

**BEAUFORT REGIONAL
ENVIRONMENTAL ASSESSMENT**

**Geospatial Analysis Tool
User Manual**

User Manual

Regional Environmental Assessment (REA) Toolkit

January 29, 2013

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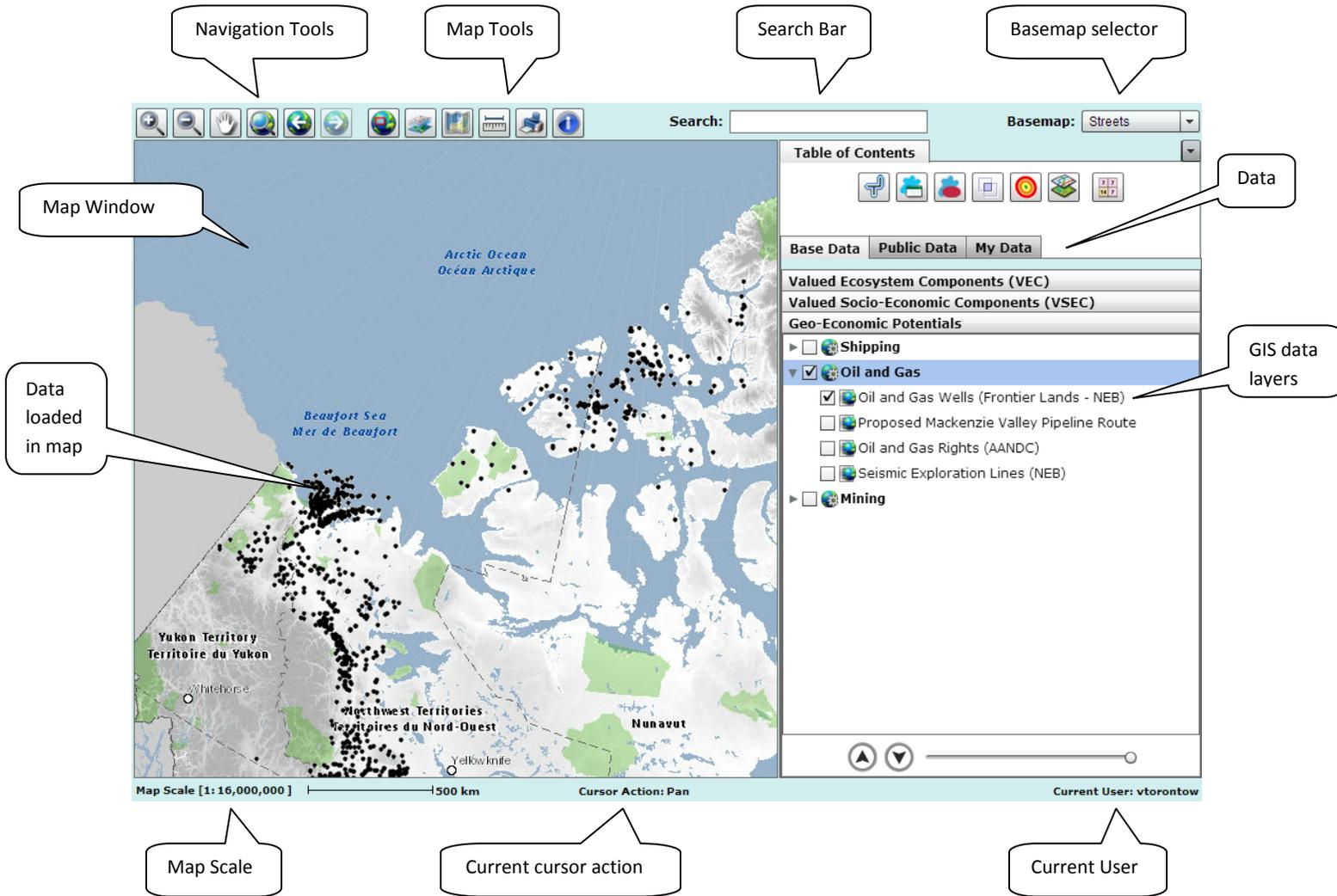
1.0 BREA Webmap

This web-based GIS tool-kit has been developed to include a variety of tools for the display and analysis of existing and new information to support the Beaufort Regional Environmental Assessment. It includes baseline information and research on a number of environmental factors including flora and fauna, water, air and climatic factors, ice and geo-hazards as well as cultural, sociological and infrastructure information.

To access the webmap, log on to the NWRC webpage and select the **BREA** map, under the **Maps** tab.



The following figure provides an overview of the portal layout.



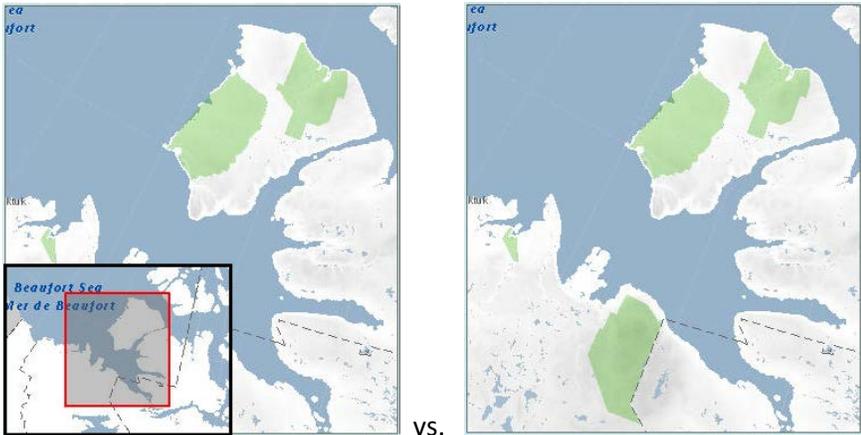
2.0 Navigation Tools

The Navigation Tools are used for map navigation within the map window.

Icon	Name	Function
	Zoom In	Zoom in by dragging a box on the map or by double clicking on the map.
	Zoom Out	Zoom out by dragging a box on the map.
	Pan	Pan the map by dragging the map.
	Full Extent	Zoom to the full extent of the map. By default, this is the extent of the BREa study area.
	Back Extent	Go back to the previous extent of the map after navigating.
	Next Extent	Go forward again through the sequence of extents you have been viewing on the map.

3.0 Map Tools

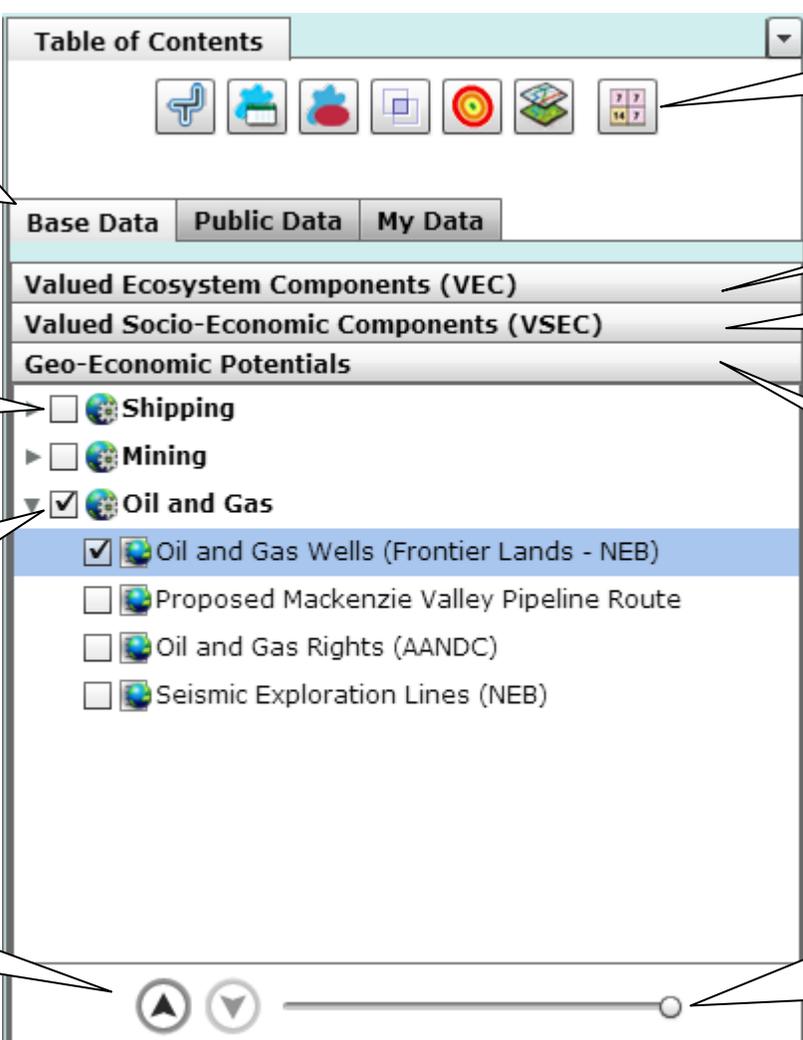
The Map Tools are used for map navigation, data access and query within the map.

Icon	Name	Function
	Overview	<p>Displays an overview map when the spatial location of the detailed map might be hard to determine. Displays in the bottom left corner of the map.</p>  <p style="text-align: center;">vs.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Overview Map Enabled</p> </div> <div style="text-align: center;">  <p>No Overview Map</p> </div> </div>
	Table of Contents	Opens the table of contents. The table of contents lists all the layers on the map and shows what the features in each layer represent.
	Legend	Displays the legend for a map layer.
	Measure	Measure distance, area and coordinates on the map.
	Print	Export a graphic image of the map currently visible on the screen.
	Identify	Identify a geographic feature by clicking on them.

3.1 Table of Contents

Click the Table of Contents  tool on the Map Tools toolbar.

The following window opens and allows you to view available layers and turn on (make visible)/turn off layers. The table of contents also gives you access to tools you will need to work/process/manipulate your data.



The screenshot shows the 'Table of Contents' window with the following structure:

- Base Data** | **Public Data** | **My Data**
- Valued Ecosystem Components (VEC)**
- Valued Socio-Economic Components (VSEC)**
- Geo-Economic Potentials**
 - Shipping
 - Mining
 - Oil and Gas
 - Oil and Gas Wells (Frontier Lands - NEB)
 - Proposed Mackenzie Valley Pipeline Route
 - Oil and Gas Rights (AANDC)
 - Seismic Exploration Lines (NEB)

Callouts provide the following information:

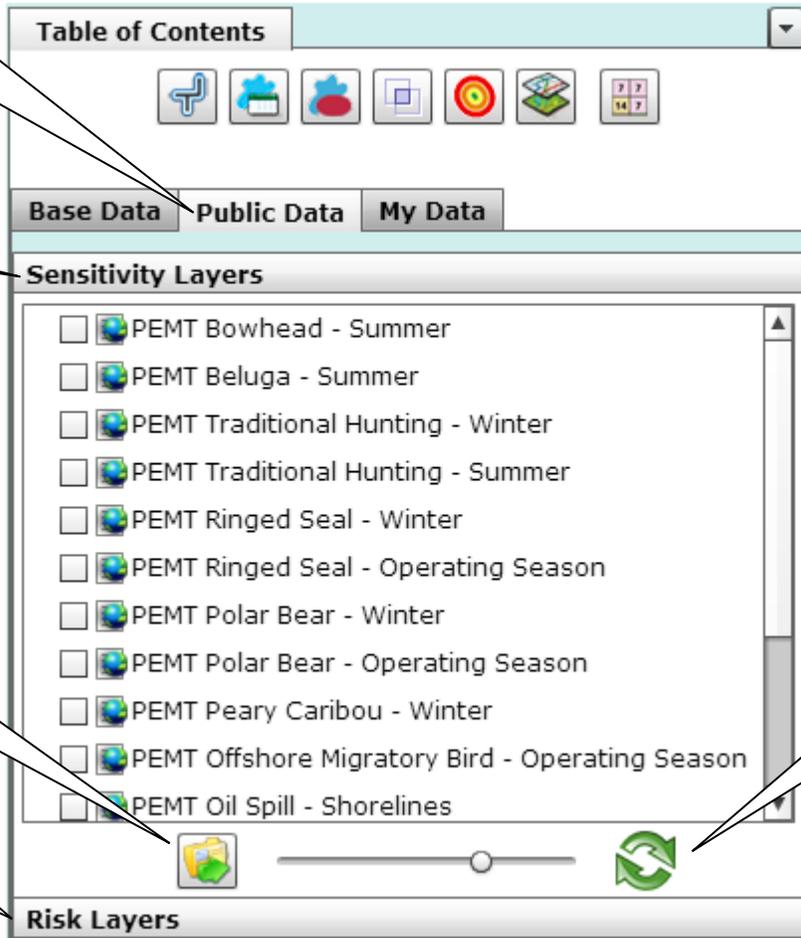
- Base Data folders:** These are 3 'folders' which contain different types of data. **Base Data** contains VEC, VSEC and GE Potential data viewable to all users.
- Analysis Toolbar:** Set of tools for manipulating GIS data.
- VEC:** Click **VEC** to view a list of VEC layers.
- VSEC:** Click **VSEC** to view a list of VSEC layers.
- GE Potentials:** Displays a list of **GE Potentials** layers.
- Transparency slider:** The slider in the left position shows the layer as 100% opaque and the slider in the right position is 100% transparent.
- Layer visibility:** An empty box means the layer is turned off (or not visible on the map). A box with a checkmark means the layer is turned on (or visible on the map).
- Layer reordering:** Moves the position of a layer up or down the list in the table of contents.

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

Displays list of sensitivity layers.

Move Layer to "My Data": Moves a public layer to your "My Data" folder for processing and analysis.

Click on **Risk Layers** to view a list of risk layers.



Refresh: Click to refresh the layer list if your layer is not visible.

Click on **Vector Layers** to view a list of vector layers.

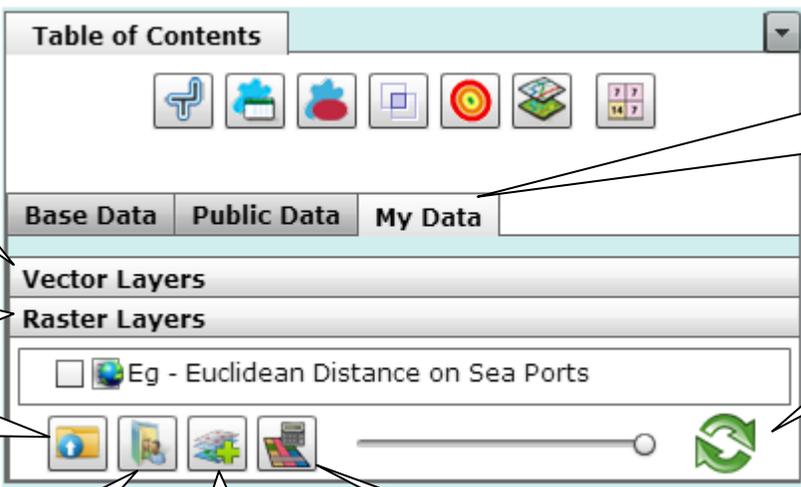
Displays list of **Raster Layers**.

Uploads Layer to the current folder.

Move to Public: Move a raster layer to the public folder.

Perform a **Weighted Overlay** calculation.

Perform **Raster Calculator** operations.



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

Refresh: Click to refresh the layer list if your layer is not visible.

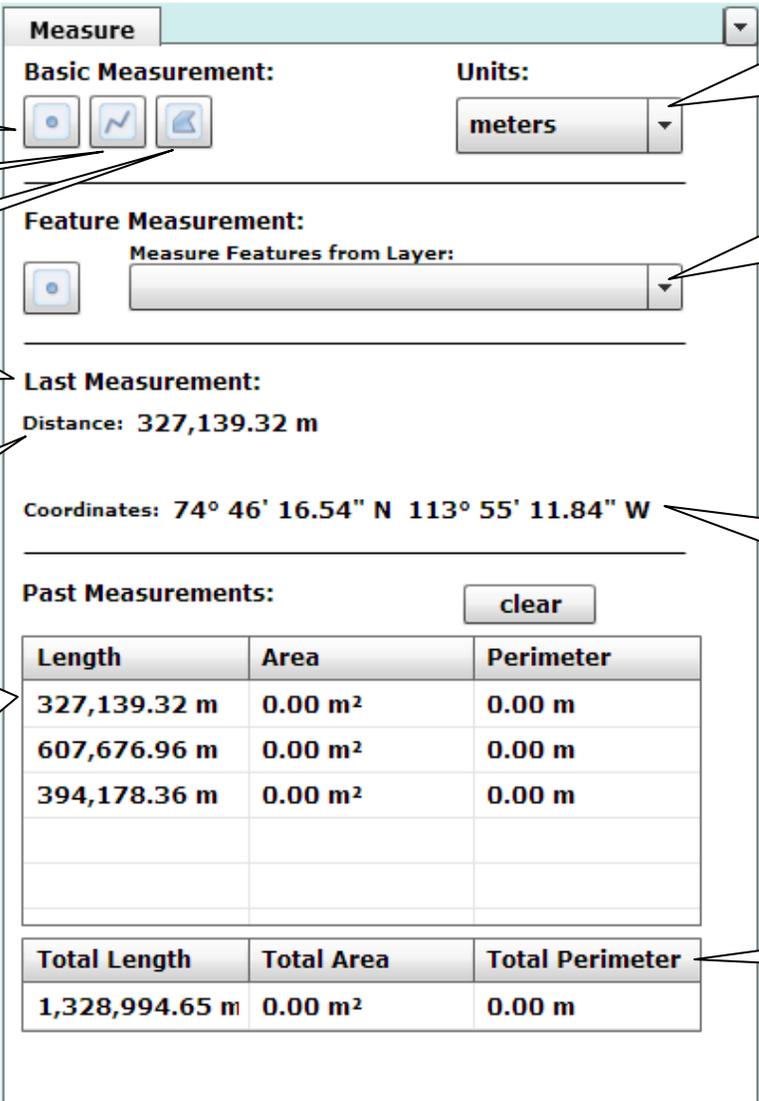
3.2 Measure tool

Click the Measure  tool on the Map Tools toolbar.

The following window opens and allows you to specify what you would like to measure.

- 1) Select the 'Basic Measurement' type, and 'Units'.
- 2) Click the point of interest on the map where you want to start measuring the distance or area.
- 3) Move the pointer to the next point of interest and click to measure the distance or area. If you want to continue measuring distances to other points or adding more vertices to your polygon, simply move the pointer to another location and click to add additional vertices.
- 4) Double-click where you want to end the line or polygon.

The distance/area are displayed in the measurement window.



The screenshot shows the 'Measure' window with the following components and callouts:

- Select a Feature to measure.** Points to the 'Basic Measurement' section containing three icons: a point, a line, and a polygon.
- Measure a Line** and **Measure a Polygon** point to the line and polygon icons respectively.
- Units:** A dropdown menu currently set to 'meters'. Callout: **Select the units you would like to measure in: meters, kilometers, miles or feet.**
- Feature Measurement:** A section with a 'Measure Features from Layer:' dropdown menu. Callout: **Select which layer you would like to measure features from.**
- Last Measurement:** Displays 'Distance: 327,139.32 m'. Callout: **The last measurement performed is displayed here.**
- Coordinates:** Displays '74° 46' 16.54" N 113° 55' 11.84" W'. Callout: **Displays coordinates (Degree Min Sec) for the 'Select a Feature' option only.**
- Past Measurements:** A table with a 'clear' button. Callout: **Displays a list of past measurements from one polygon or line. Length is displayed for Lines, and Area and Perimeter are displayed for polygons.**
- Total Length, Total Area, Total Perimeter:** Summary rows at the bottom of the table. Callout: **Displays the total length area or perimeter.**

Length	Area	Perimeter
327,139.32 m	0.00 m ²	0.00 m
607,676.96 m	0.00 m ²	0.00 m
394,178.36 m	0.00 m ²	0.00 m
Total Length	Total Area	Total Perimeter
1,328,994.65 m	0.00 m ²	0.00 m

3.3 Print tool



Click on the Print tool on the Map Tools toolbar. The following window opens and allows you to specify what you would like to print (export to graphic).

The 'Export Map' dialog box contains the following fields and callouts:

- Output File Name:** A text input field with a callout: "Specify an output file name."
- File Format:** A dropdown menu with a callout: "Select the file format: PNG8, PDF, PNG32, JPG, GIF, EPS, SVG, SVGZ."
- Layout:** A dropdown menu with a callout: "Select a page layout: Letter (8.5x11), Ledger (11x17) and Letter (Large Legend)."
- Print:** A button with a printer icon and the text "Print". A callout points to it: "Click **Print** to export map. A new tab will open with the map where you can save to file."

3.4 Identify Tool



Click on the Identify tool on the Map Tools toolbar.

Click on a location in your map to identify the features at that location. The 'Identify Results' window will appear. Choose the layer which you would like to show results for from the drop down menu. The attributes are presented in the 'Identify Results' window and the feature will be highlighted.

The 'Identify Results' window shows a map on the left with a red circle highlighting a feature. A callout points to it: "Highlighted feature."

The right side of the window has a dropdown menu labeled "Show Results For:" with the value "Oil and Gas Wells (Frontier Lands - NEB)". A callout points to it: "Specify a layer to identify."

Below the dropdown is a table of attributes for the identified feature. A callout points to the table: "List of attributes for the identified feature."

NAD_83_LAT	69.605677
OPERATOR	Imperial Oil Limited
SPUD_DATE	19860210
LAND_TITLE	EA105
NAD_27_LAT	69.60572
NAD_27_LON	-134.01997
UWI_ORIG	300G076940134000
Shape	Point
NAD_83_LON	-134.022764
STATUS_CUR	Abandoned
WELL_ID	1597
WELL_NAME	HANSEN G-07
CLASS	Exploratory Well
R_RELEASE	19860411
REGION	NWT Mackenzie Delta

4.0 Analysis Tools

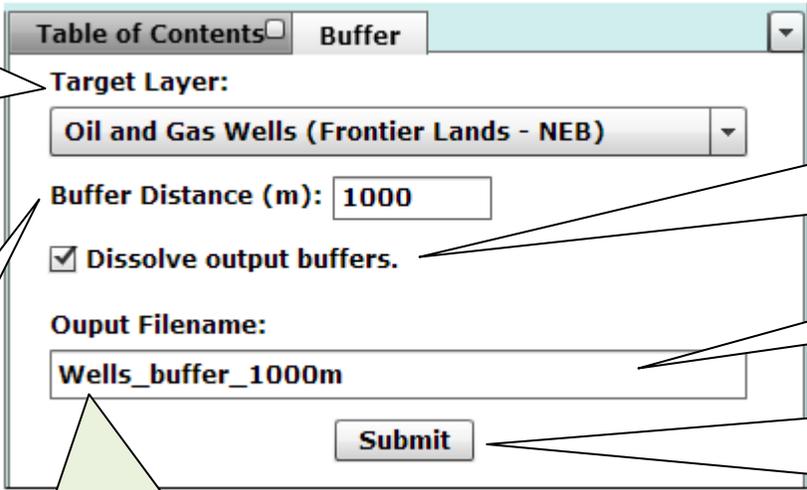
The Analysis Tools are used to manipulate and process vector and raster data (found under Table of Contents).

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.

4.1 Buffer Vector

You can create a buffer around selected points, lines, or area features. For instance, you might use buffers to show an ecological zone around a waterway, or the area around a contaminated well. You can buffer more than one feature at once, but a separate buffer will be created around each feature.

Click on the Buffer Vector  tool on the Analysis toolbar. The following window opens and allows you to specify what you would like to buffer.



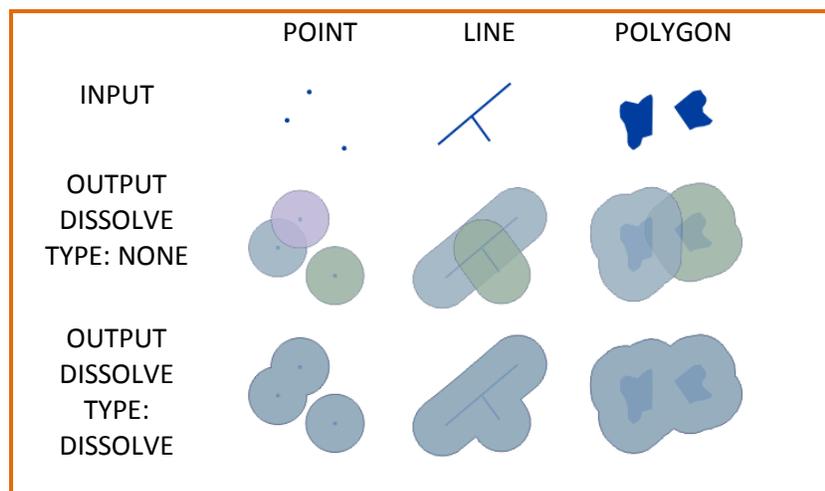
The screenshot shows the 'Buffer' dialog box with the following fields and callouts:

- Target Layer:** A dropdown menu showing 'Oil and Gas Wells (Frontier Lands - NEB)'. Callout: 'Specify the layer you would like to buffer. Note: The layer must be turned on in the Table of Contents to be able to select it.'
- Buffer Distance (m):** A text input field containing '1000'. Callout: 'Specify the buffer distance. Note: for polygons only, a negative number can be used to buffer within the polygon.'
- Dissolve output buffers:** A checked checkbox. Callout: 'Dissolve output buffers. Checked will perform the dissolve. (See below for more info on dissolve.)'
- Output Filename:** A text input field containing 'Wells_buffer_1000m'. Callout: 'Specify an output filename.'
- Submit:** A button. Callout: 'Click **Submit** to run the Buffer tool. The new buffer layer will appear in your **My Data (vector)** folder.'

A green callout box at the bottom states: 'This example buffer will export a new vector layer with all wells buffered by 1000m.'

Dissolving output buffers:

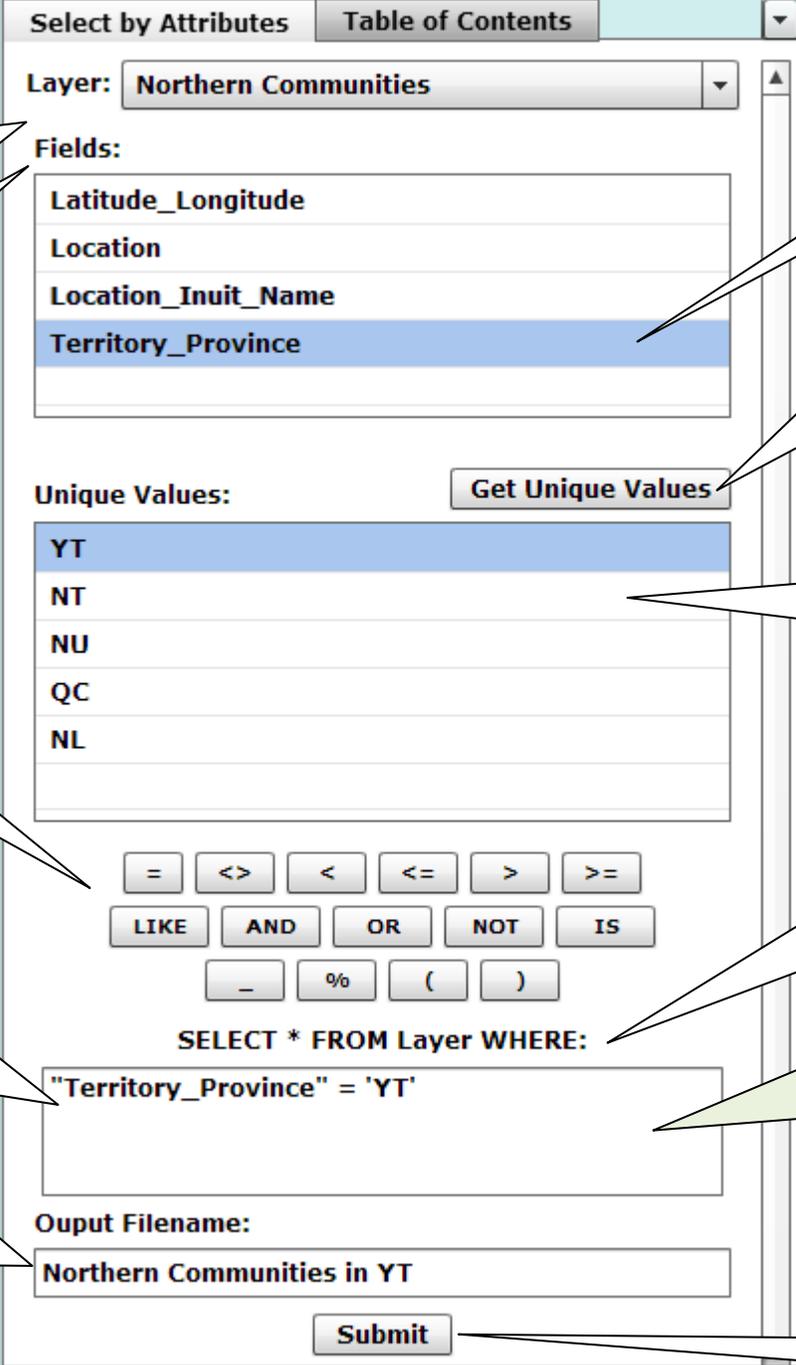
- This check box allows the user to specify if a dissolve should be performed to remove buffer overlap.
- NONE (Unchecked box): An individual buffer for each feature is maintained, regardless of overlap.
- ALL (Checked box): All buffers are dissolved together into a single feature, removing any overlap.



4.2 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 and export those features to a new layer.

Click on the Select by Attributes  tool on the Analysis toolbar. Note: Input for this tool must be vector. The following window opens and allows you to specify your selection.



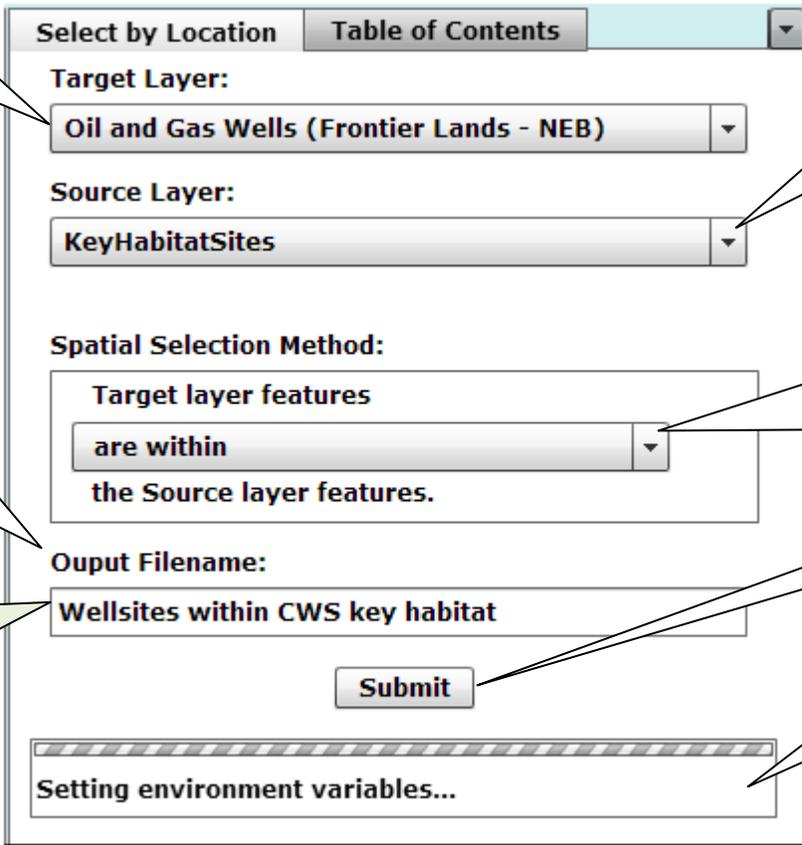
The screenshot shows the 'Select by Attributes' dialog box with the following components and callouts:

- Layer:** Northern Communities (Callout: Specify the layer to perform the selection against. Layer must be turned on in the table of contents.)
- Fields:** Latitude_Longitude, Location, Location_Inuit_Name, Territory_Province (Callout: The list of fields for that layer are displayed (which you can use to create your query).)
- Unique Values:** YT, NT, NU, QC, NL (Callout: The list of unique values for a selected field are displayed here.)
- Get Unique Values:** Button (Callout: Click Get Unique Values to see the values for the selected field when creating a query expression.)
- Expression Building Tools:** Buttons for =, <>, <, <=, >, >=, LIKE, AND, OR, NOT, IS, -, %, (,) (Callout: Expression building tools used to create a query.)
- Query Expression:** SELECT * FROM Layer WHERE: "Territory_Province" = 'YT' (Callout: Build a query in the selection window by using the expression building tools (and double clicking fields and unique values) or by typing in the query.)
- Output Filename:** Northern Communities in YT (Callout: Specify an output filename. The new data layer with your queried selection will appear in your My Data (vector) folder.)
- Submit:** Button (Callout: Click Submit to perform your selection.)
- Selected field:** Territory_Province (Callout: Selected field.)
- SQL Expression:** SELECT * FROM (Callout: SELECT * FROM forms the first part of the SQL expression and is automatically supplied for you.)
- Example Query:** This example query will export a vector file with all the northern communities that are in the province of Yukon. (Callout: This example query will export a vector file with all the northern communities that are in the province of Yukon.)

4.3 Select by Location

The Select By Location tool lets you select features based on their location relative to features in another layer.

Click on the Select by Location  tool on the Analysis toolbar. Note: Input for this tool must be vector. The following window opens and allows you to specify your selection.



The screenshot shows the 'Select by Location' dialog box with the following fields and callouts:

- Target Layer:** A dropdown menu showing 'Oil and Gas Wells (Frontier Lands - NEB)'. Callout: 'Specify the target layer from which features will be selected.'
- Source Layer:** A dropdown menu showing 'KeyHabitatSites'. Callout: 'Specify the source layer that will be used to select features from the target layer.'
- Spatial Selection Method:** A section with a dropdown menu showing 'are within'. Callout: 'Choose the spatial relationship rule that will be used for selection: 'intersect', 'are within', 'are completely within', or 'are contained by'.'
- Output Filename:** A text field containing 'Wellsites within CWS key habitat'. Callout: 'Specify an output filename. The new data layer with your queried selection will appear in your My Data (vector) folder.'
- Submit:** A button at the bottom. Callout: 'Click Submit to perform your selection.'
- Progress Bar:** A progress bar at the bottom with the text 'Setting environment variables...'. Callout: 'Progress bar appears when the tool is processing.'

Additional callout: 'This example query will export a vector file with all the well sites that are within the CWS Key Habitat Sites.'

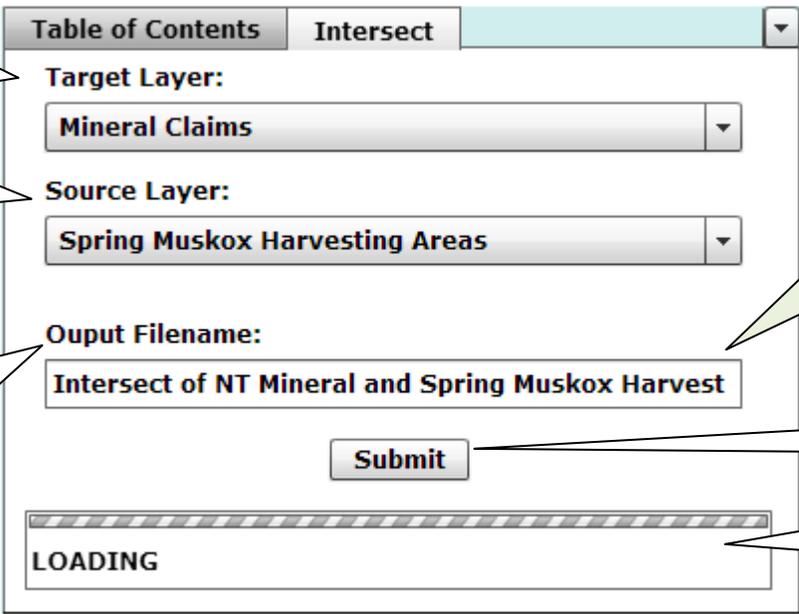
Spatial Selection Method details:

Rule	Definition
intersect	Intersect returns any feature that either fully or partially overlaps the source feature(s).
are within	To be selected, the geometry of the target feature must fall inside the geometry of the source feature. Selected features and source features can have overlapping boundaries.
are completely within	To be selected, all parts of the target features must fall inside the geometry of the source feature(s) and cannot touch the source's boundaries.
are contained by	This method differs from the Are completely within method in that the geometry of the target feature must fall inside the geometry of the source feature including its boundaries.

4.4 Intersect Tool

Intersect creates a new feature from the common areas or edges of any two selected features of the same geometry type. You can create a new feature from the intersection of features of different layers, but the layers must be of the same geometry type (point, line or polygon).

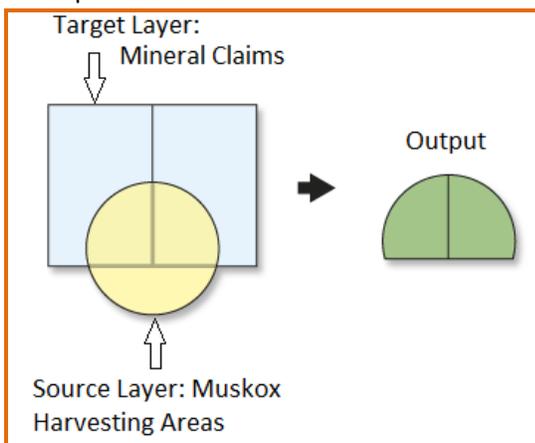
Click on the Intersect  tool on the Analysis toolbar. Note: Input for this tool must be vector. The following window opens and allows you to perform an intersect between vector layers.



The screenshot shows the 'Intersect' dialog box with the following fields and callouts:

- Target Layer:** Mineral Claims (Callout: Specify the target layer from which features will be intersected with.)
- Source Layer:** Spring Muskox Harvesting Areas (Callout: Specify the source layer that will be used to intersect features from the target layer.)
- Output Filename:** Intersect of NT Mineral and Spring Muskox Harvest (Callout: Specify an output filename. The new data layer with your intersect will appear in your **My Data (vector)** folder.)
- Submit** button (Callout: Click **Submit** to perform the intersection.)
- LOADING** progress bar (Callout: Progress bar appears when the tool is processing.)
- Example result callout: This example intersect will export a vector file with the common (intersecting) area between mineral claims and muskox harvesting areas.

Example intersect:



4.5 Euclidean Distance

Euclidean distance gives the measured distance from each cell in the raster to the closest source.



Click on the Euclidean Distance tool on the Analysis toolbar. Note: Input for this tool can be vector or raster. Output data will be raster. The following window opens and allows you to calculate Euclidean distance.

The screenshot shows the 'Euclidean Distance' dialog box in a software interface. The dialog has a title bar with 'Table of Contents' and 'Euclidean Distance'. It contains the following fields and controls:

- Target Layer:** A dropdown menu showing 'Oil and Gas Wells (Frontier Lands - NEB)'.
- Max Distance (m):** A text input field containing '6000'.
- Output Filename:** A text input field containing 'Euclidean_Wells_6000m'.
- Submit:** A button at the bottom center.

Five callout boxes provide additional information:

- Top-left: 'Specify the maximum distance (m) which accumulative values cannot exceed. If exceeded, values become NoData.' (points to Max Distance)
- Top-right: 'Specify the layer you would like to run Euclidean Distance on.' (points to Target Layer)
- Middle-right: 'This example performs a Euclidean distance calculation up to a maximum distance of 6000m.' (points to Max Distance)
- Bottom-right: 'Click **Submit** to calculate the Euclidean Distance.' (points to Submit)
- Bottom-left: 'Specify an output filename. The new raster data will appear in your **My Data (raster)** folder.' (points to Output Filename)

4.6 Vector to Raster

Vector to Raster converts point, line, or polygon data into a raster surface with 1 km cells.

Click on the Vector to Raster  tool on the Analysis toolbar. Note: Input for this tool must be vector. Output data will be raster. The following window opens and allows you to convert a vector layer to a raster layer.

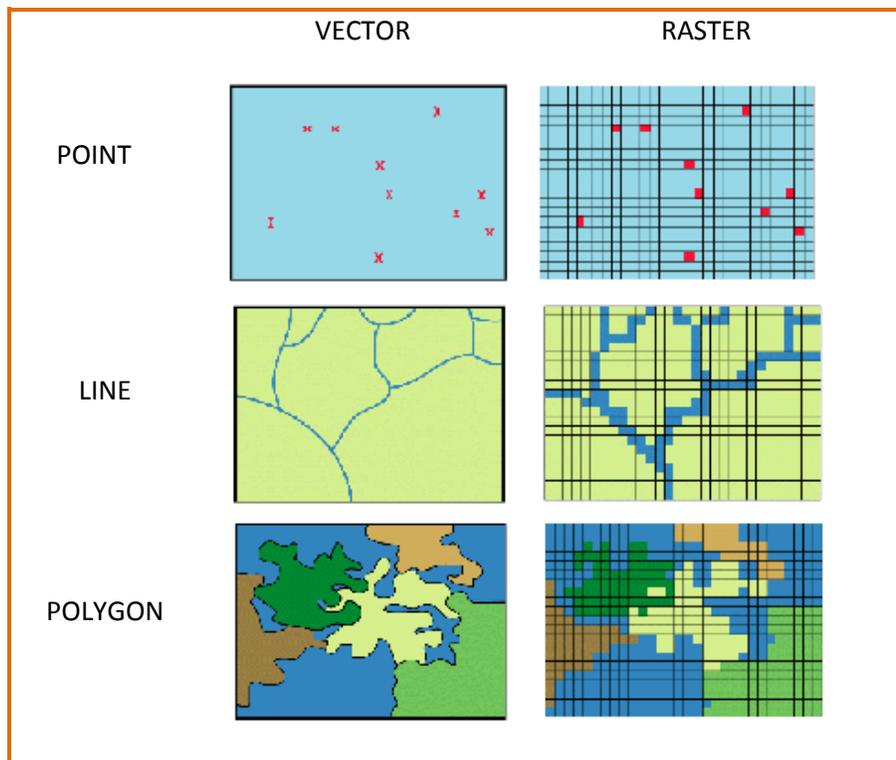
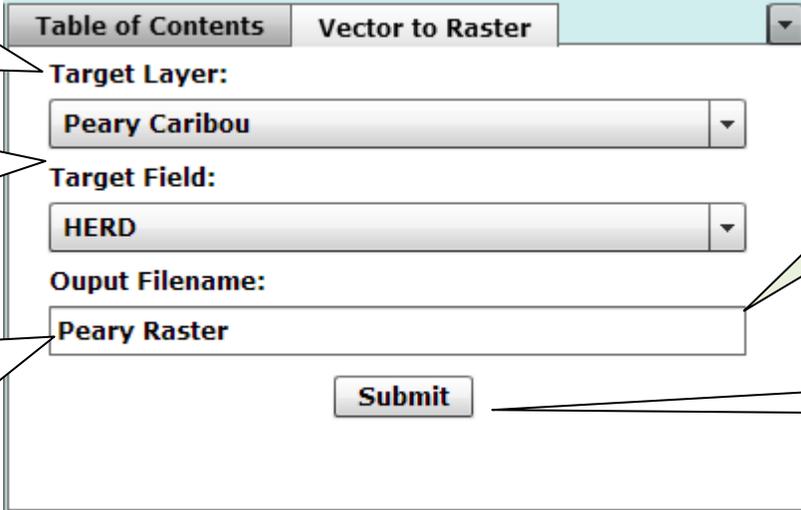
Specify the target layer which you would like to convert from vector to raster.

Specify the target field which you would like to use to convert to raster.

Specify an output filename. The new raster data layer with your will appear in your **My Data (raster)** folder.

This example vector to raster will convert the Peary Caribou layer to a raster layer based on the target field: Herd.

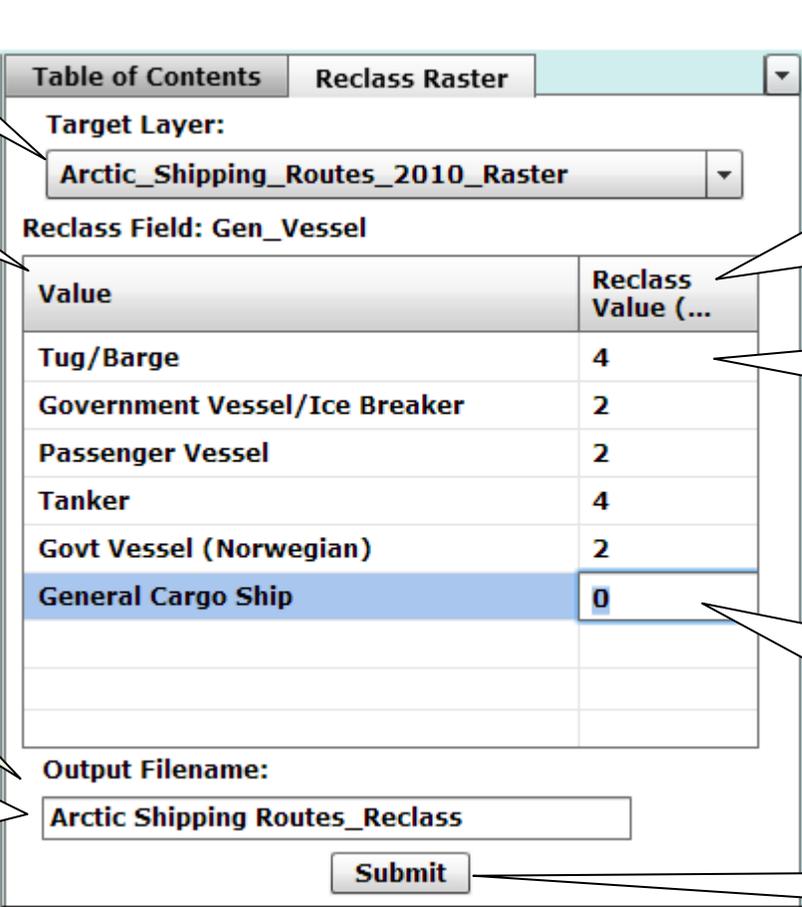
Click **Submit** to convert vector to raster.



4.7 Reclass Raster

The Reclass tool allows the user to reclassify or change input cell values to alternative values.

Click on the Raster Calculator  tool on the Analysis toolbar. Note: Input for this tool must be raster. The following window opens and allows you to specify your selection.



The screenshot shows the 'Reclass Raster' dialog box. It has a 'Table of Contents' tab and a 'Reclass Raster' tab. The 'Target Layer' is set to 'Arctic_Shipping_Routes_2010_Raster'. The 'Reclass Field' is 'Gen_Vessel'. A table lists vessel types and their reclass values. The 'Output Filename' is 'Arctic Shipping Routes_Reclass'. A 'Submit' button is at the bottom.

Value	Reclass Value (...)
Tug/Barge	4
Government Vessel/Ice Breaker	2
Passenger Vessel	2
Tanker	4
Govt Vessel (Norwegian)	2
General Cargo Ship	0

Callouts:

- Specify the raster target layer which you would like to reclassify
- The Value you will be reclassifying.
- This example **Reclass Raster** reclassifies Tug/Barge and Tanker 4, and reclassifies Gov vessel, Passenger vessel, and Govt vessel (Nor) to 2. General Cargo Ship is reclassified to 0.
- Specify an output filename. The new raster data layer with your will appear in your **My Data (raster)** folder.
- Reclass Value must be between 0-5. Reclass value 0 = transparent
- Assign a new **Reclass Value** for each **Value** in the layer.
- Double click the '0' to assign a new reclass value. Type in a new value from 0-5.
- Click **Submit** to convert vector to raster.

5.0 Raster Tools:

The Raster Tools are used to manipulate and process raster data (found under Table of Contents, My Data, Raster Layers).

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.

5.1 Weighted Overlay

The Weighted Overlay tool overlays several rasters using a common measurement scale and weights each according to its importance.

Click on the Weighted Overlay  tool on the Raster toolbar. Note: Input for this tool must be raster. The following window opens and allows you to specify your selection.

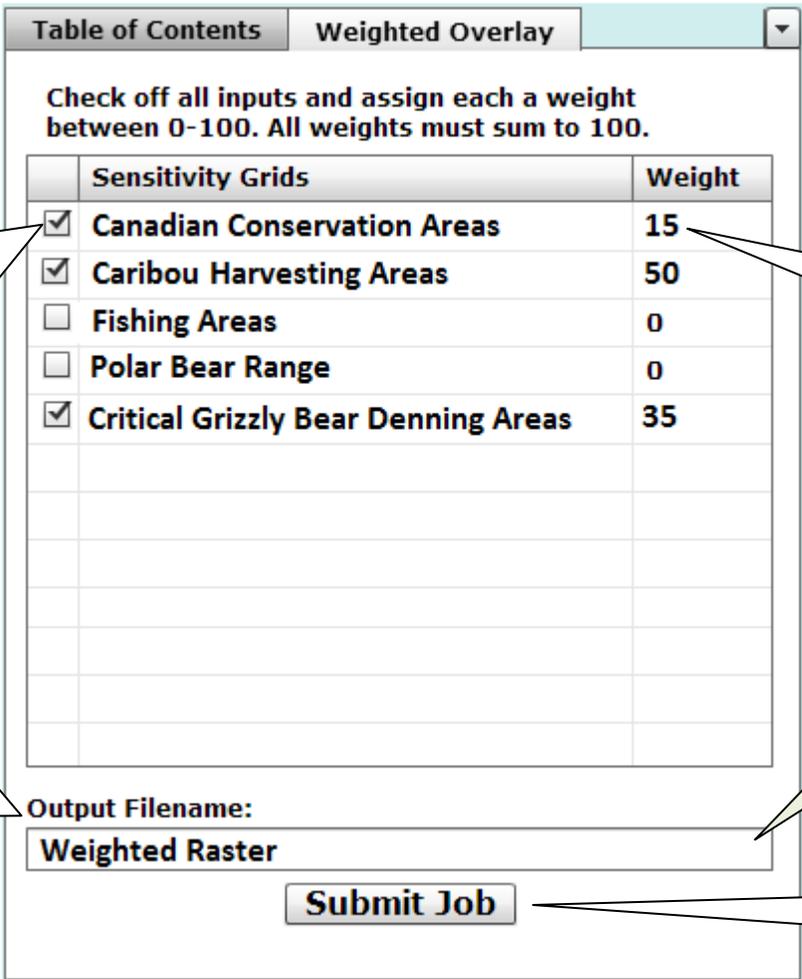


Table of Contents | **Weighted Overlay**

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

	Sensitivity Grids	Weight
<input checked="" type="checkbox"/>	Canadian Conservation Areas	15
<input checked="" type="checkbox"/>	Caribou Harvesting Areas	50
<input type="checkbox"/>	Fishing Areas	0
<input type="checkbox"/>	Polar Bear Range	0
<input checked="" type="checkbox"/>	Critical Grizzly Bear Denning Areas	35

Output Filename:
Weighted Raster

Submit Job

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

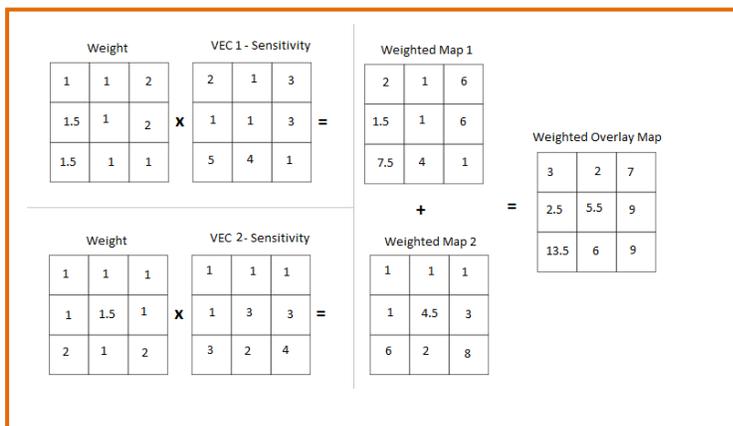
Specify the weight by typing in a value from 1-99. All weights must sum to 100.

Specify an output filename. The new raster data layer with your will appear in your **My Data (raster)** folder.

This example weighted overlay combines three rasters with their respective weights.

Click **Submit Job** to perform the weighted overlay.

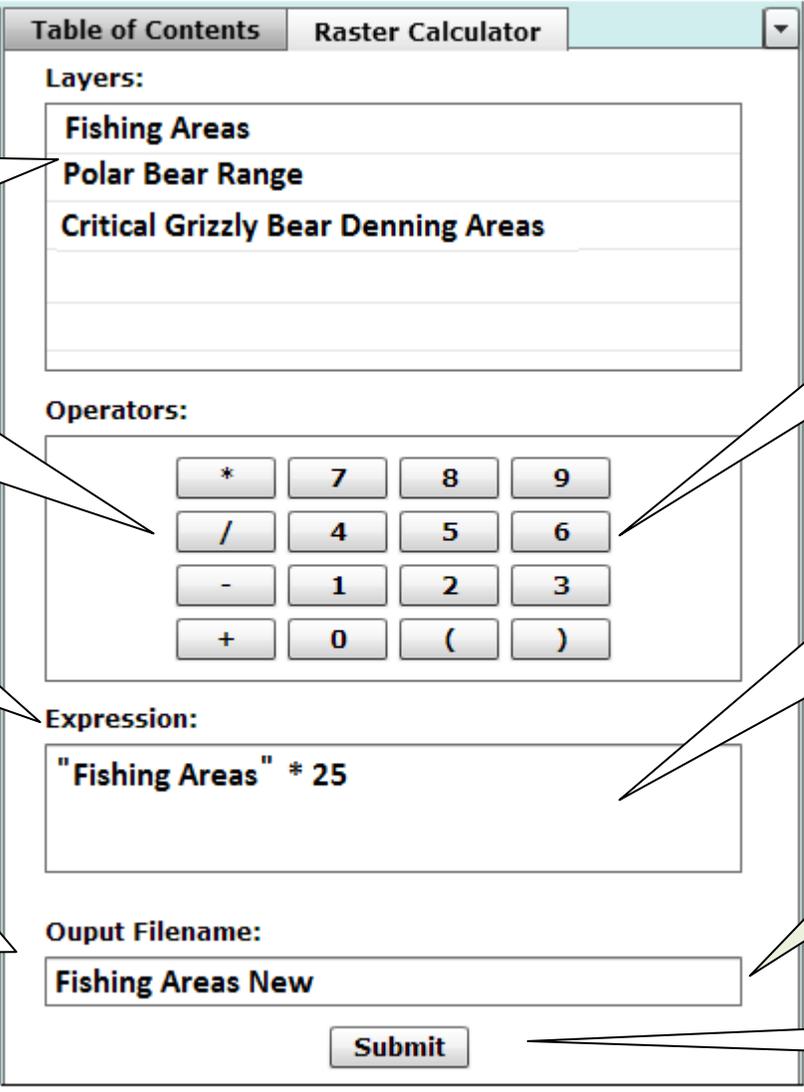
Example:



5.2 Raster Calculator

The Raster Calculator allows the user to create and execute Map Algebra expressions (add, subtract, multiply, etc.) in a tool.

Click on the Raster Calculator  tool on the Raster toolbar. Note: Input for this tool must be raster. The following window opens and allows you to specify your selection.



The screenshot shows the Raster Calculator tool window with the following sections and callouts:

- Layers:** A list of available raster layers: **Fishing Areas**, **Polar Bear Range**, and **Critical Grizzly Bear Denning Areas**. Callout: "Raster layers which can be used in the Map Algebra expression."
- Operators:** A grid of buttons for mathematical operations: *****, **/**, **-**, **+**, **7**, **4**, **1**, **0**, **8**, **5**, **2**, **(**, **9**, **6**, **3**, **)**. Callout: "The operator buttons allow you to enter mathematical (addition, division, and so on) operators into the expression."
- Expression:** A text field containing the expression: **"Fishing Areas" * 25**. Callout: "The expression is the Map Algebra expression to be executed."
- Output Filename:** A text field containing the filename: **Fishing Areas New**. Callout: "Specify an output filename. The new raster data layer with your will appear in your **My Data (raster)** folder."
- Submit:** A button at the bottom right. Callout: "Click **Submit** to perform the calculation."
- Calculator buttons:** A callout pointing to the operator buttons: "Calculator buttons allow you to enter numeric values into the expression."
- Expression building:** A callout pointing to the expression field: "Build an expression by using the operator tools (and double clicking fields and unique values) or by typing in the expression."
- Example calculation:** A callout pointing to the expression field: "This example calculation takes the Fishing Areas raster and multiplies all cells by a value of 25."