to quantify the environmental, social, and economic impacts of climate change and sea-level rise on coastal erosion and flooding in south-eastern New Brunswick. The sea-level rise project is being carried out by researchers and scientists from Environment Canada, Natural Resources Canada, Fisheries and Oceans Canada, Parks Canada, the New Brunswick Government, Université de Moncton, University of New Brunswick, Mount Allison University, Dalhousie University and the Centre of Geographic Sciences (Nova Scotia Community College), in consultation with municipalities and planning commissions, and with additional financial support from the Government of Canada's Climate Change Impacts and Adaptation Program. This project will allow Canadians to better understand the impacts of climate change and to adapt to those changes in a manner that ensures both public safety and economic wellbeing and competitiveness.

Another dimension of relevance is ensuring that EC-AR S&T capacity is used as well to address national issues and objectives, and does not duplicate the work of others. Senior committees such as Program Brief, S&T Executive Committee, and S&T Management Committee are essential to ensuring that S&T meets national priorities, while more operational committees such as the Laboratory Coordinating Committee and RSCC ensure that linkages and coordination is facilitated and duplication avoided.

Collaborative projects will continue to be undertaken with Environment Canada national institutes. Regional scientists work collaboratively with scientists from the National Water Research Institute NWRI, National Wildlife Research Centre NWRC, and the Meteorological Research Branch, all three who have staff or programs being delivered in Atlantic and other Regions.

Some of these collaborations include:

- studies with the National Water Research Institute staff at UNB on cumulative effects on the Saint John River in New Brunswick
- examining the impacts of endocrine disrupting chemicals associated with agricultural activities in Prince Edward Island;
- leading investigations of wildlife toxicology issues such as mercury impacts on loons
- Pesticide Science Fund projects in NB, PEI and NS through collaboration with universities and provincial agencies that examine pesticide runoff and air transport;
- the Gulf of Maine (GoM) initiative linking US and Canadian agencies concerned over environmental degradation of the Gulf; and
- the Bay of Fundy Ecosystem Project identifying issues of concern in the Bay and bringing scientists from many agencies and universities together to address them.

Many of the challenges of addressing regional S&T issues go beyond well-defined sectoral boundaries, both in terms of the impacts and complexity of the concerns and of the expertise and approaches needed to satisfactorily investigate and address them. Many S&T activities will thus follow an inclusive ecosystem-oriented approach that considers effects and interactions at both small and large scales.

S&T Delivery - Strategic Direction:
EC-AR will ensure that its S&T capacity is relevant to Canadians, by continuing to develop traditional and non-traditional inter-disciplinary partnerships, and further developing the ACAP model for community participation in S&T activities.

1.7 Communication and Use of Scientific Results (Service to Canadians)

Science Communication Remains Essential:

Several innovative 'Knowledge Fairs' have been coordinated by RSCC for the purposes of sharing information internally amongst all EC-AR staff. The 2003 EMAN meeting in Halifax featured a "Regional Science Day" where an interactive poster session was used to increase awareness of regional S&T. EC-AR and NWRI science was featured.

The Region also hosted an Innovation Fair in the spring of 2004 that featured 45 posters, 8 of which were "showcased", as well as a conversation café to increase internal dialogue.

EC-AR's scientific results must be communicated in many different ways, to ensure that important information reaches and is understood by many different target audiences. Communicating with a variety of audiences in today's media fragmented world is a complex matter, so it is important that communications planning is integrated earlier in the science and technology cycle. EC-AR scientists traditionally publish findings in formal scientific publications and present research and monitoring results at scientific conferences. However, as these are rarely accessible to the general public or interest groups who are often the main users and beneficiaries of EC-AR's S&T, scientists will continue to work with communications professionals to create innovative communications strategies that use a variety of tools and activities to identify and communicate with key audiences. Such tools and activities might include:

- internal reports, briefing notes and S&T policy meetings with EC-AR managers and others responsible for taking action on the basis of EC-AR S&T information,
- publication in peer-reviewed scientific journals
- public meetings and workshops, with groups such as ACAP representatives, wildlife associations, Aboriginal communities where information flows both ways between scientists and users,
- direct representations, meetings and ongoing discussions with industry representatives, such as pulp and paper and mining, or off-shore petroleum boards to assist in implementing EC-AR recommendations,
- illustrated pamphlets or posters that are widely available for broad reach communication,
- specific media products such as "Severe Weather Awareness Week" , and utilization of stakeholder partnerships as communication channels,
- television, radio and print media contacts, both in response to news releases focussing on newsworthy scientific findings, and specific programs or articles explaining the implications of scientific findings in detail, and
- providing credible content for regional and national departmental web pages.

Examples of EC-AR Publication Series:

- Environment Canada - Atlantic Region Occasional Papers
- Environment Canada - Atlantic Region Technical Reports
- CWS Technical Reports
- MSC Technical and Scientific Reports
- EPB Surveillance Reports
- MSC Technical Reports

In order for Regional S&T to influence a sustainability and competitiveness agenda, Regional S&T must be on the forefront of scientific investigation and technology innovation. It is crucial for regional scientists to maintain credibility and influence through scientific excellence. Publishing research results in peer-reviewed main-stream scientific journals, with work-in-progress and results of regional interest in in-house technical series is a key foundation to excellence. In addition to sectoral national publications, EC-AR publishes several regional series, coordinated by the RSCC and EC-AR libraries. All these publications are accessible to the international scientific community, and to many partners and managers who use the results in operational programs. For science-informed decision making and risk-management, it will be necessary for scientists to adopt the appropriate 'language' to communicate the relevance of S&T to environmental quality, health and well-being of Canadians, the conservation of natural resources and economic competitiveness.

Much of EC-AR's scientific results now reside in computer databases, rather than in published form. Increasingly, efforts are being made to make this data available to research partners, clients, and the public through the use of technologies such as the WWW and on-line mapping.

Importance of Communication:
The fall and winter of 2003 saw two major weather events. Hurricane Juan and a major blizzard (White Juan) both impacted the Region. Accurate weather warnings were provided to emergency preparedness agencies and Atlantic Canadians. A year later media interest remains high with MSC meteorologists in demand for information on high impact weather.

Communication and Use of S&T - Strategic Direction:
EC-AR will continue to place a high priority on effective communication and transfer of its scientific findings to multiple users by: ensuring that communications planning is built into overall planning and management of scientific work, seeking innovative approaches to outreach with partners, using various channels for communication, developing targeted products, and by responding to feedback from decision-makers and clients.

2. Implementing the Science and Technology Strategic Directions: The 2004 Action Plan

2.1 Objectives of the Action Plan

The Action Plan is the companion document to put the findings of the S&T Strategy into play. In 1996, twenty action items were identified to ensure that the direction of the Science Strategy were effectively and continually implemented, to best position EC-AR S&T to support departmental goals. Some of those actions were of finite duration and were completed, while others would be viewed as operational approaches or business practices that remain in place today.

Considerable progress had been made by RSCC and the Region with respect to the original 1996 Action Plan. This includes:

- Science Scans in 1996, 1999, and 2004
- Chairing the Science Horizons Review Committee since program inception (1998)
- Providing participants annually to ACAP Science Linkages Review Committee
- Coordinating several scientific presentations to Regional Management Committee (ex. AESN, ACWERN, AEPRI, Pesticides, Marine Science)
- Progress reports to RMC
- Coordination of Regional inputs to national S&T projects and reports
- Integration of the regional laboratory in regional program delivery
- Coordination of a Regional Science Day at the 2003 EMAN meeting
- Contributions to numerous poster sessions to share knowledge
- Increased electronic access to library resources and journals on-line

Hence the 2004 Action Plan is a blend of new actions and a continuance of those that have stood the 'test of time'. The 2004 Action Plan follows the structure of the S&T Strategy, in sequentially addressing: roles, issues and priorities; capacity; approaches; and communications. The committees, branches or teams responsible for taking the required action are identified for each item. Lastly, the Action Plan, like the Science and Technology strategic directions, must be consistent with the values and principles of horizontal management, public good, relevance, excellence, and synergy as described in several framework documents associated with federal S&T delivery.

2.2 The Role of Environment Canada - Atlantic Region's Science (Why)

The roles of the EC-AR's S&T activities in support of departmental mandates and policies are generally well accepted, both internally and among our clients and partners. However, ongoing internal communication to all EC-AR is needed on the role of S&T in departmental mandates and policies, and the importance of a sound S&T base for departmental decision making.

Actions

1. Confirm the commitment by EC-AR to a strong and focused S&T basis for its activities by adopting, sharing, supporting, implementing, evaluating and revising the S&T Strategy and Action Plan on a regular basis. [RMC, RSCC]

2.3 Science Issues and Priorities for Environment Canada - Atlantic Region (What)

Most EC-AR staff have an implicit, subjective understanding of regional and national priorities, and international obligations, and of the science-based programs which support them. However, effective mechanisms are required to achieve region-wide consensus on priorities, to ensure common thrusts in departmental activities, to set objectives for science-based activities to address these issues, to evaluate their effectiveness in gathering and interpreting required information, and delivering it to decision-makers or clients. As priorities change, or as answers are

provided to applied research questions, mechanisms are required to align staff and resources to focus on emerging issues.

Actions

2. Develop list of priority issues (Science Scan) of concern to EC-AR to be revised on a regular basis.
3. Assess science requirements of priority issues annually, to ensure that resources are effectively focused to address them. That includes examining inter-branch and inter-regional collaboration on horizontal issues. [Branches, RMC]
4. Identify, evaluate and report on evolving science-based issues through watching briefs scoping exercises and workshops. [RSCC, Branches]

2.4 The Science Capacity of Environment Canada - Atlantic Region (Who)

The scientific and technological staff of EC-AR is comprised of skilled and dedicated practitioners with access to a range of expertise internally and through partnerships. The challenge in the next five to seven years will be the pending retirement of many current S&T practitioners and the need to recruit a new generation of scientists and technologists while maintaining an ability to address changing priorities. The flow of intellectual capacity from post-secondary institutions will be critical in rejuvenating the S&T workforce. It is equally important that physical assets such as libraries, scientific facilities and equipment be maintained, up-graded and focused to support current and anticipated needs.

Actions

5. Encourage current S&T staff to apply their skills differently to address emerging priorities in new fields, and to gain new expertise through formal training, assignments, staff inter-changes and university appointments. [Branches, HRB]
6. Emphasize the acquisition of specific new skills, and flexibility in their application, in the recruitment of new scientific and technical staff. [Branches, HRB, RMC]
7. Encourage flexible working arrangements which enable S&T practitioners to maintain expertise and critical mass, including exchanges with internal and external partners, while working closely with others in EC-AR who use the results of scientific investigations. [RMC, Branches]
8. Access S&T recruitment pools to find qualified S&T employees for the future. [Branches and HRB]
9. Enhance the application of emerging information technology to ensure library-based scientific information is readily available to EC-AR scientists. [MSB, Branches]
10. Evaluate and augment present scientific facilities and equipment to ensure that current and anticipated priorities are effectively accommodated. [RMC, Branches, RSCC]
11. Actively support the ACAP Science Linkages and HRDC Science Horizons programs.[Branches]

2.5 Regional Approaches to Conducting Science Activities (How)

The S&T credibility of EC-AR remains quite high. Cooperative approaches such as AEPRI and ACWERN, which are influenced by EC-AR have proven to be models that allow needed science to be performed while at the same time developing a new generation of scientists, technologists and researchers. Traditional science partnerships with the academic community and non-traditional relationships with stakeholder groups such as communities, the forestry industry, fishermen or Aboriginal groups continue to increase in importance. Partnerships contribute to excellence, relevance, and public-good values and in the long term will contribute to sustainability and competitiveness.

Although the complexity of many environmental issues is well-recognised, efforts are needed to ensure the effective adoption of ecosystem-based approaches, as applied to specific issues and

programs by overcoming difficulties in understanding and applying such techniques, obtaining commitment from necessary partners, and in demonstrating the success of the approach in regional programs. Partnerships with potential economic aagencies such as ACOA, or Industry Canada need to be explored as well. This necessitates horizontal management, and inter-branch and inter-regional synergies.

Actions

12. RSCC should serve as the primary body for coordinating S&T activities, and facilitating S&T communication and information sharing.
13. Focus EC-AR's research and monitoring at locations where maximum synergies can be attained consistent with research priorities, and ensure that S&T directed towards environmental issues is done on a coordinated and integrated basis that cuts across organizational "stovepipes" and focuses on results. [RMC, Branches]
14. Maximize the use of collaborative research opportunities with universities, national EC institutes, and other natural resource departments in addressing regional and national science-based priorities. [Branches]
15. Actively support the Atlantic Environmental Sciences Network (AESN) as a mechanism to coordinate federal S&T efforts in the Region. [Branches]
16. Strengthen working relationships between EC-AR scientists and non-traditional partners, to ensure that concerned sectors of industry and the public, including native people, are involved in collecting, understanding and using scientific information for informed decision making. [Branches]
17. Ensure that all major scientific projects include: clear objectives, goals, targets; clearly identified milestones to reach those targets; a learning and knowledge transfer element; a communication strategy; and the associated budgets and other resources required. [Branches]

2.6 Communication and Use of Scientific Results (Service to Canadians)

One of the most fundamental activities is the effective communication of S&T. Without this crucial knowledge sharing aspect, S&T information cannot be utilized for policy advice or informed decision making. Target audiences must be carefully considered, and multiple channels must be used to create effective and innovative two-way communication that goes beyond traditional one-way "information transfer". Information flow must cross organizational barriers. For EC-AR to serve the public-good there must be an element of public access to relevant and timely information. The level of science literacy in each target audience must also be considered.

Feedback from users, clients and research partners must be solicited and used in the development and delivery of S&T activities. A client-centric approach is an established business approach that can also serve S&T delivery. This is critical in areas that involve commercialization, cost-recovery, and cost-shared programs.

There must also be an increased focus on internal information sharing. This should become the norm in all science project planning; there must be an explicit management expectation that potential internal audiences are given the same consideration as potential external audiences.

Actions

18. Ensure that all major scientific projects include, as part of the planning process, a communication strategy that identifies communication objectives, goals, target audiences, potential activities to reach those audiences and the budget and other resources required. [Branches, RMC]
19. Seek management commitment for more effective internal communication, both among branches to better share information, expertise and resources, and between scientists and operational sections to ensure that results are considered in taking decisions. [Branches, RMC]

20. Ensure that communications strategies incorporate "best practice" two-way communications approaches which are designed to communicate with target audiences, instead of "to" target audiences. Incorporate feedback from clients, partners and external reviewers into the design of scientific projects, evaluations, and communication of scientific results. [Branches, CDR]
21. Adopt a the appropriate 'language' as needed to communicate the relevance of S&T to environmental quality, health and well-being of Canadians, the conservation of natural resources and economic competitiveness.

The 2004 RSCC Science Scan in Brief:

Task Presented to RSCC:

- Identify the science issues that Environment Canada – Atlantic Region may be asked to address or participate in over the next three years.
- Provide Regional Management Committee a sense of what may be over the horizon so that reasonable and measured responses may be developed as issues emerge.

What the Science Scan was:

- A polling of RSCC members and organizations.
- An attempt to anticipate science-based issues.
- A preliminary identification of the issue context.
- A head's up as to what might be around the corner for EC-AR.
- An indication if we are already engaged on the topic.
- Information for RMC consideration in priorities and planning discussions.

The 2004 Science Scan Context:

- Environment Canada is identified as a Science and Technology Department
- 'S&T' faces the same human resource and workplace challenges as the whole public service (succession, capacity, diversity, etc)
- There has been increased activity in science partnerships in the past 10 years
- Regional Science and Technology is already engaged in numerous priorities related to:
    - Contaminants
    - Biodiversity
    - Wildlife and Habitat Management
    - Priority Ecosystems
    - Ecosystem Health and Clean Environments
    - Climate Change
    - Atmospheric, Climate and Weather Issues
    - Marine Issues
    - Water

The Issues RSCC Identified in the 2004 Science Scan:

- Wildlife Disease
- Effects of Genetically Modified Organisms
- Setting Population Objectives for Wildlife
- Impacts of Invasive Species
- Species at risk/Biodiversity and Human Impacts
- Climate Change Impacts and Adaptation Research
- Global Ocean Modeling and Data Assimilation
- Urban Infrastructure at Risk
- Urban Ecology
- Pesticide Research
- Pharmaceuticals and Endocrine Disrupting Chemicals in Aquatic Systems
- Cumulative Effects Assessment
- Nutrients in Aquatic Systems
- Remediation Science for Sydney Tar Ponds
- Emergence of Wind Power Technology and Ecosystem Conflicts

Appendix I. Abbreviations used in text:

ACAP Atlantic Coastal Action Program
ACWERN Atlantic Cooperative Wildlife Ecology Research Network
CABIN Canadian Bio-monitoring Network
CDR Community and Departmental Relations Branch of EC-AR
EC-AR Environment Canada - Atlantic Region
ECB & CWS Environmental Conservation Branch of EC-AR
EPB Environmental Protection Branch of EC-AR
EMAN Environmental Monitoring and Assessment Network
ENGO Environmental Non-Government Organization
GIS Geographic Information System
GoM Gulf of Maine initiative
HRB Human Resources Branch
MRB Meteorological Research Branch
MSC Meteorological Service of Canada
NWRI National Water Research Institute
R&D Research and Development
RMC Regional Management Committee of EC-AR
RSCC Regional Science Coordinating Committee of EC-AR
S&T Science and Technology

Appendix II. Regional Science Coordinating Committee:

2004 Members:

Hugh O'Neill	Les Rutherford	Dave Wartman	Co-Chairs

Rodger Albright
Wayne Barchard
Steve Beauchamp
Tim Bullock
Linda Cooper
Cathy Cormier
Zal Davar
Kevin Davidson
Jean-Guy Deveau
Sheila Eddy
Dr. Richard Elliott
Bill Ernst
Mike Howe
Peter Johnson
Gary Lines
Ian McCracken
Craig McMullen
Gary Pearson
Tom Pollock
Stu Porter
Les Rutherford
Jon Stone
Bruce Whiffen

Appendix III. 2004 Revision Team

Peter Johnson	Community and Departmental Relations Branch
Susan Murtagh	Community and Departmental Relations Branch - Communications
Hugh O'Neill	Environmental Conservation Branch
Les Rutherford	Environmental Protection Branch
Dave Wartman	Meteorological Service of Canada