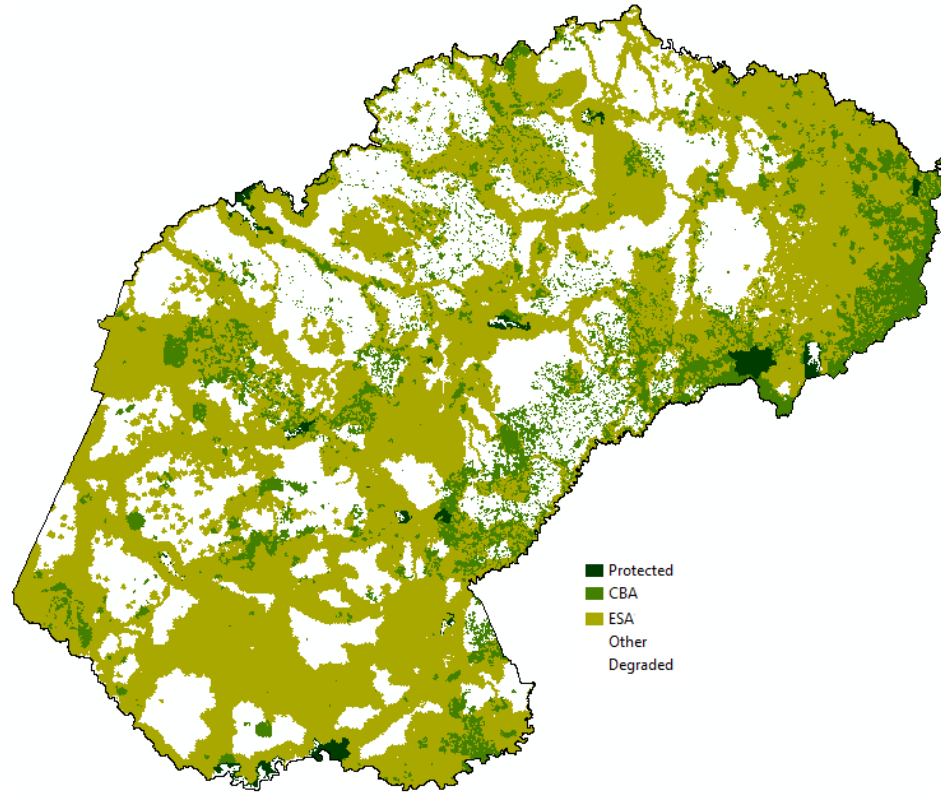


FREE STATE BIODIVERSITY PLAN

Using ArcGIS ModelBuilder for developing the Free State Biodiversity Plan



Nacelle Collins



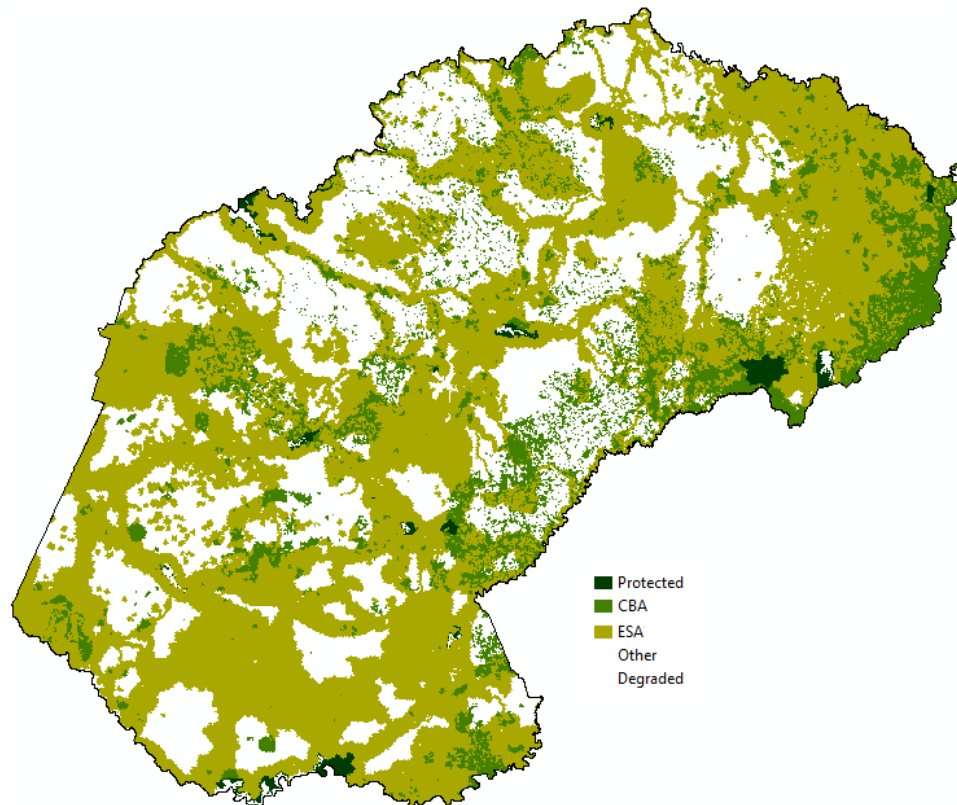
destea

department of
economic, small business development,
tourism and environmental affairs
FREE STATE PROVINCE

FREE STATE BIODIVERSITY PLAN

Overview

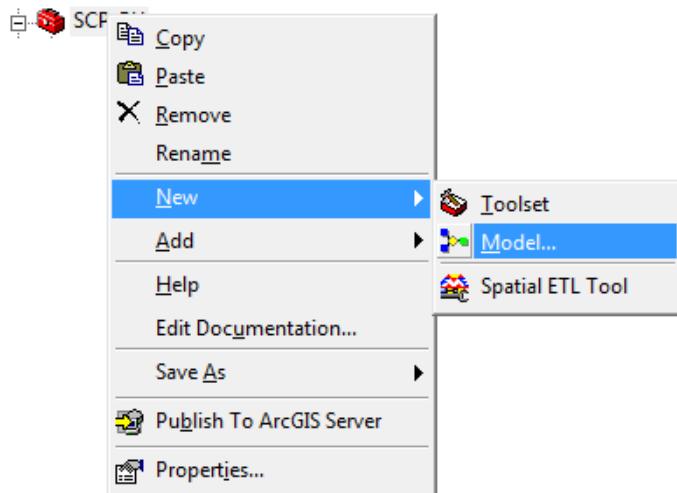
- What is ModelBuilder?
- Why use ModelBuilder?



FREE STATE BIODIVERSITY PLAN

What is ModelBuilder?

- ModelBuilder comes standard with ArcGIS
- It is an application you use to create, edit, and manage models
- Models are workflows that string together sequences of geoprocessing tools, feeding the output of one tool into another tool as input
- ModelBuilder can also be thought of as a visual programming language for building workflows

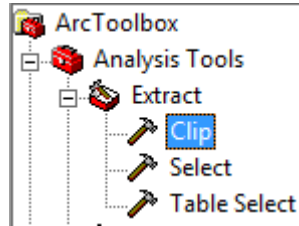


Drag and drop tools from the toolbox window into the ModelBuilder window to build the model

FREE STATE BIODIVERSITY PLAN

What is ModelBuilder?

Clip

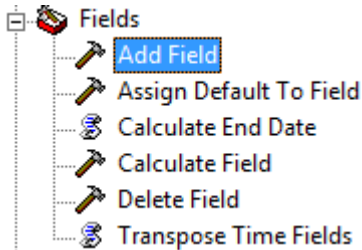


Clip Input file

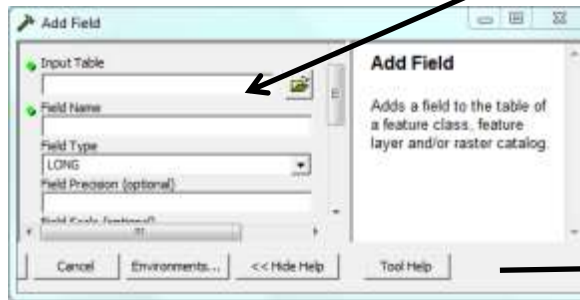


C:\SCP\clip.shp

Add Field

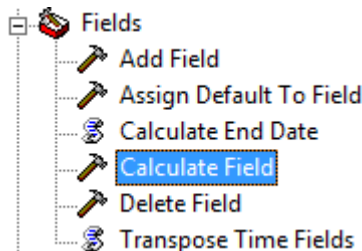


Add Field

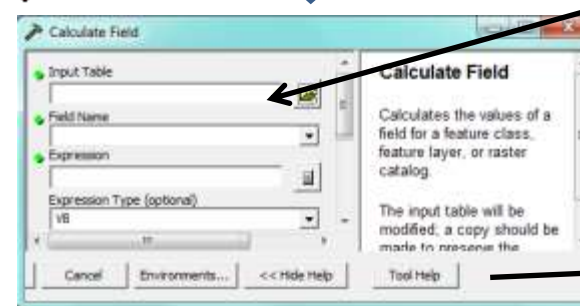


C:\SCP\Clip_AddField.shp

Calculate field



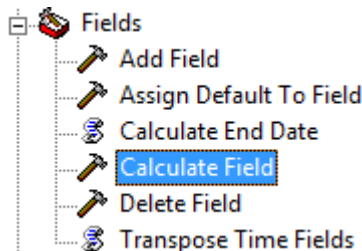
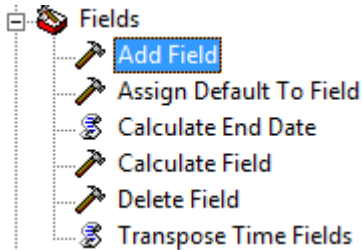
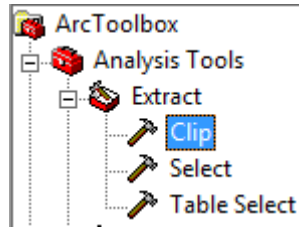
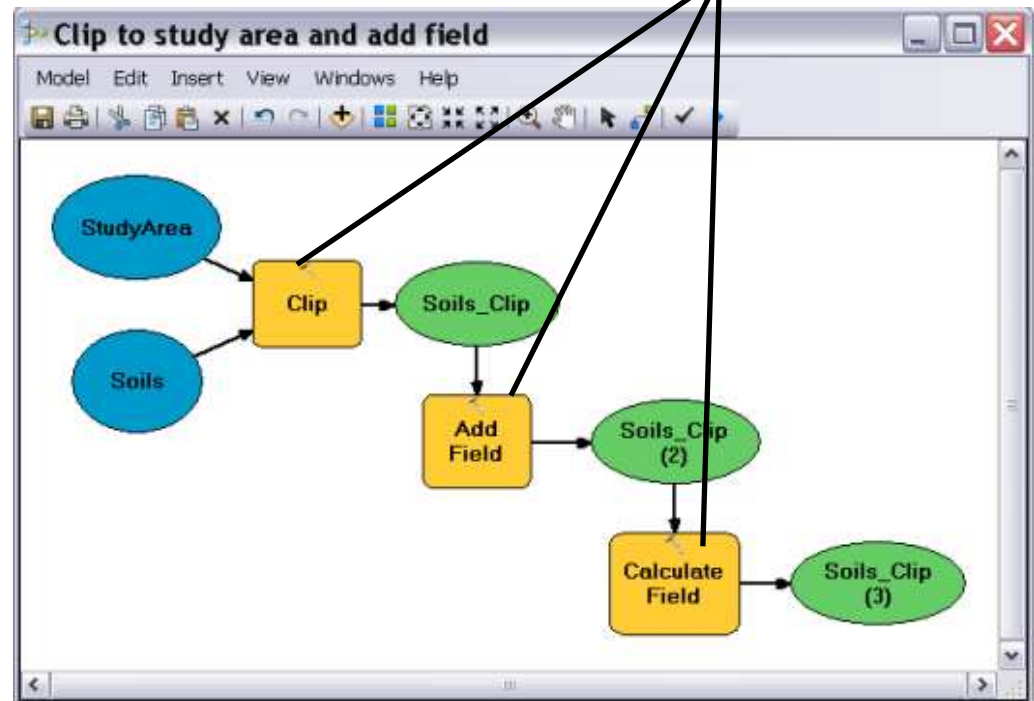
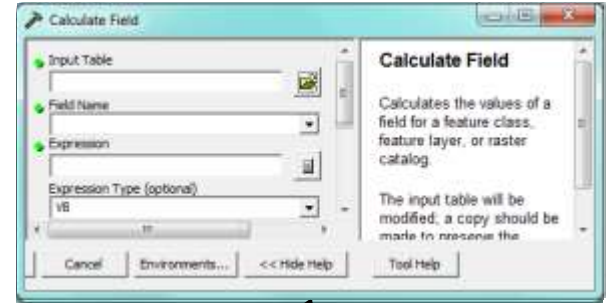
Calculate Field



C:\SCP\Clip_AddField_Calculate_field.shp

FREE STATE BIODIVERSITY PLAN

What is ModelBuilder?



Clip



Add Field



Calculate field

FREE STATE BIODIVERSITY PLAN

Why use ModelBuilder?

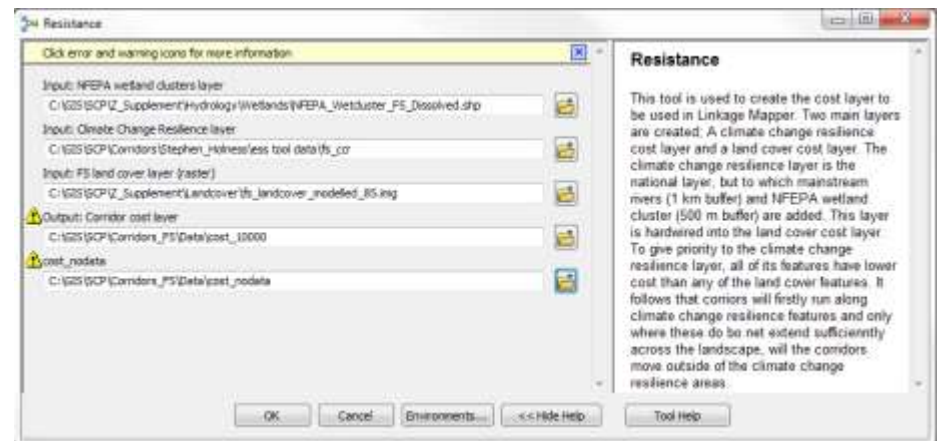
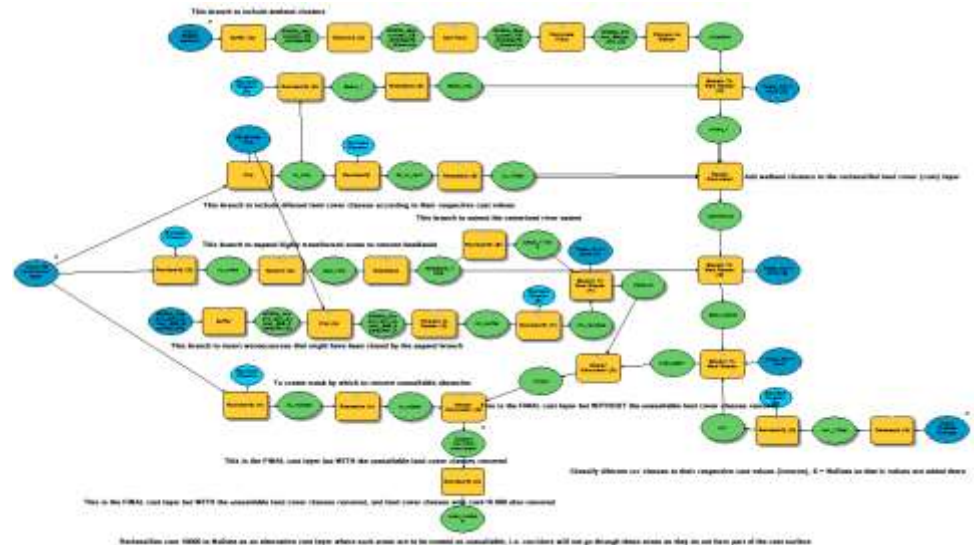
- Good record keeping of the exact GIS operations performed and parameters used
- Easy and 'quick' to change a parameter
- Makes 'trail and error' development much easier
- Additional functionality
- Easier updating
- Improved consistency from one release to the next
- Easier hand over to next biodiversity planner

Good record keeping of the exact GIS operations performed and parameters used

Resistance layer for corridor analysis

Run model C:\GIS\SCP\Tools\SCP_Corridors.tbx\Resistance

- To include wetland clusters in the cost layer NFEPA wetland clusters (C:\GIS\SCP\Z_Supplement\Hydrology\Wetlands\NFEPA_Wetcluster_FS_Dissolved.shp) were buffered by 500 m to create C:\GIS\SCP\Temp_Corridors\NFEPA_Wetcluster_FS_500mBuffer.shp and C:\GIS\SCP\Temp_Corridors\NFEPA_Wetcluster_FS_500mBuffer_Dissolved.shp respectively
- Filed 'Id' was created in C:\GIS\SCP\Temp_Corridors\NFEPA_Wetcluster_FS_500mBuffer_Dissolved.shp and all features were populated with value 900 in field 'Id' (This so that the wetland cluster have a cost of 900 when the vector is converted to raster; Riverine area were assigned a value of 1 in the climate change resilience layer which when inversed, was assigned a value of 900)
- C:\GIS\SCP\Temp_Corridors\NFEPA_Wetcluster_FS_500mBuffer_Dissolved.shp was converted to a raster layer (cell size = 100) based on field 'Id' to create C:\GIS\SCP\Temp_Corridors\clusters
- The FS land cover map (C:\GIS\SCP\Z_Supplement\Landcover\fs_landcover_modelled_85.img) was clipped to the FS border (C:\GIS\SCP\Temp_Corridors\lc_clip)
- C:\GIS\SCP\Temp_Corridors\lc_clip was reclassified to assign a value of 1 to all land cover classes to create C:\GIS\SCP\Temp_Corridors\base_1. The latter was resampled to 100 m cell size to create C:\GIS\SCP\Temp_Corridors\base_res. This was to create a base map with value 1 which is required for the 'Mosaic to new Raster' tools where this base map is the second layer in the 'Mosaic to new Raster' procedure with the values of the first layer being hardwired into those of the base map.
- C:\GIS\SCP\Temp_Corridors\lc_clip was also reclassified according to Field 'Resistance' of Table 5 to create C:\GIS\SCP\Temp_Corridors\fs_lc_recl. The latter was resampled to 100 m cell size to create C:\GIS\SCP\Temp_Corridors\lc_100m. This was to create a raster indicating the cost associated with the different land cover classes.
- C:\GIS\SCP\Temp_Corridors\clusters and C:\GIS\SCP\Temp_Corridors\base_res were mosaiced into a new raster to create C:\GIS\SCP\Temp_Corridors\clust_1. The wetland clusters were hereby hardwired into the base map with values 1.
- Using the 'Con' function of the Raster Calculator C:\GIS\SCP\Temp_Corridors\clust_1 and C:\GIS\SCP\Temp_Corridors\lc_100m were combined in a manner so that if the value of a cell in lc_100m <= 2000 and the value of the corresponding cell in clust_1 <= 900, then the value of clust_1 is assigned, else the value of lc_100m is assigned [Con(("lc_100m" == 2000) & ("clust_1" == 900), "%clust_1%", "%lc_100m%")]. In other words, if a corresponding cells have been assigned a value of 2000 (most suitable land cover classes) AND 900 (wetland clusters), then the value of clust_1 (the wetland cluster) is assigned, else the value of lc_100m) the cost assigned to the land cover class) is assigned. The output was C:\GIS\SCP\Temp_Corridors\resilience



Easy and 'quick' to change a parameter

Avifauna

- Pseudo_1(point) →
- Pseudo_1 (polygon) →
- Pseudo_2 (point) →
- Pseudo_2 (polygon) →
- Pseudo_3 →
- Pseudo_4 →
- Pseudo_5 →

Feature outputs

Cost layer outputs

- Ps_1
- Ps_2
- Ps_4
- Ps_5



Actual_point buffer distance Pseudo_1 (Pr1)

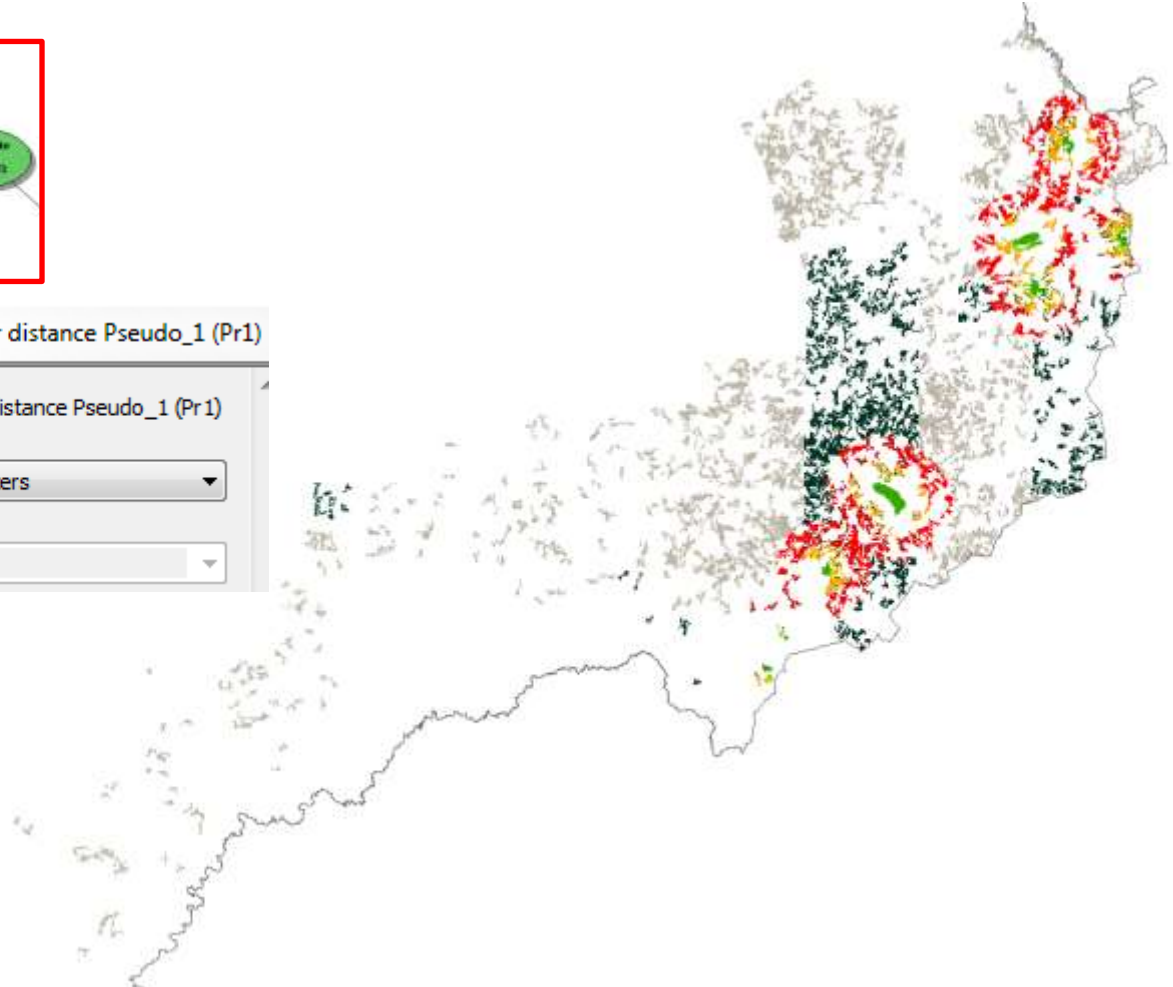
Actual_point buffer distance Pseudo_1 (Pr1)

Linear unit

500 Meters

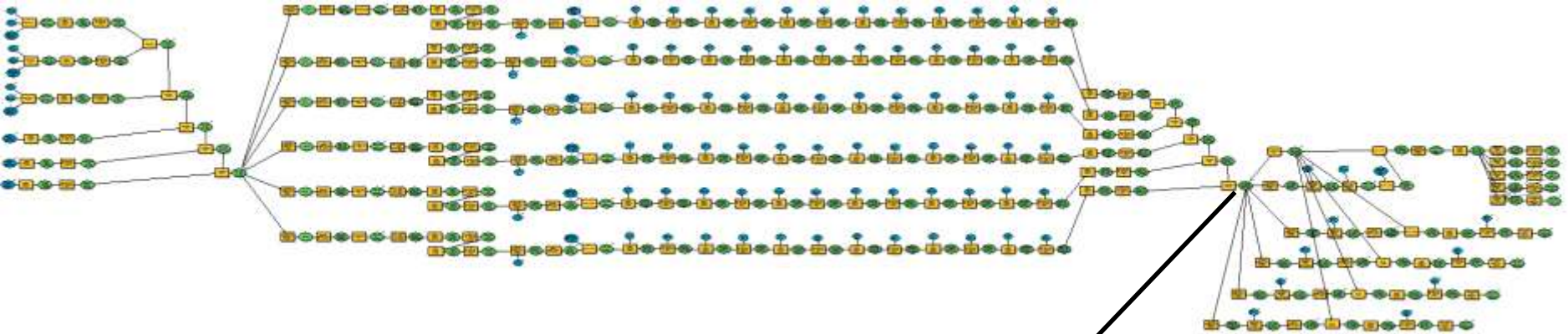
Field

- Output: Cost_Ps1
Value
1
5
10
15
- Output: Cost_Ps2
20
- Output: Cost_Ps4
25
- Output: Cost_Ps5
30



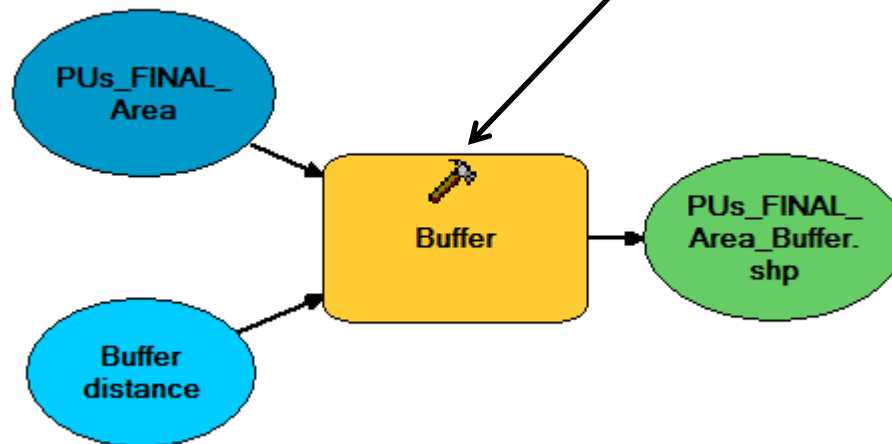
Makes 'trail and error' development much easier

E.g. to test different paramours is relatively easy, just change it and re-run the model. No need to manually redo all the GIS procedures



Need to test incidences of:

- 20 m
- 50 m
- 70m
- 100 m



Additional functionality

For Qmarxan:

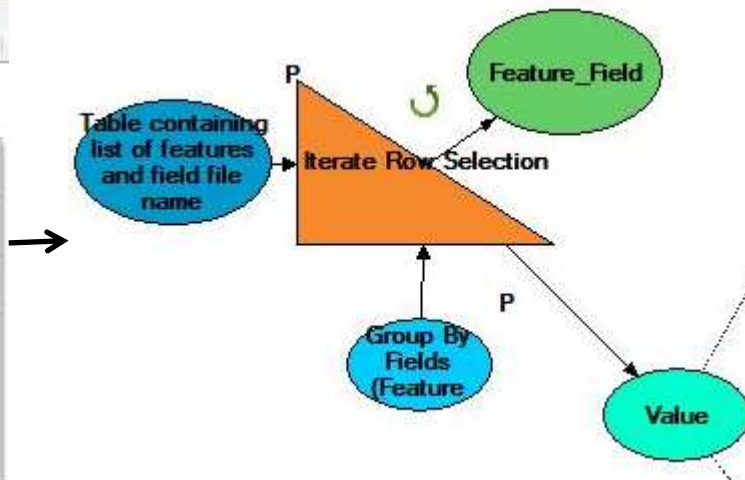
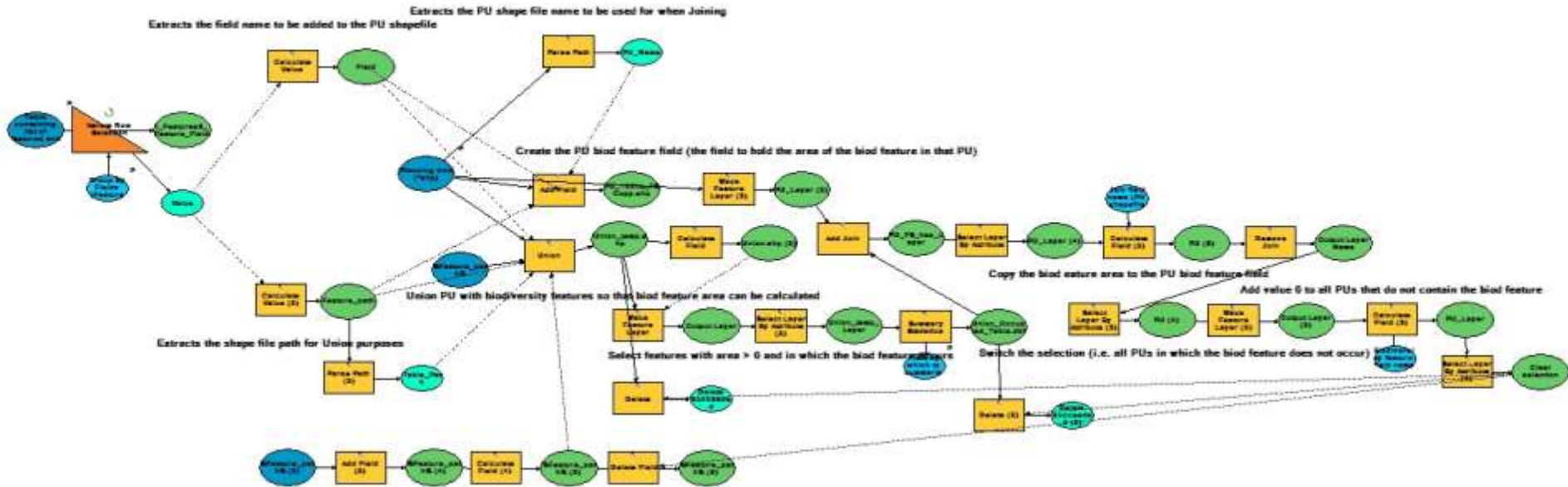
Need to calculate the area of each feature within each Planning Unit (PU) in the PU file

FID	Shape	Area_ha	PU_Cost	PU_Status	ID_PU	Blue Crane	Yellowbr_1	Yellowbr_2	Crowned_Cr	Wattled_Cr	Lesser_Kes
1061	Polygon ZM	99.999999	99.999999	0	106150	99.999999	0	0	0	0	0
1120	Polygon ZM	100.000001	100.000001	0	112032	99.994744	0	0	0	0	0
1090	Polygon ZM	99.999998	99.999998	0	109029	98.525483	0	0	56.484931	0	0
1025	Polygon ZM	99.999997	99.999997	0	102501	97.092675	0	0	0	0	0
1060	Polygon ZM	94.813404	94.813404	0	106011	94.813403	0	0	0	0	0
9737	Polygon ZM	100.000001	100.000001	0	97377	93.258434	0	0	0	0	0
1021	Polygon ZM	100	100	0	102146	93.073209	0	0	0	0	0
1088	Polygon ZM	100.000003	100.000003	0	108877	89.168275	0	0	100.000003	58.935749	0
1096	Polygon ZM	100.000004	100.000004	0	109677	88.748218	0	0	100.000004	100.000004	0
1023	Polygon ZM	99.999999	99.999999	0	102331	87.984232	0	0	0	0	0
1057	Polygon ZM	86.906568	86.906568	0	105799	86.906568	0	0	0	0	0
8129	Polygon ZM	85.356023	85.356023	0	81295	85.356023	23.457431	61.898592	0	0	85.356023
8107	Polygon ZM	99.999999	99.999999	0	81071	78.078874	39.548155	47.391415	0	0	99.999999

115 Features to include

This Qmarxan tool consistently failed, so it had to be done 'manually'

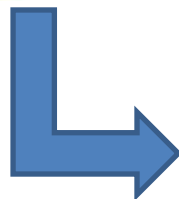
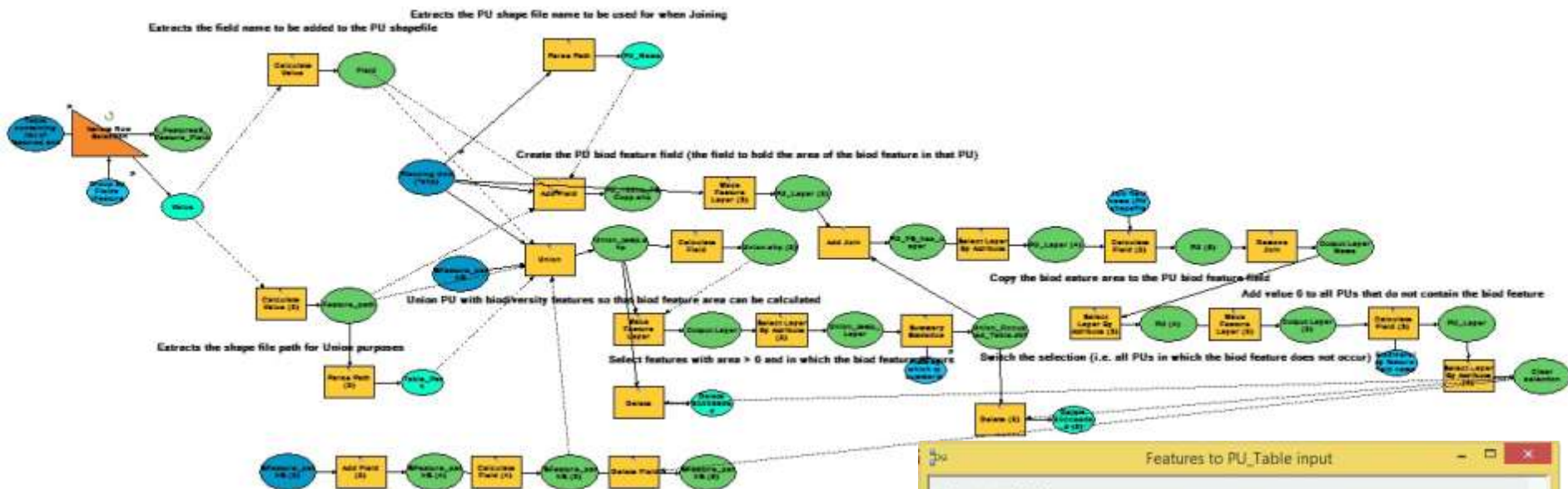
Additional functionality



115 Features

	A	B
1	Feature	Field
2	C:\GIS\SCP\FINAL\EC_Ecological_corridors.shp	Ecol_Corr
3	C:\GIS\SCP\FINAL\SP_Ekangala_CBAs.shp	Ekang_CBAs
4	C:\GIS\SCP\FINAL\VE_Allwal_North_Dry_Grassland.shp	Allwal_Nor
5	C:\GIS\SCP\FINAL\VE_Amersfoort_Highveld_Clay_Grassland.shp	Amersfoort
6	C:\GIS\SCP\FINAL\VE_Andesite_Mountain_Bushveld.shp	Andesite_M
7	C:\GIS\SCP\FINAL\VE_Basotho_Montane_Shrubland.shp	Basotho_Mo
8	C:\GIS\SCP\FINAL\VE_Besemkaree_Koppies_Shrubland.shp	Besemkaree
9	C:\GIS\SCP\FINAL\VE_Bloemfontein_Dry_Grassland.shp	Bl_Dry_Gra
10	C:\GIS\SCP\FINAL\VE_Bloemfontein_Karroid_Shrubland.shp	Bl_Kar_Shr
11	C:\GIS\SCP\FINAL\VE_Carletonville_Dolomite_Grassland.shp	Carletonvi
12	C:\GIS\SCP\FINAL\VE_Central_Free_State_Grassland.shp	Central_Fr
13	C:\GIS\SCP\FINAL\VE_Drakensberg_Afroalpine_Heathland.shp	Drak_Afr_H
14	C:\GIS\SCP\FINAL\VE_Eastern_Upper_Karoo.shp	Eastern_Up
15	C:\GIS\SCP\FINAL\VE_Frankfort_Highveld_Grassland.shp	Frank_HGR
16	C:\GIS\SCP\FINAL\VE_Gold_Reef_Mountain_Bushveld.shp	Gold_Reef

Additional functionality



Features to PU_Table input

Planning Unit (*.shp)

Field by which to summarise area statistics (unique PU identifier)

ID_PU

Table containing list of features and field file name

Group By Fields (Feature path Field named columns respectively)

Field	Null Value
Feature	
Field	

OK Cancel Environments... Show Help >>

Additional functionality

Iterate through a table

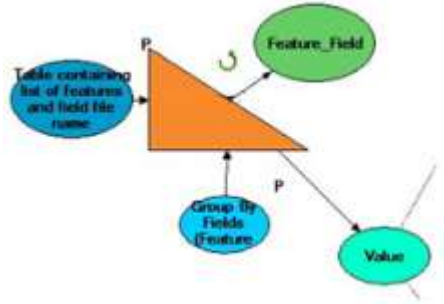
	A	B
1	Feature	Field
2	C:\GIS\SCP\FINAL\EC_Ecological_corridors.shp	Ecol_Corr
3	C:\GIS\SCP\FINAL\SP_Ekangala_CBAs.shp	Ekang_CBAs
4	C:\GIS\SCP\FINAL\VE_Allwal_North_Dry_Grassland.shp	Allwal_Nor
5	C:\GIS\SCP\FINAL\VE_Amersfoort_Highveld_Clay_Grassland.shp	Amersfoort
6	C:\GIS\SCP\FINAL\VE_Andesite_Mountain_Bushveld.shp	Andesite_M
7	C:\GIS\SCP\FINAL\VE_Basotho_Montane_Shrubland.shp	Basotho_Mo
8	C:\GIS\SCP\FINAL\VE_Besemkaree_Koppies_Shrubland.shp	Besemkaree
9	C:\GIS\SCP\FINAL\VE_Bloemfontein_Dry_Grassland.shp	Bl_Dry_Gra
10	C:\GIS\SCP\FINAL\VE_Bloemfontein_Karoid_Shrubland.shp	Bl_Kar_Shr
11	C:\GIS\SCP\FINAL\VE_Carletonville_Dolomite_Grassland.shp	Carletonvi
12	C:\GIS\SCP\FINAL\VE_Central_Free_State_Grassland.shp	Central_Fr
13	C:\GIS\SCP\FINAL\VE_Drakensberg_Afroalpine_Heathland.shp	Drak_Afr_H
14	C:\GIS\SCP\FINAL\VE_Eastern_Upper_Karoo.shp	Eastern_Up
15	C:\GIS\SCP\FINAL\VE_Frankfort_Highveld_Grassland.shp	Frank_HGR
16	C:\GIS\SCP\FINAL\VE_Gold_Reef_Mountain_Bushveld.shp	Gold_Reef

Iterate through files

- FINAL
- AV_Anthropoides_paradiseus_Blue_Crane_Actual_point_Pseudo_1
- AV_Anthus_chloris_Yellowbreasted_Pipit_Actual_point_Pseudo_1
- AV_Anthus_chloris_Yellowbreasted_Pipit_Actual_polygon_Pseudo_1
- AV_Balearica_regulorum_Crowned_Crane_Actual_point_Pseudo_1
- AV_Bugeranus_carunculatus_Wattled_Crane_Actual_point_Pseudo_1
- AV_Falco_naumanni_Lesser_Kestrel_Actual_polygon_Pseudo_1
- AV_Geronticus_calvus_Bald_Ibis_Actual_polygon_Pseudo_1
- AV_Gypaetus_barbatus_Bearded_Vulture_Actual_point_Pseudo_1
- AV_Gyps_africanus_Whitebacked_Vulture_Actual_point_Pseudo_1
- AV_Heteromirafra_ruddi_Rudds_Lark_Actual_point_Pseudo_1
- AV_Polemaetus_bellicosus_Martial_Eagle_Actual_point_Pseudo_1
- AV_Polemaetus_bellicosus_Martial_Eagle_Actual_polygon_Pseudo_1
- AV_Sagittarius_serpentarius_Secretarybird_Actual_point_Pseudo_1

Iterate through records

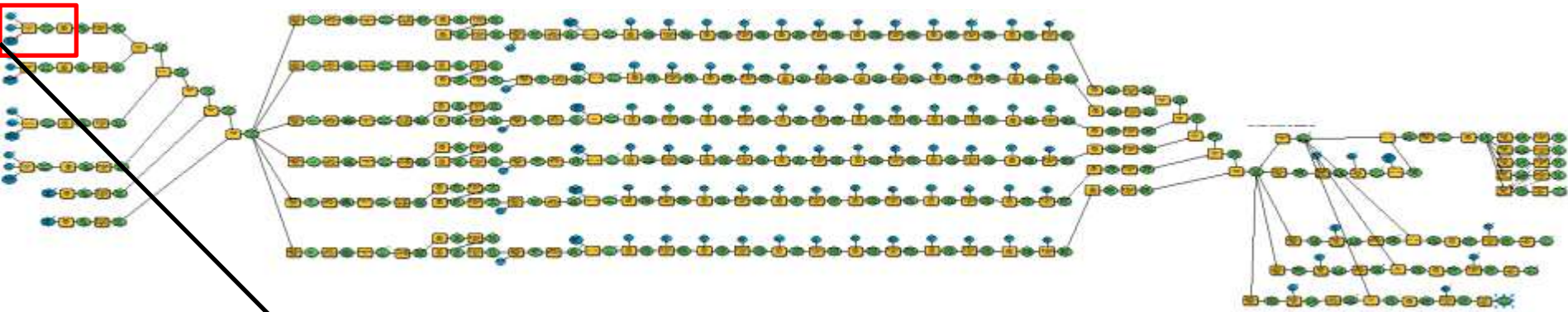
id	Shape *	MUNICNAME	Shape_Long	Shape_Arcu
1	Polygon	Dibeleeng	471183 39265	4878871900 05
1	Polygon	Kapanang	811955 952642	15839702204 2
2	Polygon	Letseeng	645341 039086	3623965376 75
3	Polygon	Mafube	380271 096733	3879643491 05
4	Polygon	Madi a Phetang	389612 285524	4339467522 82
5	Polygon	Mangang	642778 808854	4273785273 55
6	Polygon	Mantsepa	435583 323417	4287220947 36
7	Polygon	Masibonyani	560790 661012	6791046660 15
8	Polygon	Mophaheng	599852 78484	51514302798 22
9	Polygon	Mosomahala	251781 747773	1718193701 88
10	Polygon	Monokare	642925 308665	3769314553 28
11	Polygon	Moghalo	310126 685437	7910453766 04
12	Polygon	Nale	477731 77248	4125828183 88
13	Polygon	Nakadi	455788 244183	3421597893 57
14	Polygon	Ngwathe	543355 870111	7050365323 77
15	Polygon	Nyetane	403773 854204	5603619520 15
16	Polygon	Phumale	701378 003948	8189540724 21
17	Polygon	Sidatse	502013 2709	5882125695 8
18	Polygon	Tolologo	826235 336223	8324529028 8
19	Polygon	Tsevelozela	510560 109390	6520730979 38



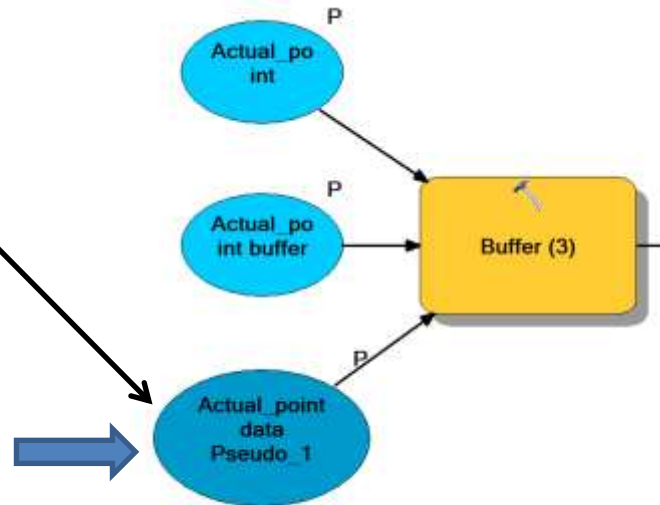
Easier updating

E.g. After having obtained new data on Blue Crane nesting sites:

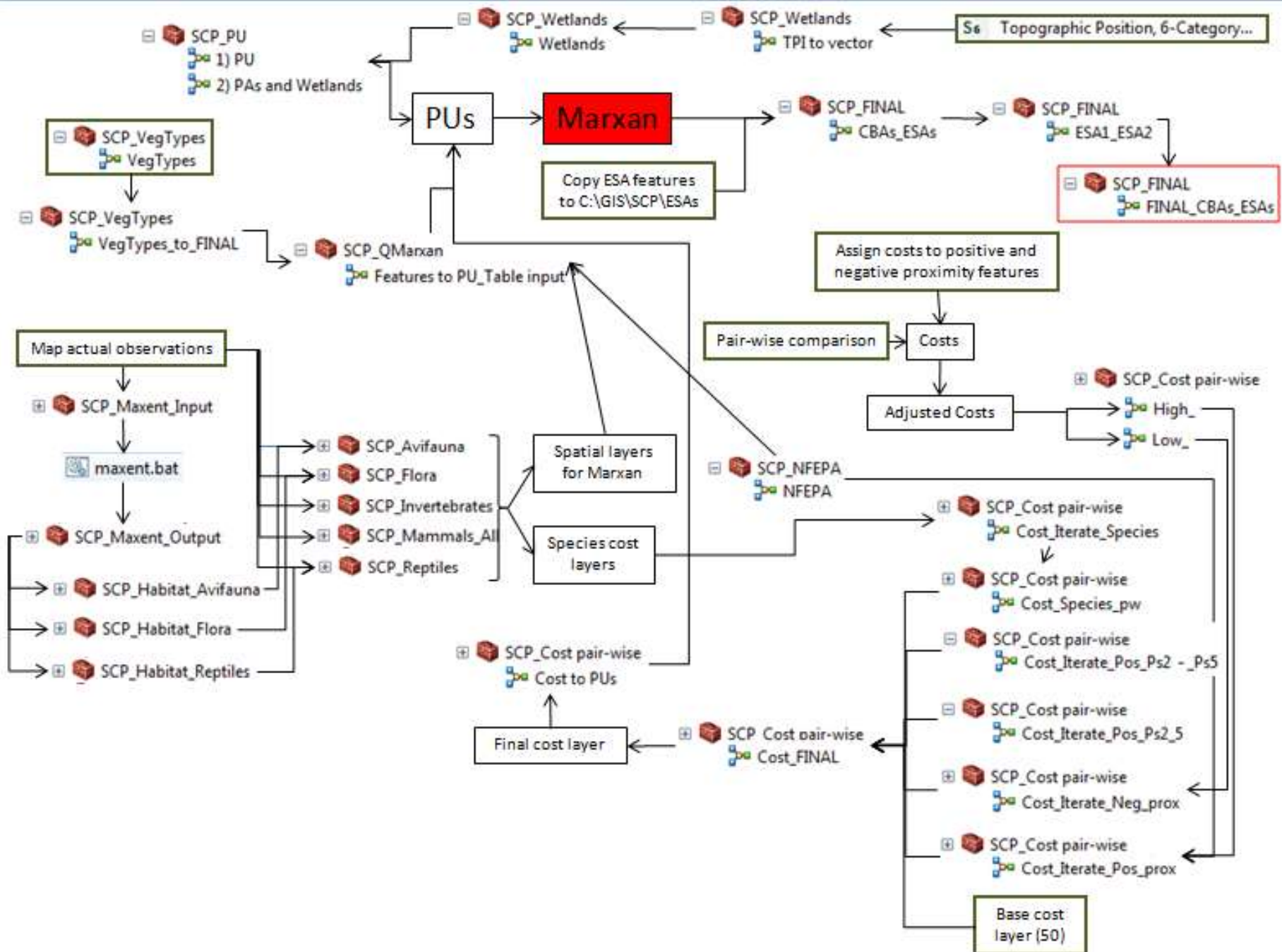
- Include the data in the Pseudo_1 feature files and re-run the model



The shapefile with
point observations
of Blue Crane
nesting sites



Easier handover to next biodiversity planner



THANK YOU!!



destea

department of
economic, small business development,
tourism and environmental affairs
FREE STATE PROVINCE