



Environmental Studies Research Fund



ANNUAL REPORT 2014

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The Environmental Studies Research Fund

ANNUAL REPORT 2014

Message from the Chair

I am very pleased to submit the Environmental Studies Research Fund (ESRF) 2014 Annual Report.

In 2013, the ESRF Management Board reassessed its practices and decided to make changes in order to continue to improve the delivery of the ESRF. This past year, the Board focussed on implementing these changes. Early in 2014, a Call for Proposals was launched, following a new, more robust, project selection process which broadened the reach of the Fund to include more proposals from the private sector and academia, as well as a more rigorous selection process based on a set of research priority areas developed by the Management Board that reflect the research needs of Canada's frontier lands.



The Call for Proposals was successful, with more than 50 Letters of Interest submitted, which led to 16 proponents being invited to submit Full Proposals and 6 high quality projects being selected by the ESRF Management Board, related to:

- the environmental aspects of seismic activities in Canada's in Coast;
- the biological impacts of potential oil spills;
- the effectiveness of treating agents on oils spilled in Arctic marine environments; and,
- improving knowledge of sea conditions in the North.

The ERSF Management Board is now looking forward to the selected projects starting in early 2015.

The ESRF Management Board has also decided to transition from a calendar year to a fiscal year for its planning and reporting activities, in order to align with the Government of Canada planning and reporting cycle. The year 2015 will be a transition year, with the new fiscal year cycle beginning April 1, 2015 and running to March 31, 2017.

Looking ahead, the ESRF Management Board will continue its efforts to deliver a high quality study program that supports decision-making in oil and gas exploration, development and production activities in Canada's frontier lands.

Thank you for your support in working towards this objective.

A handwritten signature in black ink that reads "R. Paul Barnes".

Paul Barnes
Chairperson, ESRF MB
February 27, 2015

Mandate

The Environmental Studies Research Fund (ESRF) is a research program that sponsors studies on environmental and social implications related to oil and gas exploration and development in Canada's frontier lands.

The information arising from these studies is designed to assist all involved stakeholders, including citizens, companies and government, in their decision-making related to oil and gas exploration and development.

Initiated in 1983 under the *Canada Oil and Gas Act (COGA)*, the ESRF now receives its legislated mandate through the superseding legislation, the *Canadian Petroleum Resources Act (CPRA)*, proclaimed in February 1987.

ESRF research is funded by levies on oil and gas companies that hold licenses for exploration and development in Canada's frontier lands.

The Minister, Natural Resources Canada, is responsible for the administration of the ESRF South Account for regions south of 60° latitude, including Hudson Bay, and the Minister, Aboriginal Affairs and Northern Development Canada, is responsible for the administration of the North Account for regions north of 60°.

The ESRF is directed by a twelve-member joint government/industry/public Management Board and is administered by a Secretariat that resides within the Office of Energy Research and Development of Natural Resources Canada.

FRONTIER LANDS

The *Canada Petroleum Resources Act* "frontier lands" definition was amended on April 1, 2014, to include:

- (a) that part of the onshore that is under the administration of a federal minister,
- (b) Nunavut,
- (c) Sable Island,
- (d) the submarine areas in that part — of the internal waters of Canada or the territorial sea of Canada — that is not situated
 - (i) in a province other than the Northwest Territories, or
 - (ii) in that part of the onshore that is not under the administration of a federal minister, or
- (e) the continental shelf of Canada,

but does not include the adjoining area, as defined in section 2 of the *Yukon Act*.

ESRF Management Board Members

Private Sector

Paul Barnes, Chairperson
Canadian Association of Petroleum Producers

Linda Graf
Conoco-Phillips Canada

Greg Janes
Suncor Energy

Francine Wight
Husky Energy

Public Sector

Norman Snow
Joint Secretariat-Inuvialuit Settlement Region

Gerard Chidley
Atlantic Champion and Ocean Alliance Fishing Vessels

Government of Canada

Michel Chénier
Aboriginal Affairs and Northern Development Canada

Lynne Patenaude
Environment Canada

Patrice Simon
Fisheries and Oceans Canada

Robert Steedman, Vice-Chairperson
National Energy Board

Offshore Petroleum Boards

David Burley
Canada-Newfoundland and Labrador Offshore
Petroleum Board

Eric Theriault
Canada-Nova Scotia Offshore Petroleum Board

The ESRF Management Board members are selected for their expertise and specialized technical knowledge relative to the mandate of the Fund.

Members of the MB are appointed jointly by the Minister of Natural Resources Canada and the Minister of Aboriginal Affairs and Northern Development Canada.

The ESRF Management Board directs the business of the Fund, sets priorities for study topics, determines the program budget and facilitates the development of study proposals.

Contact Information:
ESRF Secretariat
Natural Resources Canada
14th Floor
580 Booth Street
Facsimile: (613) 995-6146
E-mail: ESRF@NRCan.gc.ca

2014 Current Research Studies

SOUTH REGIONS

Mid-Labrador Marine Megafauna and Acoustic Surveys on the Labrador Coast (2010-07S). Baseline Surveys for Seabirds on the Labrador Sea (2010-08S). These two projects are documenting the occurrence and population densities of marine mammals and seabirds along those parts of the Labrador coast currently of interest for oil and gas development. The marine mammal surveys are supplemented by the deployment of acoustic recorders at two locations to record cetacean vocalizations. Another objective of the projects is to involve and transfer survey skills to local individuals, particularly Aboriginal Labradoreans, whenever possible.

Effectiveness of Observers in Visually Detecting Dead Seabirds on Open Ocean (2010-21S). This field study assesses the accuracy of observers in evaluating seabird mortality from a vessel platform in the open ocean. To achieve this objective, simulated seabirds, equipped with satellite telemetry, will be released into an area of open ocean in advance of a survey vessel carrying observers. Since the number and location of the simulated seabirds will be known, the effectiveness of the observers can be evaluated. The outcome of this experiment will improve the models used by the Canadian Wildlife Service to help evaluate seabird mortality from hydrocarbon spills.

Assessment of the Potential for Impacts on Early Life Stages of Fish and Zooplankton around Petroleum Development Sites on the Grand Banks (2011-04S). The objective of this project is to determine if the regulated discharges from oil production platforms can invoke effects in the physiology of juvenile fish in the open ocean environment. Currently in the final stages of development, this project will sample juvenile fish species upstream and downstream of three oil production platforms in the Newfoundland and Labrador Offshore Area over the course of three years.

The ESRF has sponsored and published over 200 studies on oil and gas exploration and development on frontier lands, including such topics as:

- *environmental effects on fish, bird and animal habits and habitats;*
- *iceberg detection and flow patterns*
- *oil spill prevention and countermeasures;*
- *dispersant effectiveness in cold waters and ice;*
- *frontier social and economic issues*
- *improving accuracy of ocean and weather forecasting; and*
- *verification of codes and standards.*

All study publications are available at www.esrfunds.org

Data Display and Source Apportionment of Volatile Organic Compounds and Particulate Matter on Sable Island, Nova Scotia, Canada (2011-05S). This study measures airborne volatile organic carbons and particulate matter through sensors placed on Sable Island. The experimental design will permit researchers to determine the proportion of these air contaminants that originates from nearby gas production installation versus marine traffic sources versus natural sources.



*Air Quality Measurements on
Sable Island, September 2013.*

Biodegradation of Chemically Dispersed and Non-Chemically Dispersed Oil (2012-01S).
Biodegradation of Chemically Dispersed and Non-Chemically Dispersed Condensate (2013-02S).
This project studies the biodegradation of both physically and chemically dispersed crude oil and gas condensate produced in Atlantic Canada's offshore. It evaluates the rate and extent of oil and condensate degradation by the naturally-occurring bacteria in offshore waters.

Leading edge environmental genomics and laboratory analyses are used to identify how the bacterial populations respond in terms of changes in their community structure and oil degradation activity to identify the conditions that best support oil degradation. This knowledge is essential to evaluating the capacity of the marine environment to recover following a hydrocarbon spill.

Characterization of Ocean Currents, Variability and Dispersion in the Vicinity of Sackville Spur (2013-01S). This project addresses the lack of knowledge about ocean currents near Sackville Spur in the Flemish Cap region. Information on offshore environments is essential to guide responsible decision-making as exploration for oil and gas in Atlantic Canada moves into deeper waters. The data collected by current meters at three locations in the Flemish Pass over the course of a year will significantly improve the understanding of ocean water movement in this area. This, in turn, will provide valuable input to dispersion modelling studies that support oil spill fate and effects modelling.

Development, Validation and Implementation of an Operational Ocean Forecasting System for the Grand Banks and Orphan Basin for Daily Operational Delivery at the Canadian Meteorological Centre (2013-03S). Accurate forecasting of oceanographic and weather conditions to support routine offshore oil and gas operations and emergency response operations is essential. This project will provide a significant enhancement in the resolution and hence, the accuracy of ocean forecasting services provided through Environment Canada over a large part of the Newfoundland and Labrador Offshore Area and northern parts of the Nova Scotia Offshore Area. The project will provide improved forecast data for input into oil spill

modelling and iceberg drift scenarios and modelling through the Canadian Meteorological Center. Additionally, research and development is occurring to benchmark the ocean forecast system performance in real time with oceanographic observations that are made available.

NORTH REGIONS

The Emergency Spatial Pre-SCAT for Arctic Coastal Ecosystems — Beaufort Sea/Mackenzie Delta (2011-01N). This project will identify and map shoreline characteristics, coastal habitats and resources at risk in the Canadian Beaufort Sea/Mackenzie Delta. It will also examine satellite imagery as a potential tool for monitoring and predicting biodiversity in the Beaufort Sea with a focus on marine birds and mammals. The results will be incorporated in an update to the current “Arctic Environmental Sensitivity Atlas System” (Version 3.01, 2004, E.C.), available in digital (CD) and hardcopy formats.

Upstream Oil and Gas Waste Stream Study (2011-10N). This study, completed July 31, 2014, resulted in the building of an extensive database of the types and quantities of waste streams expected from existing and future oil and gas activities in the Inuvialuit Settlement Region (ISR), the Gwich’in Settlement Area (GSA) and the Sahtu Settlement Area (SSA) coupled with the development of a Regional Waste Management Tool (model). Model outputs projected over regional temporal and spatial boundaries will provide regulators, industry and communities with the information to better assess and manage issues related to waste treatment and disposal.

The Uniqueness of Fishes and Habitat Utilization in Oil and Gas Lease Blocks Relative to Non-Lease Areas in the Canadian Beaufort Sea (2012-04N). This research project investigates the distribution, variety and abundance of Arctic marine fish and their supporting habitats, including water-mass movements, sediment type, water quality and food availability. The study looks at marine fish and their habitats from a regional perspective, within specific areas of possible oil and gas exploration and production, and within areas that could potentially be affected by development (e.g., equipment staging areas, transport routes, burrow pit locations).



*Fisheries and Oceans Canada,
Beaufort Sea Marine Fishes Project*

Timing of Beluga Entry Relative to Ice Break-Up in the Mackenzie Estuary During Late Spring (2013-05N). This study will define current patterns of the arrival of beluga whales coinciding with the ice break-up in the Mackenzie Estuary from Herschel Island eastward following the edge of the land-fast ice, to the eastern end of the Tuktoyaktuk Peninsula. These patterns will then be compared with historical data from the 1974–1985 period on beluga entry and break-up dates.

Quantitative Assessment of the Interaction between Beaufort Sea Crude Oils and Mackenzie River Delta Suspended Sediments (2013-06N). Extensive bench-scale testing will be conducted on oil-sediment interaction at low temperatures with and without chemical dispersants, using selected crude oils from the Beaufort Sea and Norman Wells and selected sediment samples from the Mackenzie River Delta and Norman Wells.

A Road Map for Planning Controlled Oil-Spill Countermeasures Research in the Canadian Beaufort Sea (2013-09N). This project will guide government, industry and university researchers in the complex organizational process required prior to conducting oil-spill countermeasures field research in the Canadian Beaufort Sea. The resulting road map will outline the various components of this process: consultations with Northern community stakeholders; environmental assessment requirements; the regulatory permits requirements; and the safety, logistical, infrastructure and support requirements needed to be in place prior to commencing field experiments.

Financial Statements

STATEMENT OF FINANCIAL POSITION

The ESRF Management Board is responsible for the presentation of the annual financial statements to the Ministers of Natural Resources Canada and Aboriginal Affairs and Northern Development Canada, pursuant to the *Canada Petroleum Resources Act*.

The total study expenditures incurred by the ESRF in 2014 amounted to \$906,525. Administration costs for 2014 amounted to \$334,237. Revenues amounted to \$288,757 (refer to Table 2 for details).

Levies are collected from oil and gas companies that hold licenses for exploration and development in Canada's frontier lands. In accordance with the *Canada Petroleum Resources Act*, when a license is issued during the course of the year, levies are collected for the current year and the two years prior. (The collection of unpaid levies is pursued on an ongoing basis by the ESRF Secretariat.)

Table 1 – ESRF Operating Budget as of December 31, 2014 (in dollars)

REGION	OPENING CASH BALANCE JANUARY 1, 2014	TOTAL REVENUE, LEVIES & RETURNS	ADMINISTRATION COSTS	STUDY PROGRAM COSTS	CLOSING BALANCE DECEMBER 31, 2014
SOUTH REGION	\$4,975,966	\$176,663	\$184,572	\$582,609	\$4,385,448
NORTH REGION	\$3,523,473	\$112,094	\$149,666	\$323,916	\$2,054,160*
TOTAL	\$8,499,439	\$288,757	\$334,237	\$906,525	\$6,439,608

Note*: An amount of \$1,107,825 was transferred as part of the Northwest Territories devolution.

Table 2 – ESRF Regional sub accounts – Levy income 2014 (in dollars)

	REGION	LEVY RATE Levy #26 2014	REVENUES Levy #26 2014	REVENUES Back Levies	TOTAL LEVY INCOME
1	Queen Charlottes North	\$0/hectare			
2	Hecate Strait	\$0/hectare			
3	Queen Charlottes South	\$0/hectare			
4	Vancouver Island	\$0/hectare			
5	Labrador North	\$0/hectare			
6	Labrador Central	\$0/hectare			
7	Labrador South	\$0/hectare		\$42,222	\$42,222
8	Northeast Newfoundland	\$0/hectare			
9	Newfoundland Slope	\$0/hectare			
10	Grand Banks North	\$0/hectare		\$50,286	\$50,286
11	Grand Banks South	\$0/hectare		\$77,043	\$77,043
12	Scotian Shelf East	\$0/hectare			
13	Scotian Shelf West	\$0/hectare			
14	Scotian Slope	\$0/hectare		\$7,112	\$7,112
15	Gulf of St. Lawrence	\$0/hectare			
16	Hudson Bay	\$0/hectare			
	Total South		\$0	\$176,663	\$176,663
17	Beaufort South	\$0/hectare		\$3,559	\$3,559
18	Beaufort North	\$0/hectare		\$36,850	\$36,850
19	Western Archipelago-Offshore	\$0/hectare			
20	Central Archipelago-Offshore	\$0/hectare			
21	Eastern Archipelago-Offshore	\$0/hectare			
22	Baffin Bay	\$0/hectare			
23	Yukon North	\$0/hectare			
24	Yukon South	\$0/hectare			
25	Mackenzie Delta	\$0/hectare			
26	Mackenzie North	\$0/hectare			
27	Mackenzie Central	\$0/hectare		\$71,685	\$71,685
28	Mackenzie South	\$0/hectare			
29	Western Archipelago-Onshore	\$0/hectare			
30	Central Archipelago-Onshore	\$0/hectare			
31	Eastern Archipelago-Onshore	\$0/hectare			
	Total North		\$0	\$112,094	\$112,094
	TOTAL		\$0	\$288,756	\$288,756

MULTI-YEAR STUDIES TO CONTINUE IN 2015

The following multi-year studies will continue in 2015:

SOUTH

- Mid-Labrador Marine Megafauna and Acoustic Surveys on the Labrador Coast (2010-07S)
- Baseline Surveys for Seabirds on the Labrador Sea (2010-08S)
- Simulation Fate and Detectability of Dead Seabirds (2010-21S)
- Effect of Platform Discharges on Juvenile Fish in Field (2011-04S)
- Source Apportionment of Volatile Organic Compounds and Particulate Matter on Sable Island (2011-05S)
- Biodegradation of Chemically Dispersed and Non-Chemically Dispersed Oil (2012-01S)
- Characterization of Ocean Currents, Variability and Dispersion in the Vicinity of Sackville Spur (2013-01S)
- Biodegradation of Chemically Dispersed and Non-Chemically Dispersed Condensate (2013-02S)
- Development, Validation and Implementation of an Operational Ocean Forecasting System for the Grand Banks and Orphan Basin for Daily Operational Delivery at the Canadian Meteorological Centre (2013-03S)

NORTH

- The Uniqueness of Fishes and Habitat Utilization in Oil and Gas Lease Blocks Relative to Non-Lease Areas in the Canadian Beaufort Sea (2012-04N)
- Timing of Beluga Entry Relative to Ice Break-up in the Mackenzie Estuary During Late Spring (2013-05N)
- Quantitative Assessment of the Interaction between Beaufort Sea Crude Oils and Mackenzie River Delta Suspended Sediments (2013-06N)
- Roadmap for Countermeasures in Oil Spills (2013-09N)

ESRF Research Priority Areas 2015-2018

In 2013, the ESRF Management Board developed and approved a new selection process for the studies to be funded by the ESRF. This selection process is adapted from the process used by other governmental programs, including the ecoEnergy Innovation Initiative. As such, the new ESRF process has already been tested in the past and has demonstrated successes.

The new ESRF study selection process starts with the ESRF Management Board defining research priority areas (RPA) based on current knowledge gaps. After the RPAs have been defined and communicated, it is then up to potential proponents to submit study proposals to the ESRF Management Board. The ESRF Management Board then harvests the best suite of studies that collectively address each RPA.

Research Priority Areas

The RPAs are chosen for four years, with the first ESRF RPA cycle scheduled to begin in 2015. The selection process was carried out in 2014.

The ESRF Management Board has identified the following four RPAs for its 2015-2018 funding cycle (see Annex 2 for the full description of each RPA):

North

1. **Spill Preparedness and Response, Fate and Effects:** to support marine safety by studying the fate and effects of accidental releases of petroleum and other hazardous substances in the Arctic marine environment and improve responses.
2. **Regional Effects Assessment and Management:** to support stakeholders in preparing and reviewing applications for oil and gas activities on themes including biophysical, socio-economic, traditional knowledge and cumulative effects.

Atlantic Offshore

3. **Seismic:** to improve the understanding of the effects of seismic sound on commercial fish and invertebrates, as well as marine mammals and/or species at risk.
4. **Oil and Gas Liquids Spill Fate and Effects:** to support marine safety by studying the fate and effects of accidental releases of petroleum in the Newfoundland-Labrador and Nova Scotia Offshore Areas.

Study Selection Process

ESRF funding can be provided solely to legal entities validly incorporated or registered in Canada, including companies, industry associations, research associations, standards organizations, aboriginal and community groups, academic institutions as well as federal, provincial, territorial and municipal governments and their departments and agencies. These organisations are thus those who are invited to participate in the ESRF study selection process.

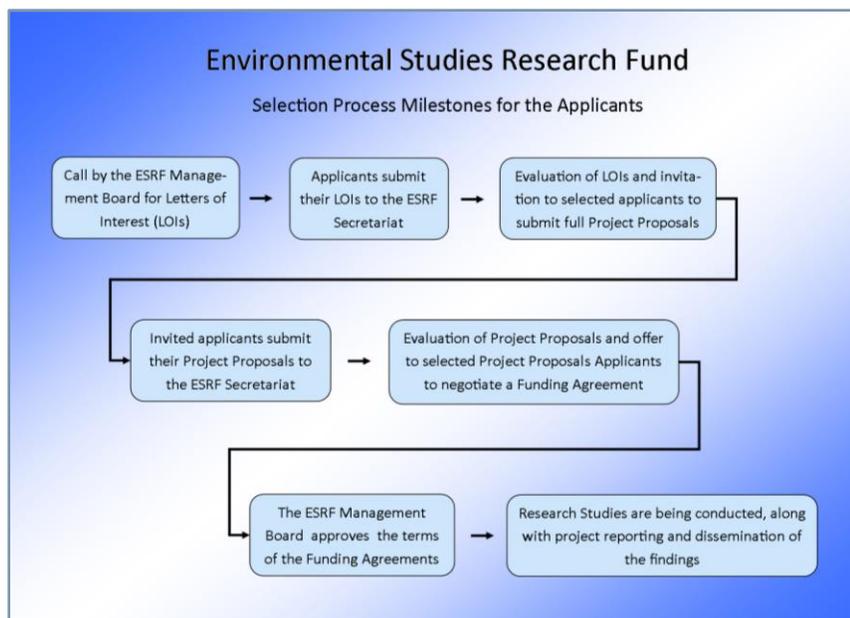
The study selection process has three distinct phases:

- Letters of Interest
- Full proposals
- Funding Agreements (or Memoranda of Understanding)

The selection process is launched with the ESRF Call for Letters of Interest. The received letters are then reviewed by technical review committees and the ESRF Management Board members. The ESRF Management Board then decides which proponents should be invited to submit full proposals.

Proponents who were successful in having their Letter of Interest selected are invited to submit a full proposal, presenting a detailed version of their proposed research study. The received full proposals are reviewed, similarly to Letters of Interest, by technical review committees and the ESRF Management Board members.

The ESRF Management Board then decides which full proposal proponents should be invited to negotiate a Funding Agreement or, if the proponent is a federal, provincial or municipal government organization, a Memorandum of Understanding.



Representation of the ESRF selection process milestones for the applicants

Selection Criteria

The Letters of Interest (LOI) and proposals that meet basic requirements regarding eligibility and completeness of information will be reviewed by a committee of technical experts mandated by the ESRF Management Board. The Technical Review Committees will use the criteria provided in the LOI and full proposal Applicants' Guides to evaluate for each submitted proposal:

- the significance of the potential impact of the study being proposed; and,
- the probability that the study achieves its stated objective.

In addition to the above criteria, the ESRF Management Board may consider other criteria, such as regional balance, in the final project selection. Any such criteria will be applied equitably to all Project Proposals reviewed.

Commitment to fairness and transparency

The ESRF Management Board and Natural Resources Canada are committed to manage the selection process for the ESRF studies fairly and transparently. All assessments and decisions will be done in accordance with this commitment. No specific guidance or advice on preparing a LOI or full project proposal will be provided to any of the proponents. No meetings on the ESRF call for LOIs or call for full project proposals will be held between any applicant and the people involved with the project selection process. Further, to avoid the risk of real, perceived or potential conflict of interest, members of expert technical committees who have a vested interest as a potential participant in a particular project will be required to sign a declaration regarding their interest in the project and will not be allowed to participate in the assessment of that project.

Annex 1. ESRF Regions

ESRF South Regions (NRCan)

Region 1: Queen Charlottes North

Region 2: Hecate Strait

Region 3: Queen Charlottes South

Region 4: Vancouver Island

Region 5: Labrador North

Region 6: Labrador Central

Region 7: Labrador South

Region 8: Northeast Newfoundland

Region 9: Newfoundland Slope

Region 9: Newfoundland Slope

Region 10: Grand Banks North

Region 11: Grand Banks South

Region 12: Scotian Shelf East

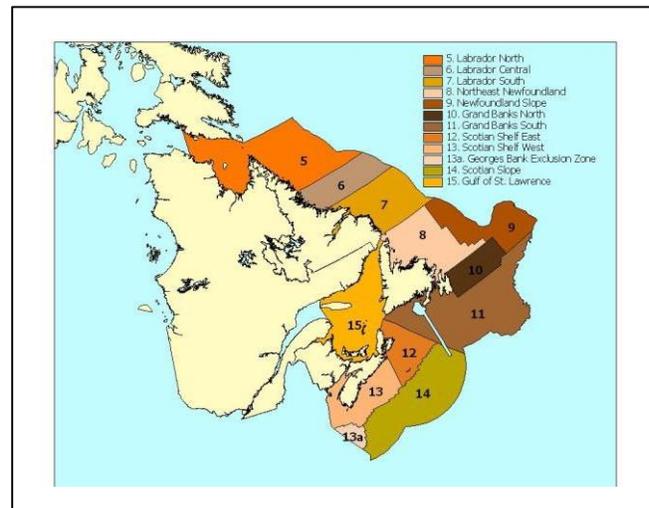
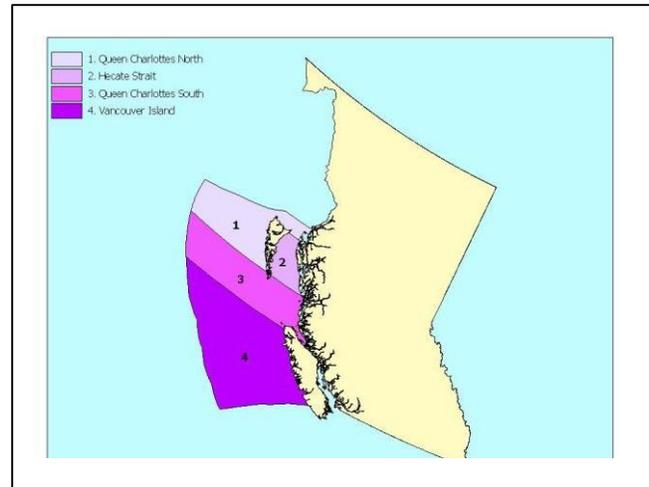
Region 13: Scotian Shelf West

Region 13a): Georges Bank Exclusion Zone

Region 14: Scotian Slope

Region 15: Gulf of St. Lawrence

Region 16: Hudson Bay



ESRF North Regions (AANDC)

Region 17: Beaufort South

Region 18: Beaufort North

Region 19: Western Archipelago — Offshore

Region 20: Central Archipelago — Offshore

Region 21: Eastern Archipelago — Offshore

Region 22: Baffin Bay

Region 23: Yukon North

Region 24: Yukon South

Region 25: Mackenzie Delta

Region 26: Mackenzie North

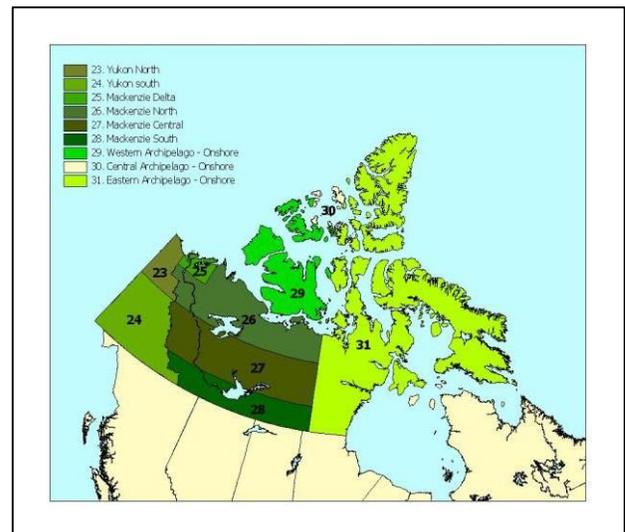
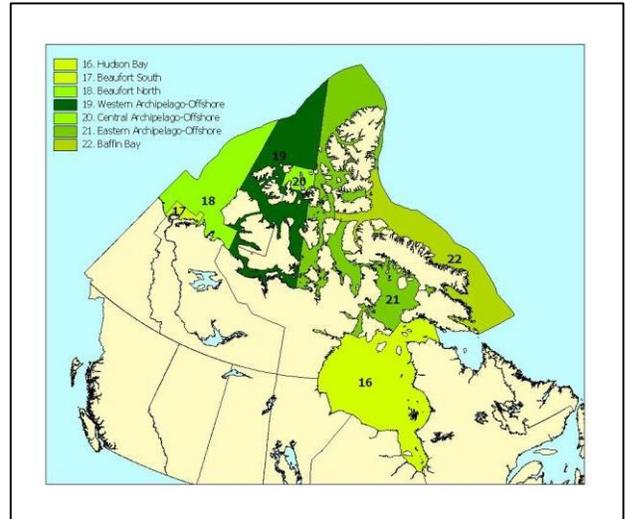
Region 27: Mackenzie Central

Region 28: Mackenzie South

Region 29: Western Archipelago — Onshore

Region 30: Central Archipelago — Onshore

Region 31: Eastern Archipelago — Onshore



Annex 2. Complete description of the ESRF Research Priority Areas for the 2015-2018 cycle

Northern Research Priority Areas

1. Spill Preparedness and Response, Fate and Effects

Research Priority Area #1: Spill Preparedness and Response, Fate and Effects
Summary: Studies will build on knowledge of the fate and effects of accidental releases of petroleum hydrocarbons and other hazardous substances in the Arctic marine environment and would be directed at the improvement of responses to such accidental releases.
Targeted Area: Eligible spill research areas include, but are not limited to, the biophysical, socioeconomic, impact and assessment aspects of spills in the following categories: <ul style="list-style-type: none">• In-situ Burning;• Dispersants;• Mechanical Recovery;• Shorelines;• Spill Modelling; and,• Detection and Monitoring. Details regarding each of the eligible research areas can be found in the following report prepared by C-CORE for the ESRF Management Board. This report is on the ESRF website: http://www.esrfunds.org/pdf/194.pdf - C-CORE (2013) Strategic Plan for Oil Spill Research in Canadian Arctic Waters, C-CORE Report R-13-108-1018, Revision 3.1.
Description: The risk of accidental releases of petroleum hydrocarbons and other hazardous substances into the Arctic marine environment has increased with the growing interest in the development of offshore petroleum operations in the Canadian Arctic. Hydrocarbon exploration is or might be taking place in both the near and offshore waters of the Beaufort Sea. In terms of oil spill response, the Arctic presents unique challenges, including the remote locations of potential spill sites, cold temperatures and limited availability of first-response personnel. Most of the research data on oil fate, effects and spill response in the Arctic have been derived from laboratory studies and field trials conducted in the 1970-1980's, with the exception of the recent Joint Industry Project effort by SINTEF in Norway (completed in 2009). The consensus of the international scientific community is that field trials are essential to advance the development of oil spill countermeasures for use in the Arctic. Unless methodologies can be validated in the field, they may not be fully accepted by regulators, Aboriginal communities and the public as operational tools. Research in this priority area will focus on filling gaps in current spill countermeasures knowledge that will contribute to the production of effective environmental protection through the improvement of operational guidelines and best practices. Studies should demonstrate benefit to stakeholders in areas where offshore petroleum operations are either ongoing or expected in the foreseeable future. In the North, offshore petroleum operations are anticipated in the foreseeable future only in the Beaufort Sea, encompassed by ESRF regions 17 and 18.
Exclusions: Research proposed exclusively for on-shore areas.

2. Regional Effects Assessment and Management

Research Priority Area #2: Regional Effects Assessment and Management
Summary: Studies will focus on environmental and socio-economic studies that will build a knowledge base that extends to a regional scale, beyond single oil and gas lease blocks or operations. The information gathered by these studies is intended for use by all interested stakeholders in preparing and reviewing applications for oil and gas activities on Canada’s northern frontier lands.
Targeted Area: Eligible research areas include: <ul style="list-style-type: none">• Biophysical studies;• Socio-economic studies;• Traditional knowledge studies; and,• Studies contributing to the assessment and management of cumulative effects.
Description: Studies building on other regional research programs may be of particular interest including areas around offshore fish and bird populations and habitats, maintenance of long-term oceanographic observatories, and remote sensing, monitoring and modelling of sea ice. Studies should demonstrate benefit to stakeholders in areas where petroleum operations are either ongoing or expected in the foreseeable future. In the North, offshore petroleum operations are anticipated in the foreseeable future only in the Beaufort Sea, encompassed by ESRF regions 17 and 18.
Exclusions: Research proposed exclusively for on-shore areas.

Southern Research Priority Areas

3. Seismic

Research Priority Area #3: Seismic
Summary: Studies will build on knowledge of the effects of the sound energy released to the marine environment during marine seismic surveys and be directed particularly at improving the understanding of the nature of seismic sound energy and its effects on commercial fish and invertebrate species as well as marine mammals and/or species at risk.
Targeted Area: Eligible research areas include but are not limited to: understanding the “natural” underwater sound environment in the absence of sound energy arising from seismic survey operations; measuring the particle motion and sound pressure levels experienced by organisms at specified distances from seismic survey operations; modelling the propagation of sound energy from marine seismic surveys and the in-field verification of those model predictions documenting commercial fish and invertebrate behaviour in response to marine seismic survey sound energy in the field; documenting the effects of marine seismic survey sound energy on commercial fish and invertebrate physiology and gene expression associated with behavioural responses in the field; understanding of the quality (i.e., accuracy, data resolution) of the observations made by marine mammal observers and/or passive acoustic monitoring techniques; best practice for training and qualifying observers and passive acoustic monitoring operators.
Description: The effects of the sound energy released into the water column from the routine operation of airgun arrays used in marine seismic surveys on fish and invertebrate behaviour and, potentially, commercial harvesting of these species, are not fully understood.

There have been some attempts to study this issue in the field and the laboratory over the last twenty years but there is no consensus on the nature and/or significance of the effects observed. In recent years, workshops and conferences, some sponsored by the ESRF, have attempted to come to terms with this issue. These efforts were driven in no small measure by the concern for the socioeconomic effects of seismic surveys on fish harvesters. Without an understanding of the behavioural effects of the sound energy, including particle motion, resulting from marine seismic surveys' air gun arrays, the effects on marine species and their behaviour, and consequently on harvesting these species, is difficult to assess.

For the purposes of focussing this research priority area, the commercial fish species of greatest interest are Northern Shrimp, Snow Crab and Atlantic Cod.

Exclusions : Laboratory scale studies, unless as part of a field study.

4. Oil and Gas Liquids Spill Fate and Effects

Research Priority Area #4: Oil and Gas Liquids Spill Fate and Effects
Summary: Studies will build on existing knowledge of the fate and effects of accidental releases of petroleum hydrocarbons in the Newfoundland- Labrador and Nova Scotia Offshore Areas.
Targeted Area: Eligible research areas include, but are not limited to: water column and benthic fate and effects of crude oil or natural gas liquids that <u>may or may not</u> have been treated with dispersants; surface and water column detection and monitoring of dispersed and non-dispersed crude oil or natural gas liquids; taint, toxicology and persistence of dispersed and non-dispersed crude oil or natural gas liquids in commercially harvested fish and invertebrate species; toxicology and persistence of dispersed and non-dispersed crude oil or natural gas liquids in seabirds; toxicology and persistence of dispersed and non-dispersed crude oil or natural gas liquids to benthic, zooplankton and/or phytoplankton species; modelling the fate and behaviour of dispersed/non-dispersed crude oil or natural gas liquids in deep water environments; socioeconomic effects of a major spill event on the fisheries sector, particularly, the impact of markets refusing to purchase commercially harvested fish species and how those effects might be mitigated.
Description: This priority area is directed at improving the understanding of the effects of such releases on marine species, ecosystems and commercial fisheries. Research proposed in response to this call for [expressions of interest/proposals] should take into account recent research undertaken by the ESRF (e.g., ongoing studies that address: biodegradation rates for dispersed and non-dispersed crude oil and gas liquids and oceanography of the Flemish Pass) and findings and lessons learned arising from international research efforts, e.g., research on the Macondo Spill. Project proponents should also take in to account the trend to exploration in continental shelf break and deep-water areas of Canada's East Coast.
Exclusions : <ul style="list-style-type: none"> • Laboratory scale, unless specifically linked to field studies or large scale experiments in wave tanks. • Research designed and focussed exclusively on shorelines. • Mechanical countermeasures and in-situ burning.

Annex 3. Published Reports

All ESRF studies are subject to a scientific/technical peer review. Reports that are deemed to be scientifically or technically significant are published in the ESRF Technical Report Series. Since its inception in 1983, the ESRF has published over 200 reports and related studies.

All reports and studies are available to download for free on the ESRF website:
http://www.esrfunds.org/pubpub_e.php

Publications are listed under the following categories:

- Bibliographies
- Environmental Effects and Monitoring
- Environmental Loading and Design
- Frontier Social and Economic Issues
- Ice-Icebergs-Ice Detection
- Oil Spill Research and Countermeasures
- Sea Bottom Ice Scour
- Sediment Transport
- Waves

Annex 4: Bibliography of Past ESRF Publications, 1985 - 2013

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