



condatis



Preparing raster files for Condatis

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What input data are required?

Data/files	Name
Reproductive rate	Number of individuals per km ² per generation
Dispersal distance	km travelled per individual per generation
Source/target raster	Source cells labelled 1; target cells labelled 2
Habitat raster	Proportion of habitat per grid cell (0-1)
Prioritisation raster	Proportion of habitat per grid cell (0-1)

All raster files for one Condatis analysis must:

- Have the same **spatial resolution** (i.e. the same pixel size, in **meters**)
- Have the same **spatial extent** (according to requirement)
- Be in **geoTIFF format**, i.e. *sourcetarget.tif*

Training plan



Training activities, in ArcMap:

0. Check your data
1. Set the “Environment” for the ArcMap project

Habitat* layer

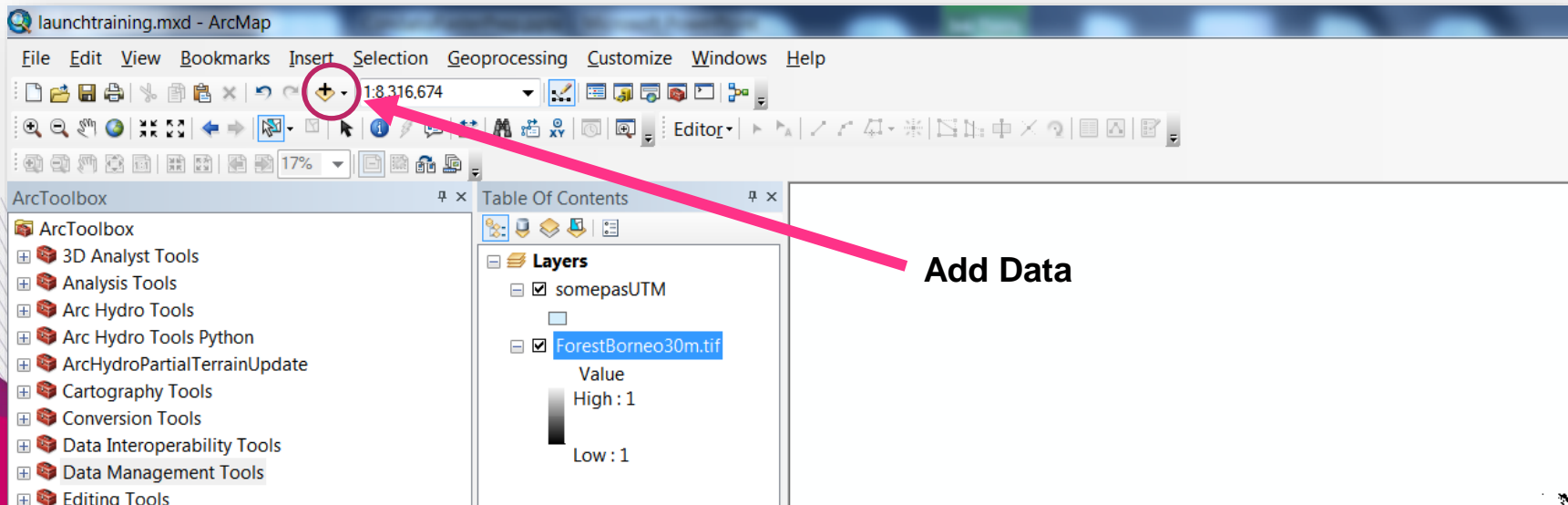
2. Reduce the extent of the *Habitat* layer
3. Coarsen the spatial resolution of the *Habitat* pixels
4. Correct the pixel values to a proportion
(*very similar process would apply to prioritisation layer)

Source-target layer from a polygon shapefile

5. Set which polygons are sources (1) and targets (2)
6. Convert polygon to raster file (same functions can be used if your habitat data starts as a shapefile)

0. Check your data

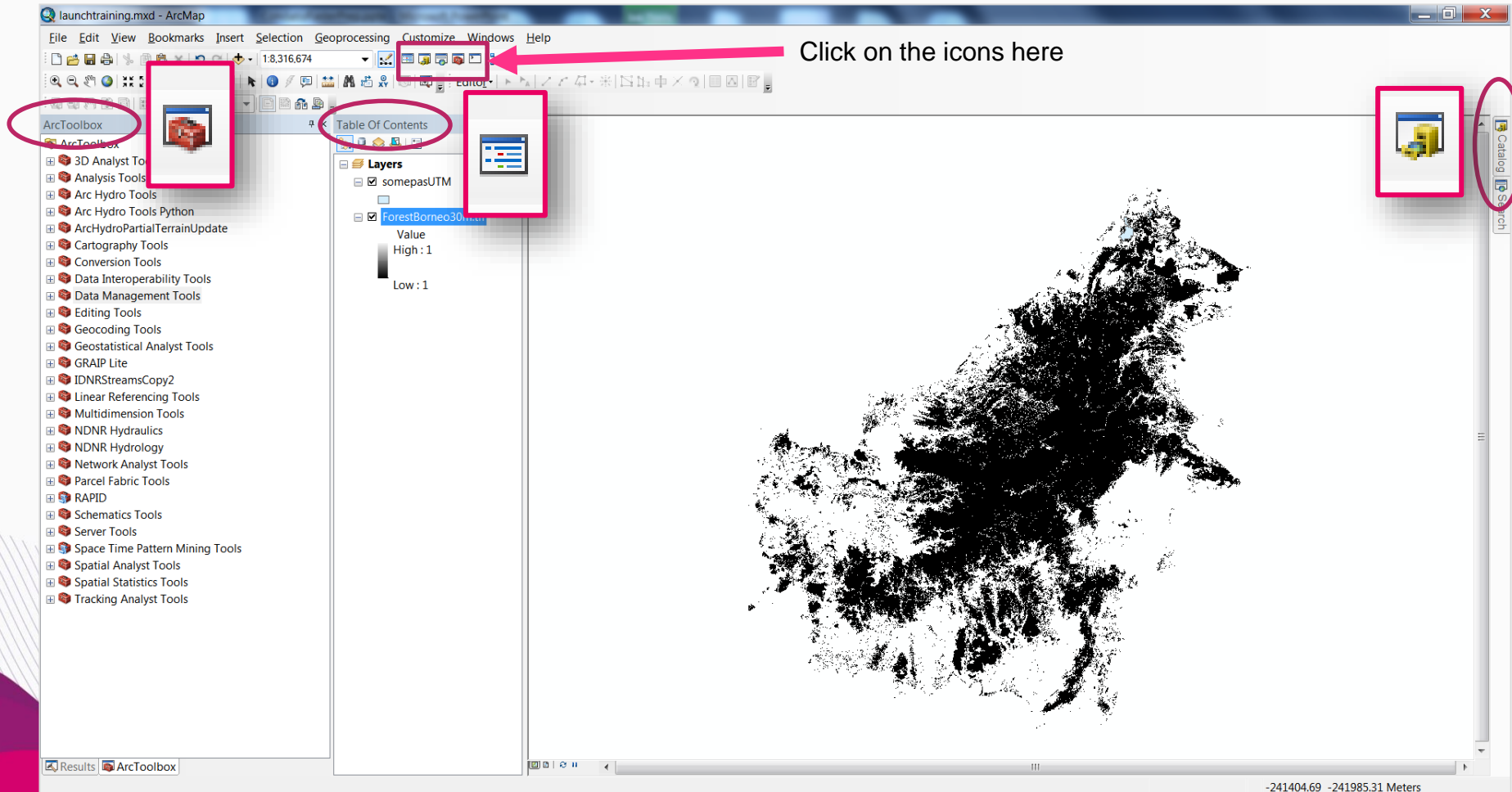
- Ensure the geographical projection for all files is the same
 - Check attributes, e.g. raster resolution
- Create an ArcMap project (a *Map Exchange Document*), e.g. *launchtraining.mxd*, in a folder where all associated GIS files will be saved – **File → Save As**
OR if a project file already exists, open it - **File → Open**
 - Ensure that all GIS files needed for the project are in the folder where the *.mxd* has been created/is, either by:
 - Pasting them into the folder at the start;
 - Ensuring they are automatically saved there after creation through setting the “workspace” for the project - **Geoprocessing → Environments → Workspace**
 - Add Data - *ForestBorneo30m.tif***
(Data may already load with your *.mxd* file if it was created previously)



0. Check your data

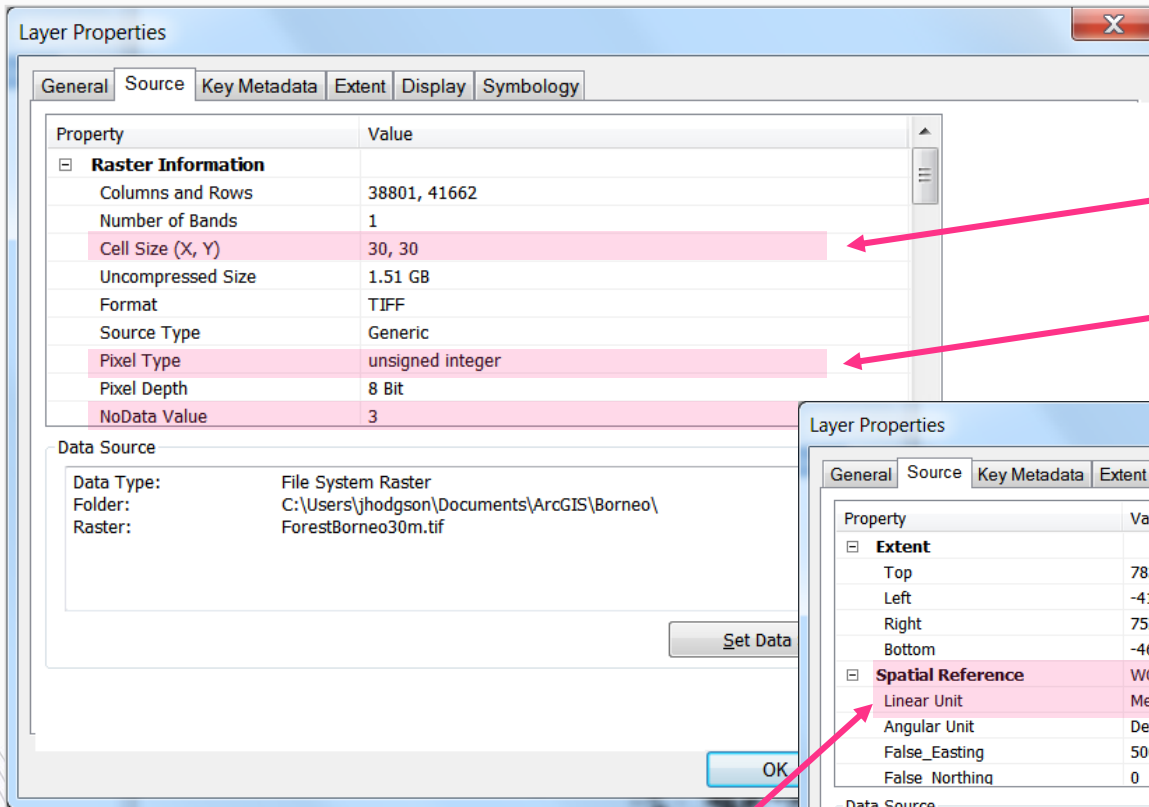
iii. Open:

- **ArcToolbox** - containing all of the ArcGIS functions needed to manipulate GIS data
- **Catalog** – containing information on the location of files and folders
- **Table of Contents** – containing information on the different layers within the project



Preliminary checks on the *Habitat* layer

- First check on the settings of the *Habitat* layer – double-click on the layer in **Table of Contents** to generate **Layer Properties** table

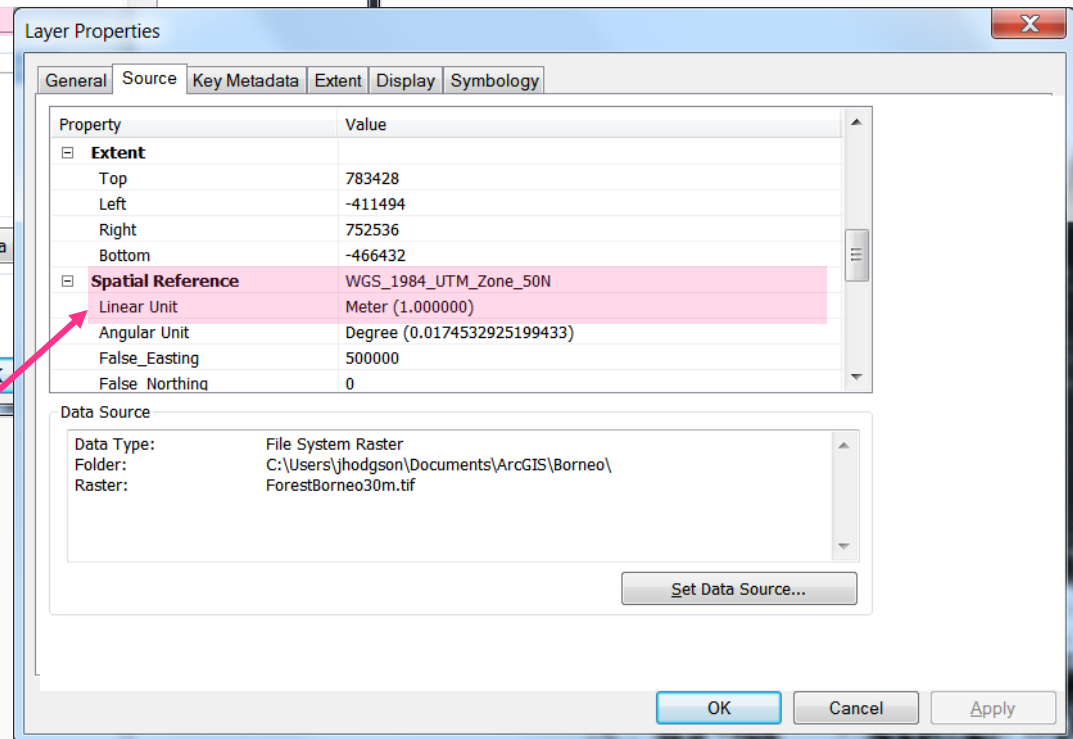


Check on these properties

Cell Size – big effect on Condatis processing time

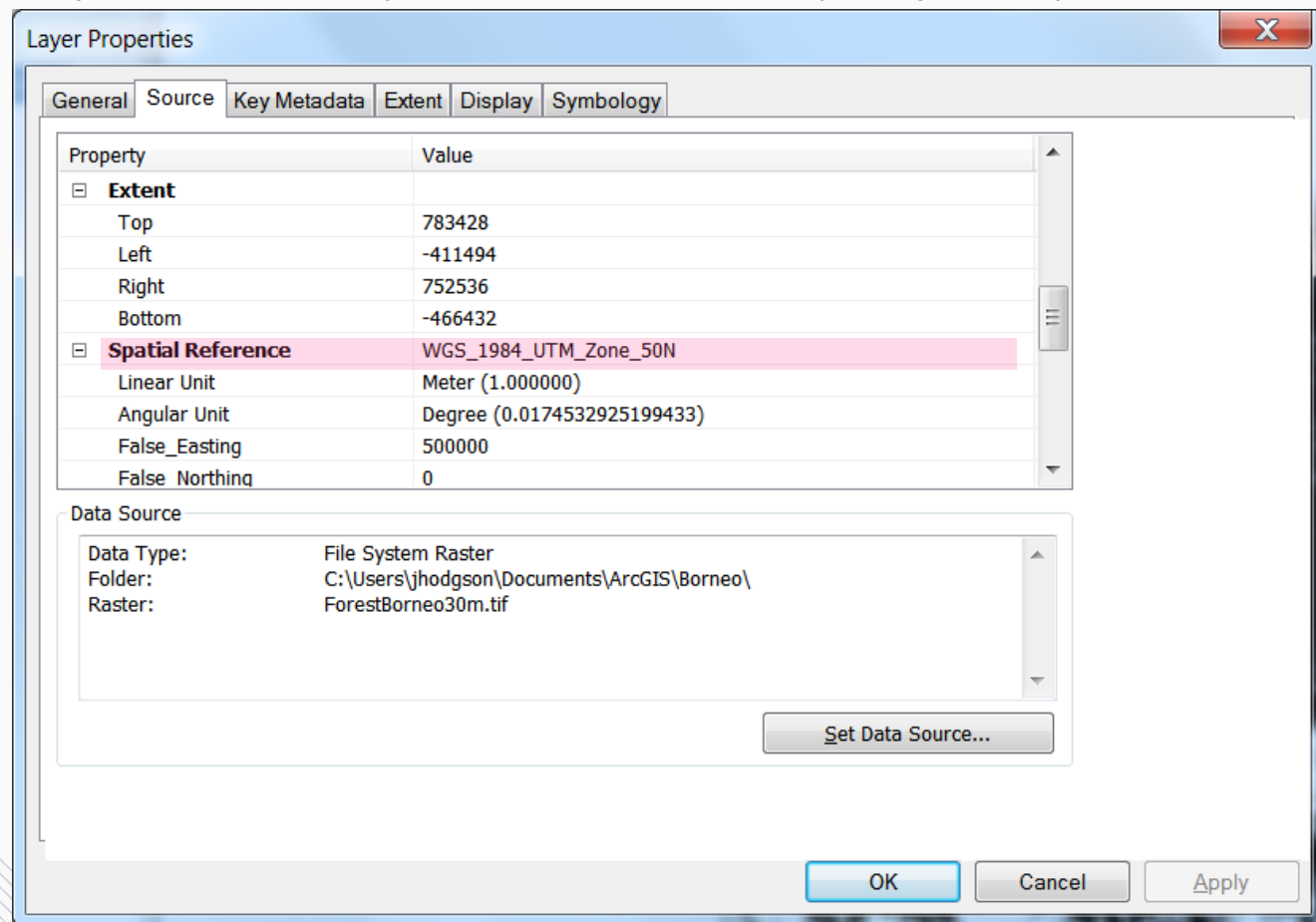
Pixel Type – we eventually need *floating points* so values between 0-1 possible

Linear Unit – Condatis will assume your spatial units are metres



Preliminary checks on the *Habitat* layer

- ii. Check on the projection (**Spatial Reference**) of the raster file in **Layer Properties**, i.e. WGS_1984_UTM_Zone_50N – all files must have this same projection. (If you ever need to change the projection of a layer, use the **Projections and Transformations** section of the toolbox (within Data Management Tools folder) to create a new version with the right projection. Don't rely on ArcGIS's 'on-the-fly' projection.)



1. Set the “Environment” for the project

Set the bounding coordinates: **Geoprocessing** → **Environments** → **Processing Extent**
....set extents (m) (according to extent requirement) (i.e. Top – 738000; Right – 613000; Bottom – 590000; Left – 435000; though exact numbers will change according to pixel size)

The screenshot shows the ArcMap interface with the 'Environment Settings' dialog box open. The 'Geoprocessing' menu item in the top toolbar is circled in pink. The 'Processing Extent' section of the dialog is highlighted with a pink background and contains the following values:

Coordinate	Value
Top	738000.000000
Right	613000.000000
Bottom	590000.000000
Left	435000.000000

Annotations with pink arrows point to the 'Processing Extent' section and the 'Snap Raster' dropdown menu. The 'Snap Raster' dropdown is currently set to 'As Specified Below'. The 'XY Resolution and Tolerance' section is also visible.

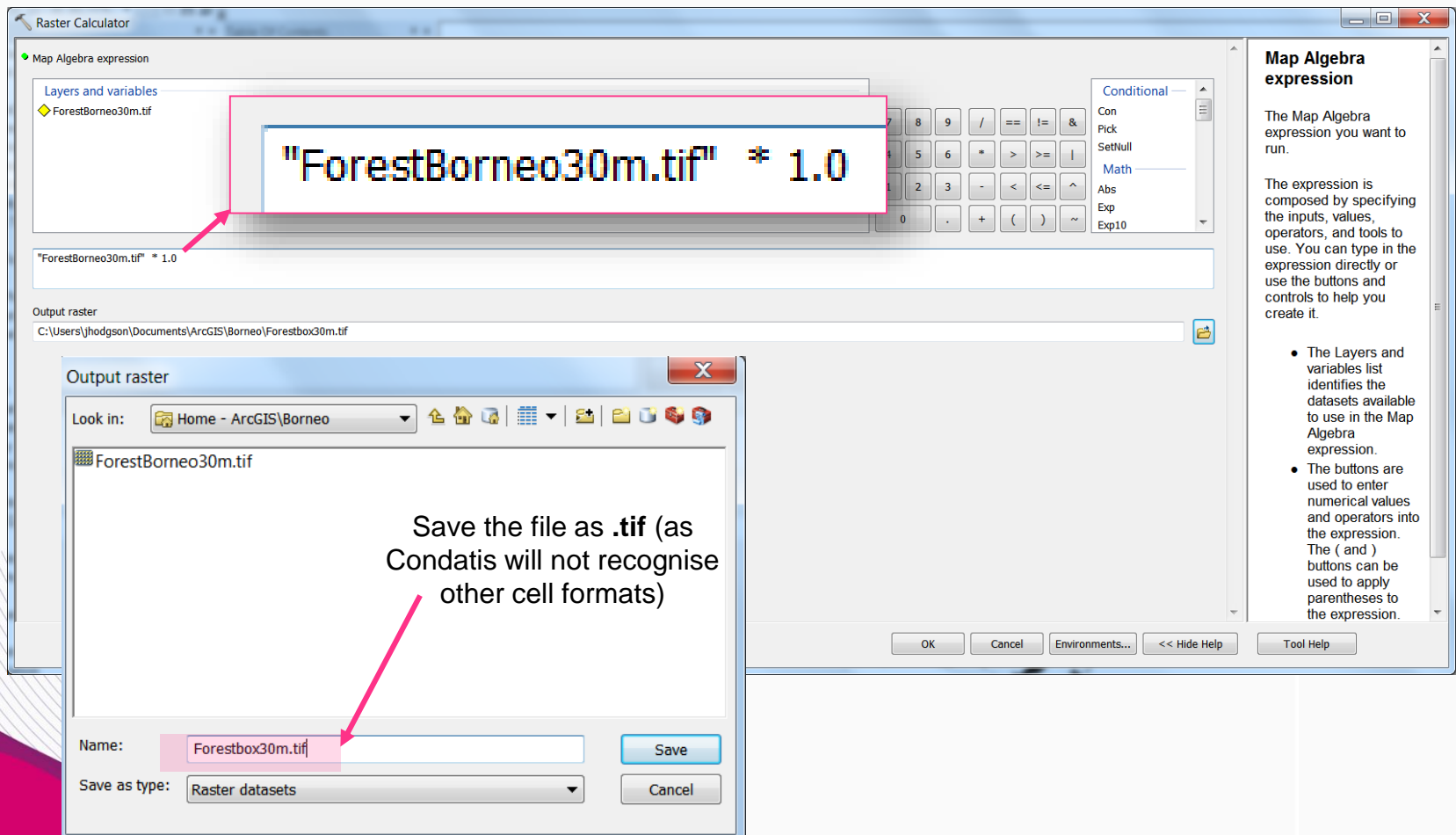
Processing Extent– we’re choosing this to analyse just a corner of Borneo, containing our source and target as you’ll see later

Snap raster– doesn’t matter now but will become important to select a .tif file here when we have different non-aligned rasters knocking around

At the bottom of the dialog, there are 'OK', 'Cancel', and 'Show Help >>' buttons.

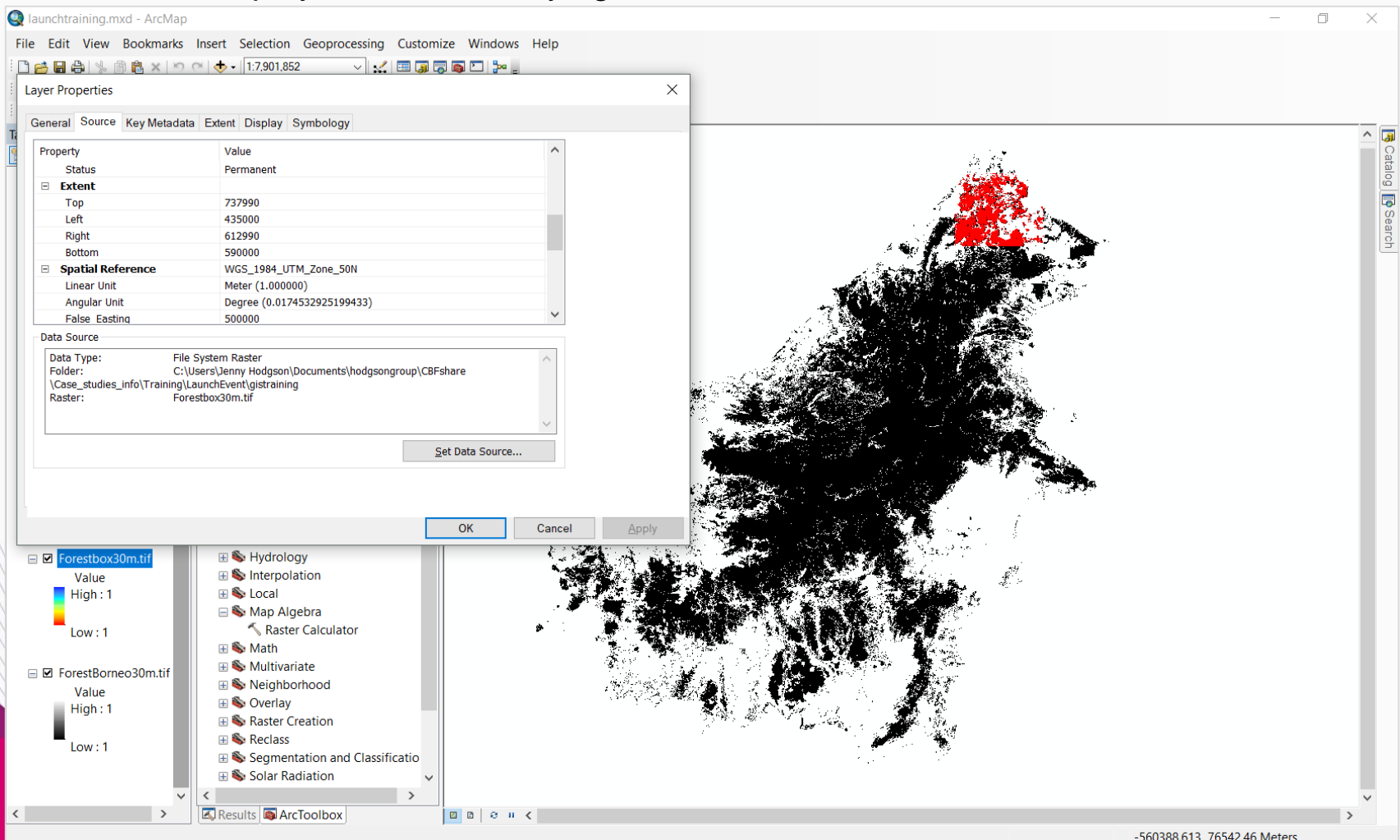
2. Reduce the extent of the *Habitat* layer

- i. Since we have set the processing extent to our desired box, *any operation* that produces a new raster will conform to this box
- ii. For convenience, we'll choose an operation that will change the **Pixel Type** from *unsigned integer* to *floating points* – **Spatial Analyst Tools → Map Algebra → Raster Calculator** Multiply the *Habitat.tif* file by **1.0** to create a new *.tif* with pixel values that can take decimal values (required for assigning each *Habitat* cell a habitat quantity/quality value)



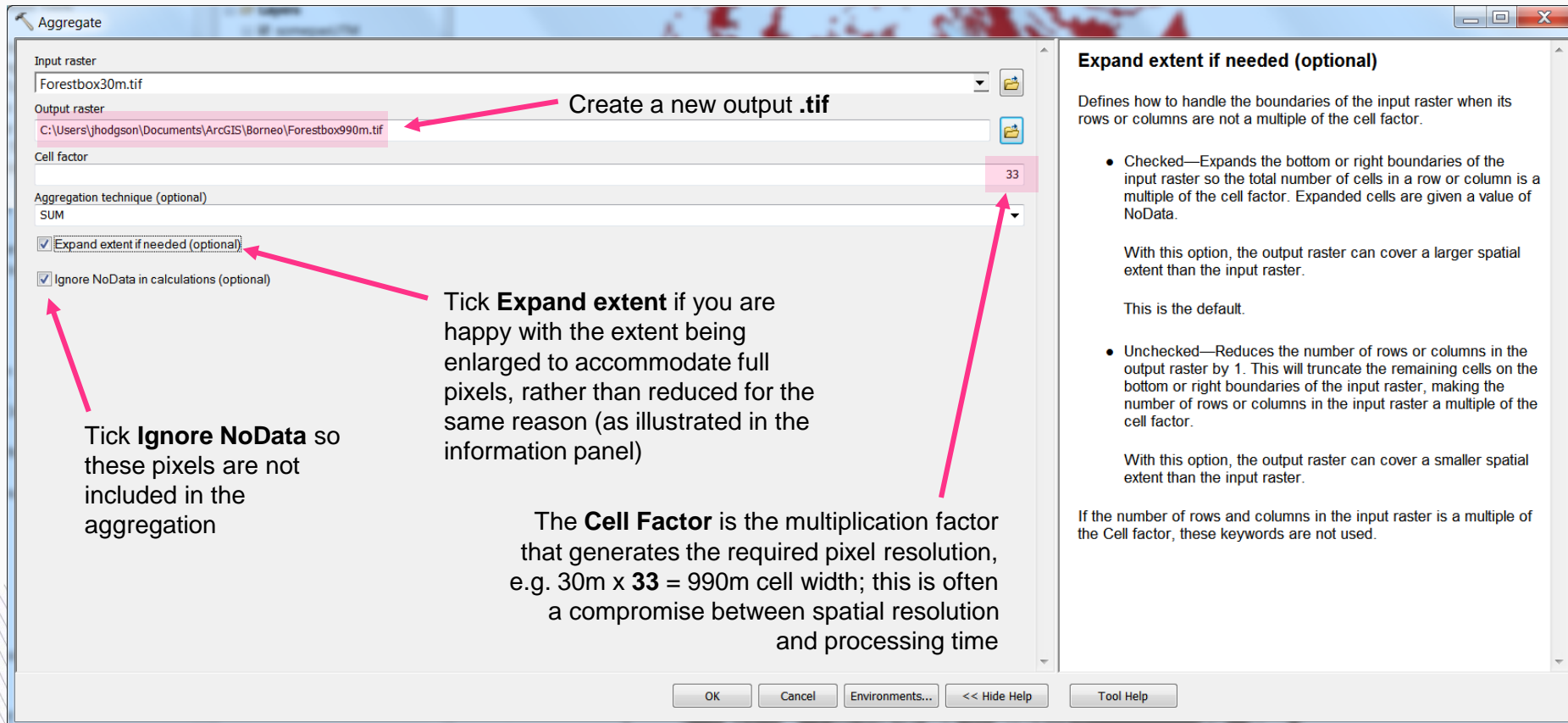
2. Reduce the extent of the *Habitat* layer

- iii. Check— **Layer Properties** → **Source** To check the extent of your new habitat layer – note it is not exactly identical to the box you specified, because it had to be a whole number of 30m cells
- iv. PS do not use **Layer Properties** → **Extent**, this only changes the range that you can see in the display, not the underlying data



3. Coarsen the spatial resolution of the *Habitat* pixels

- i. The size of the pixels of the raster layer may need to be changed, e.g. in order to increase the speed of the Condatis analysis (fewer cells = faster processing) – **Spatial Analyst Tool → Generalisation → Aggregate**



4. Correct the pixel values to a proportion

- Use the **Raster Calculator** to divide the pixel values so that the new 990m pixels are scaled from 0-1 (CondatiS uses this value to quantify the proportion or quality of habitat in each cell)

Raster Calculator

Map Algebra expression

Layers and variables

- Forestbox990m.tif
- Forestbox30m.tif
- ForestBorneo30m.tif

This aggregated layer now has pixel values scaled from 1 to 1089 (33 x 33)

"Forestbox990m.tif" / 33 / 33

Output raster

C:\Users\jhodgson\Documents\ArcGIS\Borneo\ForestProp990m.tif

Remember to save the output file as a new **.tif**

Divide the new Habitat layer twice by the same factor used to aggregate the smaller cells, i.e. **33 x 33**, to get a re-scaled pixel value between 0 and 1

Map Algebra expression

The Map Algebra expression you want to run.

The expression is composed by specifying the inputs, values, operators, and tools to use. You can type in the expression directly or use the buttons and controls to help you create it.

- The Layers and variables list identifies the datasets available to use in the Map Algebra expression.
- The buttons are used to enter numerical values and operators into the expression. The (and) buttons can be used to apply parentheses to the expression.
- A list of commonly used tools is provided for you.

OK Cancel Environments... << Hide Help Tool Help

4. Correct the pixel values to a proportion

The pixel values of this new layer are now re-scaled so that they are between 0 and 1, as shown by the legend

The value of individual pixels can be assessed by clicking on cells using the **Identify** tool

Legend for forestProp990m.tif:

- Value High : 1 Low : 0.000918274
- Forestbox990m.tif Value High : 1089 Low : 1
- Forestbox30m.tif Value High : 1 Low : 1
- ForestBorneo30m.tif Value High : 1 Low : 1

Identify tool results:

Field	Value
Stretched value	48
Pixel value	0.194674

Location: 506,747.118 706,436.418 Meters

Identified 1 feature

Preparing the source and target raster

- Load in *somepasUTM* shapefile – Click **Add Data** & find the *Home* folder
- Check on the coordinate system (a.k.a. projection) of this layer to ensure it is the same as the *Habitat* raster layer – double-click on layer → **Layer Properties** – **Source** tab
- Open up the attributes **Table** of the shapefile to observe the names of the features & their key characteristics – right-click on layer → **Open Attribute Table** (drag to location)

The screenshot shows the ArcMap interface with the *somepasUTM* shapefile loaded. The **Layer Properties** dialog is open, showing the **Source** tab. The **Data Source** section indicates the shapefile is located at *C:\Users\jhodgson\Documents\ArcGIS\Borneo\somepasUTM.shp*. The **Projected Coordinate System** is *WGS_1984_UTM_Zone_50N*. The **Extent** section shows the bounding box: Top: 731195.942990 m, Left: 140669.507366 m, Right: 611002.639875 m, Bottom: 620610.200795 m.

The **Table Of Contents** shows the following layers:

- somepasUTM* (Polygon)
- ForestProp990m.tif* (Value: High: 1, Low: 0.000918274)
- Forestbox990m.tif* (Value: High: 1089, Low: 1)

The **Table** of the *somepasUTM* shapefile is displayed below:

FID	Shape *	WDPAID	WDPA_PID	PA_DEF	NAME	ORIG_NAME	DESIG	DESIG_ENG	DESIG_TYPE	IUCN_CAT	INT_CRIT	MARINE	REP_M_AREA	GIS_M_A
0	Polygon	785	785	1	Kinabalu	Kinabalu	National Park and ASEAN Heritage Park	National Park and ASEAN Heritage Park	National	II	Not Applicable	0	0	
1	Polygon	9851	9851	1	Tenompok	Tenompok	Protection Forest Reserve	Protection Forest Reserve	National	Ia	Not Applicable	0	0	
2	Polygon	3406	3406	1	Kabili Sepilok	Kabili Sepilok	Virgin Jungle Reserve	Virgin Jungle Reserve	National	Not Reported	Not Applicable	0	0.02	0.1
3	Polygon	9853	9853	1	Mandamai	Mandamai	Protection Forest Reserve	Protection Forest Reserve	National	Ia	Not Applicable	0	0	
4	Polygon	9878	9878	1	Lungmanis	Lungmanis	Virgin Jungle Reserve	Virgin Jungle Reserve	National	Ia	Not Applicable	0	0	
5	Polygon	62579	62579	1	Botition	Botition	Protection Forest Reserve	Protection Forest Reserve	National	Ia	Not Applicable	0	0	

Preparing the source and target raster

Your final habitat layer can now be used to set the processing extent and the *Snap Raster*, using the **Environment Settings** function, to make sure the source-target raster will be the same

Environment Settings

✕

⌵ **Workspace**

⌵ **Output Coordinates**

⌶ **Processing Extent**

Extent

As Specified Below

Top

738500.000000

Left

435000.000000

Right

613200.000000

Bottom

590000.000000

Snap Raster

ForestProp990m.tif

⌵ **XY Resolution and Tolerance**

⌵ **M Values**

⌵ **Z Values**

⌵ **Geodatabase**

⌵ **Geodatabase Advanced**

OK Cancel Show Help >>

5. Define source and target polygons

- iv. Create a new column for the Source/Target markers – **Table Options** → **Add Field**
- v. Label the column appropriately, e.g. *st*
- vi. Recommended type of input is Float, i.e. floating point numbers

The screenshot shows the ArcMap interface with the 'Add Field' dialog box open. The dialog box has the following fields:

- Name:** sourcetarget
- Type:** Float
- Field Properties:**
 - Precision:** 0
 - Scale:** 0
- Buttons:** OK, Cancel

The 'Table Options' window is also visible, showing a table with the following data:

FID	Shape *	WDPAID	WDPA_PID	PA_DEF	NAME	ORIG_NAME	DESIG	DESIG_ENG	DESIG_TYPE	IUCN_CAT	INT_CRIT	MARINE	REP_M_AREA	GIS_M_A
0	Polygon	785	785	1	Kinabalu	Kinabalu	National Park and ASEAN Heritage Park	National Park and ASEAN Heritage Park	National	II	Not Applicable	0	0	
1	Polygon	9851	9851	1	Tenompok	Tenompok	Protection Forest Reserve	Protection Forest Reserve	National	Ia	Not Applicable	0	0	
2	Polygon	3406	3406	1	Kabili Sepilok	Kabili Sepilok	Virgin Jungle Reserve	Virgin Jungle Reserve	National	Not Reported	Not Applicable	0	0.02	0.1
3	Polygon	9853	9853	1	Mandamai	Mandamai	Protection Forest Reserve	Protection Forest Reserve	National	Ia	Not Applicable	0	0	
4	Polygon	9878	9878	1	Lungmanis	Lungmanis	Virgin Jungle Reserve	Virgin Jungle Reserve	National	Ia	Not Applicable	0	0	
5	Polygon	62579	62579	1	Botition	Botition	Protection Forest Reserve	Protection Forest Reserve	National	Ia	Not Applicable	0	0	

The 'Table Options' window is titled 'Table Options (hiding in this corner!)' and shows the 'somepasUTM' table. The 'Add Field' button is circled in red.

5. Define source and target polygons

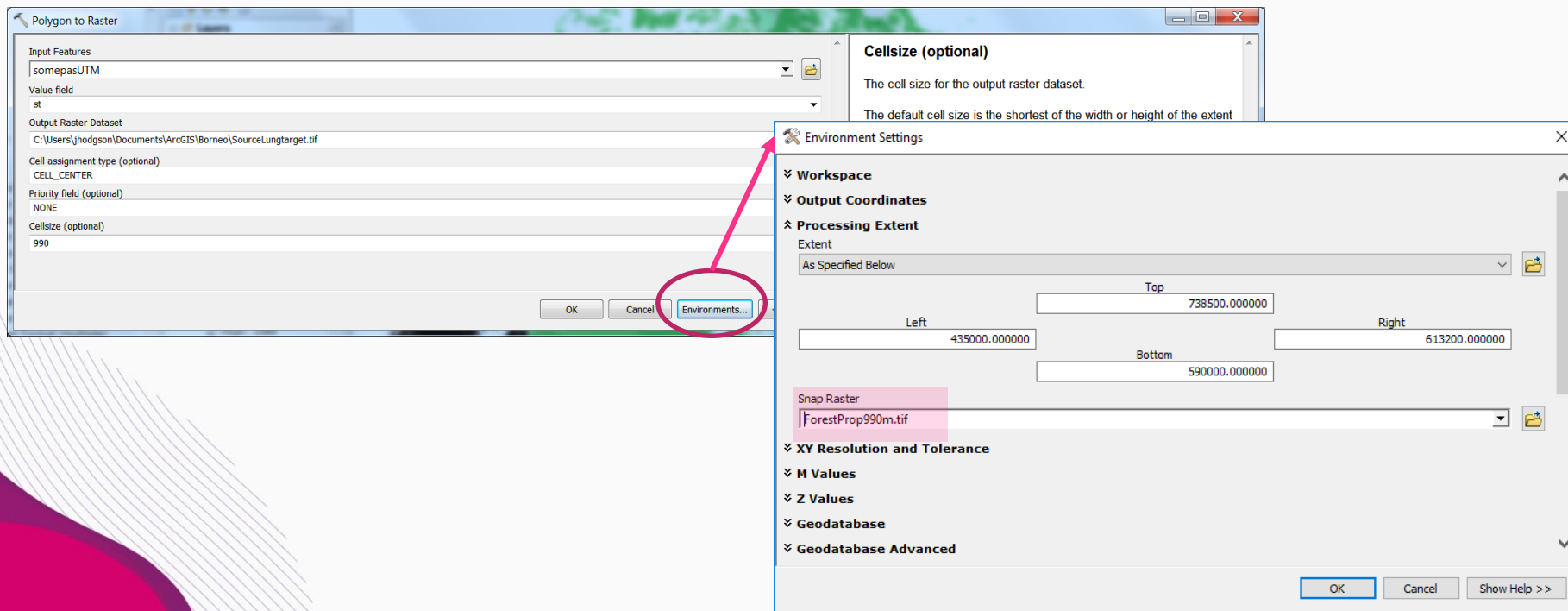
- vii. Assign the *Target** polygons – select the target(s) → right-click on *st* column header → **Field Calculator** (via bypassing the Edit mode)
 - viii. Select appropriate **Fields** (i.e. column title – *st*) → type in 2
 - v. Repeat for the *Source** polygons but type in 1
- *Assign any polygons as sources/targets at this point

The screenshot shows the ArcMap interface with the Field Calculator dialog box open. The dialog box is set to VB Script and has the 'st' field selected in the Fields list. The expression entered is '2'. The background map shows a green area with an orange polygon. Below the map, a table titled 'somepasUTM' is displayed.

GIS AREA	NO TAKE	NO TK AREA	STATUS	STATUS_YR	GOV_TYPE	OWN TYPE	MANG_AUTH	MANG_PLAN	VERIF	METADATAID	SUB_LOC	PARENT_ISO	ISO3	st
770.446852	Not Applicable	0	Designated	1964	Not Reported	Not Reported	Not Reported	Not Reported	State Verified	612 MY-12	MYS	MYS		0
19.514311	Not Applicable	0	Designated	1984	Sub-national ministry or agency	Not Reported	Not Reported	Not Reported	State Verified	612 MY-12	MYS	MYS		0
43.038357	Not Applicable	0	Designated	1931	Federal or national ministry or agency	Not Reported	Not Reported	Not Reported	Not Reported	1527 MY-12	MYS	MYS		0
53.755522	Not Applicable	0	Designated	1984	Sub-national ministry or agency	Not Reported	Not Reported	Not Reported	State Verified	612 MY-12	MYS	MYS		0
66.928947	Not Applicable	0	Designated	1984	Sub-national ministry or agency	Not Reported	Not Reported	Not Reported	State Verified	612 MY-12	MYS	MYS		0
21.593823	Not Applicable	0	Designated	1992	Sub-national ministry or agency	Not Reported	Not Reported	Not Reported	State Verified	612 MY-12	MYS	MYS		0

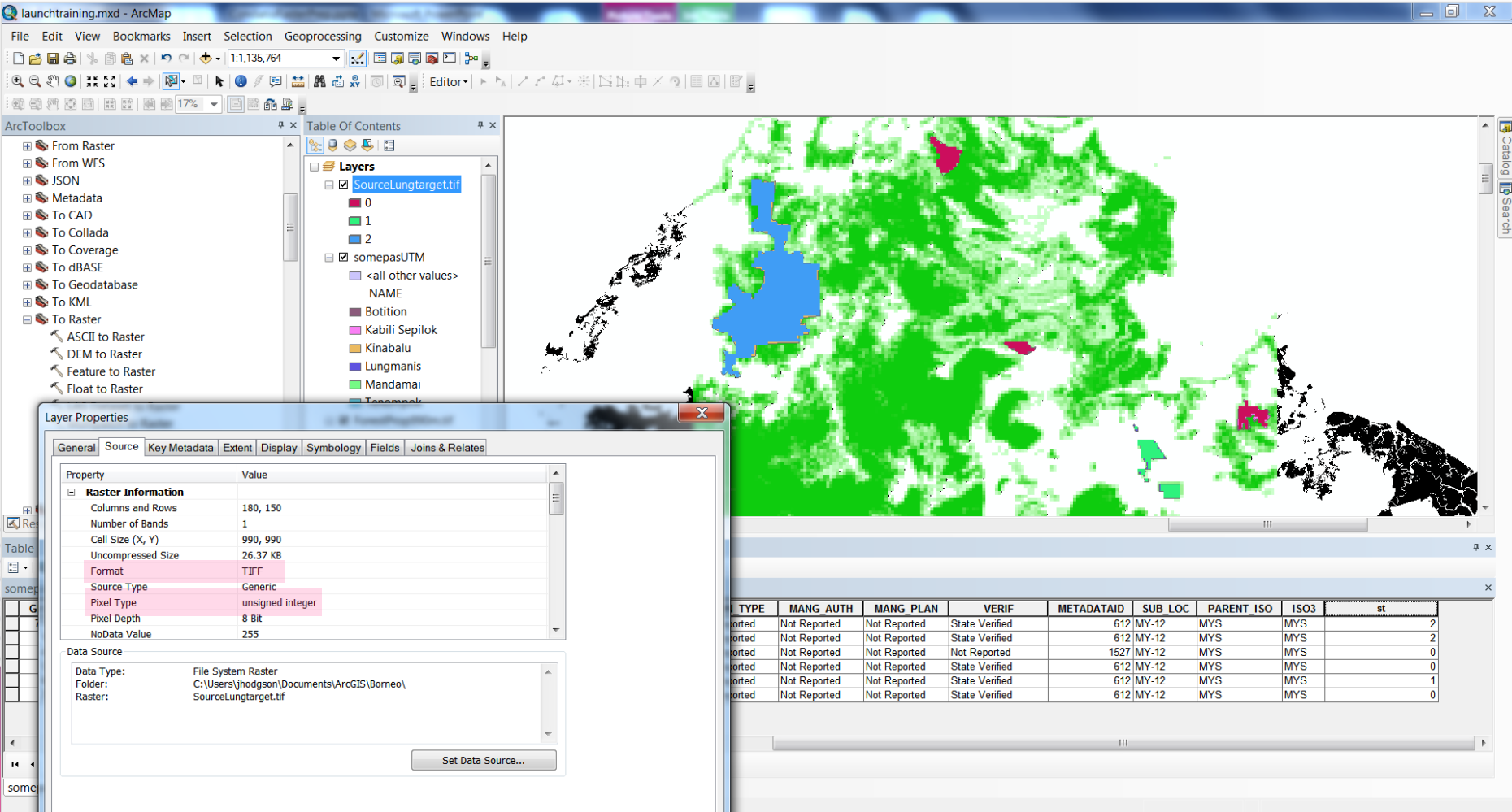
6. Convert polygon to raster file

- i. First clear all selected features (so that all are included in the raster) – **Table Options** → **Clear Selected**
- ii. Within the *ArcToolbox* find the rasterise function – **Conversion Tools** → **To Raster** → **Polygon to Raster**
- iii. Select *st* in the **Value field**
- iv. Assign your **Output Raster Dataset** an appropriate name, ending in **.tif**
- v. Set the **Cellsize** to **990m** in line with the *Habitat* layer
- vi. In **Environments....** check that the raster that is created will have the correct extent ('processing extent') and will 'snap' to the *Habitat* layer (so edges of cells will exactly align, if they are the same size)



6. Convert polygon to raster file

- Check that the *SourceTarget* polygon has been rasterised into a *.tif* of the same extent and resolution as the *Habitat.tif*
- Be aware of the **Pixel Type** – this may need converting to *floating points* for Condatis to recognise the data (see Step 2ii.)



The screenshot shows the ArcMap interface with a map of Borneo. A green raster layer is visible, and a blue polygon is overlaid. The 'Layer Properties' dialog is open for the 'SourceLungtarget.tif' layer, showing the following information:

Property	Value
Raster Information	
Columns and Rows	180, 150
Number of Bands	1
Cell Size (X, Y)	990, 990
Uncompressed Size	26.37 KB
Format	TIFF
Source Type	Generic
Pixel Type	unsigned integer
Pixel Depth	8 Bit
NoData Value	255

The 'Data Source' section shows:

Property	Value
Data Type:	File System Raster
Folder:	C:\Users\jhdgson\Documents\ArcGIS\Borneo\
Raster:	SourceLungtarget.tif

Below the dialog, a table of metadata is visible:

TYPE	MANG_AUTH	MANG_PLAN	VERIF	METADATAID	SUB_LOC	PARENT_ISO	ISO3	st
orted	Not Reported	Not Reported	State Verified	612	MY-12	MYS	MYS	2
orted	Not Reported	Not Reported	State Verified	612	MY-12	MYS	MYS	2
orted	Not Reported	Not Reported	Not Reported	1527	MY-12	MYS	MYS	0
orted	Not Reported	Not Reported	State Verified	612	MY-12	MYS	MYS	0
orted	Not Reported	Not Reported	State Verified	612	MY-12	MYS	MYS	1
orted	Not Reported	Not Reported	State Verified	612	MY-12	MYS	MYS	0



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For further help, please email
contact@condatis.org.uk