

Analysis of Locations and Temporal Datasets

These instructions enable you to extract the following seasonal habitat-related variables for point locations by date using ArcGIS (ArcInfo) 9 software. The example used here is to extract ice concentration, snow depth, and related oceanographic information for polar bear GPS locations. The tools are flexible enough to run with different parameters. The primary variables used here are listed below [new field names indicated in square brackets]:

- Distance to 10% contour line [C10]
- Distance to 50% contour line [C50]
- Distance to 75 % contour line [C75]
- Ice concentration [ICECONC]
- Snow depth [SNOWDEP]
- *Ocean depth [ODEP]
- *Distance to land [DISTLAND]

(*Note: The last two are not temporally dependent, but are included here due to the initial request for tool development)

The **TemporalTools.tbx** and scripts must be downloaded from:

<http://www.biology.ualberta.ca/facilities/gis/?Page=485>.

Each tool is numbered in the order it should be executed.

Tool #	Description	Script Name
0	Adds new field and calculates the user-specified time difference in the new field e.g. adds 3 days (use -3 to subtract 3 days). Useful to match to raster filenames for later analyses. Date field must be text and in the format YYYY_MM_DD.	0_CalculateDateName.py
1	Creates contours, intermediate folders and data subsets for use in calculating distances between locations and each contour value, selected by matching date values. Note: Two parts are needed due to memory leaks in the gp, part 1b is run in subprocesses.	1a_DistanceToSelectedContours.py and 1b_DistanceToSelectedContours.py <i>Requires ARCINFO and SPATIAL ANALYST</i>
2	Adds new field and then updates each record value with the cell value of the corresponding raster. Can be used with ice concentration or snow depth rasters.	2_GetCellValueByDate.py <i>Requires SPATIAL ANALYST</i>
3	Adds new field and then updates each record value with the cell value of the input raster. Can be used with any raster. Assumes raster and locations have same extent/spatial reference.	3_UpdateLocationsWithRasterValue.py <i>Requires SPATIAL ANALYST</i>
4	Adds new field with distance to edge (e.g. land) values if polygons are used then distance to edge when inside polygon will be 0	4_DistanceToEdge.py <i>Requires ARCINFO</i>

ORIGINAL DATA

subsets.shp	a shapefile of point locations having an explicitly formatted text field containing the date in this format: YYYY_MM_DD (this prevents software confusion between DD/MM/YY and MM/DD/YY stored date formats)
iYYYYMMDD.tif	multiple ice concentration rasters, named by date
sYYYYMMDD.tif	multiple snow depth rasters, named by date
bathy	ocean bathymetry
land_edge.shp	polygon representing shoreline

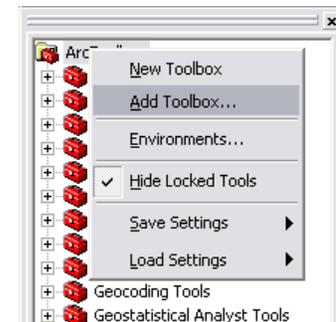
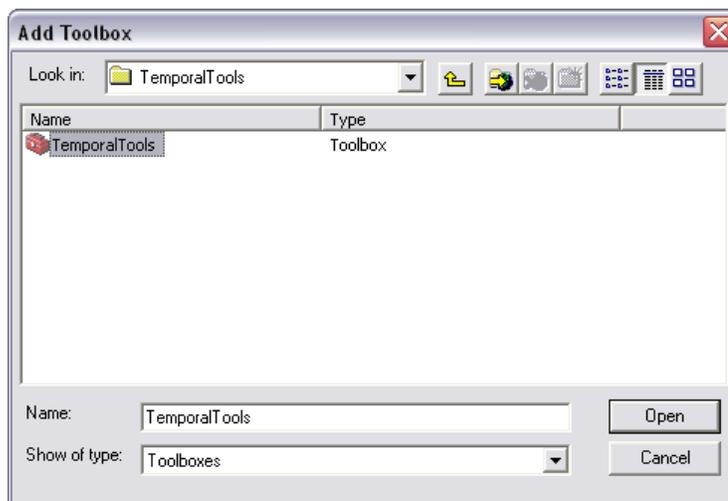
CREATED DATA

DSC_subsets.shp	various shapefiles resulting from ...
iYYYYMMDD_contours.shp	selected ice concentration contours, named by date

Some of the tools can be used in other applications. The following outlines the workflow for the original application development.

Start ArcGIS and load the custom toolbox:

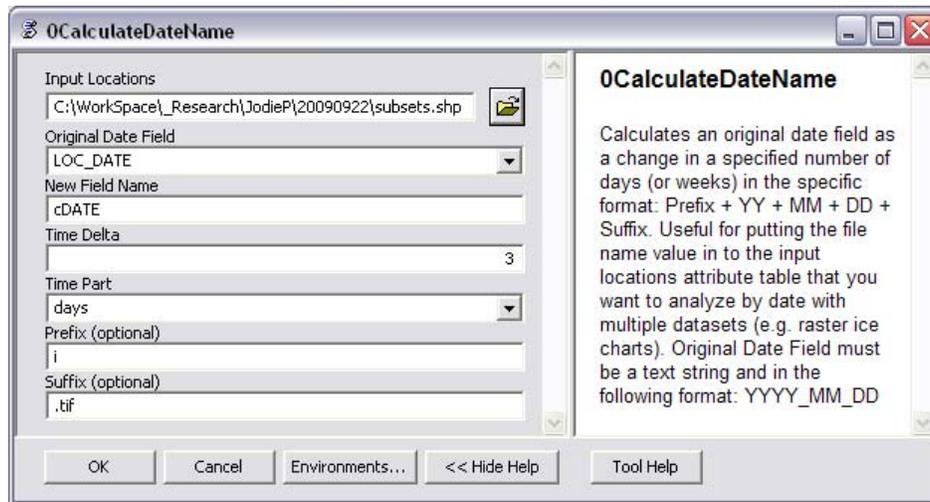
1. Start ArcMap or ArcCatalog
2. Click TOOLS >>> EXTENSIONS and check beside Spatial Analyst to enable it
3. SHOW the ArcToolbox window
4. Right-click on the ARCTOOLBOX name and click ADD TOOLBOX



5. Navigate to the TemporalTools folder – where you unzipped the TemporalTools.zip file and select **TemporalTools.tbx** and click OPEN
6. Click to open TemporalTools

Calculate new date field by adding or subtracting days or weeks

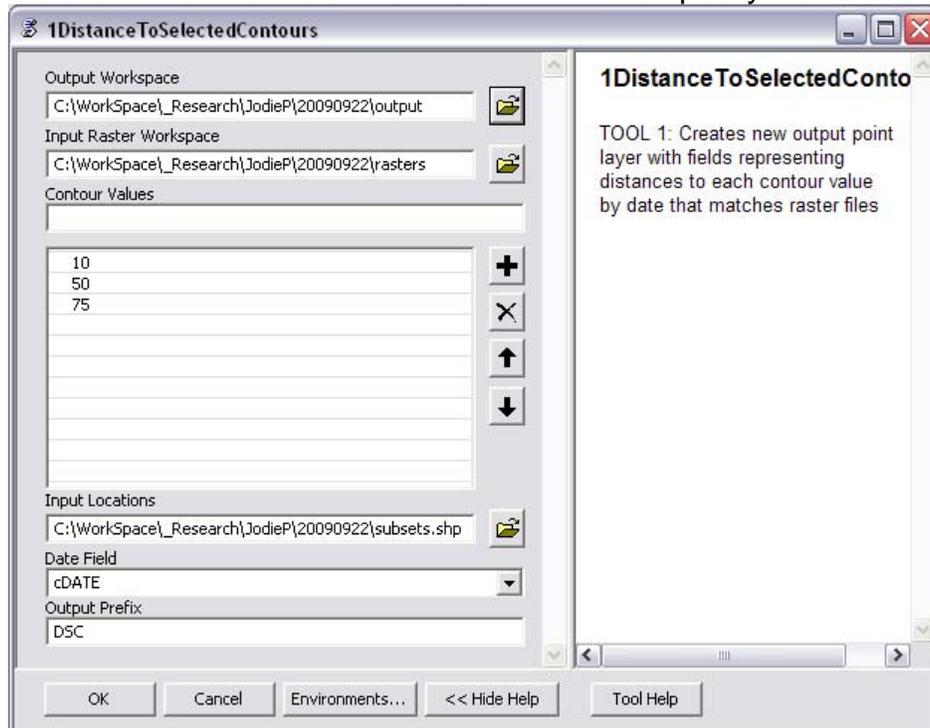
7. Double click **0CalculateDateName** and specify the following:



- Input Locations: subsets.shp
 - Original Date Field: LOC_DATE
 - New Field Name: cDATE
 - Time Delta: 3
 - Time Part: days
 - Prefix (optional): i
 - Suffix (optional): .tif
8. Click OK to run

Create selected contours and calculate distances to locations

9. Double click **1DistanceToSelectedContours** and specify the following:



- Output Workspace: create a new empty folder; e.g. output
- Input Raster Workspace: select folder containing ice concentration files
- Contour Values: accept default or modify list
- Input Locations: subsets.shp
- Date Field: cDATE (or whatever you called it using Tool 0)
- Output Prefix: DSC (something concise to differentiate it from the original)

10. Click OK to run

The tool iterates through the input raster folder and creates contour datasets for each raster, and then the selects locations with matching contours, and calculates distance to each. Intermediate data are created during the processing are deleted at completion, leaving only a folder of contour datasets and new locations with the distance attributes.

Use the DSC_subsets.shp for all subsequent steps:

Extract raster value to each point location with matching date

11. Double click **2GetCellValueByDate** and specify the following:



- Output Workspace: use same as previous; e.g. output
- Input Locations: DSC_subsets.shp
- Raster Date Field: cDATE (or whatever you called it using Tool 0)
- Input Raster Workspace: select folder containing ice concentration files
- Field Name: ICECONC

12. Click OK to run

13. Repeat for any other folder containing date-coded rasters; e.g. SNOWDEP

Intersect locations with a single raster

There are built-in Spatial Analyst tools that perform the same function. This tool differs in that you can specify the name for the added field.

14. Double click **3UpdateLocationsWithRasterValue** and specify the following:

- Input Locations: DSC_subsets.shp
- Input Raster: bathy
- Field Name: ODEP

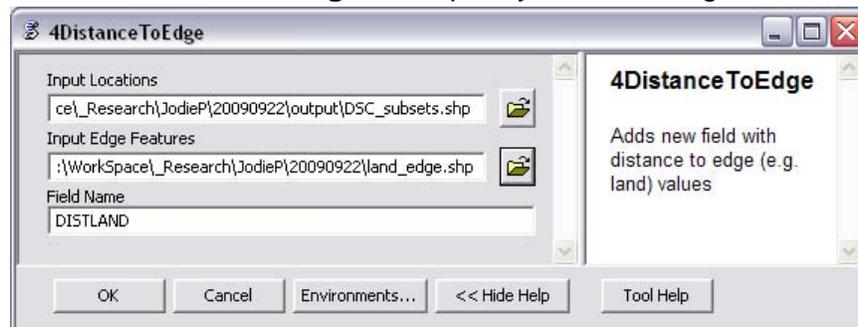
15. Click OK to run



Calculate distance of each location to shoreline

There are built-in tools that perform the same function. This tool differs in that you can specify the name for the added field in the existing file and no new dataset is created.

16. Double click **4DistanceToEdge** and specify the following:



- Input Locations: DSC_subsets.shp
- Input Edge Features: land_edge.shp
- Field Name: DISTLAND

17. Click OK to run

18. OPEN the attribute table for DSC_subsets.shp to view the added attributes

Note: Currently, this toolbox is meant for use with point data having a text field containing date values in the format "YYYY_MM_DD" and a folder of temporal rasters with filenames containing date information. However, tools 3 and 4 are flexible enough to be used for non-temporal analyses.