



A Web-based Geospatial Analysis Tool for BREA: Integrating Research into an Assessment

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Environment
Canada

Environnement
Canada

Canada



Overview

Part 1: Introduction

Part 2: Methodology

The Toolkit

Demo

Part 3: Significance

Next Steps

Part 4: Questions/Comments

Part 1: Objectives

- Facilitate data integration, visualization and analysis of existing and BREA associated research projects
- Develop geospatial toolset in webGIS for Beaufort Regional Environmental Assessment

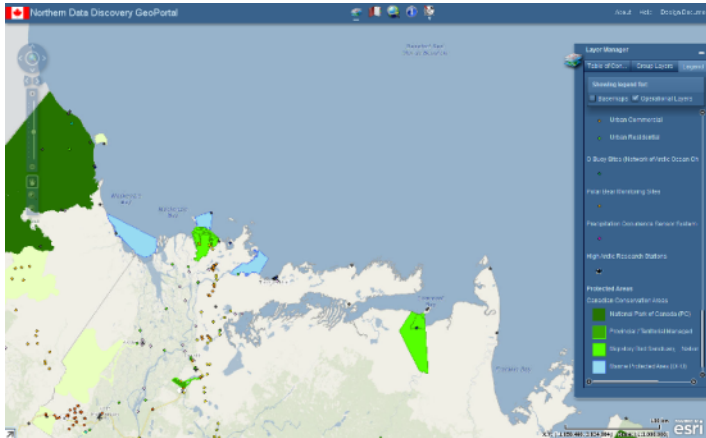




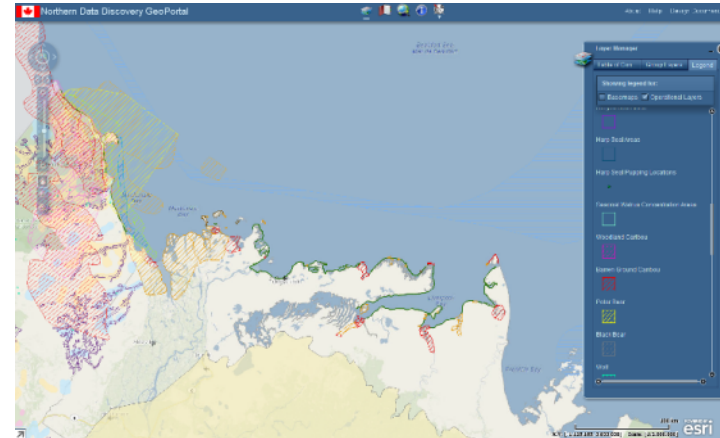
Web-based GIS

- Intended to aid BREAs stakeholders in better understanding the geographic distribution of areas which are sensitive for environmental and socio-economic reasons in the face of economic development
- Able to incorporate baseline (existing) information and research outputs on a number of environmental factors
 - Flora, fauna, water, air and climate factors, ice and geo-hazards
 - Cultural, socio-economic and infrastructure information

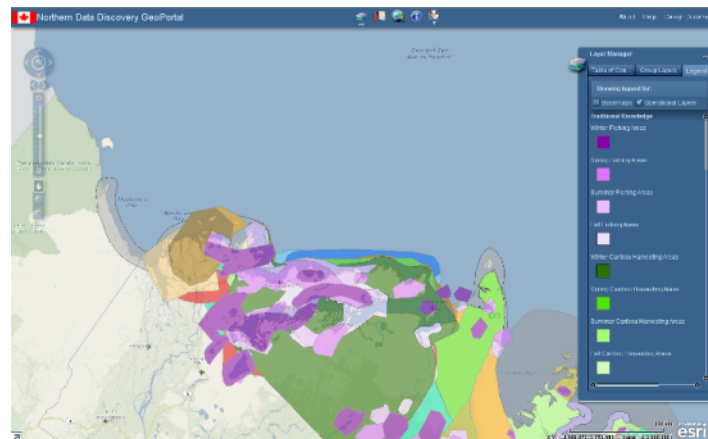
Beaufort Sea example – Wildlife Information from various sources (Legal, Western Science, Traditional/Local)



**Protected Areas and EC
Monitoring**



**Important Wildlife Areas (EC, DFO,
Territories)**



**Traditional
Knowledge**



Part 2: Purpose

What it will contribute:

Project will demonstrate the value in bringing together regional georeferenced information to support decision making.

How:

- Bring together BREAs and other datasets.
- Assemble into a single window for:
 - Viewing
 - Comparison
 - Overlay
 - Synthesis
 - Analysis.

**Analysis functions will help examine key questions such as “are there environmental impacts that need to be addressed?”

The Team

Location:

Ottawa, ON – Environment Canada
National Wildlife Research Centre

Duration:

July 2012 – March 2013

Team:

Jason Duffe

Jon Pasher

Valerie Torontow



Research/Design

Tom Giles

Matt Giles

Alexander Corsi Caya



Development





User Needs Survey

User needs survey was performed to help inform the development of the toolkit

Example Questions:

- Would this type of tool benefit your work? If so, how?
- Would it contribute to fulfilling regulatory responsibilities (if any)?
- What types of tools (visualization, upload, download, analysis, etc...) would be beneficial?

Accessing the Tool

URL: geomatics.nwrc.carleton.ca

Select: apply for an account

NWRC Geomatics

Home About Projects Contact Links

Hello, visitor. Click here to [apply for an account](#) or here to [Login](#)

Welcome to the Geomatics Lab at the National Wildlife Research Centre

GeoPortal

Boreal Ecosystem

eSPACE

Web Mapping Applications

Development of web mapping applications focusing on data integration and generation of value added products and analyses.

Greenhouse Gas - Urban Forest

Space For Habitat

Great Lakes

Environment Canada Environnement Canada

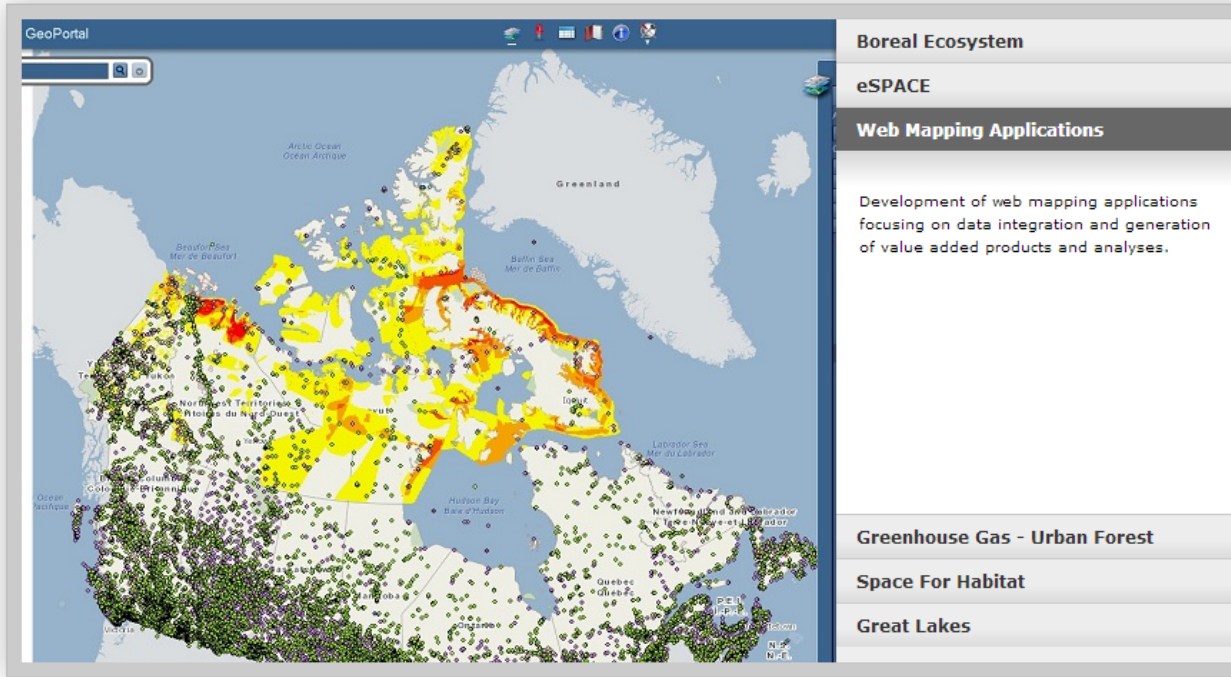
Carleton UNIVERSITY

Canada

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Hello, visitor. Click here to [apply for an account](#) or here to [Login](#)

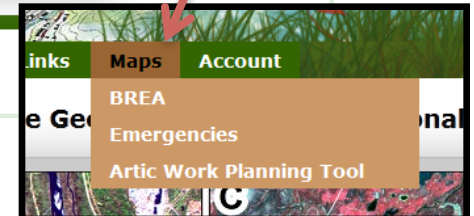
Welcome to the Geomatics Lab at the National Wildlife Research Centre



The screenshot shows the GeoPortal interface. The main map displays a geographical view of Canada with various data layers overlaid, including a yellow and orange shaded area representing a Boreal Ecosystem. The sidebar on the right contains a menu with the following items: Boreal Ecosystem, eSPACE, Web Mapping Applications (with a description: "Development of web mapping applications focusing on data integration and generation of value added products and analyses."), Greenhouse Gas - Urban Forest, Space For Habitat, and Great Lakes. The top of the interface includes a search bar and navigation icons.

Login with your username, email and password....

This will bring up the MAPS tab on the toolbar



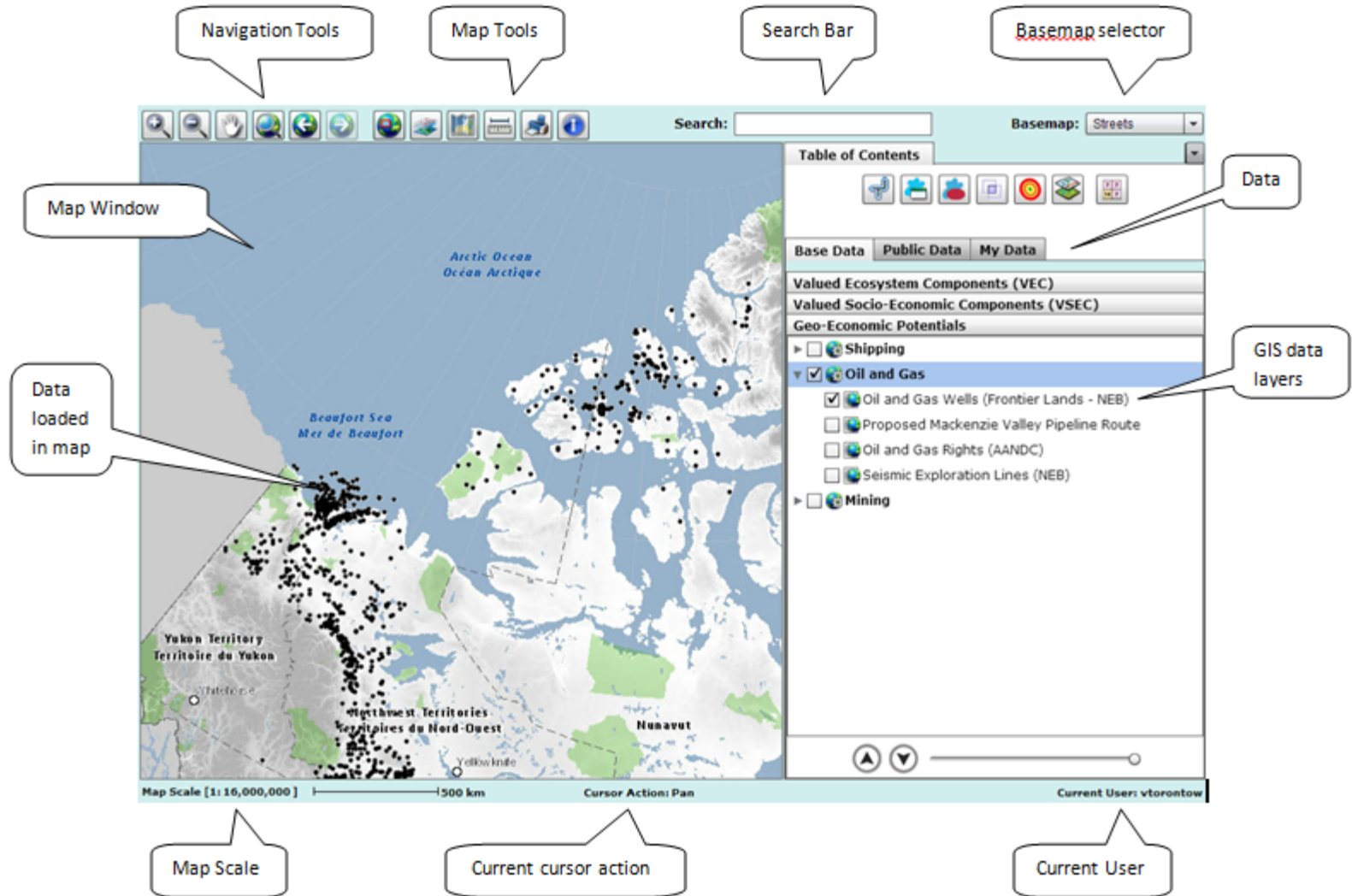
The screenshot shows the navigation menu with the following items: Links, Maps (selected), and Account. Below the 'Maps' tab, a dropdown menu is visible with the following items: BRE, Emergencies, and Artic Work Planning Tool.



Security and Functionality

- Single sign-on enables users to access webmaps to which they have access, and will secure the entire web portal, and associated Geomatics data from unwanted access.
- Uses secure web protocol (SSL certificate) to encrypt passwords sent across the internet.
- The carousel displays a preview of all our web applications in development, and live with login (Northern Portal, S&T Northern and Fieldwork Reporting).
- Once the user is logged in, they have access to the maps granted to them through their account permissions

BREA Web Mapping Application



The web applications recognize the user from the website, in order to store customized user information, layers, and future development involving forums, sharing, etc.

Table of Contents

Analysis Toolbar:

Set of tools for manipulating GIS data.

Base Data:

Contains general GIS layers (VEC, VSEC and GE Potential) viewable to all users.








Base Data	Public Data	My Data
Valued Ecosystem Components (VEC)		
Valued Socio-Economic Components (VSEC)		
Geo-Economic Potentials		
<input type="checkbox"/>		Shipping
<input type="checkbox"/>		Mining
<input checked="" type="checkbox"/>		Oil and Gas
<input checked="" type="checkbox"/>		Oil and Gas Wells (Frontier Lands - NEB)
<input type="checkbox"/>		Proposed Mackenzie Valley Pipeline Route
<input type="checkbox"/>		Oil and Gas Rights (AANDC)
<input type="checkbox"/>		Seismic Exploration Lines (NEB)





My Data: Data the user is creating/manipulating; viewable only to only the current user.

Public Data: Data shared and viewable by all users. Represents 'Sensitivity Layers' and 'Risk Layers' in raster format.

Analysis Tools

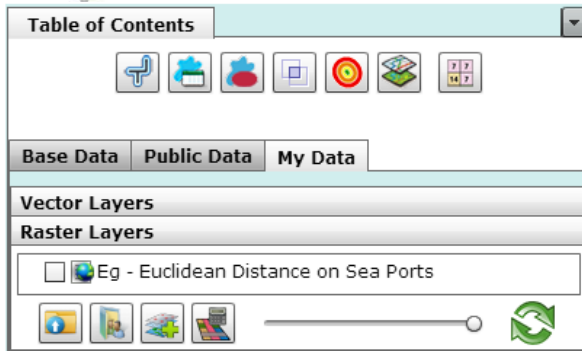






Icon	Name	Function
	Buffer Vector	Creates buffer polygons around input features to a specified distance.
	Select by Attributes	Select By Attributes allows you to provide an SQL query expression that is used to select features that match the selection criteria.
	Select by Location	The Select By Location tool lets you select features based on their location relative to features in another layer.
	Intersect	Computes a geometric intersection of the input features. Features or portions of features which overlap in both layers will be written to the output feature class.
	Euclidean Distance	Calculates, for each cell, the Euclidean distance to the closest source.
	Vector to Raster	Converts point, line, or polygon data into a raster surface (1 km cells?)
	Reclass Raster	The Reclass tool allows the user to reclassify or change input cell values to alternative values.

 Ie. Shipping routes have a 1km impact zone through the water...
 Ie. Where are oil wells WITHIN marine protected areas
 Ie. Marine Protected areas intersect offshore oil leases
 Ie. Distances away from oil spill...

The Analysis Tools are used to manipulate and process vector and raster data.

Raster Tools



Icon	Name	Function
	Upload Layer	Allows the user to upload a raster layer to their My Data (raster) folder so the layer can be incorporated into the analysis.
	Move To Public	Moves a raster layer (values 0-5) from the My Data folder to the Public Data folder so other users may access the layer.
	Weighted Overlay	Overlays several rasters using a common measurement scale and weights each according to its importance.
	Raster Calculator	Allows the user to create and execute Map Algebra expressions (add, subtract, multiply, etc.) in a tool.

The Raster Tools are used to manipulate and process raster data

BREA Demo: Working With Data

Purpose: To examine the potential conflicts between Oil and gas leases + Shipping in Beaufort with Beluga whales in the summer



<http://ott.web.cern.ch/ott/greenland/hr-beluga.jpg>

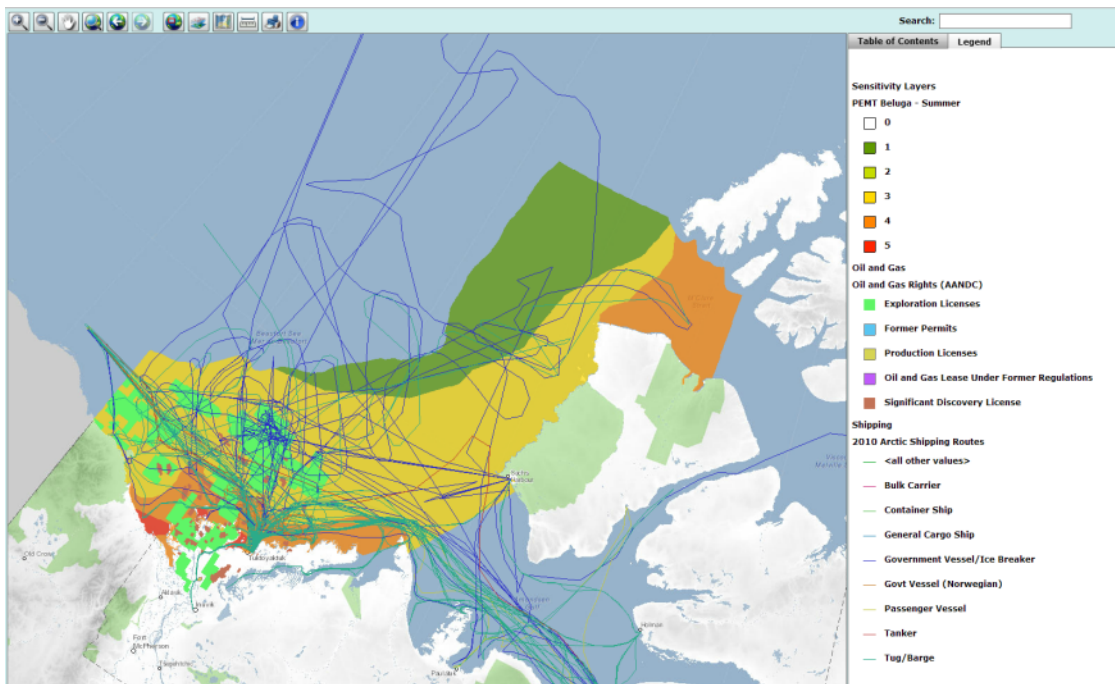


<http://www.icbergan.com/products/full/Ocean-barge.jpg>



http://http://www.edcnet.org/learn/current_cases/offshore_oil/rigs_to_reefs/SB_Channel_Rigs.jpg

BREA Demo: Working With Data



Result of 1) viewing layers

1) View the layers you would like to work with:

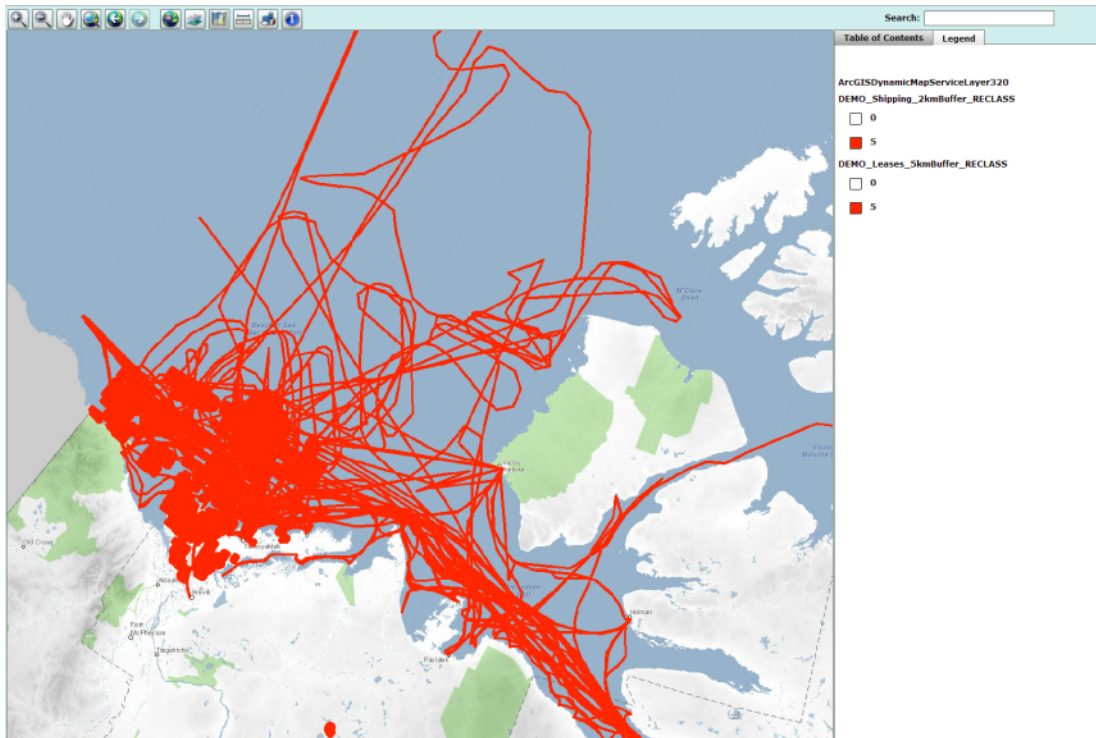
a) Turn on and make visible the following layers:

- Oil/Gas Rights
- Shipping: 2010 Arctic Shipping Route
- PEMT Beluga Summer

b) Turn on LEGEND for selected layers



BREA Demo: Working With Data



Result of 2a) buffering layers and converting to raster

2) Assign the extent and strength of effect to the Geo-Economic Potentials layers and aggregate into one Risk layer:

a) Extent of effect:

- Vector Buffer Shipping by 2km
- Vector Buffer Leases by 5km
- Convert them Vector to Raster

b) Combine the 2 risks (using Raster Calculator) and reclass so that:

- 0 = neither, 3 = one, 5 = both in same area

Buffer Vector and Vector to Raster Tools

Click on the Buffer Vector tool on the Analysis toolbar.



Table of Contents | Buffer

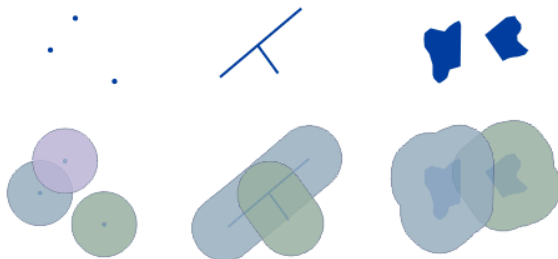
Target Layer:
2010 Arctic Shipping Routes

Buffer Distance (m): 2000

Dissolve output buffers.

Output Filename:
BufferShipping_2km

Submit



Click on the Vector to Raster tool on the Analysis toolbar.



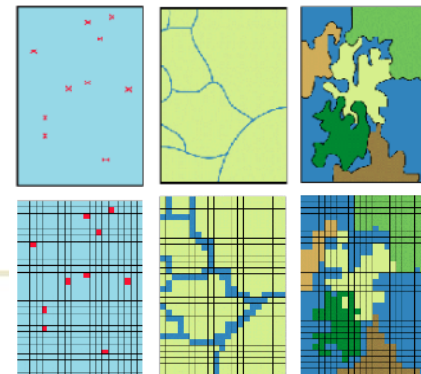
Table of Contents | Vector to Raster

Target Layer:
DEMO_Shipping2010_2kmBuffer

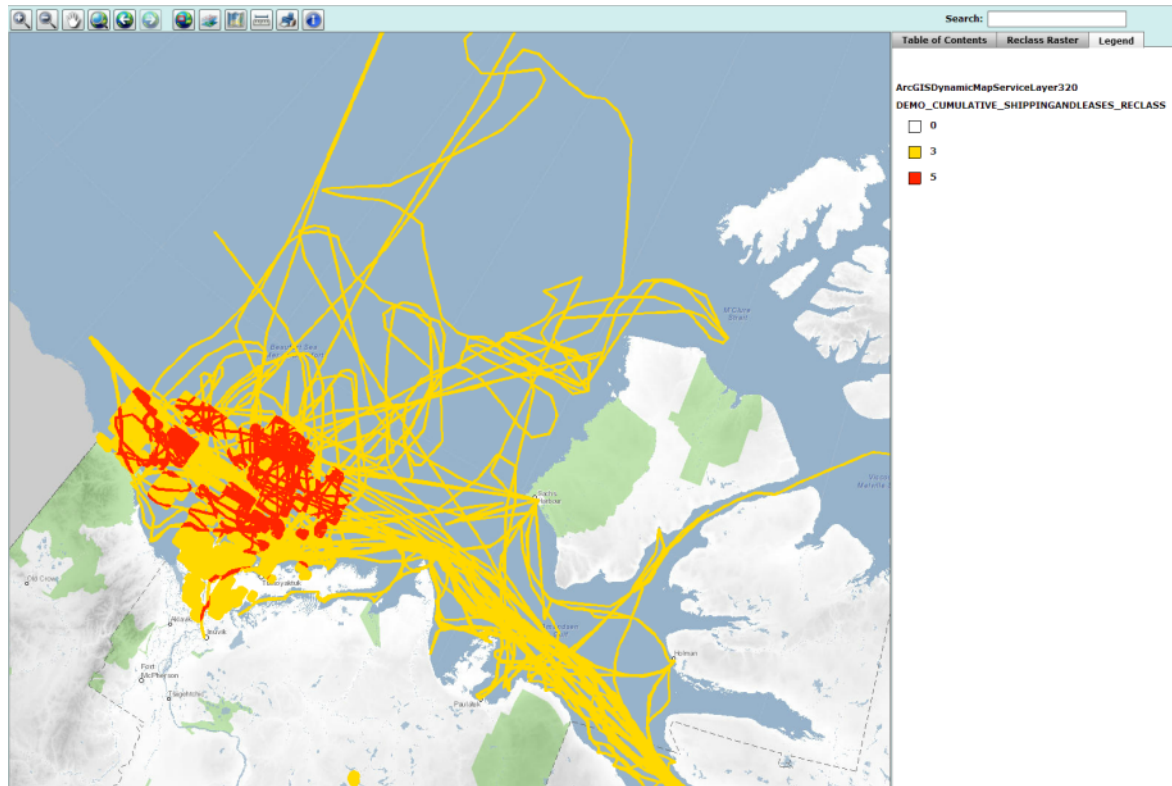
Target Field:
OBJECTID

Output Filename:
ShippingVectorTRaster

Submit



BREA Demo: Working With Data



2) Assign the extent and strength of effect to the Geo-Economic Potentials layers and aggregate into one Risk layer:

a) Extent of effect:

- Vector Buffer Shipping by 2km
- Vector Buffer Leases by 5km
- Convert them Vector to Raster

b) Combine the 2 risks (using Raster Calculator) and reclass so that:

- 0 = neither, 3 = one, 5 = both in same area

Result of 2b) combining the 2 risks and reclassifying

Reclass and Raster Calculator Tool

Click on the Raster Calculator tool on the Raster toolbar



Table of Contents Raster Calculator

Layers:

- DEMO_shipping2km_reclass
- DEMO_OilGas5km_reclass

Operators:

*	7	8	9
/	4	5	6
-	1	2	3
+	0	()

Expression:

" DEMO_shipping2km_reclass " +
" DEMO_OilGas5km_reclass "

Output Filename:

DEMO_Shipping_OilGas_Combined

Submit

Click on the Reclass tool on the Analysis toolbar



Table of Contents Reclass Raster

Target Layer:

DEMO_Shipping_OilGas_Combined

Reclass Field: Gen_Vessel

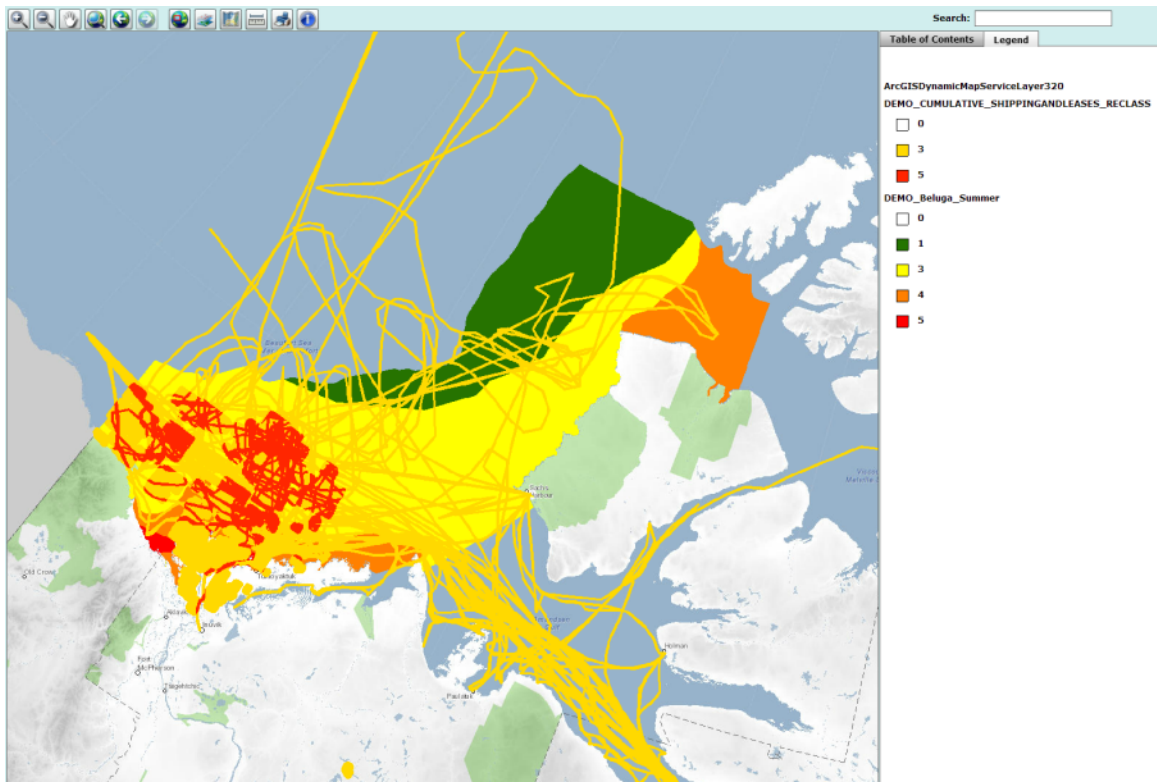
Value	Reclass Value (...)
0	0
5	3
10	5

Output Filename:

DEMO_Shipping_OilGas_Combined_Reclass

Submit

BREA Demo: Working With Data

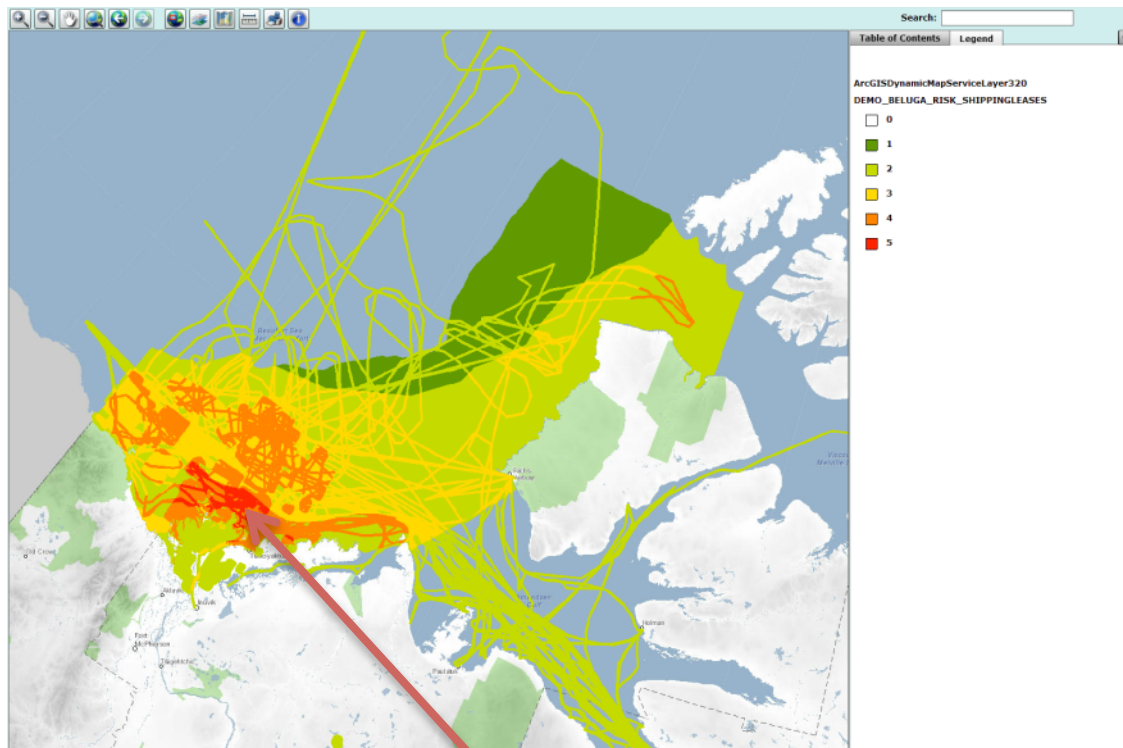


2) Determine the extent and strength of effect of Geo-Economic Potentials layers:

c) Visual overlay of Beluga PEMT and Reclassified Shipping and Oil/Gas

Overlay of Beluga PEMT and Recalssed Shipping & Oil/Gas

BREA Demo: Working With Data



MOST RISK TO BELUGAS

3) Combine Oil/Gas with Beluga PENT in a weighted overlay:

a) Use weighted overlay tool: Oil/Gas Reclassed layer & Beluga Summer Sensitivity (0-5 values) 50:50 weighting

b) Final output: Areas of most risk to Belugas

Weighted Overlay Tool

Click on the Weighted Overlay tool on the Raster toolbar



Specify the rasters to include in the weighted overlay. Checked: includes the raster in the overlay. Unchecked: excludes the layer from the overlay.

Weighted Overlay Table of Contents

Check off all inputs and assign each a weight between 0-100. All weights must sum to 100.

Sensitivity Grids	Weight
<input type="checkbox"/> Eg - Euclidean Distance on Sea Ports	0
<input type="checkbox"/> DEMO_Shipping2010_2kmBufferRASTER	0
<input type="checkbox"/> DEMO_Leases_5kmBufferRASTER	0
<input type="checkbox"/> DEMO_Shipping_2kmBuffer_RECLASS	0
<input type="checkbox"/> DEMO_Leases_5kmBuffer_RECLASS	0
<input type="checkbox"/> DEMO_CUMULATIVE_ShippingANDLeas	0
<input checked="" type="checkbox"/> DEMO_CUMULATIVE_SHIPPINGANDLEA	50
<input checked="" type="checkbox"/> DEMO_Beluga_Summer	50
<input type="checkbox"/> DEMO_BELUGA_RISK_SHIPPINGLEASE	0

Specify the weight by typing in a value from 1-99. All weights must sum to 100.



Many Other Analysis Scenarios Possible

Examples

- Which marine protected areas are at risk of oil spills?
- Where are breeding sites for belugas that intersect oil leases?
- Where is ship traffic close to wetlands?
- Where is most sensitive areas when different habitat information for polar bears is combined?
- Which traditional hunting/fishing grounds are at risk from offshore oil industry?

Limited only by data availability!



Next steps

- Further testing and evaluation of (current version) analysis tools.
 - Need access to BREAs research results to most effectively assess utility.
 - Establish collaboration with stakeholders directly involved with Regional Environmental Assessments/ Cumulative Impacts.
 - Evaluate potential for other tools.
-



Thank You!

- Comments?
- Questions?
- Suggestions?

Contacts

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