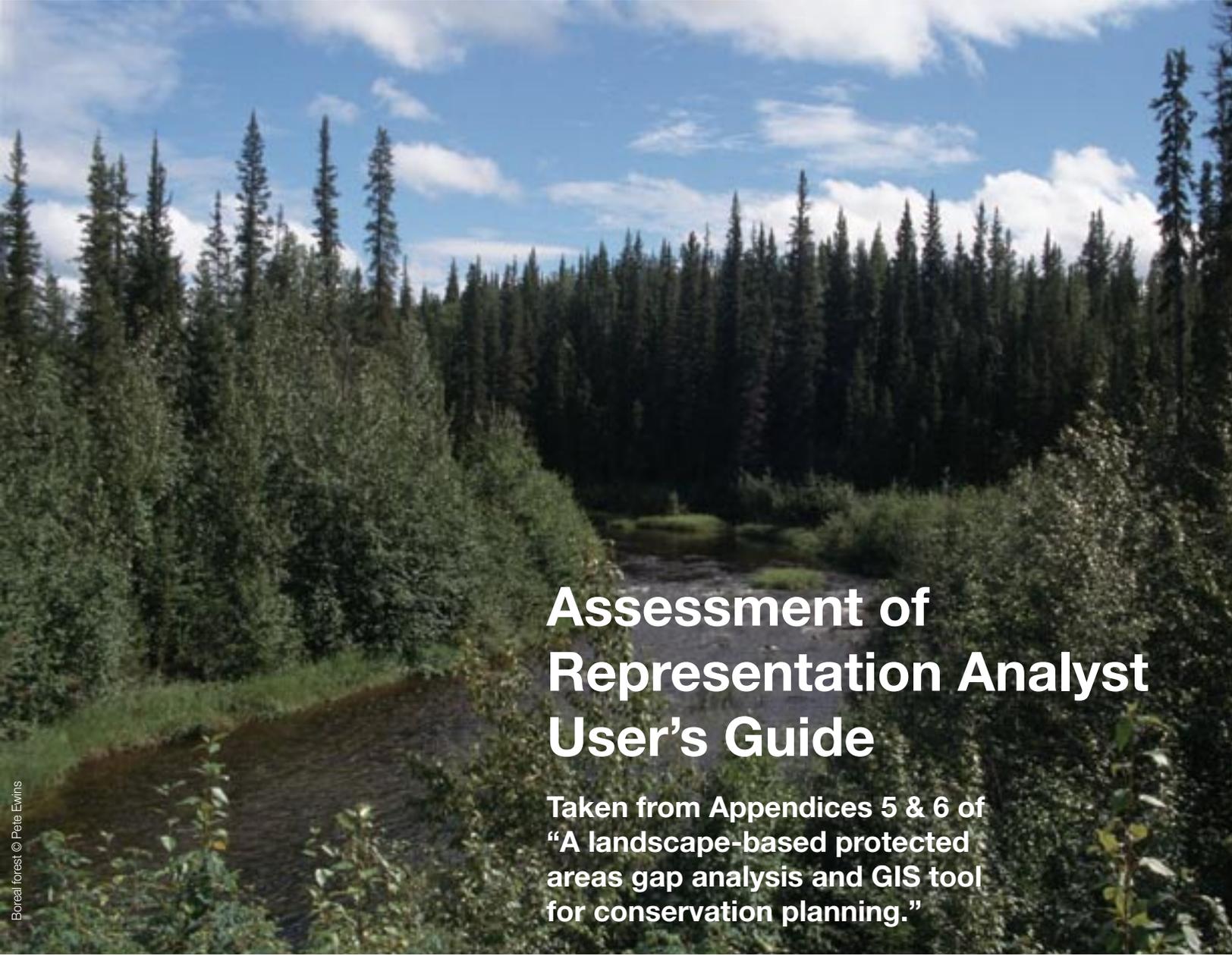# WWF

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Assessment of Representation Analyst User's Guide

Taken from Appendices 5 & 6 of "A landscape-based protected areas gap analysis and GIS tool for conservation planning."

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Assessment of Representation Analyst v9 User's Guide

1.1 General

WWF-Canada's Assessment of Representation Analyst (AoR Analyst) is an ArcGIS extension that provides the capability to assess enduring feature[19] representation by protected areas or protected area candidate sites. Representation is measured according to several conservation criteria that include size requirements to maintain viable populations of native species and sustain ecological processes, environmental gradients (e.g. elevation), important habitat types, habitat quality and adjacency. Details about how the extension evaluates each of the criteria are provided in "A landscape-based protected areas gap analysis and GIS tool for conservation planning", to which this document is an appendix.

1.2 Technical Requirements

An operating system of Windows 2000/XP is required. The tool will not run on Windows NT. The latest version of the AoR Analyst will run on any compatible ArcGIS 9.x module (e.g. ArcView 9.0). The ArcGIS 9.x Service Pack 3 and the Spatial Analyst extension and must also be installed for the AoR Analyst to operate. The minimum recommended hardware requirements are 500 Mhz processor and 256 MB RAM.

1.3 Data Requirements

To complete an assessment of representation the user must identify specific data layers for enduring features (polygons), protected areas (polygons), road/rail/utility infrastructure (lines), shoreline (lines) and elevation classes (grid). Most data sets are readily available through web sources (Table 1). The user can specify different data sets than those listed in Table 1, however the scale of the datasets may impact the results of the analysis so it is important to be consistent when running subsequent assessments. The enduring features are obtainable through the WWF ftp site, upon request, while the other base datasets are the best-known, freely available and downloadable national datasets.

Data Requirement	Source
Enduring Features	WWF-Canada (ftp://ftp.wwf.ca – obtain the username and password from WWF-Canada); derived from the Soil Landscapes of Canada http://sis.agr.gc.ca/cansis/nsdb/slc/intro.html
Existing Protected Areas	Available separately from each jurisdiction in Canada (some datasets are downloadable directly from these websites): AB: http://www.cd.gov.ab.ca/preserving/parks/lrm/ BC: Business Solutions Branch' GIS data: http://srmwww.gov.bc.ca/dss/coastal/download.html MB: Parks Branch, Manitoba Natural Resources; http://www.gov.mb.ca/conservation/pai/pai_material.html for maps NB: New Brunswick Department of Natural Resources NF: National Atlas Information Service and Newfoundland Protected Areas Association NT: http://www.enr.gov.nt.ca/pas/index.htm

[19] An enduring feature can be defined as, "A landscape element or unit within a natural region characterized by relatively uniform origin of surficial material, texture of surficial material, and topography-relief"(Kavanagh and Iacobelli 1995).

Data Requirement	Source
	NS: Department of Natural Resources NU: CD from the Nunavut Geoscience Office http://pooka.nunanet.com/~cngo/) ON: available through the Ontario Geospatial Data Exchange membership with the Ontario Ministry of Natural Resources. PE: n/a QC: Ministère de l'Environnement at de la Faune http://www.menv.gouv.qc.ca/biodiversite/aires_protegees/aires_quebec.htm for info SK: through Saskatchewan Environment upon request. YT: Yukon Department of Renewable Resources The Canadian Conservation Areas Database is a national database available from the Canadian Council on Ecological Areas (CCEA) as a point or polygon layer. A word of caution: this data layer is not complete to WWF's protected area standards (e.g. it does not include the Living Legacy sites in Ontario or other interim protected areas). http://geogratis.cgdi.gc.ca/ccea/ccea_e.html
Elevation	**National:** WWF uses the Canada 3D data (30 arc-seconds ~ 662 m[20]) http://www.cits.rncan.gc.ca/cit/servlet/CIT/site_id=01&page_id=1-005-002-005.html **NTS Tiles:** Canadian Digital Elevation Data (1:250 000) http://geobase.ca/
Shoreline and Drainage	National Scale Frameworks Hydrology – Drainage Network (1:1,000,000) http://geogratis.cgdi.gc.ca/clf/en?action=geobase
Roads	WWF-Canada recommends the National Road Network (by jurisdiction): http://www.geobase.ca/ Other sources: National Scale Frameworks: National Road Network (1:1,000,000); http://geogratis.cgdi.gc.ca/clf/en?action=geobase. This dataset is very coarse in scale but accurate. For a slightly more detailed, although outdated, roads layer for northern regions, use the 'vmap' data available through the Geogratis FTP.

Table 1. Data required or recommended for analysis of all representation criteria in the automated gap analysis tool.

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[20] This data varies in resolution from 3 to 12 arc-seconds, which is a higher resolution than what WWF-Canada has used in the past for its analysis.

1.4 Using The Extension To Conduct An Assessment

Before an assessment can be conducted, the extension must be enabled and the toolbar must be added into the current session of ArcMap. Spatial Analyst must also be enabled before an assessment can be conducted.

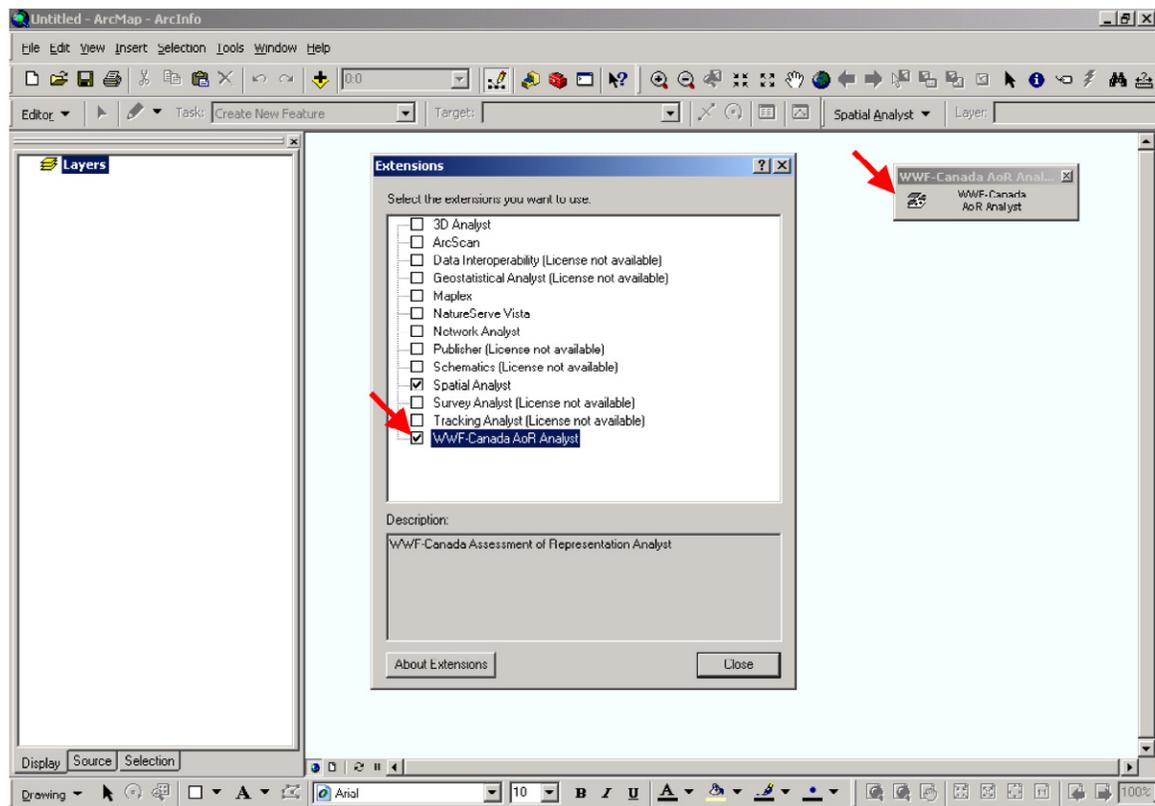The extension and toolbar will appear as in Figure 1.

Figure 1. The WWF-Canada AoR Analyst extension and button in ArcGIS 9.

Clicking on the command button initiates the WWF-Canada AoR Analyst interface, which allows the user to establish the input parameters and settings necessary to conduct the assessment (Figure 2). The AoR Analyst Interface will be local to the data frame in which it is opened. Therefore the data frame must contain all the input data required to conduct the assessment. As the AoR Analyst tool performs spatial analysis operations, each data layer must have its projection defined and must be the same projected coordinate system with metric units (i.e... not in decimal degrees).

The Interface allows the user to move forwards and backwards through 4 steps to establish the input parameters and settings necessary to conduct the assessment.

Step 1/4: Assess Representation by... Dialog

The AoR 9 Analyst offers the user the option to use feature classes from either shapefiles (or coverages) or personal geodatabase.

If all the polygons in the protected areas and the enduring features layers are required to run the assessment, then the *all protected areas and enduring features* button should be checked. If the assessment is to be conducted on a selected subset of protected areas and enduring features, then the *current selection of enduring features and protected areas* button should be checked. The latter option assesses representation only for those selected enduring features by the selected overlapping protected areas. If a subset of protected areas is being used, it is recommended that the user ensure that all adjacent, connected protected areas (within a distance of 0) are also selected. This may mean that some of the protected area polygons not overlapping the enduring features also get selected. Otherwise, the assessment may score lower for the Adjacency Score.

> **NOTE: The AoR 9 routine automatically dissolves the boundaries between adjacent protected area polygons, and dissolves enduring feature polygons in the course of its analysis. Arc GIS 9 cannot dissolve more than 500 polygons at one time due to a known issue in its geoprocessing framework. The user should check the number of polygons in the protected areas and enduring feature layers (or selections thereof) before running the assessment.**
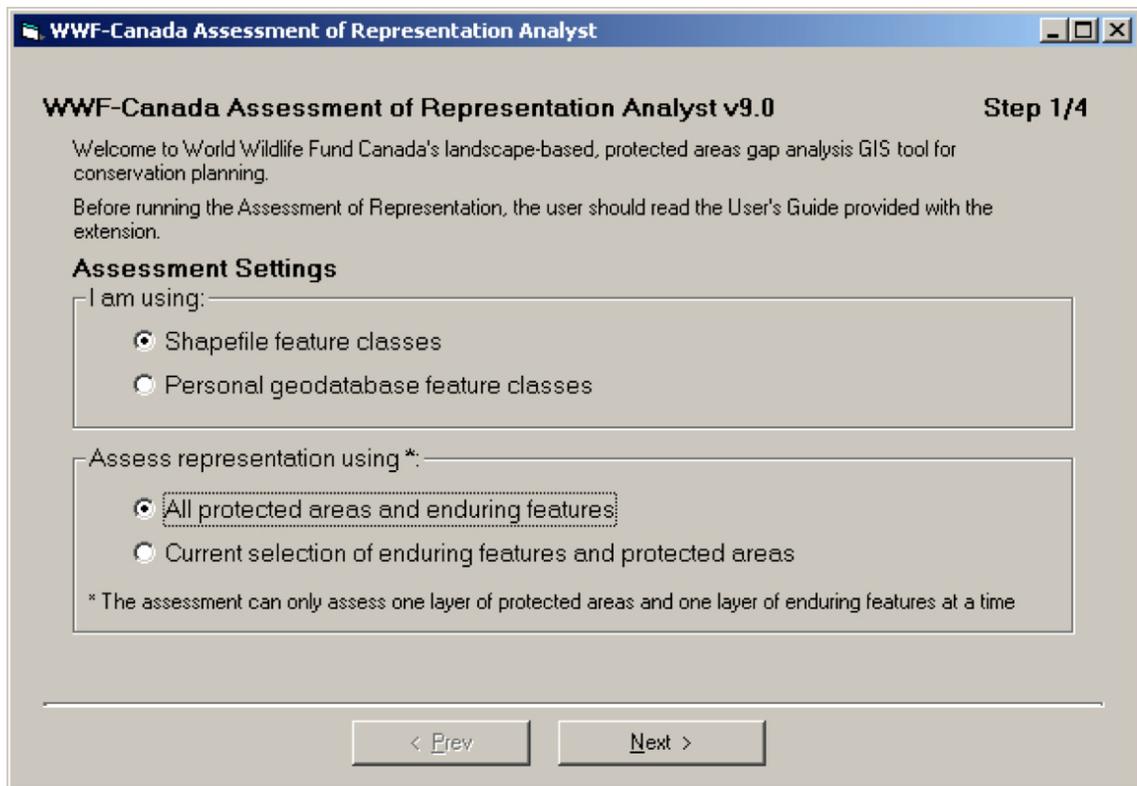

Figure 2. AoR Analyst Interface showing step 1 of 4.

Step 2/4: Assessment Layers Dialog

The Assessment Layers Dialog (Figure 3) by default requires that a dataset, and for some layers, a field item, be specified for each of the following input parameters:

1. *Enduring Feature Layer or Equivalent (POLY)* – This identifies the polygonal enduring features theme that will be used as the basis for the assessment. The user may use WWF-Canada's enduring features dataset or another equivalent dataset (eco-units in New Brunswick, Natural Landscapes for Nova Scotia, Ecosystem Units for British Columbia, etc.) if the field structure is similar to that of the enduring features. Please note that the AoR has not been tested on other base datasets.

   For each disturbance zone developed by WWF-Canada, a unique set of size guidelines were generated. The user should determine within which disturbance zone the enduring features in question fall, and make a temporary selection of these features or create a shapefile. The user can make a spatial selection by overlapping the disturbance zone layer on the enduring features or by selecting the attribute (DIST_ZONE) value in the enduring feature layer that corresponds with the appropriate disturbance zone. Since the enduring features are unique to each natural region and can be distributed in several disjunct polygons, the user should ensure that all the enduring feature polygons within the natural regions that intersect the disturbance zone are selected (see Appendix 2 for more information about disturbance zones). In some cases, this could mean selecting multiple enduring features that belong to several natural regions, even if only small portions of these regions overlap the area of interest.

   Unique Feature Code Field – This is the field in the enduring feature layer (or equivalent) that contains the unique code that differentiates each feature type in a natural region. This field must be of string or integer type. WWF-Canada's enduring features are unique to each natural region i.e. features with the same properties in two different natural regions will have a different Unique Feature Code. In WWF-Canada's enduring features dataset, the field name is EFCODE.

   Natural Region Field – This is the field in the enduring features layer that indicates the code of the Natural Region (or eco-region) in which an enduring feature is found. WWF uses the field WWFCODE. The JURCODE contains the original natural region provided by the jurisdiction, while the WWFCODE contains, for some jurisdictions, a modified JURCODE. The EFCODE should be unique to each WWFCODE. WWF-Canada typically uses the WWFCODE for the natural region field.

   NOTE: It is important to ensure that all the enduring feature polygons with the same EFCODE are selected for an assessment since the representation is based on the total area of the feature.

2. *Protected Area Layer (POLY)* – This identifies the protected areas layer that will be used for the assessment. Candidate areas may be used here instead, but the routine currently only assesses one layer at a time. Therefore, any existing protected areas and candidates to be included in the assessment will need to be merged into one layer. A subset or selection of the polygons in this layer may also be used by choosing the *current selection of enduring features and protected areas* in Step 1. Before running the assessment, the user should check how many polygons are found in the protected areas layer or subset of areas. If the protected areas contains more than 500 polygons, the user may want to dissolve the boundaries between adjacent protected area polygons in order to decrease the number of polygons. Otherwise the routine will not run and the user may be required to re-run the assessment on several subsets.

   Field uniquely identifying each polygon – This is the field in the protected areas layer that uniquely identifies each polygon in the protected areas layer. The internal unique id (FID) is typically used.

3. *Road/Rail/Utility Line Layer (LINE)* – This identifies the infrastructure theme that will be used to calculate linear infrastructure density indices. While this is usually a road line layer, the layer may contain an amalgamation of several landscape fragmenting features such as utility/hydro lines and railway corridors to better give an estimate of the fragmentation/density index. WWF typically uses permanent roads (no tertiary roads) for the assessment at a scale of 1:1,000,000.

4. *Drainage – River/Streams and Shoreline Layer (LINE)* – This identifies the rivers, streams and shoreline theme (lines) that will be used for the assessment. Boundaries of polygonal water bodies should be included in this layer. The data WWF uses typically have a scale of 1:1,000,000.

5. *Digital Elevation Model (GRID)* – This identifies the DEM to be used for purposes of the assessment. WWF typically uses a DEM that has a 30 arc-second (~ 662 m) resolution although a 1 km DEM can also be used.

Figure 3 Assessment Layers dialog box for specifying the location of input data.

Step 3/4: Ecosystem Parameters Dialog

The user is able to browse to the ecosystem.mdb file and select the natural disturbance zone appropriate for the area under examination. This points the AoR Analyst to the protected areas size guidelines developed for the disturbance zone. Appendix 2 of the full documentation kit describes the natural disturbance zones.
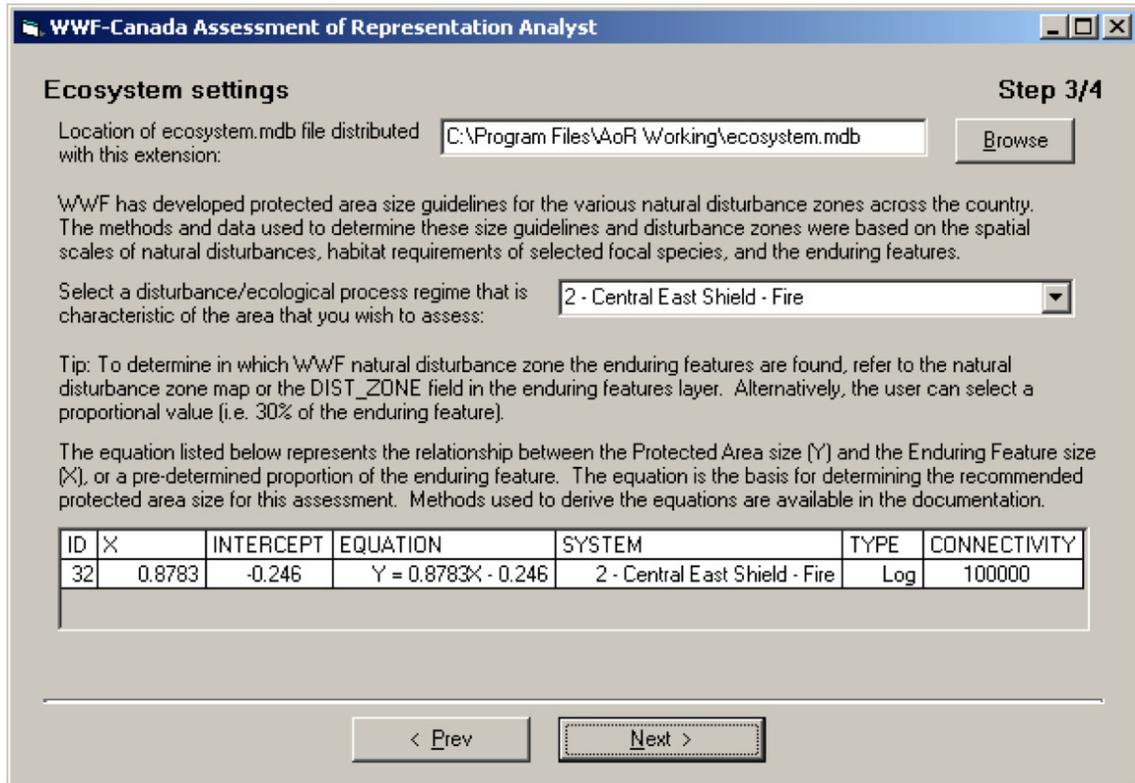

Figure 4 Ecosystem Parameters dialog box for setting the natural disturbance zone and associated recommended protected area size guidelines.

The *ecosystem.mdb* file that is distributed with this application contains the log-log equations that quantify the relationship between enduring feature size and protected area size on the basis of characteristic disturbance-recovery processes (see Appendix 4). Each equation is used to determine the recommended protected area size guidelines appropriate for the disturbance zone.

Log equations:

The log-log equations have been developed for all WWF-Canada disturbance zones. New log-log equations can be added to the Ecosystem.mdb file using a linear equation of the form, $y = ax + b$, where x is the log of the enduring features area, and y is the log of the recommended size. By specifying the type as *log*, the routine will calculate x as the log of the enduring features area and then solve for y, the recommended size, by calculating 10 to the power of the results.

Specifying a proportion:

Alternatively, the automated routine can determine representation based on a fixed proportion rather than a sliding scale. This can be done by creating a new record in the Ecosystem.mdb file using a linear equation of the form, $y = ax + b$, where a is the proportion of representation (e.g. 0.3 for 30%) and b is set to zero. Specify the type as *linear*, and the routine will treat this as any other linear equation.

Connectivity Value:

In addition to the equation that calculates the recommended protected area for the assessment, the ecosystem.mdb includes a Connectivity field, which contains a value used for the Connectivity criterion. This Connectivity value is used to assess the largest overlapping protected areas network on the enduring feature in question. This value varies from the Recommended protected area value in that it attempts to correspond to the area required to maintain long-term ecological integrity within a given disturbance zone. Each disturbance zone has a Connectivity value that applies to all its associated enduring features. Appendix 7 describes how these values were developed.

As indicated, the user may modify or add more equations and connectivity values to the *ecosystem.mdb* file. However, it is important that the field structure of this file is maintained. Changing the field definition of this file in any way will lead to errors in the routine. For each new record, the user must fill out all of the fields in the table for the routine to run properly.

1.4.4 Step 4/4: Output Specifications Dialog

This panel allows the user to select the format for presenting the results of the assessment. A check box for calculating *Natural Region Representation Statistics* is provided. Selecting this option generates an output file that contains representation statistics for each of the Natural Regions included in the analysis. Details of how natural region statistics are calculated are provided in Appendix 6.

Under *Enduring Feature Representation Results – File Specifications*, the user can chose to summarize the results of the enduring features assessment in a *Tabular file only* or in a *Tabular file jointed to the enduring features attribute layer*. The output dbf generated by the routine contains the area calculations and representation scores for each enduring feature. If the user chooses *Tabular file only*, the tabular file can be joined to the enduring features layer at a later time (with EFCODE as the common field).
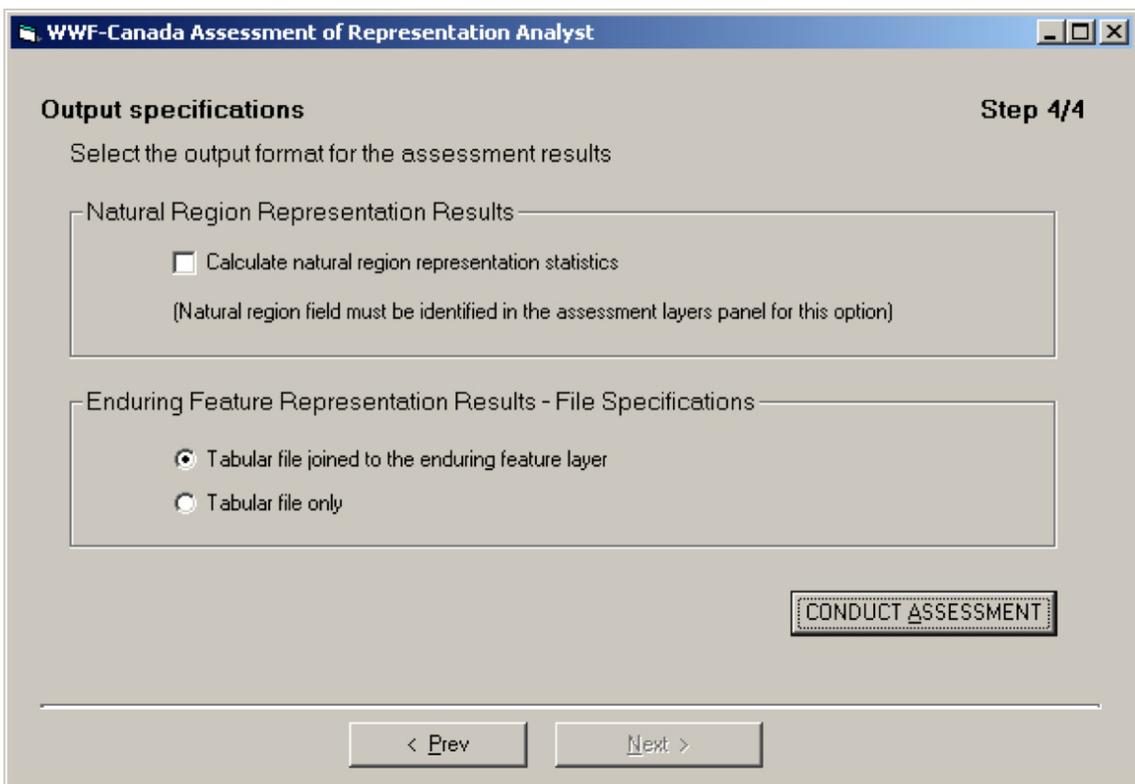

Figure 5 Output Specifications dialog box for selecting the format to present the results of the AoR Analyst.area size guidelines.

Once all input and settings have been entered into the relevant dialogs, the user is ready to conduct an assessment by clicking on the *Conduct Assessment* button.

As the assessment nears completion, the user will be prompted to name the output files and select their location. The routine will create up to 3 output files: a natural region summary .dbf, an enduring feature summary .dbf and a readme text file. The latter is created automatically and uses the enduring feature summary table as the basis for its file name and save location. This text file contains a record of all of the parameters and settings used for the assessment (i.e. the disturbance zone, connectivity value, input shapefiles).

If no protected areas intersect the enduring features in question, a message will alert the user, but the routine will still calculate the recommended protected area in the enduring feature summary table. If no roads or shorelines are found within the enduring features, the user will be notified and the assessment will finish as usual.

1.5 Technical Limitations

The AoR v9 routine makes use of the latest features available with ArcGIS 9. Nonetheless, there are some technical limitations and requirements associated with this version of the AoR tool. These are outlined below:

1. This version of the AoR tool has been developed for ArcGIS 9.x for Windows 2000 or XP, and requires Spatial Analyst and ArcGIS 9.x Service Pack 3 to be installed, so it is limited to users with access to this software and these platforms.

2. ArcGIS 9.x can dissolve a maximum of only 500 polygons. This can limit the geographic extent of the assessment if too many polygons are found in the protected areas or enduring features layer. Dissolving the protected areas layer or limiting the geographic scope of the assessment are currently the only fixes for this issue.

3. The AoR tool cannot perform coordinate system projections on-the-fly. All input data layers must be in the same projected coordinate system. Even though ArcGIS will display layers with different coordinate systems properly on-screen, the geoprocessing performed by the AoR tool will fail.

4. Before running the assessment, the user must make some decisions and data preparations:

    a. Access and prepare the base data to be used;
    b. If required, merge the protected areas and candidate protected areas layers;
    c. Decide on the spatial extent of the assessment;
    d. Decide whether to use a protected area size guideline equation for a set disturbance zone, a new equation or a proportional value;
    e. Determine in which disturbance zone the enduring features (or equivalent) fall;
    f. Decide on whether to use all the polygons in the enduring features and protected areas layers, or only a subset;
    g. Dissolve the protected area polygons if deemed necessary;
    h. Ensure that all the enduring features that fall within the natural regions of interest are included;

5. In order to make the AoR useable and its application consistent across Canada, the suggested national base data sets are relatively coarse in scale, although they are appropriate for the 1:1,000,000 enduring features.

6. The routine was built around the enduring features dataset. It has not been tested on other ecological frameworks, so the routine could produce un-foreseen results.

7. In instances where one large contiguous protected area overlaps multiple disjunct polygons of the same enduring feature (same EFCODE), the routine currently overestimates the area for the largest protected area block calculation (BLOCKHA). When calculating the BLOCKHA, the routine does not recognize the various overlapping portions of a contiguous protected area as being geographically separate. This is currently being investigated but in the interim, the user should take caution in interpreting the BLOCKHA results.

8. The recommended protected area size generated by the AoR tool (RECHA) is based upon the total size of the enduring feature. If an enduring feature is made up of several small, disjunct polygons (all with the same EFCODE), it is possible that the recommended protected area size will not be achievable on any single piece of the enduring feature.

1.6 Field Descriptions

Assessment of Representation Result Table	
EFCODE	Unique identifier from the enduring features layer, based on the user-defined field specified in Step 2/4.
EFCOUNT	Number of records in the enduring features layer sharing the EFCODE. Some enduring features layers contain multi-part polygons (i.e. a single record in the attribute table contains multiple disjunct geometries). For these multi-part polygon layers, the value of the EFCOUNT field will always be 1. For enduring features layers which contain single-part polygons only (i.e. each disjunct polygon has its own record in the attribute table), the value of the EFCOUNT field will be equal to the number of disjunct parts for each EFCODE.
NRCODE	Natural region identifier, based on the user-defined field specified in Step 2/4.
AREAHA	Total area of the enduring feature, reported in hectares.
PROTHA	Total area of protected areas intersecting the enduring feature, reported in hectares.
BLOCKHA	The largest single protected areas block intersecting the enduring feature, reported in hectares.
RECHA	The recommended protected area size for the enduring feature, based upon the equation specified in Step 3/4.
RDLENGTH	Length of road/rail/utility lines intersecting the protected areas within the enduring feature, reported in metres.
SHLENGTH	Length of river/stream/shore lines intersecting the enduring feature, reported in metres.
PSHLENGTH	Length of river/stream/shore lines intersecting the protected portions of the enduring feature, reported in metres.
PROTNET	Total area of largest contiguous protected area network which overlaps the enduring feature by at least 200 ha, reported in hectares.
ECOUNT	Number of elevation grid cells within the enduring feature.
EMEAN	Mean elevation of the grid cells within the enduring feature.
ESTD	Standard deviation of the elevation of the grid cells within the enduring feature.
PCOUNT	Number of elevation grid cells within the protected portions of the enduring feature.
PMEAN	Mean elevation of the grid cells within the protected portions of the enduring feature.
PSTD	Standard deviation of the elevation of the grid cells within the protected portions of the enduring feature.

	Assessment of Representation Result Table continued
MODVAR	The calculated 'modified variance' value for the enduring feature, used to score the environmental gradients criterion. Calculated as: $(|EMEAN-PMEAN|)/((ESTD+PSTD)/2)$
SZ_SCOREA	Size score A – see Appendix 6 for scoring
SZ_SCOREB	Size score B – see Appendix 6 for scoring
SZ_SCOREC	Size score C – see Appendix 6 for scoring
ELV_SCORE	Environmental gradients score – see Appendix 6 for scoring
HAB_SCORE	Important habitat types (shoreline) score – see Appendix 6 for scoring
HBQ_SCORE	Habitat quality score – see Appendix 6 for scoring
TOT_SCORE	Sum of individual category scores
REP_STAT	Overall representation status of the enduring feature – see Appendix 6 for scoring

	Natural Regions AoR Summary Results Tables
NRCODE	Natural region identifier, based on the user-defined field specified in Step 2/4.
COUNT	Number of enduring features within the natural region.
TOTAREAHA	Total area of the natural region, reported in hectares.
A_AREA	Total area of the natural region which scored "A"
A_PrCent	Proportion of the natural region which scored "A"
B_AREA	Total area of the natural region which scored "B"
B_PrCent	Proportion of the natural region which scored "B"
C_AREA	Total area of the natural region which scored "C"
C_PrCent	Proportion of the natural region which scored "C"
D_AREA	Total area of the natural region which scored "D"
D_PrCent	Proportion of the natural region which scored "D"
REP_STAT	Overall representation status of the natural region – see Appendix 6 for scoring

DISCLAIMER
This Extension is provided as a guide to help protected areas planners and conservation agencies conduct representation assessments. The results of the assessments conducted by these parties in no manner represents the official position of WWF-Canada on any features being assessed. WWF-Canada is not responsible for any damages in any form what so ever resulting from the use the AoR Analyst Extension. Use of this extension indicates acceptance and compliance with the terms stated above.

1.7 Contact

Limited support on the use of this extension can be obtained from WWF-Canada. Comments, suggestions and questions about AoR Analyst may be directed to:

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You can obtain more information on WWF-Canada's conservation activities by visiting wwf.ca

1.8 References

Kavanagh, K. and A. Iacobelli. 1995. A protected areas gap analysis methodology: Planning for the conservation of biodiversity. World Wildlife Fund Canada Discussion Paper. Toronto, Ontario. 68 pp.

Noss. R., 1995. Maintaining Ecological Integrity in Representative Reserve Networks. World Wildlife Fund Canada/US, Discussion Paper.

Representation Scores and Classes

Representation criteria decision rules and thresholds for enduring features in the automated gap analysis tool.

Representation Criteria		Scoring Guidelines for Representation Criteria (scores are indicated in brackets)					Maximum Possible Score
PROTECTED AREA SIZE AND CONNECTIVITY	A - Largest Single Protected Area Block on Enduring Feature	Meets size guideline (≥95% of recommended size is protected) (4)	Is at least 75% of the recommended size (3)	Is at least 50% of the recommended size (2)	Is at least 25% of the recommended size (1)	Is > 200 ha and <25% of the recommended size (0.5)	4
	B - Total Area Protected on Enduring Feature	If Size Score A = 4, skip this step, otherwise:	Meets ≥ 95% of recommended size (1)	Meets at least 50% of the recommended size (0.5)			(1)
	C - Size of Largest Contiguous Protected Area Complex Intersecting the Enduring Feature (Connectivity)	Has a minimum of 200 ha overlapping the feature and is ≥ 75% of the Connectivity Value. (1)	Has a minimum of 200 ha overlapping the feature and is at least 25% of the Connectivity Value. (0.5)				1
ENVIRONMENTAL GRADIENTS		If protected portion > 200 ha, and the calculated mean difference over the average standard deviation (MODVAR) ≤ 0.5 (1)	If protected portion > 200 ha, and the calculated mean difference over the average standard deviation (MODVAR) ≤ 0.75 (0.5)	If protected portion > 200 ha, and the calculated mean difference over the average standard deviation (MODVAR) > 0.75 (0)			1
SHORELINE AND STREAM HABITATS		Size Score A <> 0 and no shoreline habitat recorded in the enduring feature (precautionary approach); or the shoreline habitat in the protected portion ≥ 95% of the proportion of shoreline habitat in the enduring feature. (1)	Size Score A <> 0 and shoreline habitat in the protected portion is at least 50% of the proportion of shoreline habitat in the enduring feature. (0.75)	Size Score A <> 0 and shoreline habitat in the protected portion is at least 5% of the proportion of shoreline habitat in the enduring feature. (0.5)			1
HABITAT QUALITY		Size Score A <> 0 and protected portion is relatively intact: road density ≤ 0.5m/ha. (1)	Size Score A <> 0 and protected portion is less intact: road density > 0.5m/ha and < 1.75m/ha. (thresholds interpreted from Noss 1995) (0.5)	Size Score A <> 0 and protected portion is not intact: road density ≥ 1.75m/ha. (0)			1
						TOTAL:	8

Representation Score Interpretation

Total Score	REP_STAT	Qualitative Interpretation*
≥6	A	Representation of this enduring is either at or approaching the recommended protected area size guideline, or is moderately below the guideline, but contains areas with high quality, a diversity of elevational gradients, and/or representative proportions of riparian habitat.
≥3.5 and <6	B	Representation of this enduring feature is moderate to low with respect to recommended protected area size guidelines, but may contain areas with high quality, a diversity of elevational gradients, and/or representative proportions of riparian habitat.
≥1 and <3.5	C	Representation of this enduring feature is either quite low with respect to recommended protected area size guidelines, but contains areas with high quality, a diversity of elevational gradients, and/or representative proportions of riparian habitat, or representation is moderate, but the quality, diversity of elevational gradients and riparian habitat is low.
<1	D	There is very little to no representation of this enduring feature in protected areas.

*Note: More precise interpretations should be extracted from the individual criteria scores provided in the .dbf output (See Appendix 5 AoR Analyst User's Guide for output field descriptions.)

Decision rules for natural region representation classes

Region graded as "A" if:
• > 90% of the region is adequately represented at the Enduring Feature level

If the above does not apply, then Natural Region graded as "B" if:
• At least 50% of the region is adequate and at least 80% of the remaining enduring features are either partial or moderate
• At least 80% of the region is moderate
• The combination of adequate and moderate enduring features is >80% of the natural region

If the above does not apply, then Natural Region graded as "C" if:
• The combination of moderate and partial and adequate enduring features is at least 80% of the natural region
• The combination of moderate and partial enduring features is at least 80% of the natural region
• The combination of adequate and partial enduring features is at least 80% of the natural region
• If 50% of the natural region is moderate
• If 80% of the natural region is partial
• If the adequate portion of the natural region is > 0%

If the above does not apply, then Natural Region graded as "D":
• None of the above mentioned cases exists

Forest Products | Association des produits
Association of Canada | forestiers du Canada
fpac.ca | fpac.ca

ESRI Canada

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