



Association of Rivers Trusts
where there's water there's life



SCIMAP-S: Course Notes

Sensitive Catchment Integrated Modelling and Analysis Platform - for fine Sediment risks

Introducing SCIMAP, what is it and how will I use it?

See separate slide handout

Platforms

We will use two software platforms over the next two days:

SAGA – System for Automated Geoscientific Analyses- is a freely available platform for implementing geoscientific methods; with full and free access to the source code for current modules and the ability to develop new modules in C++. It was developed in Göttingen, Germany by R. Köthe, O. Conrad, A. Ringeler & J. Böhner and is available from: www.saga-gis.org SCIMAP has been developed by us as a module within SAGA allowing us to freely distribute it.

ArcGIS – is a suite of geographic information system (GIS) software products produced by ESRI. We will be using ArcInfo which includes capabilities for data visualisation, manipulation, editing and analysis. We will use ArcGIS initially to prepare the data then for visualisation since these tasks are much more difficult within SAGA.

Data

We will use **Land Cover data** from the CORINE Land Cover Map for 2000, produced jointly by the European Commission and the Member States. It is designed to be used at a scale of 1:100,000 and has a minimum mappable unit of 25 ha. It records 44 land cover and land use classes which represent the major surface types across Europe. The UK part of the map was produced by generalising a more detailed national map (LCM2000 which is also suitable for SCIMAP and available from CEH but is not free). The CORINE data can be downloaded from: <http://www.eea.europa.eu/themes/landuse/clc-download>

We use **Annual Average Rainfall Data** that are based on the UKCIP 2008 baseline data freely available from the Met Office.

We need **Topographic Data** of a resolution of 10 m or finer. Two potential sources of this data are:

1) NEXTMAP DTM data from Intermap <http://www.intermap.com/right.php/pid/4/sid/328>

The data have a resolution of 5 m and an elevation error of ~1 m they currently cost ~£10.50 per km². These data are very suitable for use in SCIMAP. Mark Stanley is the Director of United Kingdom Sales his details are Tel: 01491 671933 Email: mstanley@intermap.com

2) OS Landform Profile DTM data from the Ordnance Survey

<http://www.ordnancesurvey.co.uk/oswebsite/products/landformprofile/>

The data have a resolution of 10 m and an elevation error ~1.8 m their cost is closely related to the size of the area you are purchasing but is significantly lower than that for NEXTMAP data. There are also discounts for “non-corporate users”, which may make profile data quite reasonable. You would need to buy the Data direct from the OS and note it is definitely the profile not the profile+ that you are after and the DTM rather than the contour data. For enquiries about OS data the general enquiry line is 08456 050505 my contact there was Mark Aston 02380 305520

Running SCIMAP Session 1: Defining your catchment and preparing your data

Overview

We will be using a system called ARC to prepare our data for analysis in SCIMAP. By the end of Session 1, we want to be ready to go into SCIMAP.

Aims of Session 1.

1. Identify our catchment boundary (Steps A to I)
2. Use the catchment boundary to cut out our data on topography, land cover, and rainfall (Steps J to M)
3. Export these data so they can go into SCIMAP (Step N)

Guide to what steps to do:

If you don't know your catchment outline, do all steps

If you have a catchment outline (in the form *.shp), go to Step G

Step A. We need to get access to our data and read it into the software platform

A1. Before we can start this session you need to get access to a workspace (this is the folder that contains all the input data that you will be using on this course and where you will store all your outputs).

A1a. Log on to the computer using:

Username: dvs8te00

Password: AC28bf29

A1b. Open my computer and map a network drive (this means telling the computer where to look for the folder that you will be using).

Double Click *My Computer* on the desktop (top left)

Click *Tools* (on the My Computer toolbar) then choose *Map Network Drive...*

In the *Drive* box select X: from the drop down menu (this is the drive you will find your workspace in from now on).

In the *Folder* box type [\\geogfile\research3\\$\ART_training](\\geogfile\research3$\ART_training)

Click *Connect using a different user name*

In the *User name* box type: geog\visiting

You can leave the *password* box empty

Click *OK*

Click *Finish*

A2. Open ARC map and enable its extensions this sets the software up to deal with our data.


A2a. Click *Start* then choose *Programs* then *GIS* then *ArcGIS 9.2* then *ArcMap*.

A2b. You will see a message "Start using ArcMap with" click *OK*

A2c. Click *Tools* (on the toolbar at the top of the screen) then choose *Extensions* then make sure the tick boxes beside *3DAnalyst* and *Spatial Analyst* are ticked, click *Close*

A3. Add the relevant topographic data - using the same method as in A2, if you are using the EDEN example you should add [eden_nextdtm_10](#).

A3a. Click *File* then select *Add Data*

A3b. Click on the connect to folder icon  (you will only need to do this once), navigate to your workspace (e.g. x:\1) single left click on the folder that is your workspace then click *OK*

A3c. click on your topographic data e.g. [eden_nextdtm_10](#) then click *Add*

A4. Stitch them together – called mosaicing (NOTE if you are using the EDEN example we have already done this for you go straight to step A5).

A4a. Click on *ArcToolbox* (the little red tool box)

A4b. Choose *Data Management Tools* then *Raster* then *Mosaic To New Raster*

A4c. Choose Input Rasters (What is a Raster? a grid of numbers – the grid is square or rectangular – when the raster is loaded, the computer colours each number according to its value – using a color table – allowing you to visualise it – here we are stitching lots of rasters together – something called mosaicing)

A4d. Select the rasters you want to put in from the *Input Rasters* box using the drop down box to select your data. You want to include all the files.

e.g. [if50_\[tile1\]_dtm](#) [if50_\[tile2\]_dtm](#)... etc

In the *Output Location* box you should put your workspace. Use the folder icon to the right of the box to navigate to your workspace. Select the relevant folder (but do not go into it) and click add.

In the *Raster dataset name* box type the name that you want to give this dataset

e.g. [\[catchmentname\]_nextdtm_10](#)

In the *Coordinate System* box type *British National Grid.prj*

You can leave the *Pixel Type* box as it is, 8 bit unsigned is fine.

In the *Cellsize* box type '10' this will set the cellsize of the mosaiced raster to 10 m which is large enough to allow us to run SCIMAP for the entire of the Eden catchment.

Click *OK*

A5. Resample the topographic data so that the cell size for the raster is 50 m. Note for this stage we are going to work with a very coarse resolution – 50 m – this is fine for what we are doing in this Session – but not for SCIMAP itself

A5a. Click on *ArcToolbox*

A5b. Choose *Data Management Tools* then *Raster* then *Resample*

In the *Input Raster* box select your mosaic raster from the drop down list

e.g. [catchmentname]_nextdtm

In the *Output Raster* box type a file name for the new resampled topography raster

e.g. [catchmentname]_dtm_50

In the *Output cell size* box type 50

In the *Resampling technique* box select 'Nearest' from the drop down box

Click *OK*

A box will come up to tell you the process has completed, check the *Close this dialog when completed successfully* and click *Close*

Step B. Now we have our data we need to deal with a little problem – hydrological analysis requires water to flow down hill.

Some discussion and some notes

So, we will fill the DEM

B1. In *ArcToolbox* choose *Spatial Analyst Tools* then *Hydrology* then *Fill*

In the *Input Surface Raster* box select the resampled topographic data from the drop down list

e.g. [catchmentname]_dtm_50

In the *Output Surface Raster* box type a file name for the new filled topographic data that will be created

e.g. [catchmentname]_dtmf_50

Leave the *Z limit* box empty

Now, this may take a bit of time so, why not go and talk to someone you haven't met before

Once it is finished, we are going to do some housekeeping – this kind of GIS analysis produces a lot of interim files – files used in the analysis that you won't need again – so we will delete these as we go along.

B3. In the *Layers* box on the left hand side of the ArcMap screen right click on the files that you no longer need (that is all the files except the new filled topography data ([catchmentname]_dtmf_50)

e.g. [catchmentname]_dtm_50, if50_[tile1]_dtm, if50_[tile2]_dtm... etc

Step C. Now our water can all flow downhill, we have to decide how it would like to do that.

Some discussion ... and some notes

How does water flow down a hillslope?

So, we will generate the flow direction using D8 – note – in SAGA – there are better options – but using D8 gives a very good and rapid and probably sufficient catchment outline for our purposes

C1. In *ArcToolbox* choose *Spatial Analyst Tools* then *Hydrology* then *Flow Direction*

In the *Input Surface Raster* box select the filled topography data from the drop down list

e.g. [catchmentname]_dtmf_50

In the *Output Surface Raster* box type a file name for the new flow direction raster that will be created

e.g. [catchmentname]_fdir_50

Click *OK* Bit quicker this one – try blinking a bit and see if you miss it

Step D. We now know which way the water is going to go – imagine you are a point in the river – we have to work out where upstream the water that flows past you could have come from – when we know this – we know the area upstream that has contributed to you (your upstream or upslope contributing area) – this is, by definition, your catchment outline

Some discussion ... and some notes

D1. In *ArcToolbox* choose *Spatial Analyst Tools* then *Hydrology* then *Flow Accumulation*

In the *Input Flow Direction Raster* box select flow direction raster from the drop down list

e.g. [catchmentname]_fdir_50

In the *Output Flow Accumulation Raster* box type a file name for the flow accumulation raster

e.g. [catchmentname]_uca_50

Click *OK*. This is another long one, time to find someone else to say hello to.

D2. Once it has finished open ArcCatalog by clicking on the filing cabinet just to the left of the red toolbox on the toolbar

Step E. We now have to tell the computer, which struggles to understand our desires at the best of times, where we want to focus on downstream – the outlet of our catchment – which we call the pour point – note we are introducing a new sort of GIS data here – vector data (the other sort being raster data)

Some discussion ... and space for notes

E1. Navigate to your workspace in the *Catalog* box on the left hand side of the ArcCatalog screen, right click on the folder that is your workspace then select *new* then *shapefile*

In the *Name* box type a name for your catchment outlet point

e.g. [catchmentname]_pour1

In the *Feature Type* box select Point

In the *Spatial Reference* box click *Edit* then *Select* then *Projected Coordinate Systems* then *National Grids* then *British_National_Grid*,

Click *Apply* then *OK* then *OK*

Now we need to go back into ArcMap again (the globe with a magnifying glass)

E2. Click *File* then select *Add Data*

Navigate to your workspace and add the catchment outlet point

e.g. [catchmentname]_pour1.shp

E3. Click *View* then select *Toolbars* then *Editor*

E4. A new toolbar appears on it click *Editor* then select *Start Editing*

A dialog box will pop up asking you 'which folder or database do you want to start editing from?'

Click on *Shapefiles* then click *OK* then click *Start Editing*

E4a. In the *Task* box on the toolbar select 'Create New Feature'

E4b. In the *Target* box on the toolbar select the catchment outlet point

e.g. [catchmentname]_pour1

E4c. Click on the pencil tool on the toolbar

E5. Click on the location of the catchment outlet (you will be able to find this from [catchmentname]_uca_50) – please try to put the dot in the centre of one of the cells with a big upslope contributing area you will find this easier if you zoom in on one of the rivers using the

zoom tools  

NOTE: If you are working with the EDEN example please choose a subcatchment to the river Eden rather than the entire catchment since the computer will take a very long time to perform the calculations on the entire catchment. You might instead choose a subcatchment like those in the table below.

| LOCATION | EASTINGS | NORTHINGS |
|----------------|----------|-----------|
| River Eden | 360460 | 528330 |
| River Eamont | 357570 | 530450 |
| River Irthing | 348650 | 558110 |
| River Petteril | 341190 | 554500 |
| River Caldw | 339480 | 552730 |

E6. Click on *Editor* then *stop editing* when it asks if you want to *Save edits?* Choose Yes

Step F. Finally, and remembering that in most GIS, you have to take a lot of steps to get to what you actually want to do, we can work out our catchment outline – like most partners/wives/husbands, ARC doesn't always do what you want it to do at this stage – so you may have to go back and repeat Step E, making sure you find a big upslope contributing area

F1. In *ArcToolbox* choose *Spatial Analyst Tools* then *Hydrology* then *Watershed*

In the *Input Flow Direction Raster* box select flow direction raster from the drop down list

e.g. [catchmentname]_fdir_50

In the *Input raster or feature pour point* box select the catchment outlet point from the drop down list e.g. [catchmentname]_pour1

In the *Output Raster* box type a file name for the new watershed raster

e.g. [catchmentname]_catch_50

Step G. Step F has worked out our catchment outline, but the data it is handling are in a raster data set – we need to convert this back to a vector dataset

In *ArcToolbox* choose *Conversion Tools* then *From Raster* then *Raster to Polygon*

In the *Input Raster* box select the watershed raster from the drop down list

e.g. [catchmentname]_catch_50

In the *Field* box select 'Value'

In the *Output Polygon* box type a file name for the new watershed polygon

e.g. [catchmentname]_catch.shp

Uncheck the *Simplify Polygons* box

Step H. When we go on to do processing with our catchment outline, the software gets most distressed if it doesn't have a cushion to soften the calculations at the edges – in short – it will crash – so we add in a bit more data around the catchment edge to stop this happening – this does not impact on your calculations at all – but makes the computer feel much better about it

In *ArcToolbox* choose *Analysis tools* then *Proximity* then *Buffer*

In the *Input Features* box select the watershed polygon from the drop down list

e.g. [catchmentname]_catch.shp

In the *Output Feature Class* box type a file name for the new buffered watershed polygon

e.g. [catchmentname]_catch_buff.shp

In the *Linear Unit* box type 100 and select 'Meters' from the drop down box next to it.

All the other options can be left as their default settings, click *OK*

Step I. More housekeeping now (if you have done Steps A to H that is) – some datasets to remove

I1. In the *Layers* box on the left hand side of the ArcMap screen right click on the files that you no longer need (that is all the files except the new buffered watershed polygon ([catchmentname]_catch_buff.shp). You can remove: [catchmentname]_dtmf_50, [catchmentname]_fdir_50, [catchmentname]_uca_50, [catchmentname]_pour1.shp, [catchmentname]_catch_50 then choose *remove*.

Step J. Now we have a catchment boundary, we need to get our data cut down to size – as defined by the catchment boundary

J1. No greedy capitalists behind this one – the CORINE land use data are free! Add the CORINE landcover map for the whole of the UK from X:\data\corine_30m (note if you are using the EDEN example you can add the CORINE map *ed_corine_30m* for only North West England from your workspace). Add the data using the same method as you used for the topographic data at the start of this session (step A3).

J2. Is the Met Office missing a trick here – rainfall data are also free (but then the Met Office is funded by tax payer's money – shame it wasn't the EA that commissioned NEXTMAP data)!

Add the Rainfall map for the whole of the UK from: X:\data \uk50_rain (note if you are using the EDEN example you can add the rainfall map [ed_uk50_rain](#) for only North West England from your workspace). Add the data using the same method as you used for the topographic data at the start of this session (step A3).

J3. In each case it will ask you if you want to build pyramids for the data. This is a way of speeding up the visualisation of the data but it is not required for what we are doing so choose **No**.

Step K. We have our data, so now let's get the scissors out, starting with the rain data – and in here there is a critical trick – we have to get the rain (50 m) data onto the same resolution as the topography (10 m in this application) – note the alert amongst you might think this means you could use coarser resolution topography and do the same trick – no such luck – as annually-averaged rainfall doesn't have that much of a spatial variability, so you can make it finer (if you don't believe us, try lying down, outside, for a year, and seeing if you think your head is wetter than your toes at the end of it) – topography is more complex

K1. Click **View** then select **Toolbars** then **Spatial Analyst**

K2. A new toolbar appears on it click **Spatial Analyst** then choose **Options**

In the **General** tab change the **Analysis mask** to the buffered watershed polygon

e.g. [\[catchmentname\]_buff.shp](#)

In the **Extent** tab change the **Analysis extent** to the buffered watershed polygon

e.g. [\[catchmentname\]_buff.shp](#)

Click **OK**

K3. Click **Spatial analyst** again then select **Raster Calculator**

In the **Layers** box double click on the rainfall raster (e.g. [\[uk50_rain\]](#))

Click **Evaluate**

K4. In **ArcToolbox** choose **Data Management Tools** then **Raster** then **Resample**

In the **Input Raster** box select 'Calculation1' from the drop down list

In the **Output Raster Dataset** box type a file name for the new resampled rainfall raster (note be careful here to make sure that the output is saving to your workspace i.e. X:\ rather than C:\)

e.g. [\[catchmentname\]_rain_10](#)

In the **Output cell size** box type 10

In the **Resampling technique** box select 'Nearest' from the drop down box

Click **OK**

K5. Remove: [ed_uk50_rain](#) and [Calculation1](#) using the same method as in B3 and I1.

Step L. As per K, but for the landcover – and the same trick – we have to get the landcover (30 m) data onto the same resolution as the topography (10 m in this application) – note that you should think about what CORINE actually is – it is derived from satellite imagery (i.e. it is synoptic) – try sitting in a field one day, write down the land use, and see for how long it stays the same – this may take a few years – i.e. a critical question about SCIMAP is the validity of the assumptions we make about land cover

L1. In the *Layers* box on the left hand side of the ArcMap screen right click on the buffered catchment polygon then choose *Zoom to Layer*

L2. Click *Spatial analyst* on the toolbar then choose *Options*

In the *General* tab change the *Analysis mask* to <none>

In the *Extent* tab change the *Analysis extent* to 'Same as Display'

Click *OK*

L3. Click *Spatial analyst* again then select *Raster Calculator*

In the *Layers* box double click on the landcover raster (e.g. [\[ed_corine_30m\]](#))

Click *Evaluate*

L4. In *ArcToolbox* choose *Data Management Tools* then *Raster* then *Resample*

In the *Input Raster* box select '[Calculation1](#)' from the drop down list

In the *Output Raster* box type a file name for the new resampled landcover raster

e.g. [\[catchmentname\]_lcm_re](#)

In the *Output cell size* box type 10

In the *Resampling technique* box select 'Nearest' from the drop down box

Click *OK*

L5. Remove: [ed_corine_30m](#) and [Calculation1](#) using the same method as in B3 and I1.

L6. Click *Spatial Analyst* then choose *Options*

In the *General* tab change the *Analysis mask* to the buffered watershed polygon

e.g. [\[catchmentname\]_buff.shp](#)

In the *Extent* tab change the *Analysis extent* to the buffered watershed polygon

e.g. [\[catchmentname\]_buff.shp](#)

Click *OK*

L8. Click *Spatial analyst* on the toolbar then choose *Raster Calculator*

In the *Layers* box double click on the resampled landcover raster

(e.g. [catchmentname]_lcm_re)

Click *Evaluate*

L9. In the *Layers* box on the left hand side of the ArcMap screen right click on *Calculation1* then choose *data* then *make permanent*

Check that you are saving the data in your workspace

In the *Name* box type a file name for the new clipped and resampled landcover raster

(e.g. [catchmentname]_lcm_10)

L10. Remove *Calculation 1*

L11. Add the new resampled landcover raster [catchmentname]_lcm_10 using the same method as in A2.

Step M. As per K and L, but for the topography

M1. Add the 10 m topography raster from your workspace (this will either be the pre-provided data for the eden, eden_nextdtm or it will be the data you created using mosaic in step A4)

(e.g. [catchmentname]_nextdtm)

M2. Click *Spatial analyst* on the toolbar then choose *Raster Calculator*

In the *Layers* box double click on the newly imported 10 m topography raster then click *Evaluate*

(e.g. [catchmentname]_nextdtm)

M3. In the *Layers* box on the left hand side of the ArcMap screen right click on *Calculation1* then choose *data* then *make permanent*

Check that you are saving the data in your workspace

In the *Name* box type a file name for the new clipped topography raster

(e.g. [catchmentname]_dtm_10)

M4. Remove *Calculation 1*

M5. Add the new topography raster [catchmentname]_dtm_10 using the same method as in A2.

Step N. Arc has a most peculiar data storage system – but that is true of every software system, in that each storage system is unique – so, we have to use common interchange formats for data – as we are, at last, nearing the end of preparing our data, it is time to get ready to send them off on their travels to another place (SAGA, where SCIMAP sits) and another time (tomorrow’s session) – we will use a very simple but extremely inefficient data system called ascii (American Standard Code for Information Interchange, for the nerds amongst you)

N1. for landcover

In *ArcToolbox* choose *Conversion Tools* then *From Raster* then *Raster to ASCII*

In the *Input raster* box select the clipped resampled landcover grid from the drop down list

e.g. [catchmentname]_lcm_10

In the *Output ASCII* box type a file name for clipped resampled landcover grid

e.g. [catchmentname]_lcm_10.asc (note the .asc end here)

Click *OK*

N2. for rain

In *ArcToolbox* choose *Conversion Tools* then *From Raster* then *Raster to ASCII*

In the *Input raster* box select the clipped resampled rainfall grid from the drop down list

e.g. [catchmentname]_rain_10

In the *Output ASCII* box type a file name for clipped resampled rainfall grid

e.g. [catchmentname]_rain_10.asc (note the .asc end here)

Click *OK*

N3. for topography

In *ArcToolbox* choose *Conversion Tools* then *From Raster* then *Raster to ASCII*

In the *Input raster* box select the clipped DTM from the drop down list

e.g. [catchmentname]_dtm_10

In the *Output ASCII* box type a file name for clipped DTM

e.g. [catchmentname]_dtm_10.asc (note the .asc end here)

Click *OK*

Running SCIMAP Session 2: Introduction to SAGA and running SCIMAP

Overview

- Review of Day 1
- Today we are moving on to running SCIMAP, which runs in a freely available GIS code called SAGA – note, please, this is not GIS for old people, as some people have called it – but a piece of software that the developers have made free to download – celebrate their philanthropy before you make jokes about their unfortunate choice of name
- Note though, we don't suggest you download SAGA yourselves, as we will supply a version of SAGA with SCIMAP in it

Aims of Session 2

1. To familiarise ourselves with SAGA
2. To load in the data generated in ARC
3. To think through how we convert our land cover into erodibility
4. To run SCIMAP

Step A. Start SAGA and Load Grids

A1. Before we can start this session you need to regain access to your workspace (the folder with your data in).

A1a. Log on to the computer: Username = dvs8te00, Password = AC28bf29

A1b. Open my computer and map a network drive.

Double Click *My Computer* on the desktop

Click *Tools* then choose *Map Network Drive...*

In the *Drive* box select X: from the drop down menu. In the *Folder* box type [\\geogfile\research3\\$\ART_training](\\geogfile\research3$\ART_training)


Click *Connect using a different user name*

In the *User name* box type: geog\visiting

You can leave the *password* box empty

Click *OK*

Click *Finish*

A2. In the 'My Computer' window navigate to your workspace then open the folder SAGA2.0 then double click on saga_gui.exe (it will display with this icon )

Saga will open and you may see a SAGA error "failed to load shared library..." don't worry about this since it refers to tools that are surplus to our requirements. Click **OK**

A3. Next we want to close any open grids

Go to the **Data** tab at the bottom of the **Workspace** right click on **Grids** choose **close** then **Yes**

A4. In the **Modules** tab click **Import/Export – Grids** then double click on **Import ESRI Arc/Info Grid**

Click in the box to the right of **File** then click on the **...** icon (this is the same as the folder icon in ARC or windows). Navigate to your workspace e.g. X:\1\ select the landcover raster that you want to import (note that it will have an .asc extension).

e.g. [catchmentname]_lcm_10.asc

Click **Open**, Click **Okay**

A5. In the **Modules** tab click **Import/Export – Grids** then double click on **Import ESRI Arc/Info Grid**

Click in the box to the right of **File** then click on the **...** icon, navigate to your workspace, select the rainfall raster that you want to import (note that again it will have an .asc extension).

e.g. [catchmentname]_rain_10.asc

Click **Open**, Click **Okay**

A6. In the **Modules** tab click **Import/Export – Grids** then double click on **Import ESRI Arc/Info Grid**

Click in the box to the right of **File** then click on the **...** icon, navigate to your workspace, select the topography raster that you want to import (note that again it will have an .asc extension).

e.g. [catchmentname]_dtm_10.asc

Click **Open**, Click **Okay**

A7. Go to **Data** tab and double left click on each of these to check that they have imported properly and that they look right.

Step B. Save Grids

B1. On the top toolbar click **File** then choose **Project** then **save project as**

Check that you are in your workspace and if you aren't then navigate to it as usual.

In the File Name box type the name of your catchment or something memorable

e.g. [catchmentname].sprj

Click *Save*

In the pop-up window check the box beside *Save all*

Click *Okay*

We are now at a critical point – starting to apply SCIMAP – so we will have a quick refresher before we go any further

See A3 handout – note also the written description in Annex 1.

Step C. We are now going to calculate the erodibility of a location given its land cover

Some discussion ... and space for notes

C1. In the Modules tab click *Grid – Tools* then double click on *Change Grid Values*

Click in the box to the right of *Grid system* choose the long string of numbers. This box is telling the software about which dataset you are going to work with, because we have only loaded one dataset there is only one option which makes things much simpler. The numbers tell the software the cellsize; no of columns and rows; OS grid coordinates of the lower left corner.

Click in the box to the right of *>> Grid* choose your landcover raster

e.g. [catchmentname]_lcm_10

(note the >> sign indicates a compulsory input, a > sign would be an optional input, a << is compulsory output and a < is an optional output)

Click in the box to the right of < *Changed Grid* and select [\[create\]](#) (this will create a new grid as an output)

Click in the box to the right of *Lookup Table* then click on the ... icon, click on *load*, navigate to the saga2.0 folder in your workspace select [reclass_lcm_to_fs_risk.txt](#)

Click *Open*

Click *Okay*

Step D. We can now run SCIMAP

Some discussion ... and space for notes

D1. In the *Modules* tab click *SCIMAP Risk Maps (beta 20 July 07)* then double click on *Fine Sediment Risk*

Click in the box to the right of *Grid system* choose the long string of numbers again.

Click in the box to the right of >> *Dem*: choose your topography raster

e.g. [\[catchmentname\]_dtm_10](#)

Click in the box to the right of >> *Erodability* choose your new rescaled landcover raster

e.g. [Changed Grid](#)

Click in the box to the right of >> *Rainfall Pattern* choose your rainfall raster

e.g. [\[catchmentname\]_rain_10](#)

Check the boxes for *Fill DEM?* And *Use stream power?*

Click *Okay*

This shouldn't happen for the segment of the Eden we are using at 10m resolution, but if SAGA crashes at this point it is probably because your datasets are too large – either covering too large an area or a smaller area but at too high a resolution. You need to go back into ArcMap, resample each of the grids at a coarser resolution then reconvert them to ASCII. Once you have

done this repeat the steps in SAGA. Or you could try doing the calculation for a smaller area, but at the higher resolution, by moving your pour point (Session 1, Step E) upstream.

Once SAGA has successfully run SCIMAP go to the *data* tab to check the outputs are all there. You should have the following rasters:

Slope, Catchment Area, Channels, Erosion Risk, Surface Flow Index, Accumulated Erosion Risk, Erosion Risk in Channels, Erosion Risk in Channels concn.

Some discussion ... and space for notes

Step E. We now need to save the grids

E1. On the top toolbar click *File* then choose *Project* then *save project as*

Check that you are in your workspace and if you aren't then navigate to it as usual.

In the File Name box type the name of your catchment and an indication that this is for the completed model

e.g. [catchmentname]_fs.sprj

Click *Save*

In the pop-up window check the box beside *Save all*

Click *Okay*

Session 3. Exporting and interpreting SCIMAP predictions

Overview

- We have now produced risk predictions in SCIMAP, these are most easily interpreted back in ArcMap. To do this we need to export the data from SAGA, read it back into ArcMap and visualise it using a consistent method.
- We will then be ready to start examining and interpreting the results

Aims of Session 3

1. To export the generated risk maps from SAGA
2. To load these maps into Arc Map
3. To examine the SCIMAP predictions

Step A. We have our data as a raster dataset – they are much better to use as vectorised files

A1. In the *Modules* tab click *Shapes – Grid* then double click on *Grid values to points*

Click in the box to the right of *Grid system* choose the long string of numbers again.

Click in the box to the right of *>> Grids* then click on the *...* icon, click on *Erosion Risk in Channels concn* then click on the *>>* icon then *Okay*

Click in the box to the right of *<< Points* choose [create]

Check the box for *Exclude NoData Cells*

Step B. We can now export the data for viewing

B1. To export points as a shapefile (a suitable format to import into ArcGIS. In the *Data* tab in the *workspace* box right click on the Points you want to save

e.g. *Points from Grid(s)*

B2. Choose *save shapes as*

Check that you are in your workspace and if you aren't then navigate to it as usual.

In the File Name box type the name for the fine sediment risk points

e.g. *[catchname]_fs_riskc.shp*

B3. In the *Modules* tab click *Import/Export – Grids* then double click on *Export ESRI Arc/Info Grid*

Click in the box to the right of *Grid system* choose the long string of numbers again.

Click in the box to the right of *>> Grid* choose the raster that you want to export (start with *Erosion Risk* but you can export as many of the rasters as you like).

Click in the box to the right of *File* then click on the *...* icon, navigate to your workspace, in the *File Name* box type your name for the erosion risk (note that SAGA will give it a .asc extension).

e.g. [catchmentname]_erisk.asc

Step C. We view the raster data in ARC

C1. Click on *ArcToolbox*

C2. Choose *Conversion Tools* then *To Raster* then *ASCII to Raster*

In the *Input ASCII raster file* box navigate to your workspace and select the erosion risk ascii file (note you may need to change the *Files of type* to (*.ASC) in order to see your files)

e.g. [catchmentname]_erisk.asc

In the *Output raster* box type a file name for the converted raster

e.g. [catchmentname]_erisk

Change the *Output data type* to 'FLOAT'


Click *OK*

C3. The new dataset will be displayed once the process is complete. To change the colour bar left click on it in the Layers window and you will see a drop down list of other alternatives. There is also a check box here to invert the colour bar, i.e. ensure green is low and red high risk.

Step D. We view the vector data in ARC

D1. Click *File* then select *Add Data* navigate to your workspace add the risk concentration shapefile that you saved in SAGA

e.g. [catchname]_fs_riskc.shp

To do this you will have to re-connect to the folder that is your workspace using the  icon as you did in step A3 of the first session.

D2. In the *Layers* box on the left hand side of the ArcMap screen right click on the newly imported shapefile and choose Properties.

D3. Select *Quantities* from the *Symbology* tab

D4. Change the *Value* field to 'EROSION RISK' and *OK* the warning about sample size.

D5. Click *Classify* and again *OK* any warning, click the *Sampling* button and add "00000" to the end of the *Maximum Sample Size* value shown then click *OK*


D6. Change the classification *Method* to 'Standard Deviation' and the *Interval Size* to '1/3 Std Dev' *OK*

D7. Click on *Symbol* underneath the Color Ramp box choose *Properties for all symbols* then *Properties* then uncheck the *Use Outline* box click *OK* then change the *size* to 2.00, click *OK*

D8. Click on the dropdown arrow for *Color Ramp* and select the green – red colour ramp (this will already be selected but needs doing again after changing symbol properties). Click *OK*

Step E We will find this data easier to interpret with some additional information about the catchment so that we can orientate ourselves. The Ordnance Survey have good GIS data for this that we can use for today.

E1. Click *File* then select *Add Data* navigate to X:\data\strategi then choose either strategi-north or strategi-south depending on where in the UK your catchment is, add the relevant features that you think might help you to identify locations in your catchment (you will need to do this by single clicking on the feature then clicking *Add*

NOTE, you will again have to connect to the folder that contains the data X:\data using the  icon as you did in step A3 of the first session.

E2. You may find: 'coast', 'rivers' and 'river2' useful. You may also want to add some local towns or villages and display their names. You can do this by adding 'village', 'town' or 'city'.

E3. To display town or village names

E3a. In the *Layers* box on the left hand side of the ArcMap screen right click on the newly imported shapefile and choose Properties.

E3b. In the *Labels* tab check the box *Label features in this layer* in the *Label Field* box choose *FM* from the drop down list.

E4. You can navigate around the map using the icons on the Tools Toolbar to zoom and scroll as you did in step E5 of the first session.