Preparing a Gap Analysis of Zimbabwe's conservation areas

Scenario:

The government of Zimbabwe is auditing its conservation strategy with a view to expanding its network of national parks and game reserves. An expert committee has been convened that will be presenting its findings to parliament. The committee is currently gathering evidence for its report. You work as a GIS officer for an environmental charity that wishes to contribute to this debate. Your colleagues have heard of gap analysis and have asked you to prepare a gap analysis of Zimbabwe's current network of parks.

Data Sets:

You have been provided with two map layers for the analysis:

- **Zimbabwe_outline**: a 'mask' image, which shows the outline of Zimbabwe. Pixels within Zimbabwe are coded as 1.
- **Zimlandcover4**: A raster grid depicting the main land cover types in Zimbabwe, based on imagery from the NOAA Advanced Very High Resolution Radiometer satellite. Grid cells in this image have been classified as one of the following land cover types based on satellite imagery for 1992-93:

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code      0 : outside study area
code      1 : cropland
code      2 : tropical forest
code      3 : grassland
code      4 : savannah
code      5 : shrubland
code      6 : woodland
code      7 : barren/sparse vegn
code      8 : inland water
```

- **Zimparks**: A shape file, depicting the existing network of conservation areas within Zimbabwe. The field **IUCNCAT** in this vector file contains the IUCN management category for each park, but note that the system used is a slightly older version of the current IUCN classification. The **IUCNCAT** field is text, since the categories are Roman numerals. The field **IUCNCAT2** contains a short integer (number) version of the same information. The older classification was based on 8 categories as follows:

Category I: Strict nature reserve	protected area managed mainly for science

Category II: National Park	protected area managed mainly for ecosystem protection and recreation
Category III: Natural Monument	protected area managed mainly for conservation of specific natural features
Category IV: Managed Nature Reserve / wildlife sanctuary	protected area managed mainly for the sustainable use of natural ecosystems
Category V: Protected landscape/seascape	protected area managed mainly for landscape/seascape conservation and recreation
Category VI: Resource Reserve	To protect the natural resources of the area for future use – a 'holding category'
Category VII: Anthropological reserve / natural biotic area	To allow the way of life of societies living in harmony with nature to continue undisturbed
Category VIII: Multiple Use Management Area	To provide for the sustained production of timber, wildlife, pasture and tourism

Practical exercise:

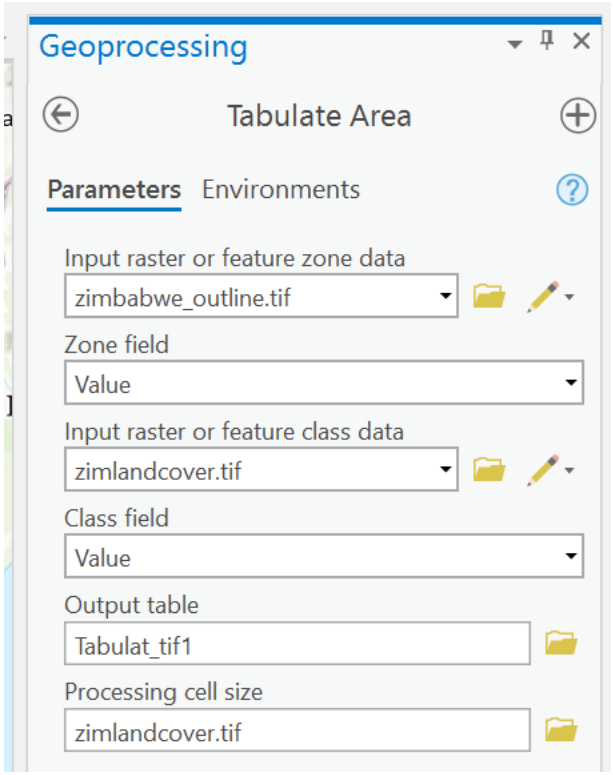
Task:

Using your knowledge of GIS, identify the least protected land cover type for Zimbabwe (i.e. those land cover types that have the lowest percentage of land within the existing conservation areas). If you would like any hints about how to start tackling this exercise, head to the back 2 pages of this handout.

Hints

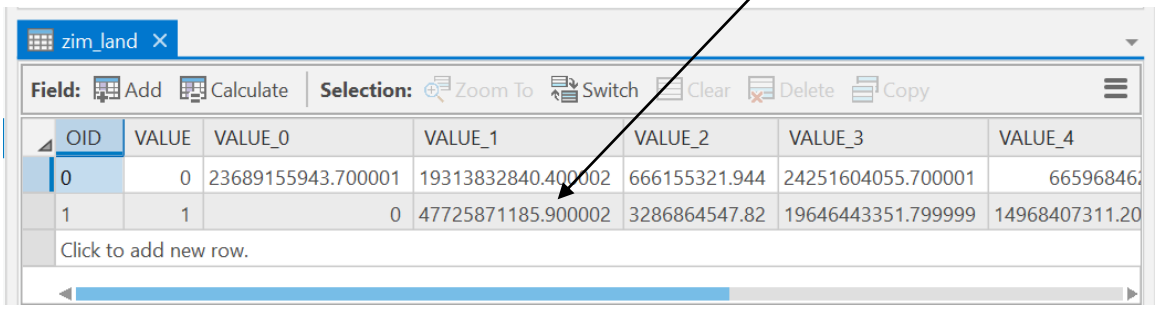
One way of tackling this would be to use the *tabulate areas* tool. What this does is to generate a table with unique values in one raster layer (or vector layer) in the columns, unique values of a second raster layer in the rows, and then areas in the cells within the table.

We could run this tool with the **Zimbabwe_outline** and **zimlandcover** map layers, as shown below:



The output table, shown at the bottom of the table of contents, which can be opened up via a right-click and choosing *open*, looks as shown below. There are two values (from Zimbabwe_outline): 0 means outside Zimbabwe; 1 means inside Zimbabwe. In

the columns we can see the land cover codes from zimlandcover. Thus, VALUE_1 means "cropland" (see explanation of codes on the first page), and this cell shows the area of cropland (in metres squared) in Zimbabwe (Zimbabwe being the row with a VALUE of 1).



We could run the tool again, but replacing **Zimbabwe_outline** with **zimparks** and IUCNCAT or IUCNCAT2 as the *zone field*.

The tool would then output a similar table, but this time, it would show us the area of each land cover class (in the columns) in each IUCN conservation category (in the rows). It would take a little more work to combine these two tables and figure out which land cover categories have the greatest area under conservation. This is probably easier to do in Excel than ArcGIS Pro. For example, we could use the tool *Table to Excel* to export both of these tables to Excel, then copy and paste the information into the same worksheet. Finally, with a bit of work using formulas, for each land cover class, we could work out the proportion of Zimbabwe's land area that is covered by the IUCN conservation zones.