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Report on the workshop to implement an  
ecosystem monitoring and research initiative for  
the Northern Arctic/Arctic Cordillera ecozones

Iqaluit, Northwest Territories, Canada  
October 27-29, 1993

Sponsored by

State of the Environment Reporting  
Environment Canada

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## EXECUTIVE SUMMARY

The Iqaluit workshop on establishing an ecological science centre (ESC) for the Northern Arctic and Arctic Cordillera ecozones was held October 27–29, 1993. It constituted the follow-up to a meeting held May 20, 1993, in Winnipeg, which considered the concept and recommended a workshop involving a wider array of people to implement the ESC in the Northern Arctic/Arctic Cordillera ecozones.

The objectives of the Iqaluit workshop, as approved by the participants, were to:

- achieve an understanding of, and comfort with, the concepts of long-term ecosystem monitoring and research (EM&R) and ESCs;
- identify important monitoring and research issues in the Canadian northern Arctic;
- begin the process of establishing an ESC for the Northern Arctic/Arctic Cordillera ecozones.

The workshop was attended by more than 30 representatives from a variety of federal departments, the Government of the Northwest Territories, Nunavut Tunngavik Inc., universities, nongovernmental organizations (NGOs), and Arctic College. Organizations unable to attend the workshop expressed their support for the initiative.

Through discussions in the plenary and small breakout group sessions, participants built up considerable enthusiasm for the idea of an ESC in the Northern Arctic and Arctic Cordillera ecozones, although there was initially some skepticism about the likely success of the proposal without a massive infusion of financial resources. By the conclusion of the workshop, it was agreed that such resources were not needed initially, given the multiplicity of current, uncoordinated activities, data, and information, and the organizational, planning, and synthesizing activities still to be worked out. Financial resources for workshops to facilitate planning and coordination were, however, essential.

The ESC in the Northern Arctic and Arctic Cordillera ecozones was seen as very different from ESCs in the rest of the country, given the size of the area, the large distances between communities, the importance of logistics, and the evolution of Nunavut towards territorial status. Further, most of the research and monitoring undertaken to date has been southern-based for southern reasons.

The workshop stressed the importance of involving northern communities in identification of priority issues that should be addressed through research and monitoring activities. The ESC must address northern concerns and integrate northern ecological knowledge and northern scientists, managers, and technicians into the knowledge system.

Among the key issues the ESC should address were:

- understanding the organizational “rules” of traditional ecological knowledge so that it can be incorporated with other types of knowledge;
- problems associated with sustainable development;
- the continuation of traditional lifestyles;
- impacts of local and transported toxic chemicals, ultraviolet radiation (UV-B), etc.; and
- climatic change.

The substantial progress achieved in meeting the objectives is encapsulated in the recommendations. SOER agreed that it would, in cooperation with volunteer organizations, facilitate the next steps, the first being the production of this report.

### The workshop recommended that:

1. The EM&R initiative being facilitated by SOER should be supported and implemented. A multi-locational Northern Arctic/Arctic Cordillera ESC (High Arctic ESC) should be established that closely involves local communities.
2. The High Arctic ESC should focus on EM&R and facilitate the integration of disciplines and synthesis of results. It should be tied into international circumpolar and similar scientific activities. The knowledge derived should serve local purposes as well as regional, national, and international purposes.
3. The High Arctic ESC should comprise, initially, the areas (anchor nodes) surrounding Eureka, Igloolik, Iqaluit, Pond Inlet, and Resolute. The workshop endorsed the Canadian Polar Commission proposal to establish a marine centre at Resolute and recommended its participation in the ESC.

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4. The National Parks system being developed on the eastern side of the ecozones from Ellesmere Island through Baffin Island to Northern Labrador should be included as soon as management plans and logistics are made final. Identification of an anchor node in the western part of the Arctic Archipelago (e.g., Cambridge Bay) should be made as soon as feasible to complete the east-west representation. Information and data sets from "opportunistic" sites should be included in any synthesis.
  5. A consultative process should be implemented to prepare a common research agenda for the ESC that recognizes and includes the agendas of northern residents, as well as of governments and southern academics. SOER should facilitate the organization of a workshop to prepare this common agenda.
  6. A communication strategy should be an essential element of the ESC. It should include communications not only among scientists, but also between scientists and (a) local communities (essential), (b) local decision makers, and (c) the Canadian public at large. Language should be understandable and the information relevant and timely.
  7. The Polar Continental Shelf Project should be fully involved in the ESC. Appreciation of its logistical and other support to Arctic research was stressed by participants.
  8. Innovative ways of getting information to communities should be explored. In addition to the print media, the production of tapes and videos, interviews with the local media, cooperation with the Community Learning Centres, and informal discussions should all be explored.
  9. A central computerized catalogue (meta-database) that lists sources of databases and information on who is doing what and where should be developed to facilitate exchange of ideas as well as data and information.
  10. SOER should facilitate a workshop/brainstorming session early in the next fiscal year to help in the synthesis of information and to explore additional means of informing people about what is going on and what it means.
  11. An interim coordinating committee should be set up as quickly as possible to serve as a focal point for cooperation and contact and as a facilitating body for the ESC. This interim committee should work closely with Nunavut Tunngavik Inc. and other Nunavut groups in developing an action plan on priority issues. SOER should take the leadership in establishing this committee.

## BACKGROUND

A workshop was held in Iqaluit, Northwest Territories, on October 27-29, 1993, sponsored by State of the Environment Reporting (SOER). Approximately 30 people attended (Appendix 1), representing a wide variety of research disciplines and resource management interests from university, native, nongovernmental organization (NGO), federal, and territorial agencies. In addition, participants were pleased to welcome students and instructors from Arctic College to plenary sessions.

This workshop — one of a series to establish ecological science centres (ESCs) in the 15 Canadian terrestrial ecozones — was specifically the follow-up to a meeting of representatives of various federal and territorial government agencies held in Winnipeg, on May 20, 1993, to explore the concept of an arctic ESC. One recommendation of the meeting was that a workshop be convened in the North to inform and involve members of the research community and representatives of the northern native population in the initiative (Appendix 2).

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## OBJECTIVES

The objectives of the Iqaluit workshop to establish a Northern Arctic/Arctic Cordillera ESC as presented in the letter of invitation were discussed and modified by participants as follows:

- to achieve an understanding of, and comfort with, the concepts of EM&R and ESCs;
- to identify important monitoring and research issues in the Canadian Arctic — for example, (a) priority environmental concerns, (b) science management, (c) community priorities, (d) communications, (e) Nunavut issues, and (f) integration of traditional ecological knowledge; and
- to begin the process of establishing an arctic ESC, including (a) definition of sites, (b) identification of opportunities for monitoring and research, (c) management mechanisms/needs, at least for the short term, and (d) ways to manage data, integrate scientific and traditional ecological knowledge, and synthesize information.

The workshop was organized into alternating plenary and small breakout group sessions. Three breakout groups met concurrently to consider both general and specific issues, which were then discussed in a plenary session. For the agenda, see Appendix 3.

## INTRODUCTORY PLENARY SESSION

The workshop began with a welcome and introduction by the plenary chairperson, Mr. Bruce Rigby, District Superintendent, Parks Canada, Iqaluit. He spoke of the need for greater coordination of science in the Arctic and suggested that there were opportunities available to develop the EM&R initiative in the North. He stressed the importance of informing and involving local people, particularly given the evolution of new administrative structures within Nunavut. Following Mr. Rigby's opening remarks and general introductions, the SOER video "Earth's Harmony" was shown. This was followed by a presentation on Canada's EM&R initiative by Dr. Patricia Roberts-Pichette, SOER, who described the objectives of Canadian EM&R, the role of ESCs, and the progress that had been made nationally and internationally (Appendix 4).

Dr. Rick Riewe then delivered a keynote presentation entitled "Initial Thoughts on Integrating Traditional Ecological Knowledge into the Northern Arctic/Arctic Cordillera Ecological Science Centre" (see Appendix 5). He pointed out the value of involving high schools and Arctic College in the

EM&R initiative, explaining how local Inuit had contributed to the success of the Arctic Research Establishment in Pond Inlet. He also argued that "The richest and most useful information that could be collected in the communities ... is not the quantitative scientific data, but rather the traditional ecological knowledge held by the elders." He concluded that the success of an arctic ESC was dependent on the empowerment and integration of the Inuit in the initiative.

In the general discussion that followed, the thesis presented by Dr. Riewe was strongly supported. Questions focusing on the needs and objectives of ESCs were raised and included: Do we need more monitoring? Would ESCs be policy-oriented? Could ESCs lever more funding for monitoring and research? Who were the clients for the knowledge generated at ESCs? These questions were referred to the breakout groups for further discussion and recommendations.

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## ISSUE IDENTIFICATION

The first breakout group session was devoted to discussion of the general theme of monitoring and research issues in the Canadian High Arctic in each of the three breakout groups. As general guidance, participants were asked to consider:

- current broad-based monitoring and research activities in the Arctic, and if the right things are being done in the right places;
- what progress was being made in understanding ecological functions and processes in the Arctic;
- what is known and what should be known about people and how they use the environment;
- whether there were opportunities for better coordination of research and monitoring; and
- whether synthesized information is getting into the hands of decision makers in a timely, efficient, and understandable manner, and, more particularly, whether local residents have opportunities to influence the research direction and whether results are getting back to local residents in an understandable form.

Discussions were wide-ranging. The key points that were presented for discussion in the plenary session are grouped together under four subheadings:

### 1. ENVIRONMENTAL/ECONOMIC ISSUES

- Environmental issues are apparent at different spatial and temporal scales, ranging from local contamination caused by local waste management practices to the sweeping implications for the Arctic of southern-generated toxic chemicals and global change predictions. Stresses are largely similar across the Arctic, but the physical environment differs widely, making multiple monitoring and research sites necessary.
- Monitoring should contribute to identification of where research should be done.
- Trend data and information on rates of change are essential for the interpretation of change and for predicting future impacts and taking preventive action.
- Sustainable economic development in the Arctic is dependent on understanding ecosystem linkages, particularly those involving human

population growth, renewable and nonrenewable resource use, and the perpetuation of traditional lifestyles and skills.

- A holistic approach is essential and must include the integration of terrestrial and marine EM&R. Any new centre for marine ecosystem study and monitoring, as proposed for Resolute, should be established where complementary terrestrial work is already ongoing.

### 2. ROLE OF THE ESC

- The ESC is a mechanism to bring varied interests together, identify and concentrate effort on priority issues, coordinate activities, and set data gathering and other standards.
- It is a "centre of excellence," a forum for the identification of issues and cross-disciplinary research, a convenor of workshops, a facilitator for the synthesis of state of knowledge, a "clearinghouse," and an information repository.
- It will bring leverage to obtain financial resources.
- It facilitates communication among disciplines and with local communities, decision makers, and the public at large and, where necessary, acts as a go-between.

### 3. OPERATIONAL AND ADMINISTRATIVE ISSUES

- The ESC must be dynamic and interactive, facilitating information exchange among biophysical and social scientists of all relevant disciplines, between scientists and local communities, and between scientists and the general public, including decision makers.
- It must be locally driven and coordinated to ensure relevance and survival. There is a sense that most current science is done without thought for local residents
- International agreements on such programs such as the Arctic Monitoring and Assessment Program, International Tundra Experiment, Canadian Arctic Flora and Fauna, etc. support the ESC ecosystem focus. The ESC should facilitate coordination and information exchange among the agencies responsible.



- Recommendations contained in the scientific plan for a regional research program in the Arctic on global change should be considered in establishing ESC anchor sites and guiding the ESC program.
- Information and states of knowledge derived from monitoring and research should be easily accessible.
- The relevance of the ESC to individual researchers has to be better communicated, to demonstrate the value of cross-disciplinary cooperation and to promote personal involvement.

#### **4. SITE SELECTION ISSUES**

- The key concern is "representativity," but the anomalous nature of areas such as Polar Bear Pass, Wager Bay, and Eureka must be recognized. A single site, or even a limited few, would not make an appropriate ESC; there must be a combination of sites or areas to cover the vast and diverse nature of the Northern Arctic and Arctic Cordillera ecozones.
- "Ecological Science Centre" may not be the best terminology;  
"Ecological Science Network" may be better.
- Logistical support will be a primary consideration in selection; the ESC should be built on existing facilities.
- The potential to increase knowledge and define future information needs and emerging issues should be paramount in site selection.

#### **Plenary discussion**

The plenary discussion generally agreed with the points raised. The vast size of the area, the evolution of Nunavut to territorial status, the small communities, the importance of involving the

communities, the scattered nature of the population, and the reliance on logistical support were all seen as making the Northern Arctic and Arctic Cordillera ESC (High Arctic ESC) very different from those in the rest of Canada. It was noted that the land claims legislation provides guidelines on activities that should be implemented (e.g., monitoring, research, etc.) and that the ESC could assist in the collection, integration, and interpretation of data and synthesis of information.

In coming to grips with the organization of the ESC, one group proposed two models, the "Chevette" and the "Cadillac." The Chevette model (or the ecological science network) would have no new money for research and monitoring. It would focus on (a) communication and facilitation (e.g., identification of issues, convening of workshops, dissemination of scientific results) and (b) provision of support for northern science (e.g., exerting influence to obtain funding, lobbying for government-supported northern programs). The Cadillac model would require more financial resources than currently exist in the EM&R initiative. It would, in addition to (a) and (b) above, (c) coordinate research, (d) provide a geographical focus for research and monitoring, (e) synthesize the results of studies through the integration of data, and (f) disseminate the results.

These models served to focus discussion. Participants reached the conclusion that, at least initially, the Chevette model would be sufficient, given the number of activities already under way in the Arctic and the lack of coordination among them, the wealth of disparate information that needs to be integrated, and the organizational and administrative issues still to be worked out. Financial support for these activities was, however, essential, and there was some agreement that focused, cooperative, and long-term EM&R might of itself have the effect of leveraging funds to support the work.

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## **"INVENTING THE NORTHERN ARCTIC/ARCTIC CORDILLERA (HIGH ARCTIC) ESC"**

To set the scene of the next part of the workshop, a number of participants were invited to summarize their current and proposed research activities and the organization and history of the organizations they represented (see Appendix 6). In addition, some of the participants and students from Arctic College put up descriptive posters on current work.

The breakout groups were requested to build on these presentations, and the outcome of previous discussion, as they concentrated on one of three themes:

- opportunities for sites of the ESC;
- management mechanisms/needs in the short term; and
- achieving "synthesis" and the "big picture."

### **GROUP ONE SITE SELECTION**

The group devoted considerable time to an analysis of site selection criteria, as identified the day before by Dr. Patricia Roberts-Pichette in her presentation on the ESC concept. Important attributes of the Arctic from the standpoint of the EM&R initiative were seen to include ecological diversity, a limited knowledge base, high logistics costs, the relative lack of economic development, sensitivity to change, and international linkages. Two criteria were concluded to be of primary importance in the Arctic: "representativeness" and "logistics."

Recognizing that there were many potential opportunities available, depending upon financial and other considerations, three categories of sites were identified:

- "anchor nodes": sites or areas that stand out for such reasons as existing logistical support, breadth of research, and length of monitoring record;
- "potential anchor nodes": monitoring sites (e.g., atmospheric monitoring) that have the potential for becoming anchor nodes; and
- "opportunistic sites": field sites anywhere in the Arctic outside an anchor node area, offering short-term opportunities.

The breakout group recommended that the initial anchor nodes of the High Arctic ESC should be:

- Eureka (Atmospheric Environment Service);
- Resolute (Polar Continental Shelf Project);
- Pond Inlet;
- Igloolik (Science Institute of the Northwest Territories); and
- Iqaluit (Arctic College/Science Institute of the Northwest Territories).

### **Plenary discussion**

Most of the discussion related to the lack of an existing site to represent the southwestern part of the Northern Arctic ecozone and the distinction between "anchor" and "potential" nodes or sites. The group explained that an anchor node is one that exists now and meets the key site selection criteria (ecologically representative; logistically sound), whereas a potential anchor node is currently lacking in one or both key criteria but is a definite prospect for the future. In summary, an anchor node would require minimal resourcing for the present, whereas a potential node would require significant resourcing to make it viable.

The plenary group accepted the recommendation of the breakout group on locations as the initial anchor nodes but indicated that National Parks should be included — they offered the potential for research and monitoring of biota, for the involvement of local people, and for understanding of human interactions with their environment, which was not necessarily equalled at the recommended anchor nodes.

Need for stronger east-west representation across the archipelago was also recognized, comparable to north-south representation of the National Parks. Cambridge Bay and Mould Bay were suggested for future consideration. The lack of an anchor node on the mainland was also pointed out.

### **GROUP TWO: MANAGEMENT MECHANISMS**

Two key issues that were identified were infrastructure and local community involvement. Evolution towards the establishment of Nunavut has to be taken into consideration. Institutions that deserve consideration in the management of an ESC include the Nunavut Wildlife Management Board, the Nunavut Impact Review Board, the Heritage Trust, the

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Traditional Knowledge Centre, municipal governments, and local councils. As the ESC encompasses territory beyond Nunavut, decision makers from other jurisdictions would also have to be involved.

Two distinct research agendas were recognized: one arising from the local community agenda, and the other springing from agendas of the federal government (e.g., Environment Canada, Fisheries and Oceans Canada, Indian Affairs and Northern Development Canada, Energy, Mines and Resources Canada), the territorial government (e.g., Science Institute of the Northwest Territories), and southern academic institutions (the "corporate" agenda). It was suggested that a workshop be convened that brings these two parts together to develop a cooperative research agenda.

Funding sources for the ESC could include Nunavut institutions, granting councils, the Green Plan (e.g., Eco-research Program), and NGOs. SOER could offer limited funding in its role as facilitator.

The breakout group recommended that:

- SOER should provide support to enable the identification of the research needs and concerns of affected communities, which could be identified through community meetings, a consultation contract, and contact with Community Learning Centres and Nunavut Tunngavik Inc.;
- a corporate research agenda should be developed; and
- SOER should facilitate the organization of a workshop that brings together community and corporate interests to develop a common research agenda.

### **Plenary discussion**

Leadership of a coordinating committee coming from northern institutions or bodies was strongly supported, and the potential of Nunavut Tunngavik Inc. in this role was recognized. Participants faced two important concerns: the transition towards territorial status of Nunavut, and the current federal and territorial government reorganization. Given the responsibilities that institutions such as Nunavut Tunngavik Inc. are currently facing in the evolution of Nunavut Territory, the initiative was seen as a mechanism that could provide vital information for natural resource management strategies as they were being developed. Establishing an interim

coordinating committee during the transition period would be welcome. Nunavut Tunngavik Inc. requested that it be kept informed of developments. Commitments to participate on an interim coordinating structure were made on behalf of Environment Canada's Western and Northern Region, Parks Canada, Arctic College, and the Canadian Arctic Resources Committee.

### **GROUP THREE: SYNTHESIS**

Group Three addressed the issues of data compatibility, data quality, and where data management occurs. Data management occurs in many places, at many levels — for example, at all levels of government, in universities and other academic institutions, and in the private sector.

"Data compatibility" entails the exchange/incorporation of another database with one's own, structurally (i.e., format) and/or scientifically. Making old databases compatible was concluded to be out of the question. Compatibility was something to strive for in the future, and Environment Canada's integrated monitoring initiative was cited as an example to follow.

The control of data quality was an issue. It was noted, on the one hand, that if database comparability were assured, data quality should improve. On the other hand, research costs might increase, more red tape could result, academic freedom might be infringed upon, and agreed-upon standards might change over time anyway.

The need for centralized data storage and/or linkage of data management was discussed. Although there was some support for centralization, concerns were raised about the amount of money required to centralize databases, the issue of rights to data, the question of who the client would be, and the problem of selecting a geographic location for centralization.

Participants recommended the establishment of a central computerized catalogue of databases with designated northern and southern repositories and their whereabouts identified in the central computerized catalogue. The catalogue would facilitate access to information by identifying where the databases resided and would promote exchange of ideas. It might be administered by the Science Institute of the Northwest Territories, for example, and could be updated annually through existing communication mechanisms such as E-Mail and periodicals such as "Northline." The lever to ensure

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compliance of researchers in identifying and updating their databases could entail, for example, the continuation of assistance from the Polar Continental Shelf Project and other key support agencies.

On the subject of incorporating traditional knowledge, it was pointed out that parts of the North are not even visited, let alone populated, by humans. On the other hand, it was recognized that traditional ecological knowledge, whether indigenous or nonindigenous, could contribute to such tasks as research design and the environmental assessment and review process. Success stories relating to the incorporation of traditional knowledge need to be publicized. Repositories of traditional ecological knowledge include the Canadian Museum of Nature's Centre for Traditional Ecological Knowledge, the Prince of Wales Northern Heritage

Centre, the Canadian Museum of Civilization, the Inuit Cultural Institute, Parks Canada, and the Canadian Polar Commission.

### **Plenary discussion**

The participants agreed with the general tenor of the group's findings and supported its recommendation for a central computerized catalogue of databases. Participants emphasized that the catalogue should serve as a directory of databases, not a warehouse for data. It was suggested that there might already be something out there to build on (e.g., ASTIS through the Arctic Institute), although not everyone was comfortable with existing services. It was pointed out that the Polar Institute has been asked to consider the creation of a meta-database, so that should be kept in mind.

## **CONCLUSIONS**

The workshop concluded with a wide-ranging discussion of the points raised by the speakers and during the breakout groups. Participants were enthusiastic about the ESC concept and requested that the recommendations be implemented as soon as possible. The Atmospheric Environment Service and Parks Canada were recognized as two federal government organizations with mandates and strong interests in the North and the ability to give leadership. On the other hand, the current reorganization in the federal government was seen as a temporary check until new structures and positions were confirmed.

There was reference to the importance of the activities of the Polar Continental Shelf Project right through the workshop. Participants were informed that although representatives of the Polar Continental Shelf Project could not be present, it was interested and welcomed the ESC initiative.

The workshop in general terms saw the High Arctic ESC as consisting of a number of nodes or areas

that currently had good logistical support, a long-term monitoring record, and a broad research capability. These areas were not seen as exclusive — some may drop out, and others were certain to come in. An essential step is the establishment of an interim coordinating committee to do the detailed planning for the ESC as a whole, take decisions with respect to addressing the priorities among the needs identified, and establish an initial action plan.

SOER was requested to assist in establishing an interim coordinating or steering committee for the High Arctic ESC and, as quickly as possible, to circulate a draft of the workshop report for review.

Participants left the workshop with the feeling of progress achieved and agreed that they would discuss the outcome of the workshop with their constituencies to continue the forward momentum. They also agreed that they would be in touch with SOER on their constituencies' reactions.

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## RECOMMENDATIONS

Participants saw the High Arctic ESC as very different from ESCs in the rest of the country, given the size of the area, the scattered population, the problems of logistics, the evolution of Nunavut towards territorial status, and the fact that much of the research and monitoring undertaken in the past has been southern-based for southern reasons. EM&R must now address northern concerns and integrate northern ecological knowledge and northern scientists, managers, and technicians into the knowledge system. Participants agreed that the ecosystem approach was valid and held considerable promise for assisting in the identification and testing of strategies and policies for sustainable development in the North.

### The workshop recommended that:

1. The EM&R initiative being facilitated by SOER should be supported and implemented. A multi-locational Northern Arctic/Arctic Cordillera (High Arctic) ESC should be established that closely involves local communities.
2. The High Arctic ESC should focus on EM&R and facilitate the integration of disciplines and synthesis of results. It should be tied into international circumpolar and similar scientific activities. The knowledge derived should serve local purposes as well as regional, national, and international purposes.
3. The High Arctic ESC should initially involve the areas (anchor nodes) surrounding Eureka, Igloolik, Iqaluit, Pond Inlet, and Resolute. The workshop endorsed the Canadian Polar Commission proposal to establish a marine centre at Resolute and recommended its participation in the ESC.
4. The National Parks system being developed on the eastern side of the ecozones from Ellesmere Island through Baffin Island to Northern Labrador should be included as soon as management plans and logistics are made final. Identification of an anchor node in the western part of the Arctic Archipelago (e.g., Cambridge Bay) should be made as soon as feasible to complete the east-west representation. Information and data sets from "opportunistic" sites should be included in any synthesis.
5. A consultative process should be implemented to prepare a common research agenda for the ESC that recognizes and includes the agendas of northern residents, as well as of governments and southern academics. SOER should facilitate the organization of a workshop to prepare this common agenda.
6. A communication strategy should be an essential element of the ESC. It should include communications not only among scientists, but also between scientists and (a) local communities (essential), (b) local decision makers, and (c) the Canadian public at large. Language should be understandable and the information relevant and timely.
7. The Polar Continental Shelf Project should be fully involved in the ESC. Appreciation of its logistical and other support to Arctic research was stressed by participants.
8. Innovative ways of getting information to communities should be explored. In addition to the print media, the production of tapes and videos, interviews with the local media, cooperation with the Community Learning Centres, and informal discussions should all be explored.
9. A central computerized catalogue (meta-database) that lists sources of databases and information on who is doing what and where should be developed to facilitate exchange of ideas as well as data and information.
10. SOER should facilitate a workshop/brainstorming session early in the next fiscal year to help in the synthesis of information and to explore additional means of informing people about what is going on and what it means.
11. An interim coordinating committee should be set up as quickly as possible to serve as a focal point for cooperation and contact and a facilitating body for the ESC. This interim committee should work closely with Nunavut Tunngavik Inc. and other Nunavut groups in developing an action plan on priority issues. SOER should take the leadership in establishing this committee.

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## Appendix 1

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## **Appendix 2**

### **OUTCOME OF THE DISCUSSIONS HELD IN WINNIPEG,**

**MAY 20, 1993**

### **BACKGROUND**

On May 20, 1993, State of the Environment Reporting (SOER) and the Committee of Regional Executives, Western and Northern Region (Winnipeg office), organized a meeting to discuss possible candidate areas and opportunities for the establishment of an ecological science centre (ESC) in the Northern Arctic and Arctic Cordillera ecozones. The discussions involved 14 participants representing Energy, Mines and Resources Canada, the Science Institute of the Northwest Territories, the Government of the Northwest Territories, Environment Canada's Western and Northern Region, Atmospheric Environment Service (Downsview), and SOER. Written material and comments were also received from Indian Affairs and Northern Development Canada, the Polar Continental Shelf Project, and the Office of the Science Advisor (Fred Roots).

Over 10 candidate sites were reviewed, including the Atmospheric Environment Service's base stations (e.g., Eureka), Energy, Mines and Resources Canada's High Arctic integrated research areas (e.g., Hot Weather Creek), and the University of Alberta's Truelove Lowland Station. Beyond candidate sites, a number of complementary programs were discussed, such as the Arctic Mapping and Assessment Program, the Canadian Arctic Flora and Fauna, and the Integrated Research and Monitoring Areas. Representatives of the territorial government, the Science Institute of the Northwest

Territories, and SOER then led discussions on science gaps and information requirements, focusing particularly on the broader state of the environment and ecosystem-level needs.

### **CURRENT STATUS**

In June, members of the Government of the Northwest Territories, Environment Canada's Western and Northern Region, and SOER will be visiting Arctic sites and will further discuss the ESC initiative with local contacts in Resolute, Yellowknife, and Iqaluit. It is hoped that a northern scientific and technical workshop can subsequently be organized to discuss specific native, scientific, and regional interests.

### **WORKSHOP PROPOSAL**

#### **Goal:**

The purpose of the workshop is to further the development of an action plan and strategy for the establishment of an ESC in the Northern Arctic and Arctic Cordillera ecozones.

#### **Context:**

How best to consult with:

- northern local residents - importance of including native people and organizations; and



- northern scientists (both regular visiting and local scientists) – important to include such sciences as anthropology and sociology as well as the natural sciences.

**Content:**

To examine further:

- the suggestion that Eureka serve as a focal point for an arctic ESC, with several other associated sites (e.g., Hot Weather Creek and Resolute Bay);
- environmental/ecosystem information gaps and science priorities; importance of examining not only ecosystem structures, but also processes and functions;
- existing long-term integrated monitoring and research networks; level of monitoring detail and scale appropriate for the ecozones;

- complementary programs and projects (e.g., Arctic Monitoring and Assessment Program, Canadian Arctic Flora and Fauna, Northwest Territories projects);
- terrestrial and aquatic (marine and freshwater) ecosystems;
- integrated data sets/repository — data management; and
- the importance of addressing basic Arctic ecosystem objectives rather than relying solely on an issue-driven orientation.

**LOCATION AND DATE OF WORKSHOP:**

- Preferred location is Resolute Bay or some other northern community to ensure credibility.
- Possible dates suggested were late August or early September.

**Appendix 3**

Workshop to Implement an Ecosystem Monitoring and Research Initiative in the Northern Arctic/Arctic Cordillera Ecozones

Workshop to be held October 27–29, 1993  
Iqaluit, NWT

**PROPOSED AGENDA**

1. Welcome and introduction
2. Ecosystem monitoring and research (EM&R) initiative and the ecological science centre (ESC) concept: background presentation by State of the Environment Reporting (SOER)
3. Opportunities for EM&R in the Northern Arctic/Arctic Cordillera ecozones: theme presentation (Dr. Rick Riewe)

4. Priority ecosystem issues affecting the North: discussion in breakout groups with reports back to plenary group
5. Inventing the Northern Arctic/Arctic Cordillera ESC: models and other suggestions (speakers to be announced)
6. Inventing the Northern Arctic/Arctic Cordillera ESC (cont'd): discussion in breakout groups with reports back to plenary group
7. Discussion and recommendations for the Northern Arctic/Arctic Cordillera ESC
8. Next steps/follow-up
9. Summary and conclusions

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## Appendix 4

### CANADA'S ECOSYSTEM MONITORING AND RESEARCH INITIATIVE: BUILDING A NETWORK OF ECOLOGICAL SCIENCE CENTRES

Patricia Roberts-Pichette  
State of the Environment Reporting

Part of the Green Plan goal is to "establish a long-term state of the environment monitoring and assessment capability to study resources at risk." Most people recognize that the current capability for monitoring aspects of the environment (e.g., atmospheric or water variables) is very good and that Canadians are well provided with information about how these and similar variables affect them and/or are changing. It is also recognized that the linkages among these variables, and their interactions with other parts of the environment, especially with biota, are not always clear.

Systematic monitoring of many of the important ecological processes (e.g., energy flows, population dynamics) needed to understand ecosystem processes and functions is lacking in Canada. This lack of monitoring increases the difficulty in tracking why and how ecosystems are changing. Before reliable indicators of ecological processes and functions can be pinpointed, it is clear that more ecosystem research will be required to identify the most appropriate variables to monitor. Sustainable management of Canada's ecosystems and of the environment that sustains them depends on understanding how ecosystems function, what is happening to them, why they may be changing, and at what rate the changes are occurring.

It is within this context that State of the Environment Reporting (SOER) is facilitating the development of the ecosystem monitoring and research (EM&R) initiative to address the national need to provide better information on Canadian ecosystems to decision makers at all levels of society. Consultations were held within governments and with other groups and individuals across the country.

The outcome of these consultations has been the development of the ecological science centre (ESC) concept. It has been agreed that ESCs should be ecozone-based and together form a national long-term EM&R network. During 1993-94, steps were taken to establish ESCs in the Atlantic Maritime, Boreal Shield, Northern Arctic/Arctic Cordillera,

Mixed Wood Plains, and Pacific Maritime ecozones. This process will continue in 1994-95.

Workshops are being organized to develop a framework and plan of action for the ESC in each of the ecozones under consideration. This, then, is the background for the organization of this workshop. In a very real sense this workshop will "invent" the ESC for the Northern Arctic/Arctic Cordillera ecozones. What is done here will be a model for future workshops in other ecozones.

Once in operation, each ESC would encourage cooperative research and monitoring of the ecosystem through partnerships and alliances among the scientists (social and biophysical) of the ecozone. The development of a "profile" of the ecosystem (ecozone level) will be an important activity, as would be the search for appropriate ecosystem variables to monitor.

Each ESC, made up of a number of research sites and including at least one with a dedicated long-term monitoring facility, would set its own research agenda within the overall framework of gaining greater understanding of the functions and processes of the ecosystem. Energy flows, material cycling, population dynamics, and biodiversity would be major components for study, and changes in rates or composition over time would be monitored. An ESC would encourage and facilitate the integration of appropriate initiatives (both new and established) in the overall framework of its program. Researchers from disciplines in the biophysical, social, and economic sciences would be encouraged to work together, discuss, and exchange information in order to gain a greater depth of understanding of the ecosystem.

Although each ESC would be locally managed and would receive advice from an advisory group drawn from specialists knowledgeable about the specific ecozone, it would be part of a national network and function within an overall national framework. The Canadian long-term EM&R network, made up of all ESCs, would be highly decentralized

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and flexible, guided by a Canadian steering/ coordinating committee. This function is currently provided by the Assistant Deputy Ministers' interim steering/ coordinating committee. Advice would be provided to the steering/ coordinating committee by national scientific and management committees drawn from the constituent ESCs and experts on the ecozones.

This workshop is a key step in the creation of the long-term EM&R network in Canada. By the time it is completed, the Northern Arctic/Arctic Cordillera ESC should have a form — an overall program framework, issues/concerns and priorities identified, and agreement about general responsibilities for follow-up.

## Appendix 5

### INITIAL THOUGHTS ON INTEGRATING TRADITIONAL ECOLOGICAL KNOWLEDGE INTO THE NORTHERN ARCTIC/ARCTIC CORDILLERA ECOLOGICAL SCIENCE CENTRE

Rick Riewe  
Zoology University of Manitoba and  
Canadian Circumpolar Institute  
University of Alberta

Many southerners assume that the Inuit are living in an environment free from the ecological disasters facing the rest of the world. Unfortunately, nothing could be further from the truth. The Inuit are well aware of the southern intrusions into their land, such as radiation, arctic haze, waterborne pollution, and the negative environmental spinoffs from northern developments.

In the 1970s, Herman Steltner opened the Arctic Research Establishment in Pond Inlet. He realized that there were major developments being initiated in the eastern Canadian Arctic and that the Inuit were the ones most likely to be impacted by these developments. He also believed that the Inuit, with their vast store of environmental knowledge, were the most qualified to collect the data necessary to assess the potential problems. Herman Steltner was ahead of his time! He believed that anyone could collect scientific data — there was no magic involved, and there was no need to speak English (data forms could be written in Inuktitut), nor was there a need to have a university degree to do so.

When Steltner established the research centre in Pond Inlet, he trained Inuit as technicians who would collect field data for southern-based scientists. He envisioned that these Inuit would in turn train other Inuit technicians. The Inuit technicians were superior to southern technicians for several reasons: they knew the land and sea intimately; they possessed the survival skills necessary to live and travel under all weather conditions; they lived in the study areas and could collect data year-round; and they could collect

data more cheaply, as there were lower transportation and housing costs. Unfortunately, the Pond Inlet research centre has been mothballed — partially because of the lack of government support. However, this station could probably be revived for the continuous environmental monitoring needs of state of the environment reporting. The Pond Inlet station might be considered as one of the possible ecological science centres (ESCs). As an ESC, it would have the advantage over Eureka, or any other Arctic stations that are isolated from Inuit communities, because the resident Inuit could play a major role in the activities of the ESC. The government-sponsored research centres in Igloolik and Iqaluit are two other possible ESC sites that would profit from the local Inuit populations.

Another approach to gathering long-term environmental data is through the high schools or Arctic College. It may be possible to get science or geography teachers in the schools involved with collecting useful state of the environment monitoring data on topics that are relevant to the communities. Perhaps simple but very useful long-term data collection projects could be worked into the science and geography curricula, or the projects could at least be passed on from one teacher to the next (this is probably unlikely, however, because most teachers wish to use the curriculum as they see fit). If schools in the northern communities became involved with data collection and provided this information to interested scientists, this may begin to bridge the chasm that currently exists between native peoples and scientists. It is extremely important that the

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scientists provide the students with feedback, especially in the form of an analysis over several years. Raw data would be useless to the schools and would provide no incentive to continue the data collection. These analyzed data might be expressed as trends, which could be exchanged between schools from different regions for comparative purposes.

There are all sorts of important long-term monitoring data that could be collected in the communities by the schools with little or no equipment:

- plant phenology: record time of blooming and fruiting;
- record date of freeze-up and break-up;
- record date of first frost, first snowfall;
- animal migrations: record arrival and departure dates of Snow Buntings and snow geese;
- record ambient temperatures;
- collect soil, snow, or water samples for analysis of pollutants;
- collect tissue samples, such as seal livers, for analysis of pollutants; and
- locate and collect known aged skins in the community for hair samples for analysis of heavy metals.

If the schools were provided with some basic field equipment, the students could collect additional data that could be easily incorporated into their curriculum. As examples, with micrometeorology equipment, students could collect data and correlate them with phenological data. With snow testing kits, the students could quantify the physical properties of different kinds of snow that are useful to the Inuit, such as the ideal snow for igloo construction. With transits, students could record the annual advance or retreat of glaciers.

The richest and most useful information that could be collected in the communities, however, is not the quantitative scientific data, but rather the traditional ecological knowledge held by the elders. This knowledge encompasses the Inuit's understanding of their spiritual, cultural, social, physical, and economic relationships with the land and the wildlife. This information is invaluable to our understanding of the Arctic environment and hence to the success of the proposed ESCs.

Indigenous peoples fully realize that knowledge is power and that in the past the dominant western societies have misused the knowledge gained from them (Inglis 1993). Many Inuit elders are no longer willing to pass their knowledge on to individuals or groups unless the Inuit retain control over the use of this information. It is hoped that the management boards that are evolving out of the northern land claims agreements will once again give native peoples control over their knowledge and the management of their land.

With these thoughts in mind, it is imperative that the ESCs empower the Inuit and fully incorporate them and their designated organizations into all decision-making processes. If the Inuit feel it is to their benefit to participate in the ESCs, they could provide long-term, in-depth knowledge on all sorts of ecological topics, such as the timing and routes of animal migrations, the location and timing of animal aggregations, animal behaviour, reproductive success of wildlife populations, location of rare and endangered species, biological responses to climatic change, predator-prey cycles, changing snow and ice conditions, influx of pollutants into the Arctic food web, etc.

As Chief Robert Wavey (1993) has pointed out: "Aboriginal people often notice very minor changes in quality, odour and vitality long before it becomes obvious to government enforcement agencies, scientists or other observers of the same ecological system." Therefore, the Inuit are in the best position to determine which environmental sites are the most sensitive to change and, therefore, the most useful as long-term monitoring sites.

In conclusion, the proposal to establish an ESC in the eastern Canadian Arctic to monitor the environment and conduct research can be successful only if the Inuit are empowered and integrated into the decision-making process.

## REFERENCES

- Inglis, J.T. (ed.). Traditional ecological knowledge: concepts and cases. Canadian Museum of Nature. 142 pp.
- Wavey, R. 1993. International Workshop on Indigenous Knowledge and Community-Based Resource Management: keynote address. Pages 11-16 in Inglis, J.T. (ed.). Traditional ecological knowledge: concepts and cases. Canadian Museum of Nature.

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## Appendix 6

### SUMMARIES OF THE INVITED PRESENTATIONS: PERSPECTIVES ON MONITORING AND RESEARCH IN THE ARCTIC

An entire morning was devoted to short invited presentations on the general theme of monitoring and research in the Arctic. The perspectives presented served to display the variety of research and other activities ongoing in the Northern Arctic and Arctic Cordillera ecozones and to highlight opportunities for integration, synthesis, and future cooperation among agencies and scientists.

- (1) On behalf of the Centre for Northern Studies and Research, McGill University, **Peter Barry** provided a summary of McGill's work in the Arctic and Subarctic over the past four decades. This included climatological and glaciological research on Axel Heiberg Island and geomorphological investigations currently under way on the Fosheim Peninsula of Ellesmere Island.
- (2) **Ming-Ko Woo** (Department of Geography, McMaster University) and **Antoni Lewkowicz** (Department of Geography, University of Toronto) discussed the multidisciplinary program currently under way on the Fosheim Peninsula. On the theme of climatic variability as an analogue of climatic change, studies relating to botany, climatology, entomology, geomorphology, geology, and hydrology are in progress. Paleoecological information is also being acquired through the analysis of ice cores from nearby glaciers.
- (3) **Ken Fluto**, of the Atmospheric Environment Service, Winnipeg, talked about Environment Canada's integrated monitoring initiative, particularly business planning within the department and the ecosystem approach to a new way of doing business. There is movement towards the creation of a single agency for monitoring within the department, as a means of increasing effectiveness and efficiency in data collection and management, and for providing a more client-oriented organization. The needs of state of the environment monitoring and ESCs should fit within existing environmental monitoring activities for mutual benefit. High Arctic weather stations were put forward as candidate sites for the arctic ESC.
- (4) **Josef Svoboda** (Department of Botany, University of Toronto) commenced his presentation with an overview of Arctic ecosystems. These ecosystems are particularly sensitive to environmental change, as exhibited, for example, through biotic response to interannual differences in climate. Changes in plant populations over time due to this sensitivity could be expected to be an important indicator of global warming. The International Tundra Experiment is designed to detect changes in Arctic plant growth and the timing of their phenological events, in relation to year-to-year changes in climate. A Canadian site for this international program has been established at Eureka, and the selection of additional sites is under way.
- (5) **Patricia Sutherland** of the Canadian Museum of Civilization spoke about the potential contribution of archaeological studies to an arctic ESC. Archaeological research can provide relevant information by documenting changes in human adaptations to local environmental conditions in the past and by recovering paleobiological materials such as animal bones, which are concentrated as construction materials and food remains in archaeological contexts. It can also illustrate how humans might be expected to react to future environmental change. In the Eureka area, for example, archaeological evidence now spans a period of 4500 years.
- (6) **Dennis Gregor** (Waterloo Centre for Groundwater Research, University of Waterloo) spoke about the Arctic Monitoring and Assessment Program (AMAP), part of the circumpolar Arctic Environmental Protection Strategy. AMAP's primary objective is to monitor the levels of key anthropogenic pollutants (persistent organics such as polychlorinated biphenyls [PCBs], heavy metals, and radionuclides) and assess their effects.

Dr. Gregor and **Julie Beauchesne** (Arctic College) also outlined the multidisciplinary research that has been carried out on contaminant mass balance at Amituk Lake, Cornwallis Island. In this study, attention has been paid to involving not only a wide range of southern research interests, but also the local population, in the work.

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- (7) **Michael English** (Cold Regions Research Centre, Wilfrid Laurier University) outlined the research that has taken place in the Expedition Fiord area of Axel Heiberg Island since the mid-1950s. Studies have focused on climatology, glaciology, limnology, periglacial features, and groundwater. In spite of eight years of research, the basic determinants of lake water chemistry in the area are not well known.

**Dr. English** also spoke about a recently initiated interdisciplinary study aimed at understanding how decisions are made in northern communities on Baffin Island. The study aims to integrate a broad range of expertise from the physical, social, and health sciences.

- (8) **Renee Wissink** (Parks Canada, Pangnirtung) discussed the types of monitoring and research that have taken place within Ellesmere Island National Park Reserve. Plots have been established, for example, to see how sensitive the terrain is to foot traffic. Annual aerial surveys are conducted to monitor population size and structures of various species, including Peary Caribou, Polar Bear, Arctic Hare, and Snowy Owl. Studies at Lake Hazen have revealed two distinct forms of Arctic Charr. The Park presents opportunities for additional monitoring and research.
- (9) **Harold Welch** (Freshwater Institute, Fisheries and Oceans Canada) talked about aquatic research undertaken out of Resolute as long ago as 1968. Resolute is a key logistics centre, the location of both a Polar Continental Shelf Project base and a Fisheries and Oceans Canada marine laboratory.

Char Lake, near Resolute, is the world's best-known polar lake because of the research done there on trophic dynamics. A considerable amount of physical and biological oceanography has also been supported out of Resolute. The Fisheries and Oceans Canada Marine Station is scheduled to close in December 1993, and a commissioned report has been submitted to the federal government, calling for the establishment of a permanent marine research station in the High Arctic, preferably at Resolute.

- (10) **Derek Wilton** (Centre for Earth Resources Research, Memorial University) gave a presentation on the development of the Labrador Ecosystems Analysis Facility (LEAF). Like its sister initiative in Newfoundland, TERRAMON, LEAF seeks to improve the understanding of environmental conditions and trends through broad-based monitoring and research. Communication is central to LEAF, and the intention is to establish five nodes in an information-sharing network in Labrador.
- (11) On behalf of the Department of Renewable Resources, Government of the Northwest Territories, **Michael Ferguson** talked about research on the caribou of south Baffin, specifically the measures taken to incorporate traditional knowledge in increasing our understanding of the species. He stressed the need to involve local people in Arctic research, pointing out how the hunters and trappers associations could contribute in various capacities to research programs.