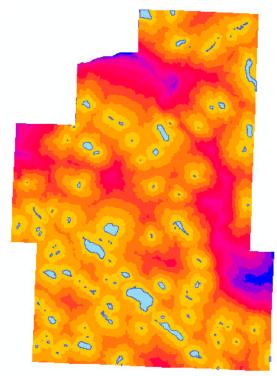
Pond Distance and Habitat for use in Wildlife Modeling



These instructions enable you to aggregate layers within a study area, calculate new fields, and create new data out of existing data, for use in further habitat analyses. In this example, Alberta Vegetation Index (AVI) coverages are available to extract habitat, landuse, soil moisture, and pond information from. A DEM is also used to incorporate slope into the habitat model. In Part 1, you use <u>ArcGIS 8.x</u> to perform the following:

- Calculate new fields by selecting values according to habitat classification criteria
- Use the geoprocessing wizard and XTools to dissolve/explode
- Convert to raster, derive slope, and calculate new grids

You need to have the **XTools** and **Spatial Analyst** extensions installed for use with ArcGIS. In Part 2, you will use <u>ArcView 3.2</u> with the **Nearest Features** extension to do the distance analysis.

ORIGINAL DATA

Avi_all6twp.shp	shapefile of merged AVI data within the study area
Boundary.shp	shapefile of the study area boundary
DEM	raster grid of a digital elevation model

CREATED DATA

All_ponds.shp Habitat	shapefile of pond data selected from the AVI data raster grid of wood frog habitat rankings
Land_soil	raster grid of landuse/soil moisture rankings
Slope	raster grid of slope derived from the DEM
Slope10c	reclassified grid of 10 slope class rankings
Cost_hab	raster grid created by combining habitat criteria layers
CostDistance	raster grid created from the cost weighted surface function

PART 1

Start ARCMAP:

- 1. Choose START \rightarrow PROGRAMS \rightarrow ARCGIS \rightarrow ARCMAP
- 2. Start using a new empty map document
- 3. Click the ADD DATA button and add Avi_all6twp.shp, Boundary.shp and DEM

Enable the required extensions:

Whenever adding an extension to ArcMap, you must first enable it and then display the toolbar.

- 4. Choose TOOLS \rightarrow EXTENSIONS
- 5. Click a check beside XTOOLS and SPATIAL ANALYST to enable them
- 6. Click CLOSE
- 7. Right click on an empty spot of any visible toolbar
- 8. Make sure there is a check beside XTOOLS and SPATIAL ANALYST to make them visible
- 9. Save the map document

Select and create the ponds:

The first step is calculating a field with a value that indicates which features are ponds as defined by your criteria.

- 10. In the table of contents, right click on avi_all6twp.shp
- 11. Choose OPEN ATTRIBUTE TABLE
- 12. Click on the OPTIONS button
- 13. Choose ADD FIELD
- 14.Name the field **POND**, of type **TEXT**, with length **1**
- 15. Click OK
- 16. Click on the OPTIONS button
- 17. Choose SELECT BY ATTRIBUTES
- 18. Create a new selection with the following SQL expression:

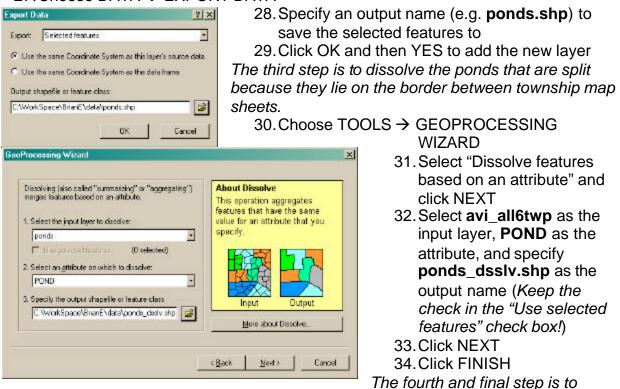
"L1_MOIST" = 'a' OR "L1_NATURAL" = 'NWL' OR "L2 MOIST" = 'a' OR

- "L2 NATURAL" = 'NWL'
- 19. Click APPLY
- 20. Right click on the POND field heading
- 21. Choose CALCULATE VALUES
- 22. Click YES to the warning
- 23. Type "y" in the expression box
- 24. Click OK



indat Unique values: "L2_MOD_2_Y" - <> Like "NWF" "L2_NON_FRS" > > And "NWF" "L2_NON_F.2" < <= Or "NWF" "L2_NON_F.2" < <= Or "NWF" "L2_NON_F.2" < <= Or "NWF" "L2_NATHRO." _ < <= Or "NWF" "L2_NATHRO." _ < <= Or "NWF" "NWF" "L2_NATHRO." _ _ < <= Or "NWF" "L2_NATHRO." _ _ < <= Or "NWF" "L2_NATHRO." _ _ _ < Complete Late "L2_NATURAL" _ _ SQL Into Complete Late Complete Late ELECT "FROM evic_eRXmp WHEFE: _ _ _ _ _ _ _ _ _ _ _ _ _ <th>and a second second</th> <th>new selection</th> <th></th> <th></th>	and a second	new selection		
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		SQL Into		Complete List
	ELECT * FROM avia	Stop WHERE:	- NW120	-

25. CLOSE the Select By Attributes dialog box
The second step is to export those selected features into their own layer.
26. In the table of contents, right click on avi_all6twp.shp
27. Choose DATA → EXPORT DATA



explode the resulting multi-part shape into single-part shapes for each poind. 35. Choose XTOOLS \rightarrow FEATURE CONVERSIONS \rightarrow CONVERT MULTIPART

SHAPES TO SINGLE PARTS

36. Select **ponds_dsslv** as the layer to convert and specify **all_ponds.shp** as the output

37. Click OK

This last pond layer appears similar to the previous dissolved layer, but when you use the selection tool (from the TOOLS toolbar) to interactively select one pond – all ponds are highlighted in **ponds_dsslv** and only the single pond is highlighted in **all_ponds**. 38.Choose XTOOLS \rightarrow CALCULATE AREA,

PERIMETER, LENGTH

- 39. Select **all_ponds** as the layer to measure
- 40. Click the SPECIFY button and then click OK to accept the layers original coordinate system

41. Click OK

If you open the attribute table, you will see area and perimeter values calculated for each pond according to the default units set in XTools.

culate Tool	
Select layer to measure:	
al_ponds	
	21.14
Type: Projected Coordinate System Name: NAD_1927_UTM_Zone_12N	
Specific source, data units (only for Univers	en CS)
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•	
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Name: NAD_1927_UTM_Zone_12N Units: Meter	
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Help OK	Cance

Select and calculate the habitat and landuse/soil moisture fields:

To create habitat criteria layers for use in further modeling, you will first need to apply selection and classification labeling to each polygon record in the **avi all6twp.shp** layer and calculate new field values.

42. Close all tables and other dialog windows that may be open

43. Click on the CLEAR SELECTED FEATURES button in the TOOLS toolbar

44. Turn all other layers off except for avi_all6twp.shp

45. In the table of contents, right click on avi_all6twp.shp

46. Click OPEN ATTRIBUTE TABLE

47.Click OPTIONS → ADD FIELD

48. Name the field Habitat, of type SHORT INTEGER, with precision 2

49. Click OK

50. Click on the OPTIONS button

51. Choose SELECT BY ATTRIBUTES

Create new selections with each of the following SQL expressions in the table below and calculate the corresponding habitat ranking value.

52.Enter <the SQL expression>

53. Click APPLY

- 54. Right click on the **HABITAT** field heading
- 55. Choose CALCULATE VALUES
- 56. Click YES to the warning
- 57. Type <the value> in the expression box
- 58. Click OK
- 59. Repeat the previous 7 steps for each entry in the table

Also, add a new field for **Land_soil** and apply selection/calculation.

Example Habitat Table (substitute your criteria here):

<the expression="" sql=""></the>	<the value=""></the>
"L1_SP1" = 'Aw'	1
"L1_SP1" = 'Pj'	7
"L1_SP1" = 'Sw'	7
"L1_SP1" = 'Sb'	5
"L1_NATURAL" = 'NMS'	9
"L1_NATURAL" = 'NWR'	10
"L1_ANTHRO1" = 'AIG'	10
"L1_ANTHRO1" = 'AIH'	10
"L1_NON_FRS" LIKE 'S%'	1
"L1_NON_FRS" = 'BR' OR	2
"L1_NON_FRS" = 'HF' OR	
"L1_NON_FRS" = 'HG'	
etc	etc

Note: These are purely made up for demonstration purposes only. Use criteria that you have gleaned from the scientific literature. Also, see **"Building an SQL** expression" in ArcGIS Desktop Help for more information on making selections.

Create habitat rasters:

Working with raster data requires the Spatial Analyst extension. When using this extension it is important to set the analysis OPTIONS the way you need them to be. In this example, the study area boundary.shp file is used a mask, and the extent is snapped to the DEM grid and cell size. This ensures that the output is only processed within the boundary mask, and the output grid cells are in the same size and spatial position as the DEM cells.

Set the Analysis Options:

Options		2 Dptions	Options	<u>₹</u> ×
General Extent Ca	ll Size	General Extent CellSize	General Extent CellSize	
Working directory:	C \WeikSpace\BrianE\data	Analysis extent: As Specified B	Below _ Analysis cell size: Same as Layer "demo	📰 : 🥃 🛛
Analysis mask:	bounday 💽	[2] Top: 6125	29725 Celsize: 50	
- Analysis Doordinate	e System	1 aft 318085 1638 Right	Number of rows 592	
	r will be saved in the same occrding input (or first raster input if there are t	te	Number of columns: 432	
	t will be saved in the same coordina active data frame.	ie .		
	message if raster inputs have to be analysis operation.	Snap extern fo:		
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- 60. Choose SPATIAL ANALYST → OPTIONS
- 61. In the GENERAL tab, set Working directory and specify **boundary** as the analysis mask
- 62. In the EXTENT tab, set the Analysis extent to **boundary** and Snap extent to **DEM**
- 63. In the CELL SIZE tab, set the Analysis cell size to **DEM**
- 64. Click OK

Convert features to raster:

The classified AVI data must be converted to raster grids so that they can be combined using Spatial Analyst's RASTER CALCULATOR and COST WEIGHTED

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50		
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		50 [E:\WorkSpace\BrianE\data\h

functions.

- 65. Choose SPATIAL ANALYST → CONVERT → FEATURES TO RASTER
- 66. Select avi_all6twp as the input layer
- 67. Select HABITAT as the field to convert on
- 68. Specify habitat as the output raster name
- 69. Click OK
- 70. Repeat for the land_soil attribute field

Derive raster surfaces:

The first part here is to create a slope class grid by deriving slope from the DEM and then create a permanent grid by reclassifying into ranked values.

UofA Biological Sciences – GIS

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clase field:	<vske></vske>	
et values to reclassi	y	
Old values	New values	_≜ Classity
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2.080843735 • 4.161		Unique
16168747 - 6.2425	C	1114144-0-1
i.242531205 · 8.323		Add Enty
323374939 · 10.40		-
1	2	Delete Entries
Loed	Save	
Change missing val	ies to NoData	
put raoter	C/WorkSpace/BrianE/data/slop	e10c 🛛

The second part is to combine the habitat criteria into a cost surface.

- 79. Choose SPATIAL ANALYST → RASTER CALCULATOR
- 80. Type the expression to combine the raster layers into your habitat cost surface

Make sure that your rankings are appropriate for each raster (lower values indicate better potential habitat in the habitat, land_soil, and slope10c rasters and higher values indicate worse potential habitat).

- 81. Click EVALUATE
- 82. In the table of contents, right click on **Calculation**
- 83. Choose MAKE PERMANENT
- 84. SAVE as a new name; e.g. Cost _hab
- 85. In the table of contents, rename the layer name to **cost hab**

Cost weighted distance:

Cost Weighted	<u>? ×</u>	Refer to "Cost Weighted Distance mapping" and
Distance Io: Dost raster: Maximum distance:	al_ponds 🔹 🕍	related topics in ArcGIS Desktop Help for more information on this function. 86.Choose SPATIAL ANALYST → DISTANCE
Create direction	(Temporey)	COST WEIGHTED 87.Select all_ponds for Distance to
Create allocation:	(Tempolary)	88. Select cost_hab as the cost raster
Output raster:	ace\BrianE\data\CostDistance	89. Specify and output raster name; e.g.
	OK Cancel	CostDistance
		90. Click OK

91.SYMBOLIZE this output and create a map layout

- 73. Select the desired parameters or leave at defaults
 - 74. Click OK
 - 75. Choose SPATIAL ANALYST → RECLASSIFY

71. Choose SPATIAL ANALYST →

72. Use **DEM** as the input raster

SURFACE ANALYSIS → SLOPE

- 76. Click the CLASSIFY button and set the method and parameters as desired: e.g. Equal Interval, 10 classes
- 77. Specify and output raster name; e.g. slope10c

78. Click OK

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[slope10c] + [HAB	FIAT]						

31 July 2003

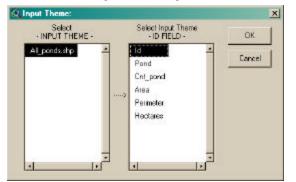
10. In the SELECT

box, select

PART₂

Nearest features in ArcView 3.x:

- 1. Choose START MENU → PROGRAMS → ESRI → ARCVIEW GIS
- 2. Create a new project with a new view
- 3. Add **all_ponds.shp** to the view now



COMPARISON THEME

AND ID FIELDS dialog

all_ponds.shp as the

ID as the ID field

then click OK

RESULTS Table data for Nearest Features

Do you want to join your RESULTS table with your input Theme Attribute Table?

Comparison Feature ID

E Centroid X-Coordinate

E Centroid Y-Coordinate

P Distance to Centroid

E Bearing to Centroid

Sel Distances to Zero?

Join Tables

Data for RESULTS table

comparison theme, and

Please enter the number of closest comparison features you want

to identify and check off the fields you went in your Results tables

Number of Closest Comparison Features per Input Feeture: 1

In cases where either the Input Feature or the Comparison

TO LIST for each set of

15. Check "Save connecting

lines in a shapefile?"

17. Specify the output names

connecting lines you want

P Comparison Feature Theme

F Closest Edge X-Coordinate

P Dosest Edge Y-Coordinate

P Distance to Closest Edge

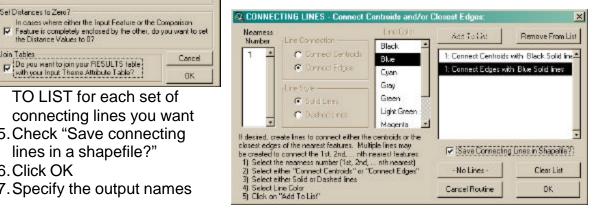
nK

E Bearing to Closest Edge

- Choose FILE → EXTENSIONS
- 5. Click a check beside **Nearest** Features v3.5
- 6. Click OK



- 7. In the View Toolbar, click on the NEAREST FEATURES button
- 8. In the INPUT THEME dialog box, select **all_ponds.shp** as the input theme and **ID** as the ID field
- 9. Click OK
- Q Select Comparis Themes and ID Fields x Select COMPARISON THEME Select Comparison Theme ID FIELD List of comparison Themes; ID fields In Analiza All ponds shp All ponds sho; Id ld. Pond Cnt_pand Add Área Perimeter Hestares Remove 11. Click the ADD button and Cancel DK.
 - 12. In the DATA FOR RESULTS TABLE dialog box, enter the number of closest comparison features, select the desired results. etc.
 - 13. Click OK
 - 14. In the CONNECTING LINES dialog box, click on the nearness number, choose line connection, select line color, and click ADD



16. Click OK