Section 3: Survey design

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3.1. Sampling designs: wildlife and human sign

Either recces or a combination of recces and transects are currently used for multi-species and human impact monitoring in the Central African forests. These are pre-designed sample units representative of the whole area to be surveyed, consisting of known trajectories, along which trained teams of wildlife technicians walk, collecting data on human and animal sign.

Since about 2000, sampling designs have usually been drawn up using a combination of DISTANCE (Thomas *et al.* 2009) and ArcView (or ArcGIS) (ESRI 2000; 2004). DISTANCE is a computer program first developed in 1993 specifically to analyse wildlife survey data collected on line-transects. DISTANCE has been the standard program used for analysis of transect data since about 1995 and, since 2001, has included the possibility to design recce and transect surveys (e.g. Fig. 1), which is (i) much quicker and more accurate than doing it by hand (ii) allows a true random component in the design whilst assuring proportional sampling of the area of interest, and (iii) automatically provides the start and stop points of survey lines as GPS locations (Strindberg 2001; Strindberg *et al.* 2004)..

The sampling designs for recces are usually a series of zigzags or parallel lines drawn up using the DISTANCE. The lines sample the whole of the site proportionally to the shape and size of the site. The program takes into account the fact that a given site is not a perfect circle or square, and lays out equally-spaced lines to avoid over-sampling or under-sampling of

different parts of the area to be surveyed. All vegetation types are surveyed on recces, but not as rigorously as on transects (see “Field procedure”, below).

The sampling designs for transects are also a series of lines (at least 20 is advisable), again usually drawn up using DISTANCE, where the distances between each transect, the length of each transect, and the compass bearing of the transects are defined in advance. Transects are straight lines that cut through all vegetation types and provide complete sample coverage of the area to be surveyed. The design is normally from a random start point, but is a regular design (equally spaced). They are laid out at right angles to the major gradient within a habitat (usually the drainage pattern) to minimise inter-transect variance caused by differences in habitat. If there are enough resources, more than one stratum can be defined, as this increases the precision of the estimate (e.g. Buckland 2001, 2004, Hedges & Lawson 2006, MIKE 2005), but it should be remembered that for a robust estimate of density from a transect design, especially in tropical rainforest, it is advisable that the design includes at least 30 transects *per stratum*. This has budgetary implications (see below), so many surveys start by defining just one stratum: the whole area to be surveyed.

The example in Fig. 3.1 shows a recce design and a transect design suitable for an area. Note that in transects, the field team has to walk between the transects in any case, so roughly the same number of kilometres is walked in the field in both cases.

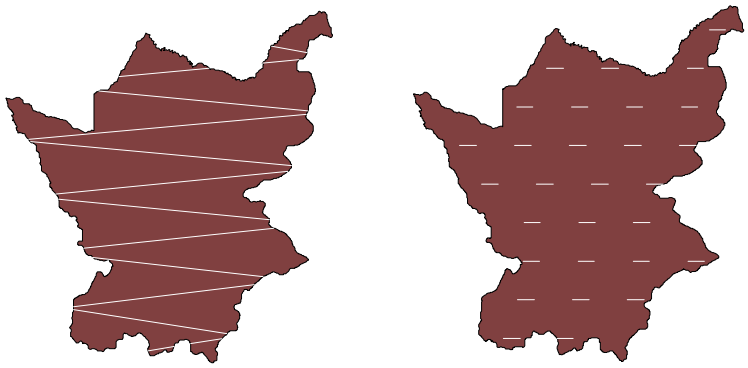


Fig. 3.1. A suitable recce design (left) and a transect design (right) for the same area, where only one stratum is used.

3.1.1. Which sampling design to use?

Do we really need to know animal numbers as opposed to relative abundance?

Trend analyses carried out on the data collected in monitoring programs inform management as to whether wildlife populations are increasing or decreasing. Both the results from transects (animal or dung density) and the results from recces (encounter rates) can easily be mapped, so shifts in distribution and abundance can be visualised.

In the case of sites which contain large-bodied endangered species, where one aspect of their long-term survival is their absolute population size and density, it is advisable to calculate animal density (using transects) across the protected area. An important caveat here is that if their numbers are already low, density estimation will not be possible without a very high (and often prohibitively expensive) amount of effort.

Where no such species remain (sites which maintain populations of smaller species but from which, for example, elephants, apes, most monkeys and the larger ungulates have gone or are at very low density) recce surveys will provide the information required.

Monitoring programs are designed to detect differences between monitoring cycles. The ability to detect a trend depends upon the precision of survey estimates (Gerrodette, 1987; Barnes 2002). Where numbers of animals are concerned (or their density, or the density of their signs) this ability to detect differences is decided, *a priori*, to a target precision. This is expressed as the coefficient of variation. Practically speaking, a target coefficient of variation of 25% means that *only when more than a quarter of the animals have disappeared will this be detectable by the monitoring program!* Therefore, from a conservation point of view, it is desirable to have as small a coefficient of variation as is possible. However from a practical point of view, money spent on detection of change and money spent on, for example, anti-poaching, must be balanced- it is not useful to spend the entire budget on measuring something which would not have happened if there had been more spent on prevention of a decline. Therefore, the amount of effort spent on these two activities must be carefully balanced.

Typically, at the start the creation of a protected area, a comprehensive site-wide survey is be carried out, which is the first cycle of a monitoring program. At remote forest sites, where there has been little human impact in the past, wildlife densities can be high and a transect-based design can be used. In areas which have been heavily hunted, and wildlife numbers are very low, a recce-based design is normally used. The coefficient of variation of a line transect survey estimate is often inversely related to the square root of population size. This means that when a population of animals is reduced in size, the CV of the estimate of it size increases, and the probability declines that we will detect the change (Jachmann 2001; Taylor & Gerrodete, 1993).

3.1.2. Pilot studies

The final sampling designs for comprehensive surveys are normally based on pilot studies and/or previously collected data on wildlife abundance and distribution (Barnes 1996, Buckland 2001; 2004; Spellerberg 2005). The practical methods for elephants, for example, are outlined in Hedges & Lawson (2006) and Walsh *et al.* (2001), and those for apes are in Maisels *et al* (2007). Pilot studies consist of a few transects laid out throughout the area to be

surveyed, where the different vegetation types and hunting gradients are represented. The results indicate whether a transect-based or a recce-based survey should be undertaken. It is important to consider costs- transects cost roughly four times as much as the equivalent number of kilometres of recce per kilometre walked, because speed is about four times slower on transects. This is because of the care needed to cut a straight transect, plus the additional measurements taken on transect slow the team down considerably. This decrease in speed is directly translatable to extra man (or woman)-days in the field. It is important to remember that transects are designed to calculate animal density (and not relative abundance). A minimum of 60 to 80 objects must be observed within any given stratum in order to reliably estimate density of, for example, ape nest groups, elephant dung, etc. It can be difficult to find this many objects in forests where wildlife has been depleted by hunting without considerable sampling effort. In areas where wildlife is already rare, many hundreds of kilometres of transect may be necessary in order to estimate density with sufficient precision to (i) inform managers of current animal density and (ii) to be able to detect change over time. This has important budgetary implications.

3.1.3. Budgetary constraints

It is clear that at some point a budget decision has to be made. Monitoring costs most in terms of person-days, fuel to get to different places in the areas to be surveyed, and food for the teams. In comparison the costs of field equipment are smaller as tents, cookware, measuring tape, compasses, GPS units, etc. last for a long time - normally more than one monitoring cycle, and in some cases (compasses, GPS) for many years. During the recent MIKE surveys in the Central African region, the mean price of each kilometre-long transect was over $500 (MIKE 2005). This included all costs, including designing the surveys, pilot studies, salaries, food, equipment, and fuel. There is a required minimum of 20 transects per stratum, so any transect survey at all in this region, done correctly, will cost in the order of 8000 Euros if the transects are one kilometre long each (a total of only 20 kilometres), and of course longer transects (and/ or longer total transect lengths where wildlife populations are low) will be correspondingly and more expensive.

3.1.4. Estimation of sampling effort required

Once the pilot study has been completed (this usually takes a couple of weeks), total number of kilometres walked and the number of objects recorded along the set of pilot transects are put into a simple equation in order to calculate the number of kilometres required to achieve a target precision (a given coefficient of variation) as follows (Buckland 2001):

$$L = \left[\frac{b}{(cv_t(\hat{D}))^2} \right] \left[\frac{L_0}{n_0} \right]$$

Where L = number of kilometres to be walked in the final transect design (the total length of the transects in a stratum);

cv_t = target coefficient of variation, expressed as a number between 0 and 1 (for example, 25% would be expressed as 0.25); remember that this means that "only when more than a quarter (25%) of the animals have disappeared will this be detectable by the monitoring program".

$\hat{D}$ = the estimator of density;

L_0 = total length of the pilot study transects;

N_0 = number of objects detected along the transects in the pilot study.

$$b = \left\{ \frac{\text{var}(n)}{n} + \frac{n.\text{var}\left\{\hat{f}(0)\right\}}{\left\{f(0)\right\}^2} \right\} *$$

**b* does not actually have to be computed as an acceptable value for b for these purposes is 3 (Buckland 2001; Burnham *et al* 1980).

An example is as follows, from real data from the Takamanda gorilla surveys in 1999 and 2001 (Sunderland-Groves *et al.* 2003).

In 1999, 136 kilometres of transect were walked, mostly in the lowlands but with some highland transects, and nine nest groups of gorillas were encountered. Encounter rate was therefore 0.066.

If the target c.v was to be 25%, the equation would be as follows:

$$L = \left[\frac{3}{0.25^2}\right]\left[\frac{136}{12_0}\right]$$ = 727 kilometres of transect required.

In 2001, 28 kilometres were walked, only in the highlands (as the 1999 surveys had showed there were almost no gorillas remaining in the lowlands), and 18 gorilla nest groups were encountered. Once again, if the target c.v was to be 25%, the equation would be as follows:

$$L = \left[\frac{3}{0.25^2}\right]\left[\frac{22}{18_0}\right]$$ = 58.7 kilometres of transect would be required (in the highlands).

Other examples of real encounter rates (from the MIKE surveys of 2003-2004: MIKE 2005) are as follows:

The encounter rate of gorilla nest groups in the Ndoki National Park in the Central African Republic was 1.04 nest groups/ kilometre. If the target coefficient of variation is 20%, then 75 kilometres of transect must be laid out in the site to be surveyed. If the target coefficient of variation is only 25%, then only 48 kilometres are required.

The encounter rate of elephant dung in the Bangassou Forest, also in the Central African Republic, was 0.5 dungpiles/ kilometre. For the same two levels of precision (coefficients of

variation of 20% and 25%) the required number of kilometres to be walked on transects to obtain a reliable density is therefore, respectively, 150 and 96.

If encounter rate was only 0.29 objects/ km (the real data for elephant dung encounter rate on transects from the Salonga National Park in DRC, where only one dungpile was seen for every 3.4 kilometres walked) then the transect distance to be walked in the main survey would be 375 and 240 kilometres for coefficients of variation of 20% and 25%, respectively.

To summarise: if wildlife populations are at low density, recce surveys are the only cost-effective way of monitoring a site until management actions – usually a combination of sustained sensitisation and anti-poaching- have resulted in an increase in wildlife populations. This can take several years. When animal numbers have risen to the levels that their densities (rather than their relative abundance) can be monitored, a transect-based survey can be envisaged.

3. 2. How to design a survey in DISTANCE

This requires the use of two computer programs: DISTANCE (Thomas *et al.* 2009) and ArcView or ArcGIS (ESRI 2000, 2004)

The basis is as follows: using polygons of the areas to be surveyed, and some previous knowledge of the encounter rate (number of objects/ kilometre) of the things you wish to estimate density, you place transects or survey lines across your study area in such a way that all of the area is surveyed. We usually use transects or long zig-zag or parallel lines 9the last two for recces: see Section 5). For transects, we must know what the sampling effort will be per stratum(see section 3.1.4) in kilometres, and we know that thirty transects per stratum are advisable.

Before starting, ensure the Regional parameters of your computer are set to English (UK). This is because in some regional settings, especially French, the sign used to denote the decimal point is a comma (virgule), and this will severely compromise the survey design. Both French and English versions of the dialogue box are shown below (Fig. 3.2); they are reached via the Start button, and then the Regional and Language Options.

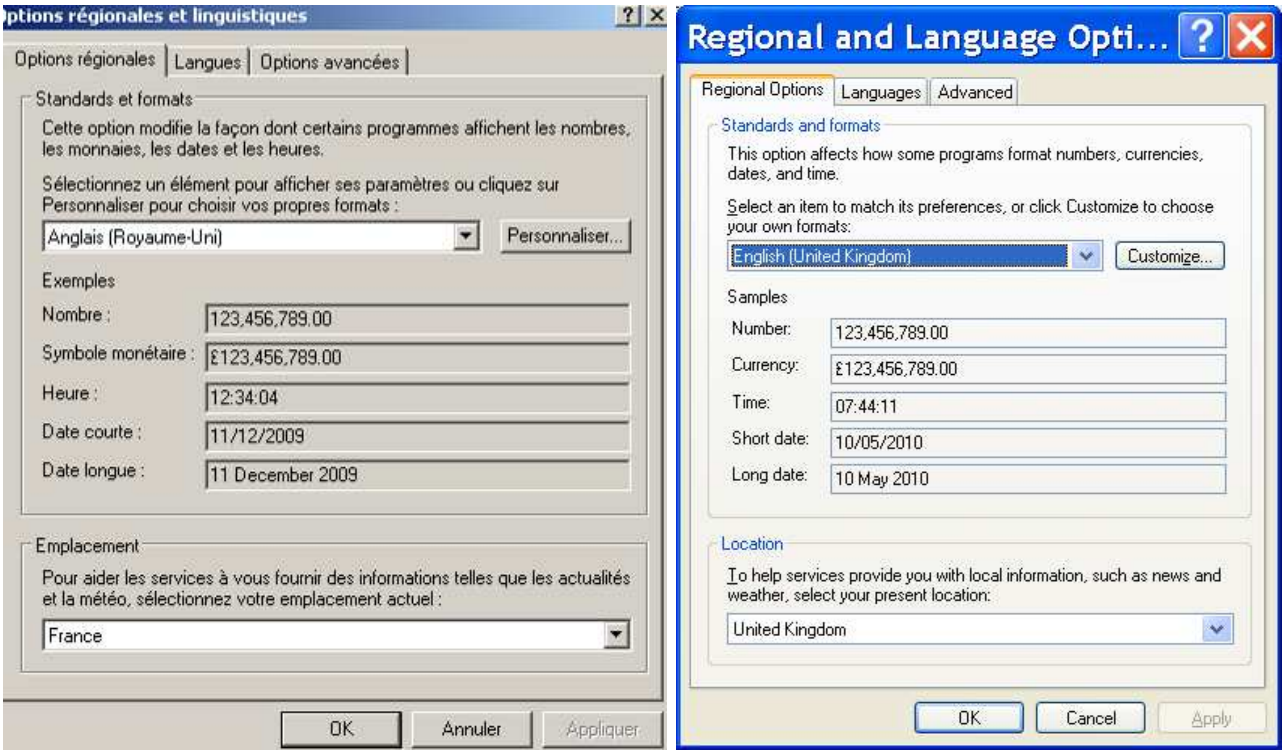


Fig. 3.2. Preparing the regional options for survey design in DISTANCE.

Next, ensure that you have a destination folder ready for the survey design. In our example (Fig. 3.3) survey designs for three National Parks in Gabon are all within the folder Survey Design.

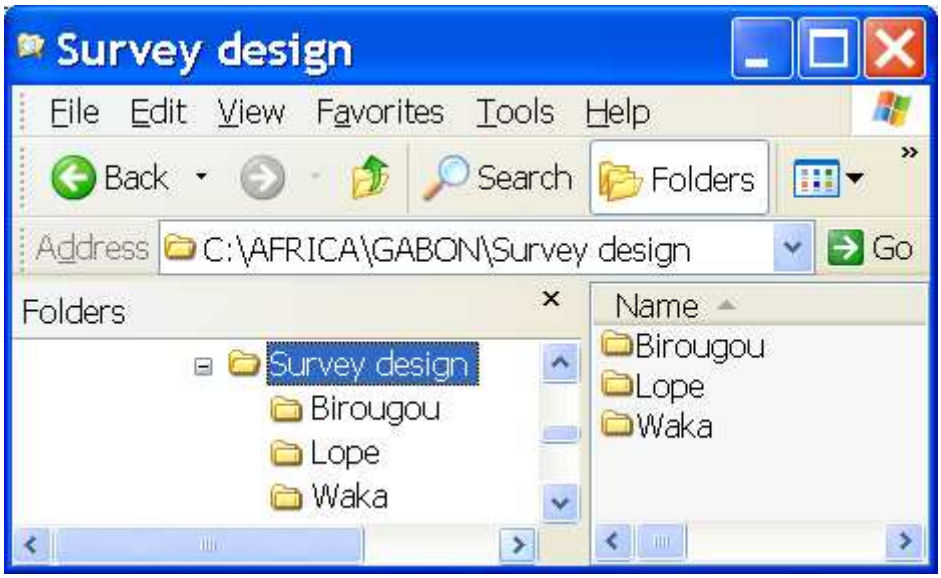


Fig. 3.3. Location of the survey design files.

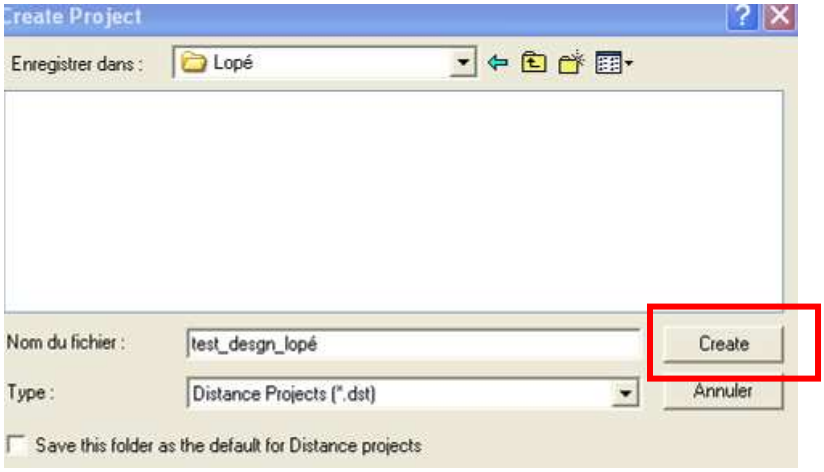
PROCEDURE.

1. Open Distance by clicking on its icon

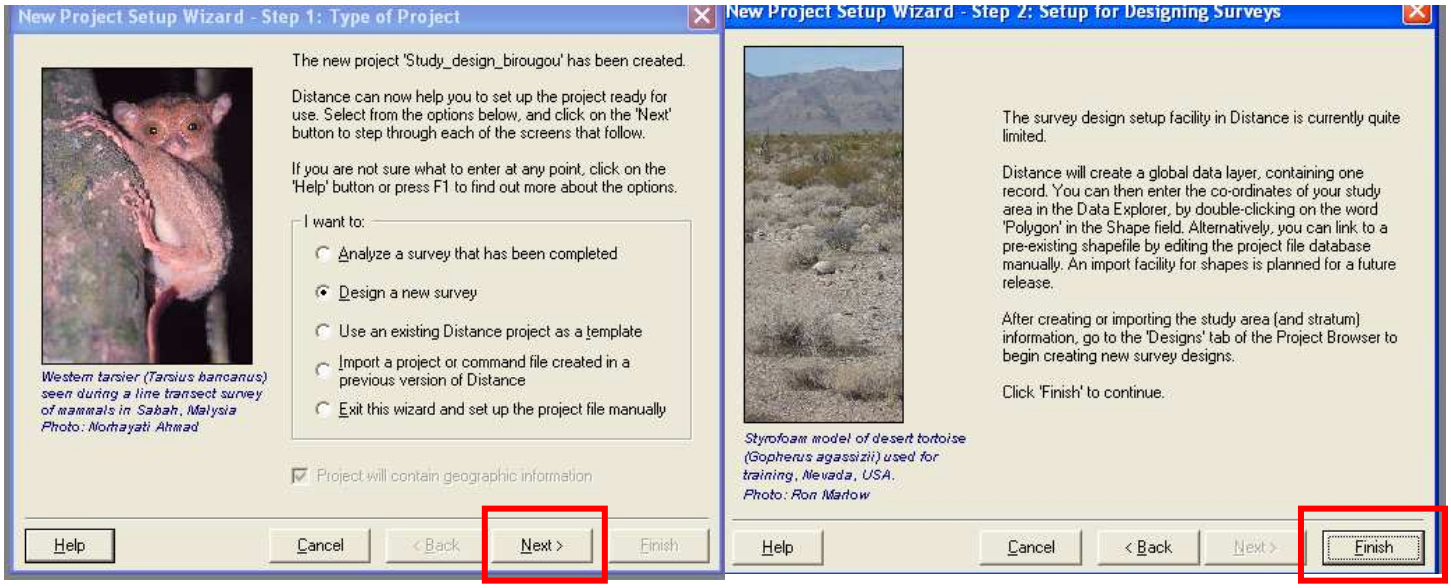
(at the time of writing (2010) it is Distance 6.0, release 2)

2. Create a new project within Distance by clicking on “File”, and then “New Project”.

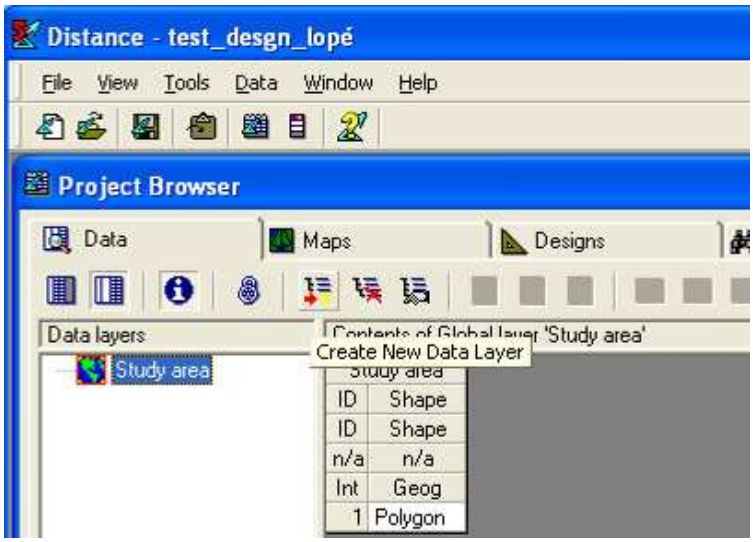
3. A dialogue box will open. Navigate to one of the named folders that you created earlier (in this case “Lope”), give the new project a name (in this case test_desgn_lope), and click on “Create” ;



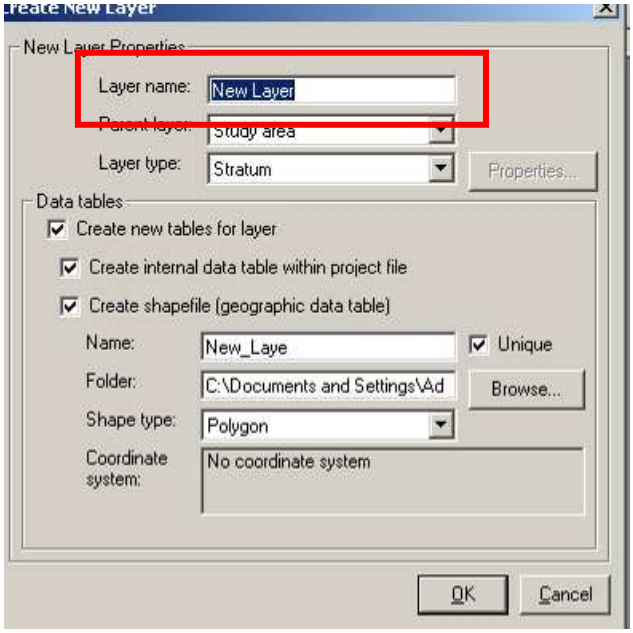
4. A new dialogue box will open (below, left). Choose the “Design a new survey”, then click on “Next”. A new dialogue box will open (below, right); then click on “Finish”



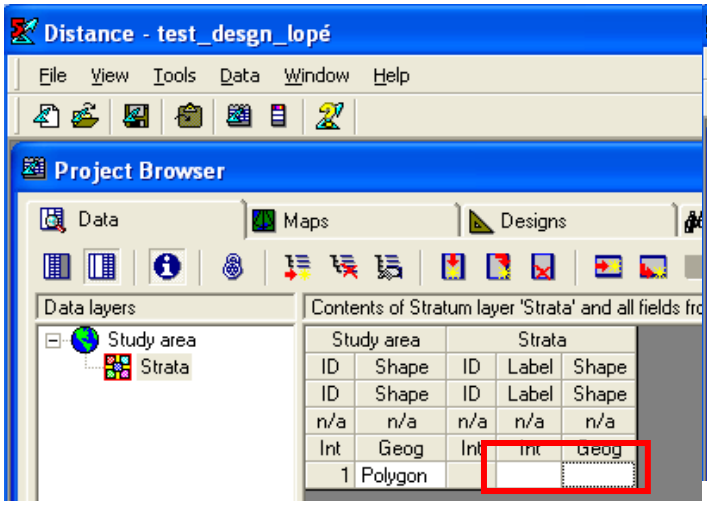
5. A new dialogue box will open. The correct number of strata should be created (if there is more than one). To do this, click on the icon “Create a new data layer” ;

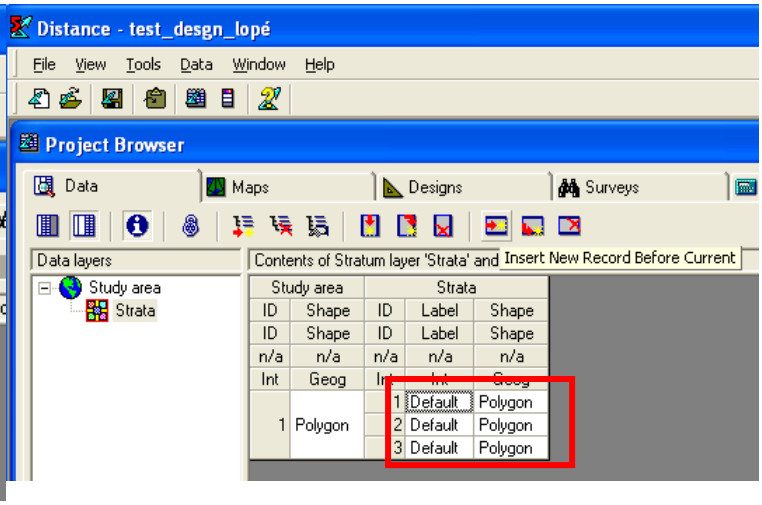


6. A new dialogue box will open. Give the layer the name “Strata” (where “layer name” appears), then “Ok”



7. A new dialogue box will open. Click on one of the empty cells in the table that appears (below, left), and then click again on “Insert New Record Before Current” (below, right), until you get an additional line. Repeat for the number of strata that you have in your study area. In the example here there are three strata.

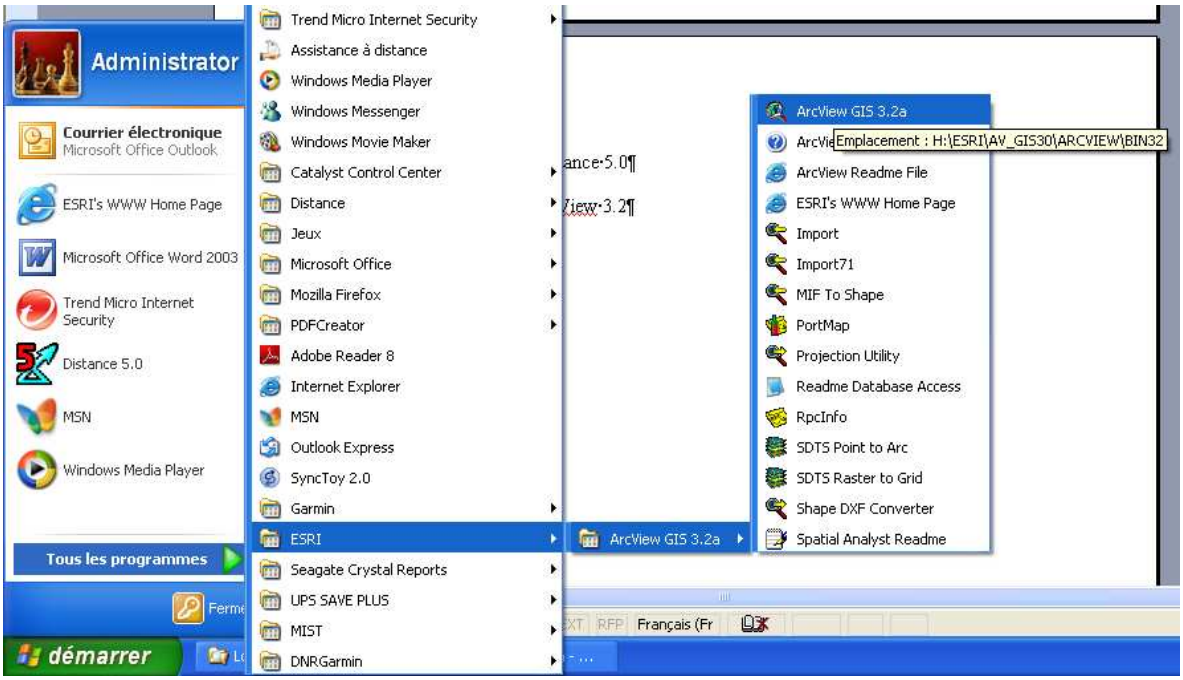




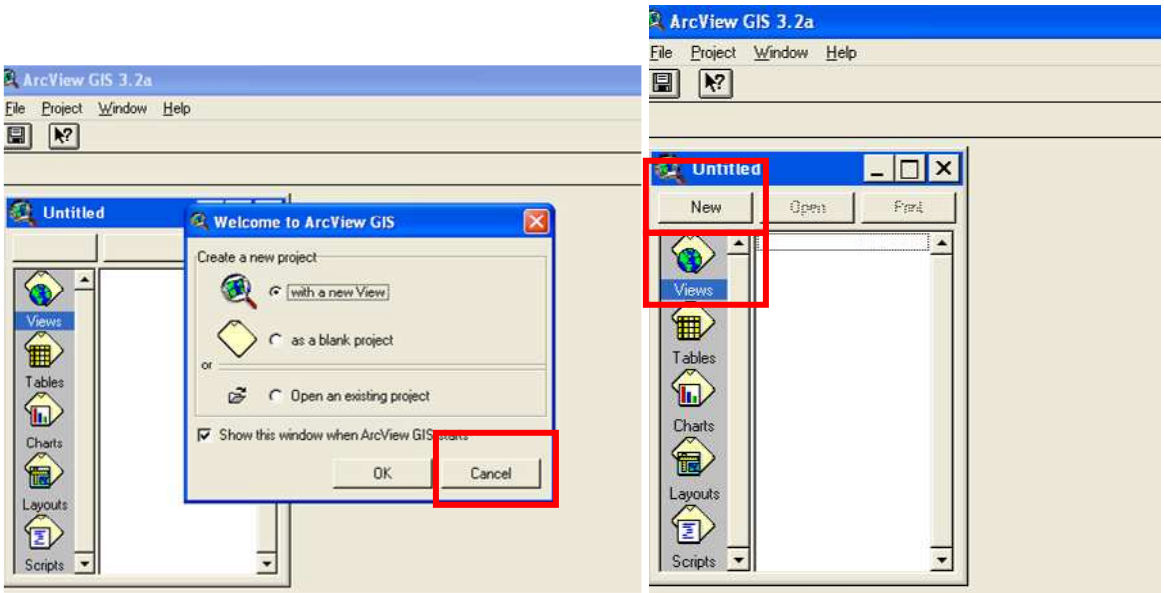
8. Now close Distance. The next thing to do is create the shapefile or shapefiles (if there is more than one stratum) that must be inserted into DISTANCE for the creation of the design itself.

9. Open ArcView 3.2 (go to Start, “All programmes”, “ESRI”, ArcView GIS 3.2, and then click on its icon

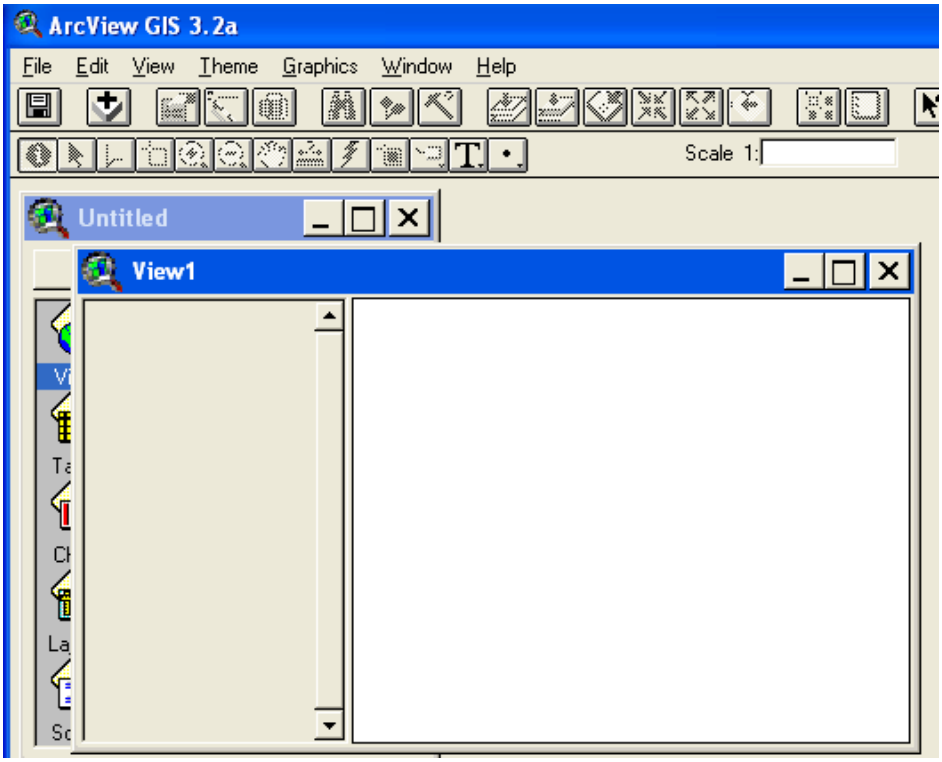
;



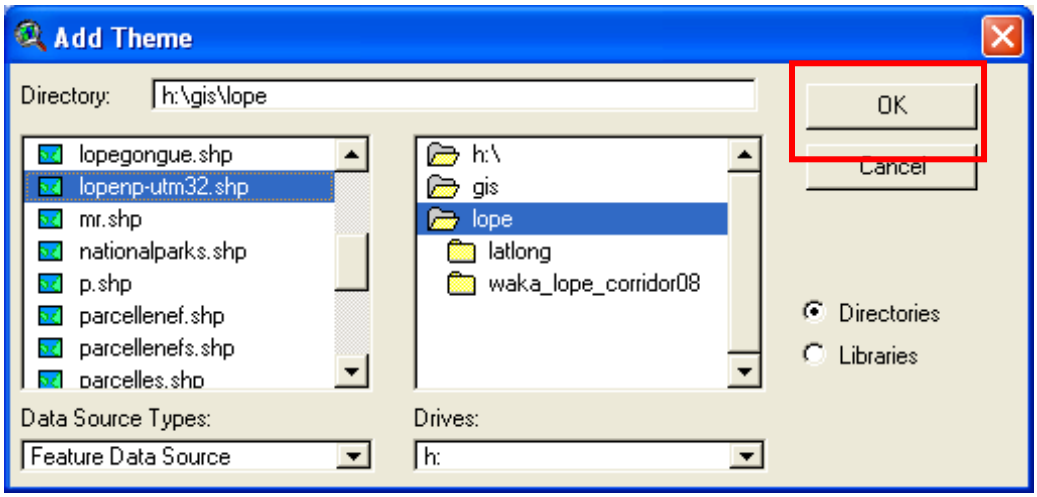
10. A dialogue box will open. Click on “Cancel”, then go to “Views” then “New” ;



11. Add the theme containing the zone to be sampled onto the “View”, using the button “Add Theme”
;

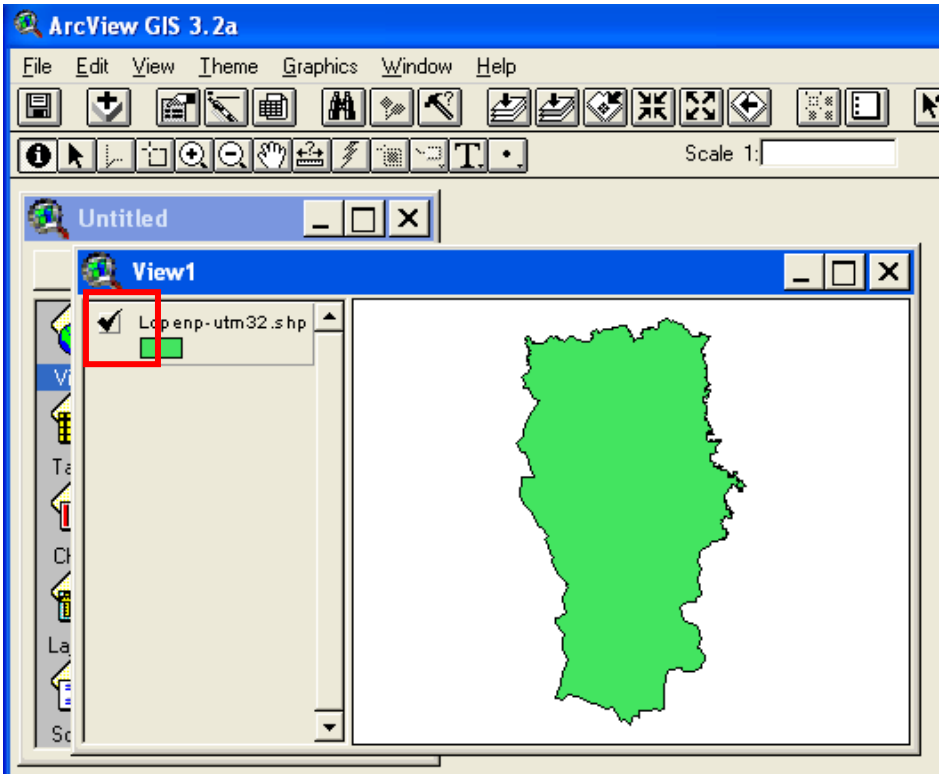


12. A dialogue box will open, whereopon you should navigate to the folder containing the shapefiles of the area to be sampled. Click on the shapefile and then on “Ok” (the shapefile is Lopenp-utm32.shp in our example)

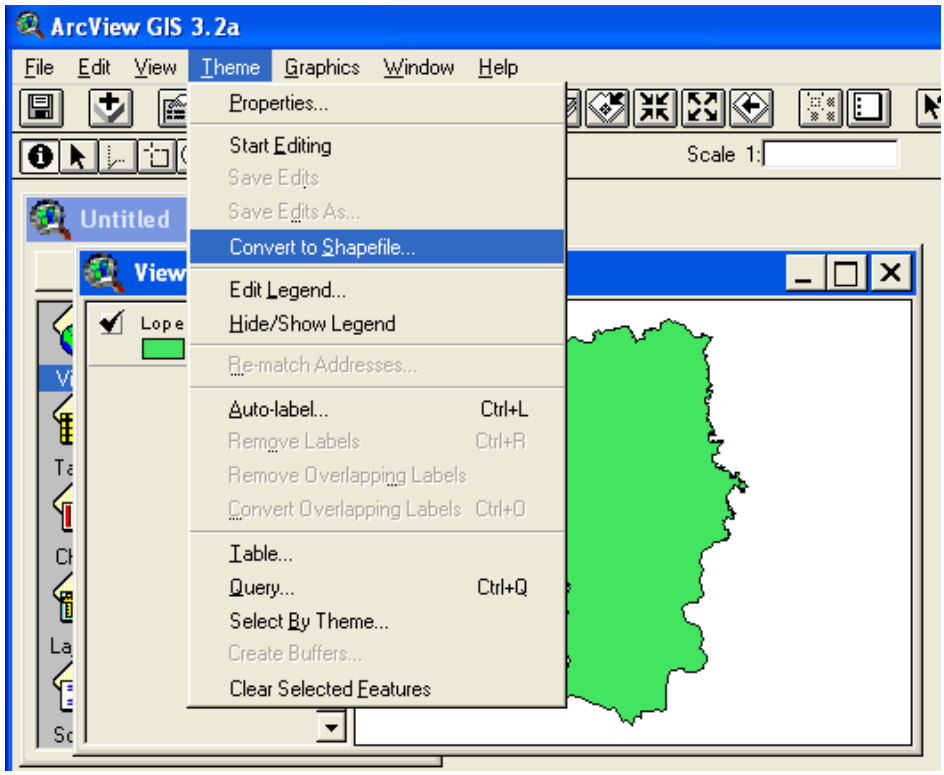


NB : It is vital that the shapefiles are in UTM. If the original shapefiles are in another projection (usually Geographic), they must be reprojected in UTM. See section on “Projector!” for this.

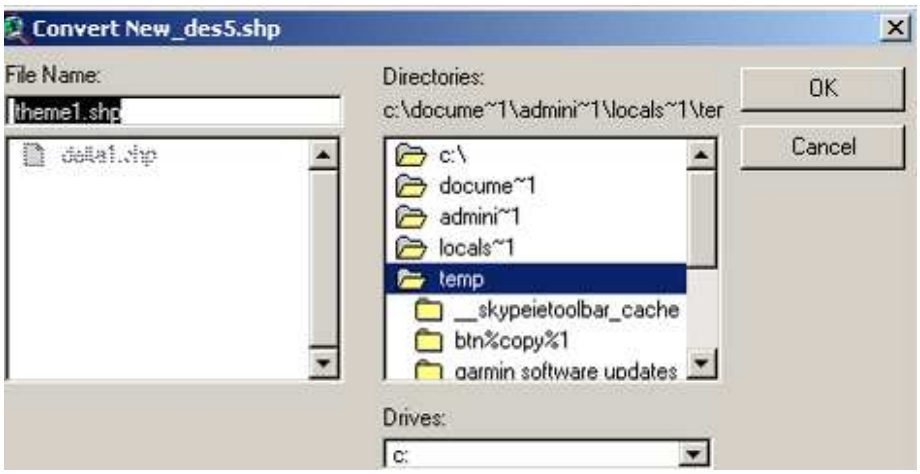
13. When the theme is activated (tick the box indicated), a shape appears, if there is only one stratum;


ArcView GIS 3.2a
File Edit View Theme Graphics Window Help
Scale 1:
Untitled
View1
Lopenp-utm32.shp

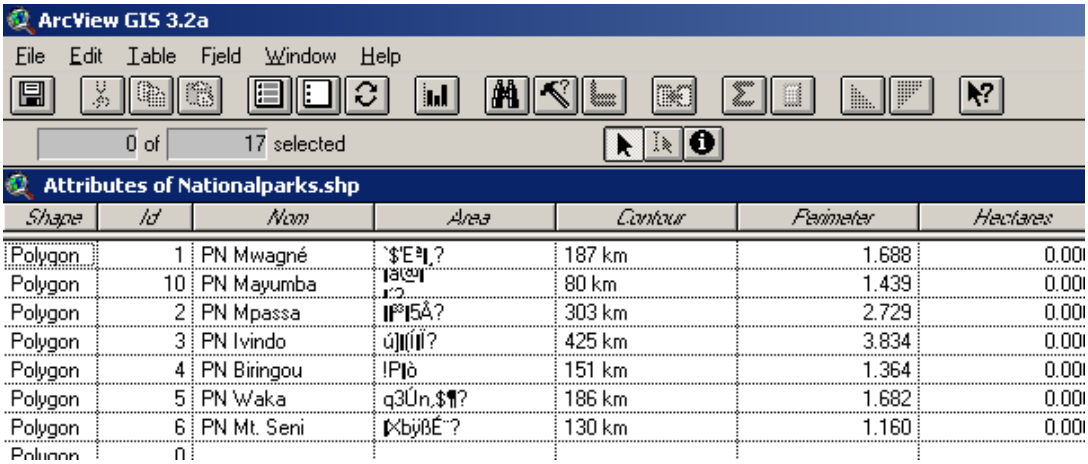
14. Now convert this theme to another shapefile, and give it the name “Study_ar”. To do this, first click on the theme, then go to “Theme” on the menu bar at the top, then “Convert to Shapefile” ,



15. The following dialogue box appears; and you should Navigate to the folder with the correct name of the area to be sampled, and save the new shapefile “Study_ar”. No other name can be used!



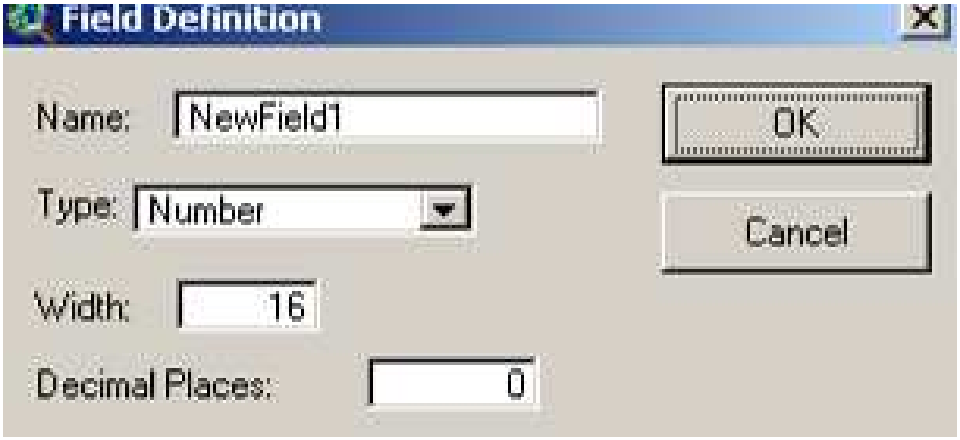
16. Open the attribute table of the shapefile by first clicking on the theme and then on the icon for “Open Theme Table” ;



17. Whatever is in the table, delete all the columns except the one called “Shape” ; and all the lines except the one which contains the feature(s) you require;

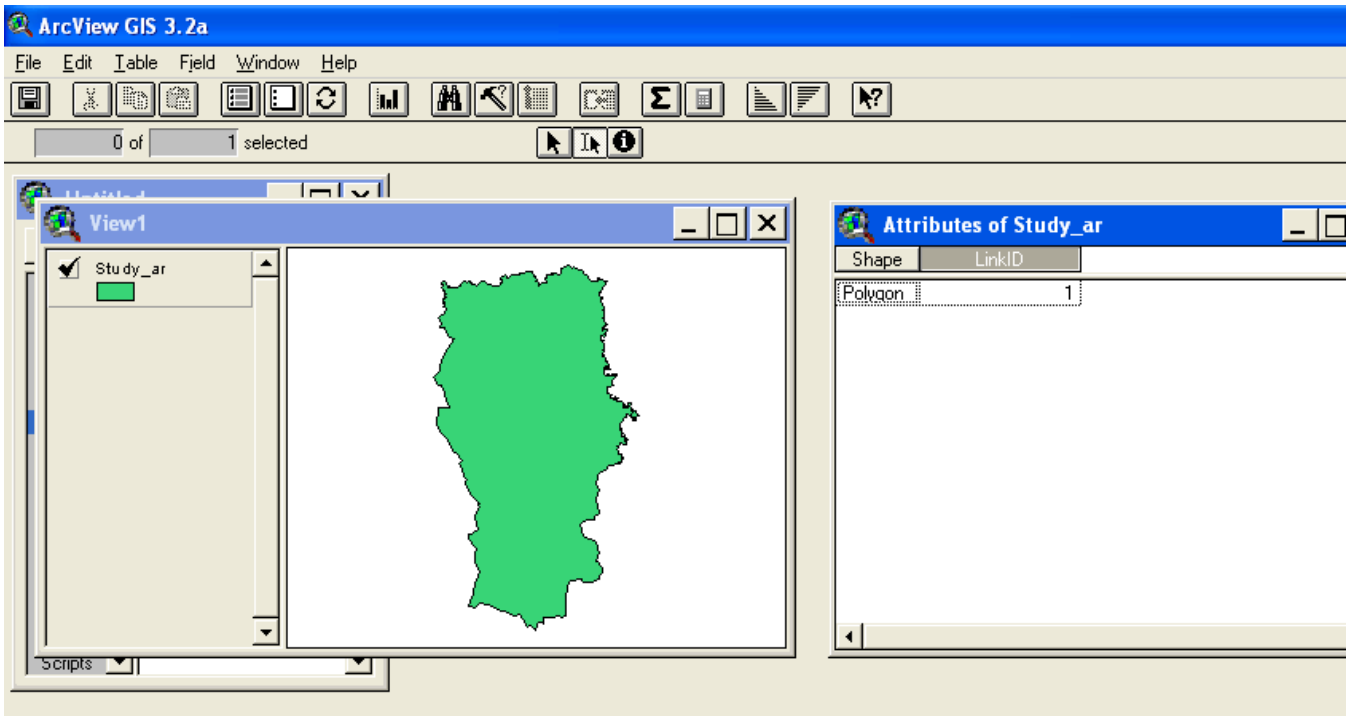
18. To delete columns (known as “Fields”) or lines (known as “Records”) you need to first go to “Table”, then “Start Editing” ; then go to “Edit” then “Delete Field” or “Delete Records”.

19. Create a new field (column) using “Add Field”; call it “LinkID”, ensure the Type is Number (this is the default) and add “1” in the empty cell.



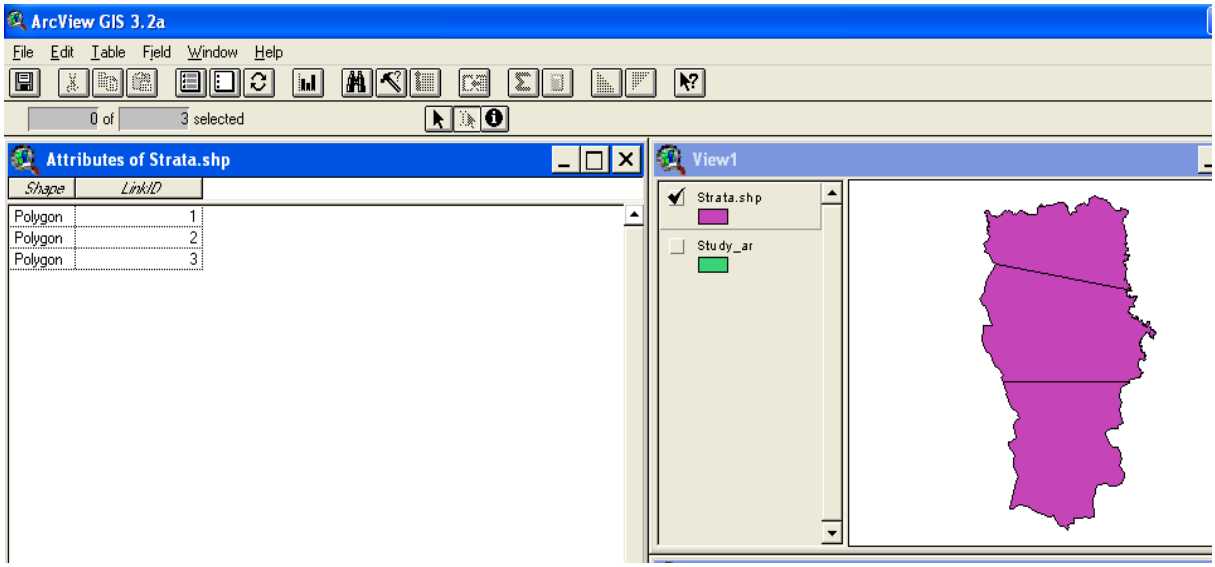
20. To enter data into the table, click on the “Edit” button,

, then go to the cell where you wish to enter data, and write.



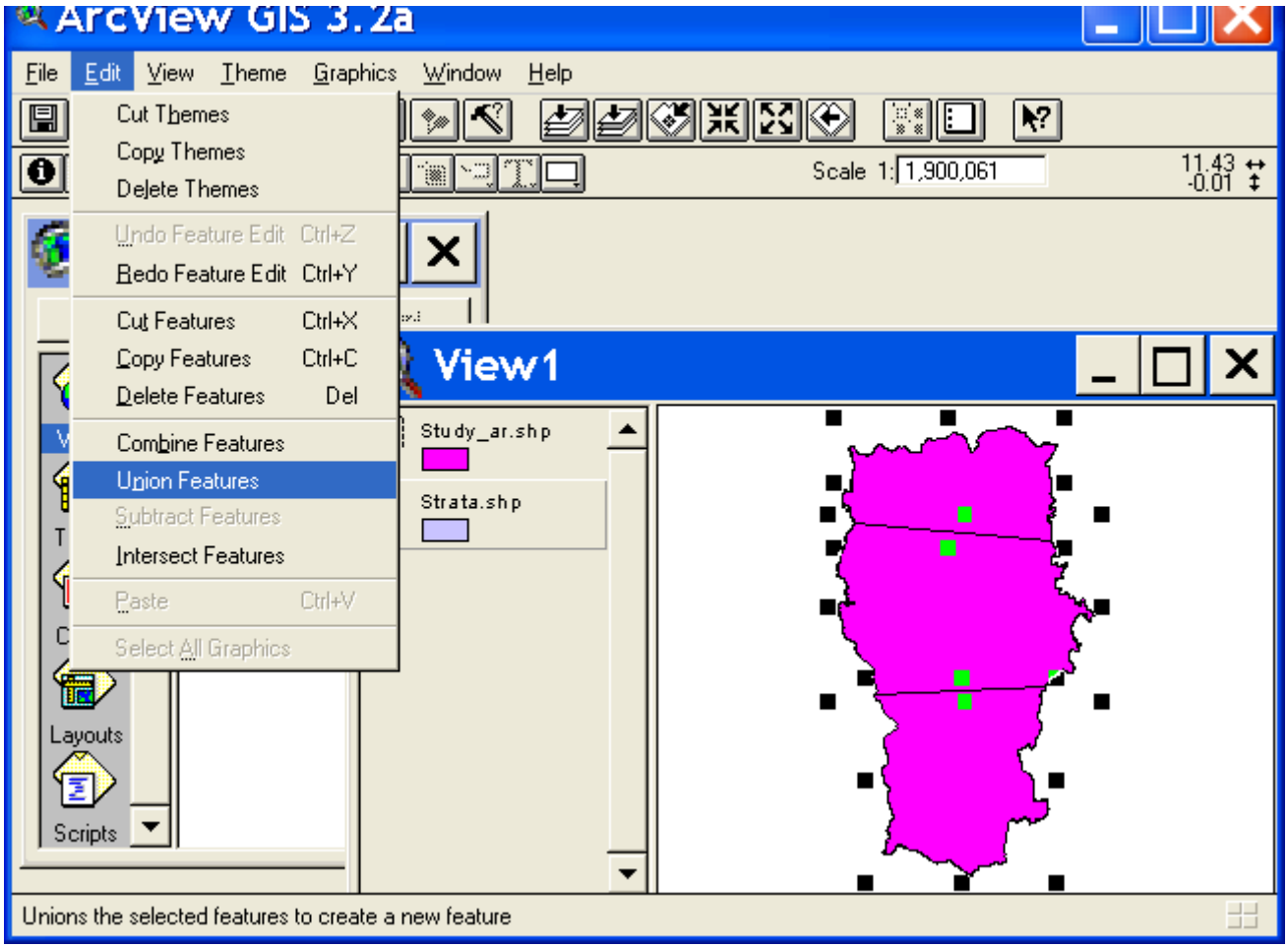
21. Ensure the shapefile is saved in the named folder for the survey;

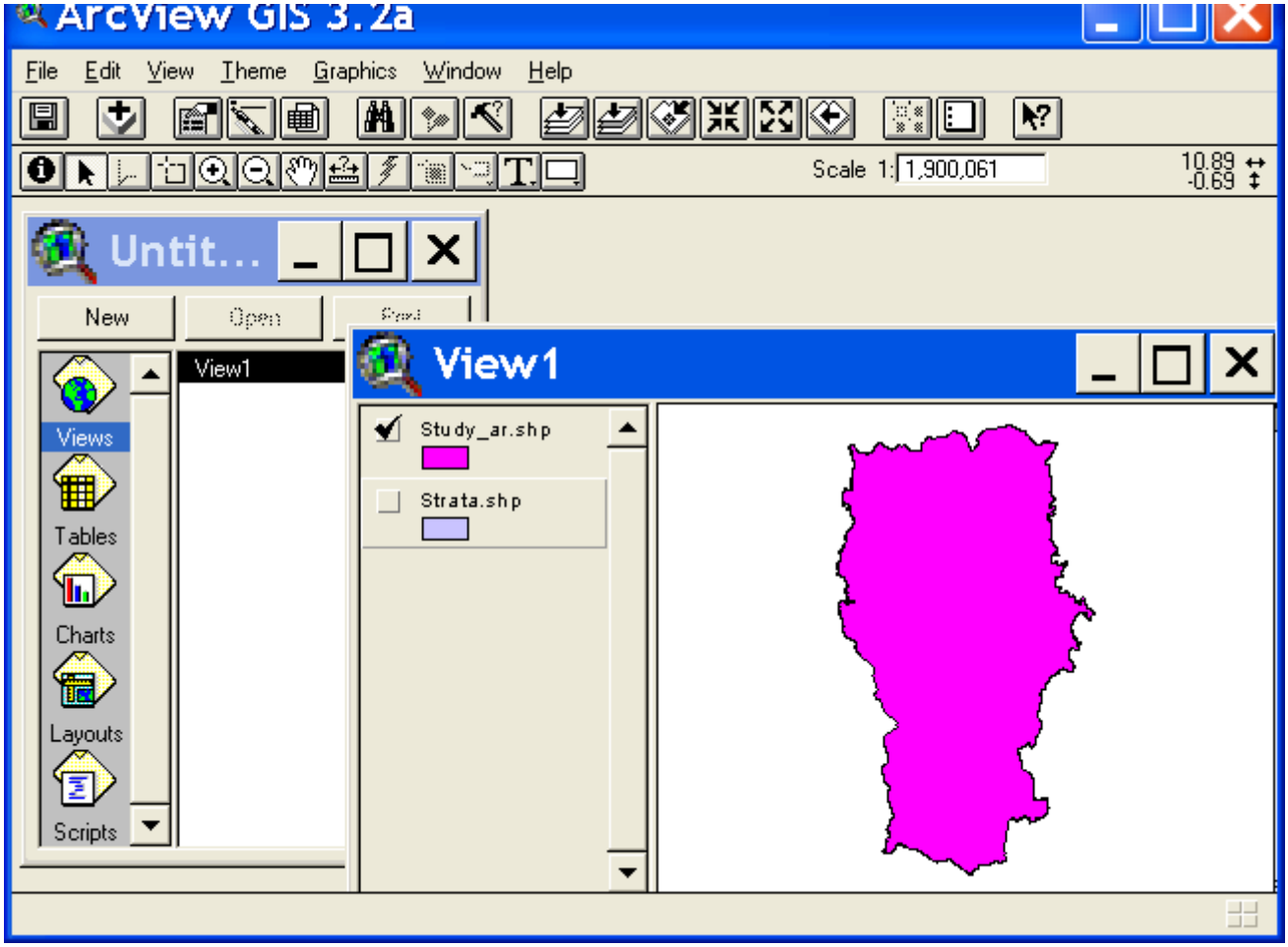
22. If there are different strata to be surveyed, then it is best to create the multistrata shapefile first. This should be called “Strata”. The process is as above, but instead of a single cell in the LinkID column, there should be the numbers 1, 2, 3 and so on (each corresponding to one of the strata).



23. The theme « Strata » should then be converted to a second shapefile, called « Study_ar ».

24. The three strata in this shapefile should be merged into one. To do this, “Start Editing” the shapefile, select all the strata, and, using “Edit” on the menu bar, click on “Union Features”. All the strata will be merged into one. Then click “Save”;

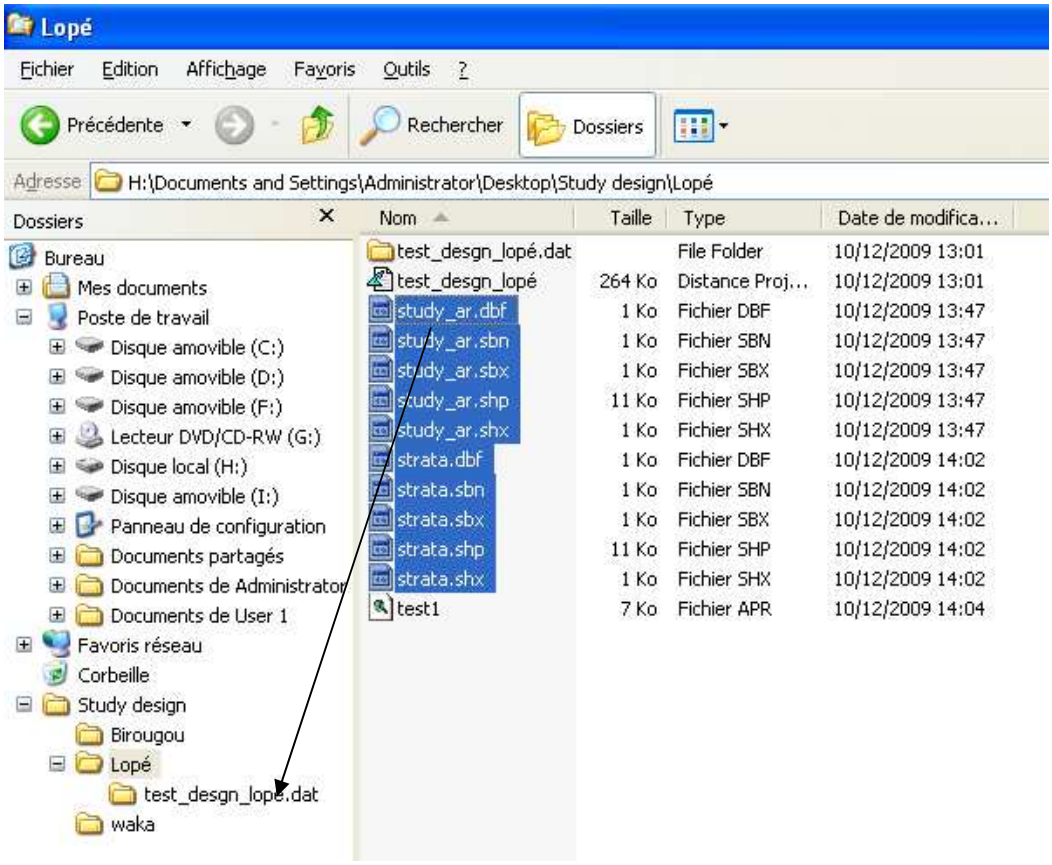


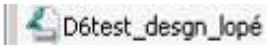


25. Check the Attribute Table of this shapefile to ensure there is only one line and that there is the LinkID column containing the number 1.

26. Close Arcview .

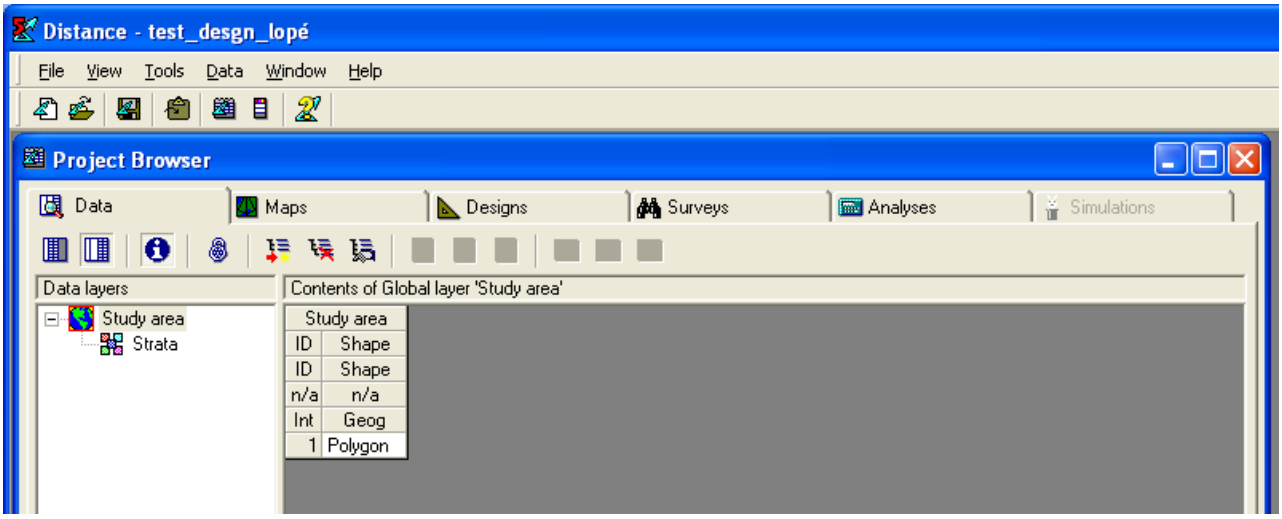
27. Now, in Windows Explorer, go to the folder containing the study area, and copy the two new shapefiles “Study_ar” and “Strata” that you have created, and paste them into the Distance folder of the zone where you wish to create the study design. This folder will finish with “.dat”- see the example below where the study design was called “test_desgn_lope”. It will ask if you wish to replace the existing files (which are created by default when you created the Distance project). Click on “Yes to All”



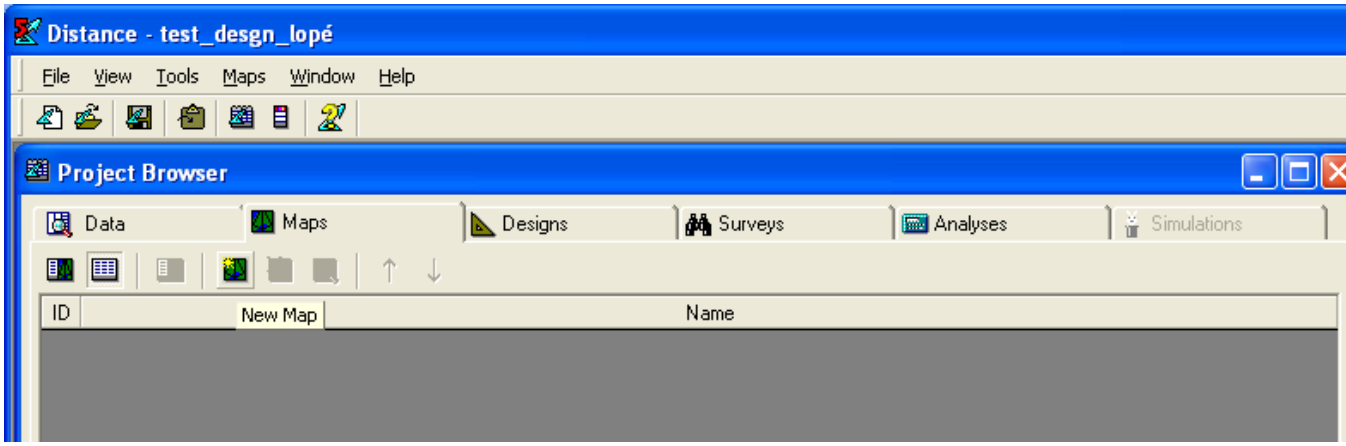
28. Open the Distance project in the appropriate folder (the one of the area that you wish to survey) 

either by clicking on the *.dst file, or by opening the Distance program and navigating to the *dst file within Distance. Then click on the "Maps" tab

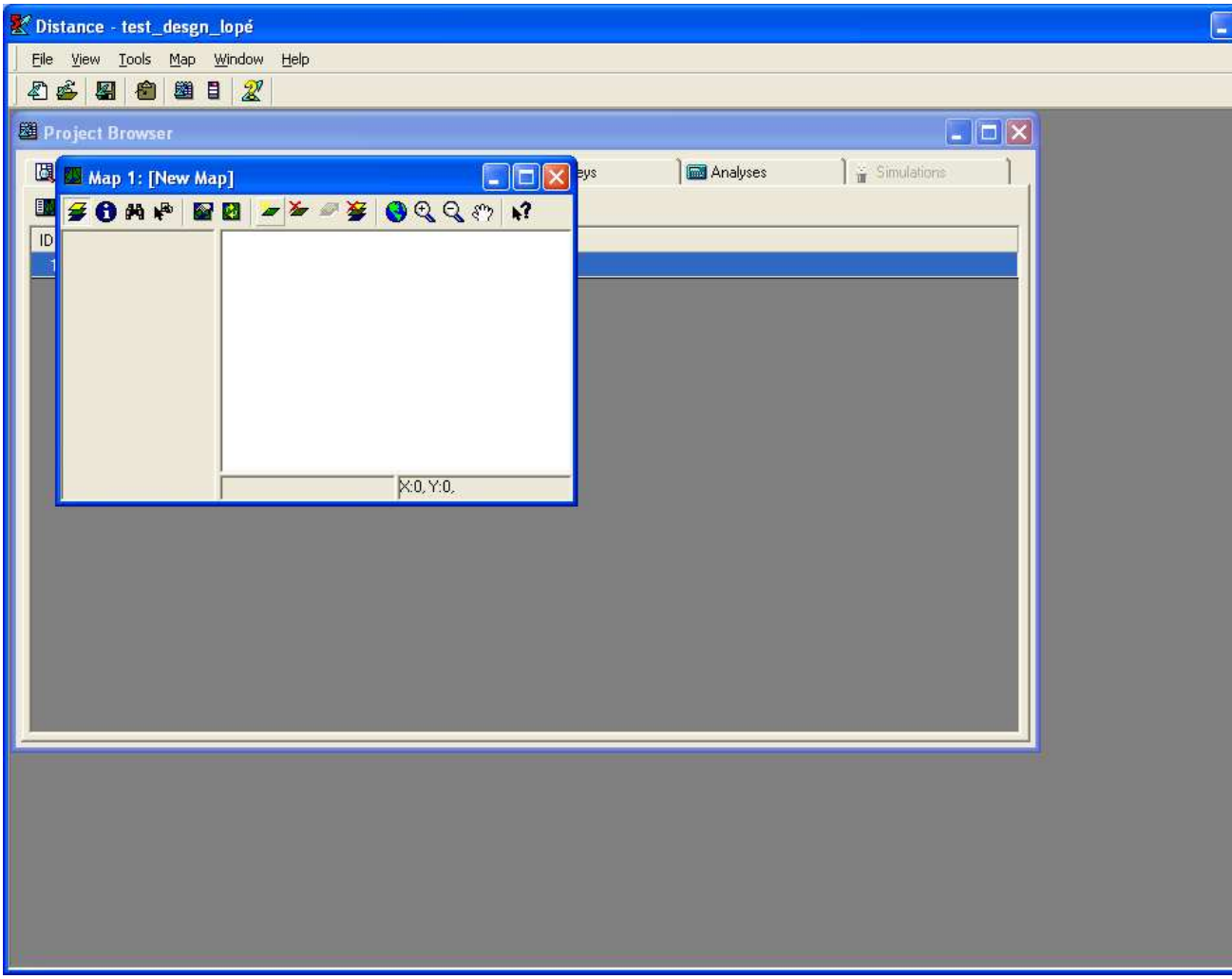
;



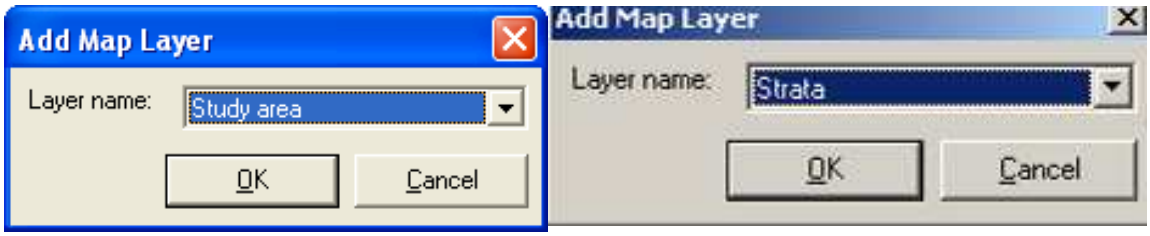
29. Then on "New Map"
;



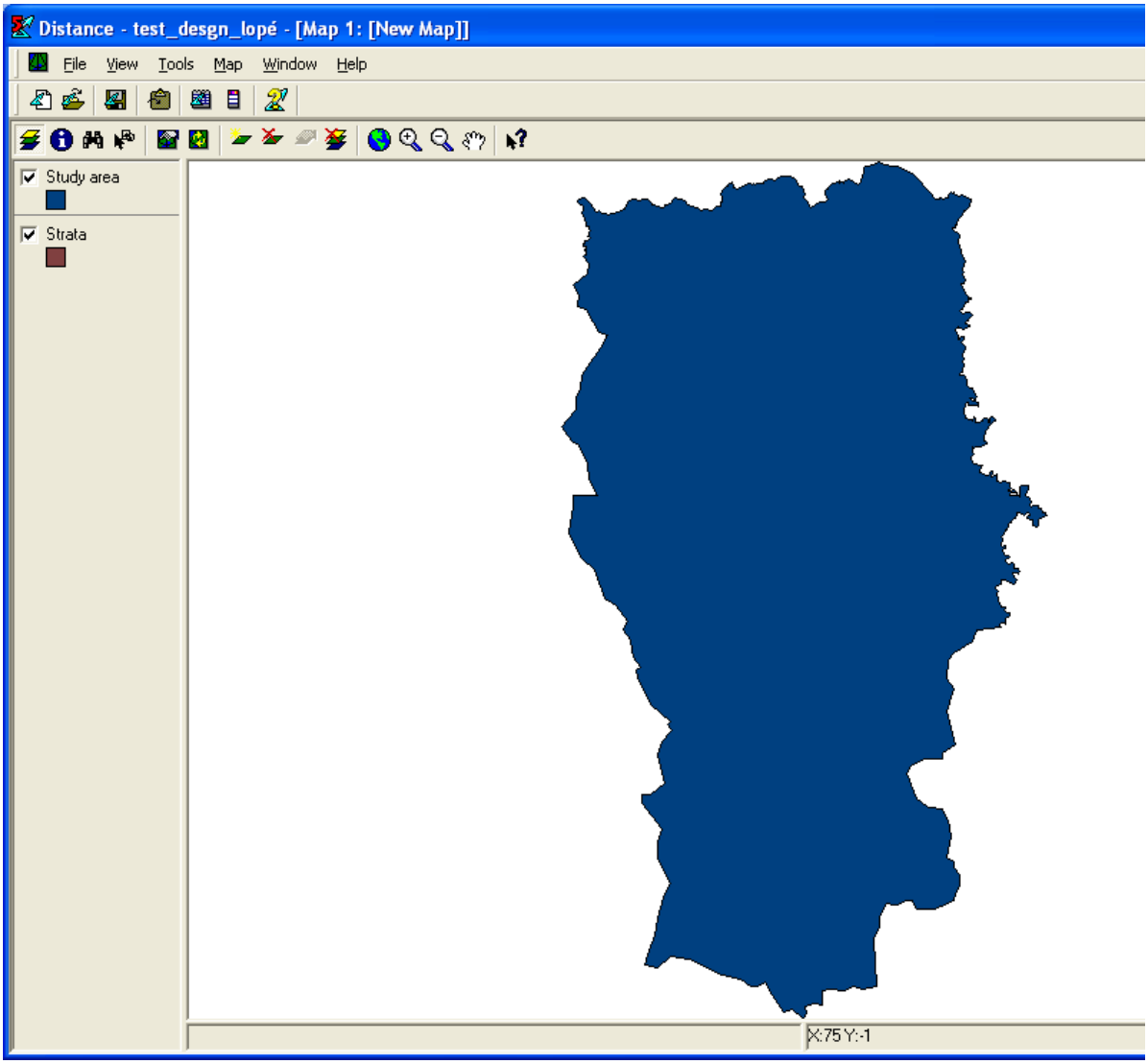
30. Then on “View Map” ; then click on “Add Layer to Map”



31. Choose the themes to add (Study area and Strata) and click “Ok”


Add Map Layer
Layer name:
Study area
OK
Cancel
Add Map Layer
Layer name:
Strata
OK
Cancel

32. You should see this:

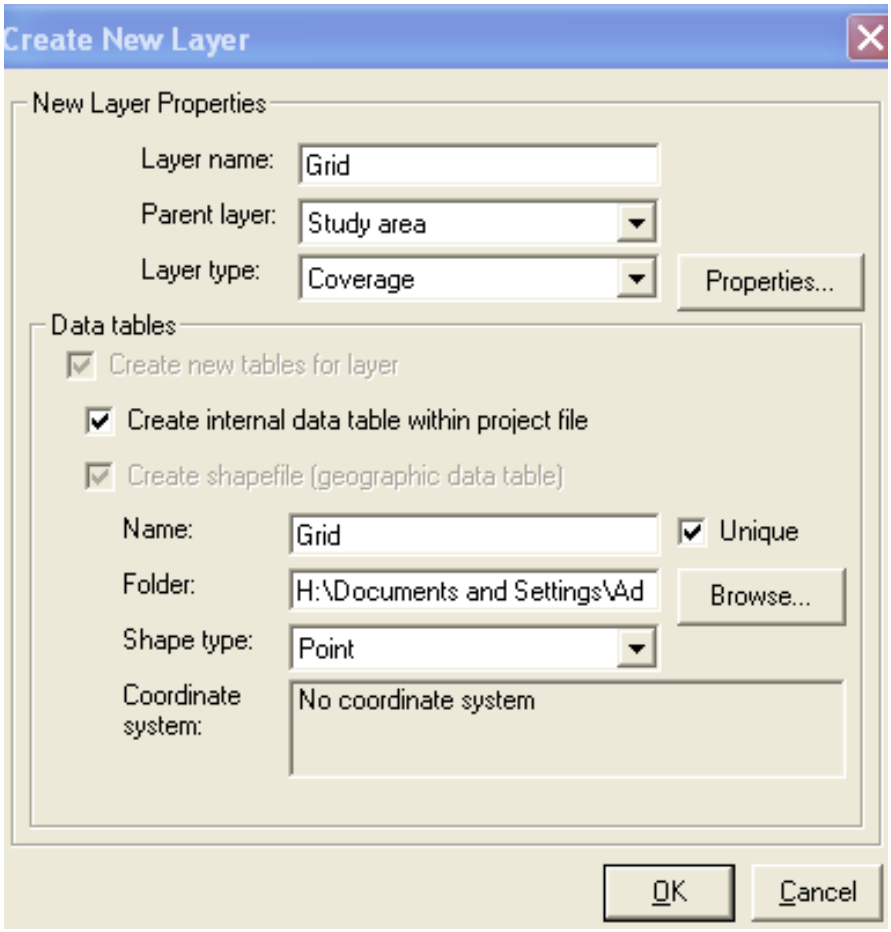


33. If you have no strata in your area to be surveyed, there will only be the Study area theme.

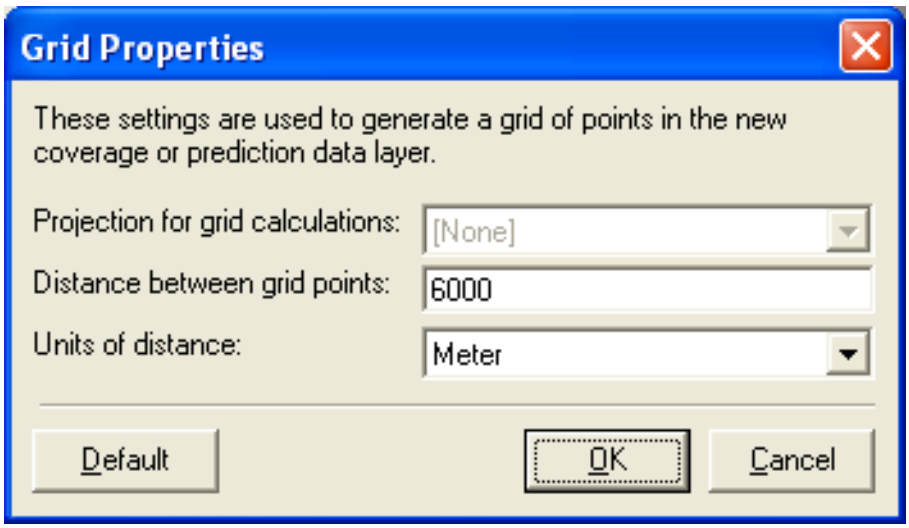
34. Close the “Maps” page (it will ask you to save it, so do so).

35. Go to the “Data” tab

, then “Create a New Data Layer” . Click on it, and a dialogue box appears;



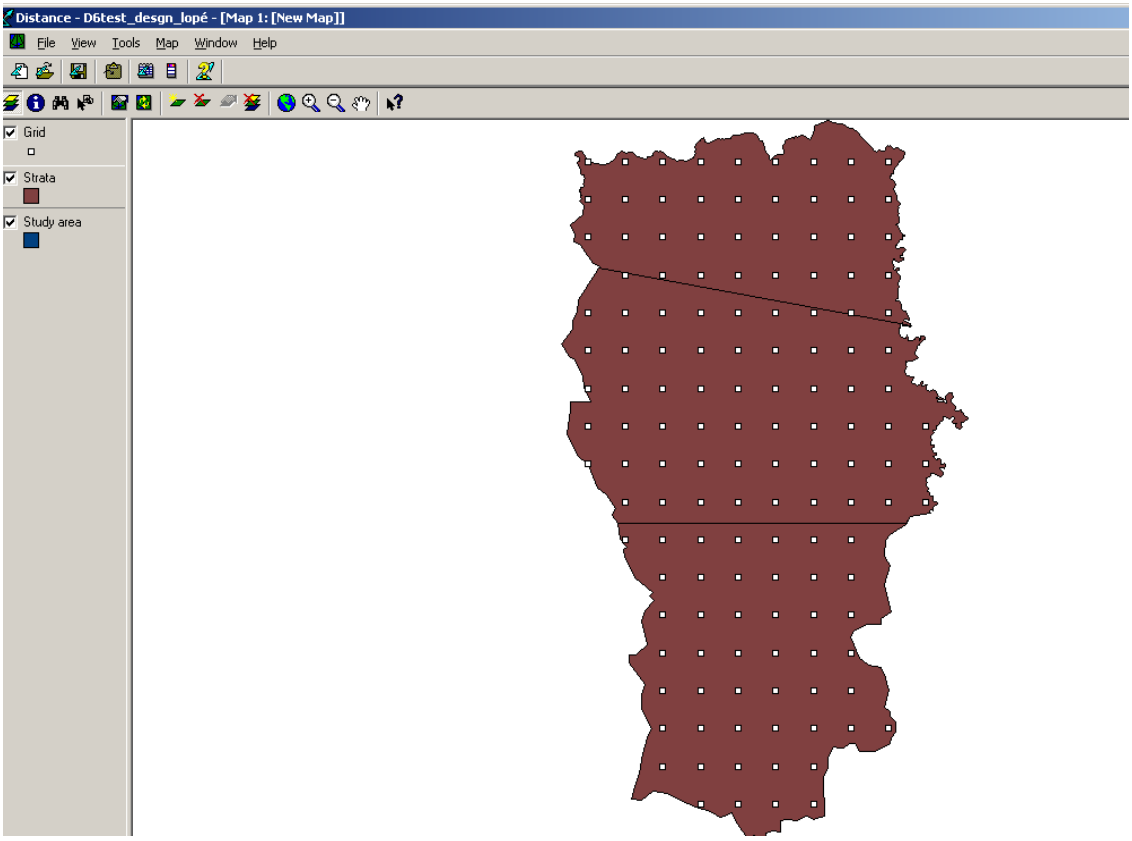
36. Make sure that in “Layer name”, you write “Grid” and in “Layer type”, choose “Coverage” in the drop-down menu. Then click on “Properties”. The following dialogue box appears; and you should fill in the Distance between Grid points (here we have chosen 6000m or 6 kilometres) and then click OK. It will tell you how many grid points this will create, and this gives you the chance to continue or to cancel.



37. There should be at least several hundred points in total (you will have to do trial and error in order to get this right),

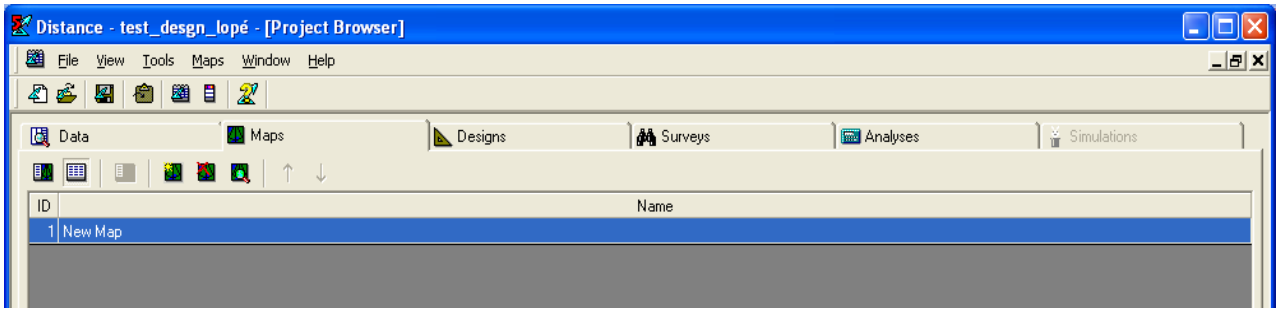
38. The add the Grid theme to the Map by going to the Map tab; choose “View Map” ; then click on “Add Layer to Map” . In the resulting dialogue box, make sure that “Layer name” is “Grid”, then click “OK” ;

39. The grid will appear on the map;

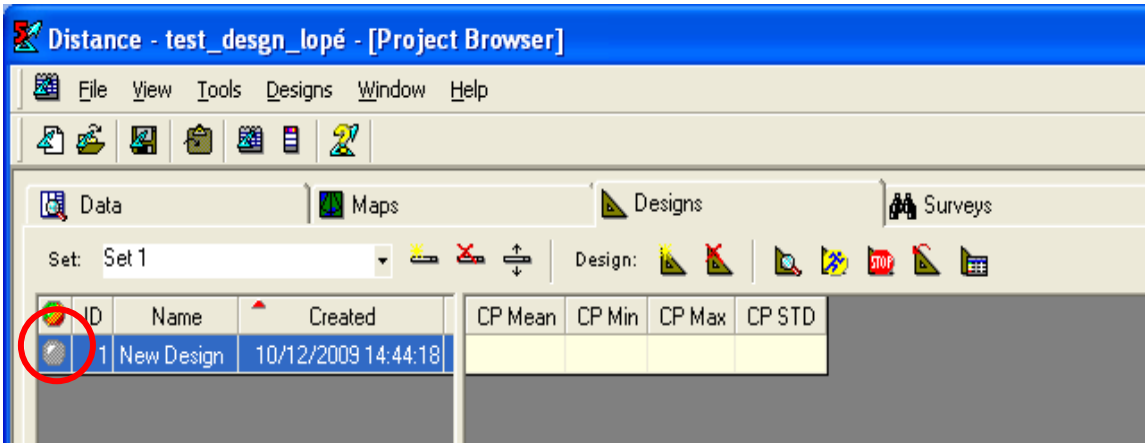


Now, click on the Design tab:

;

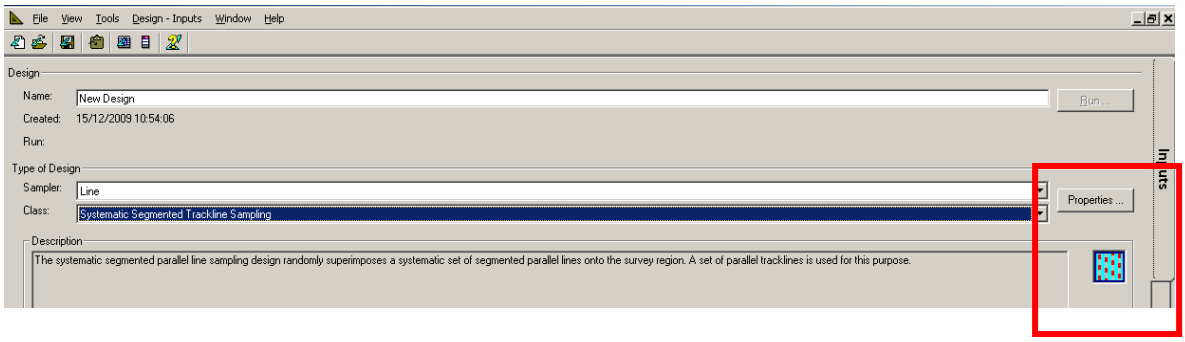


40. Click on “New Design” , and then double click on the round grey icon just to the left of “New design”



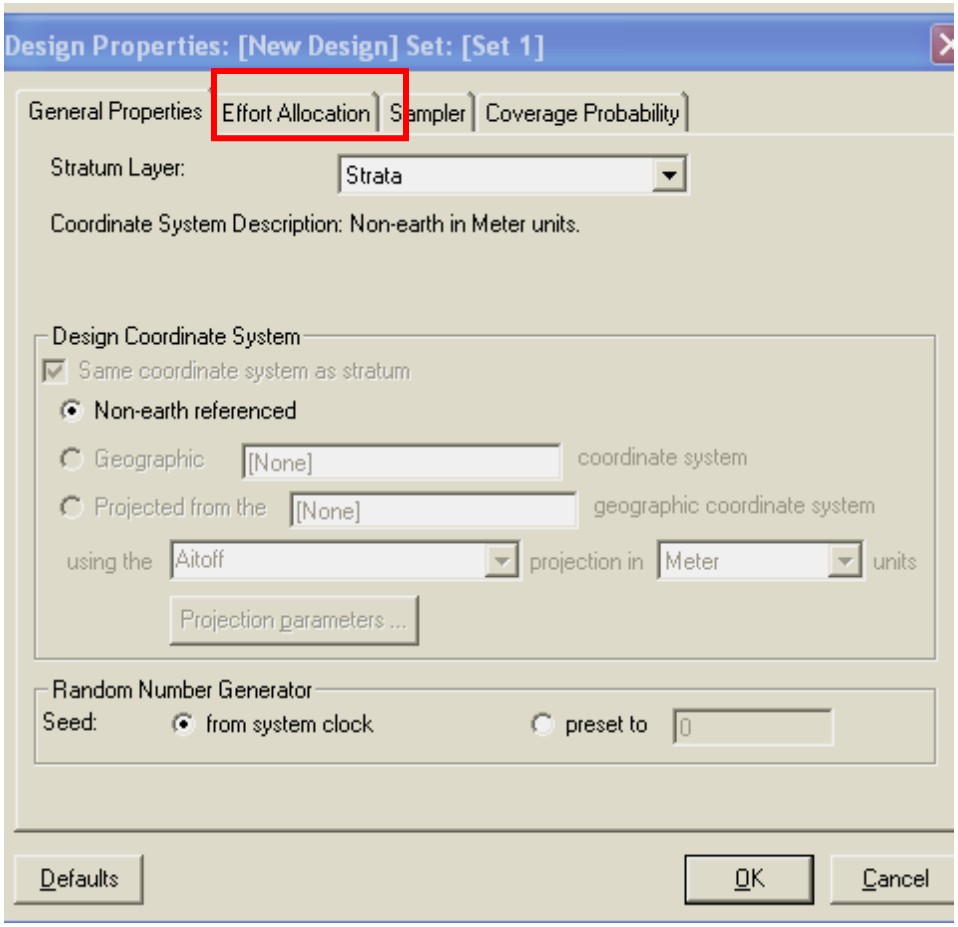
41. A dialogue box appears. Choose what type of sampling you would like on the “Samples” line. Choose what type of sampling units on the “Class” line. Each type of design is represented by a little schematic picture of it like this : just below the “Properties” button;

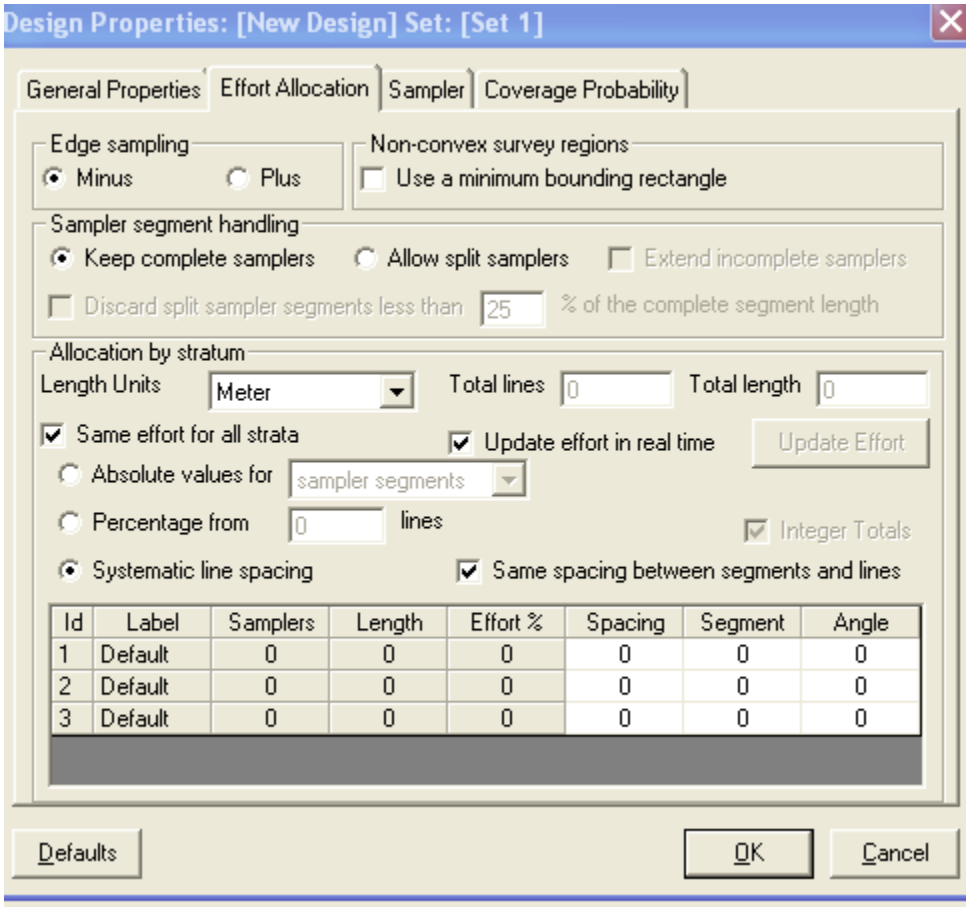
42. Click on “Properties”



43. A new dialogue box appears. This example is for transects ;

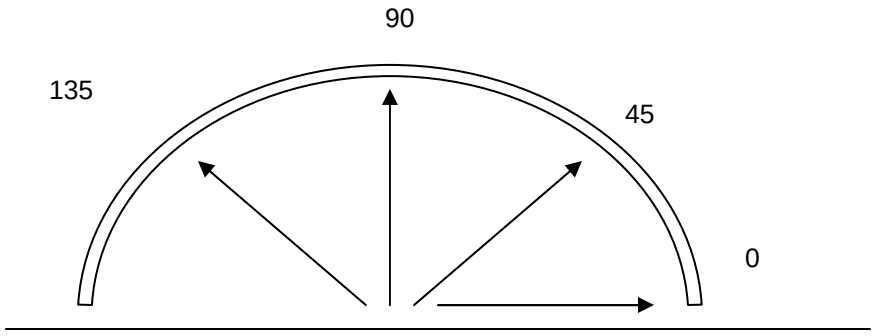
44. Click on “Effort Allocation” ;

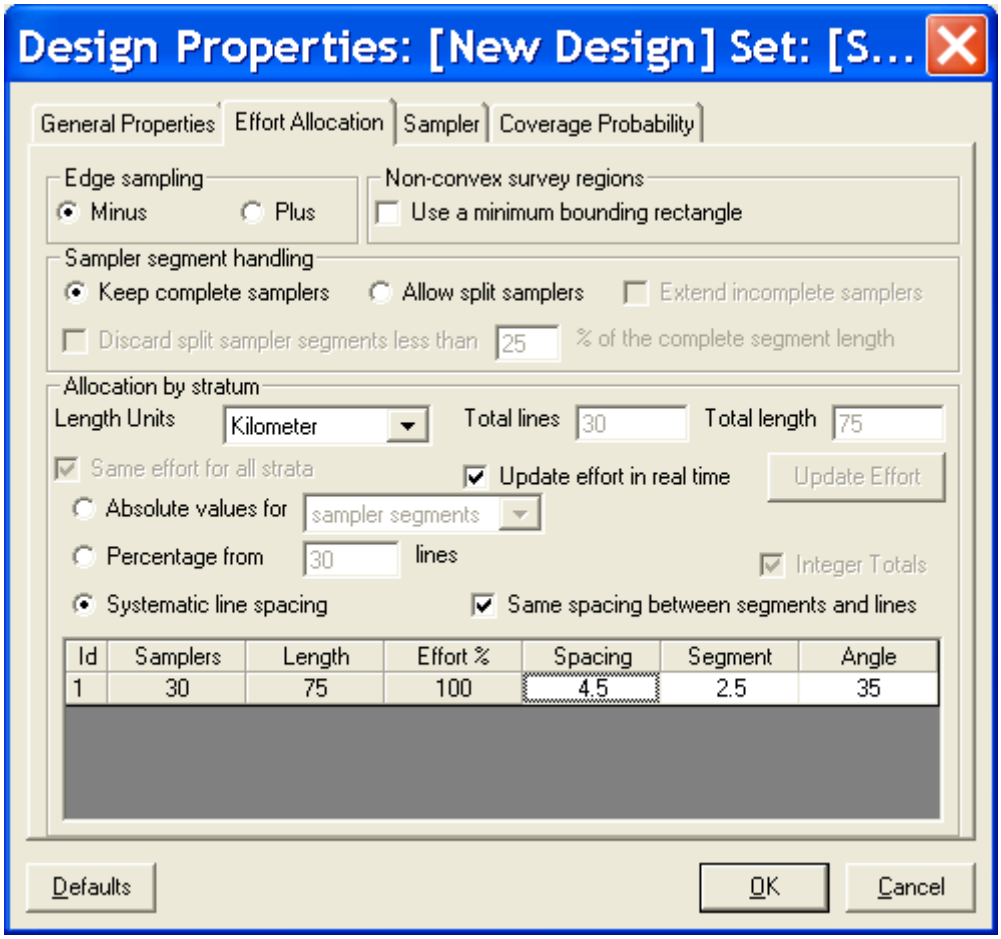




45. Choose the various units and values for your survey design. You should already know what the total sampling effort will be for your target coefficient of variation, from section 3.1.4.. You already know what orientation the transects in each stratum should be (perpendicular to the main environmental or hunting gradient). Normally your effort will be in kilometres, so ensure that the “Length Units” are kilometres. It is usually best to keep complete samples. It is also usually best to have thirty transects *per stratum.* Now, if you have three strata, for which you need 30 transects each, and you already know that each transect needs to be, for example, two kilometres long, enter the value 2 under « Segment », and enter the transect angle under « angle ». You can see how many samples and the total length per stratum as this table is interactive. By repeating and refining the spacing, you will get the right effort.

For the angles, DISTANCE does not use obvious compass bearings. Examples of angles are as follows:

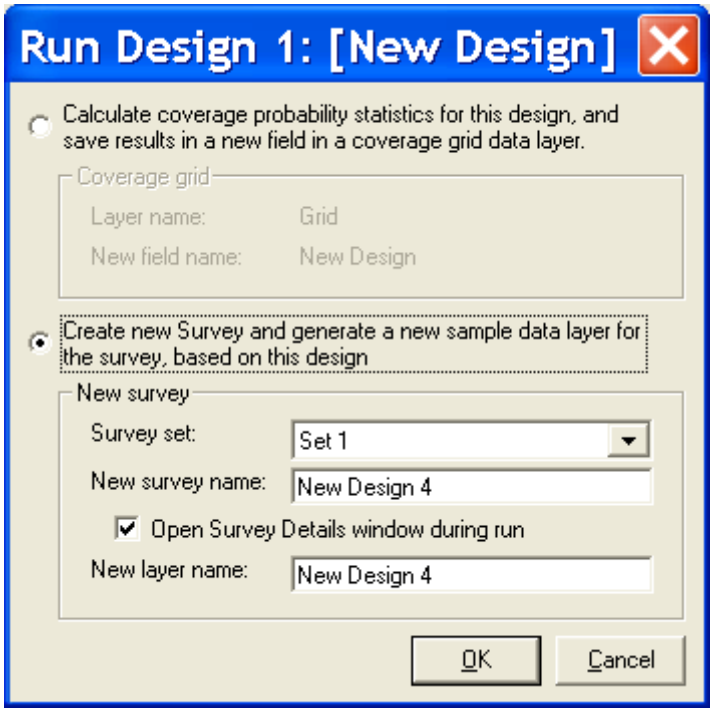




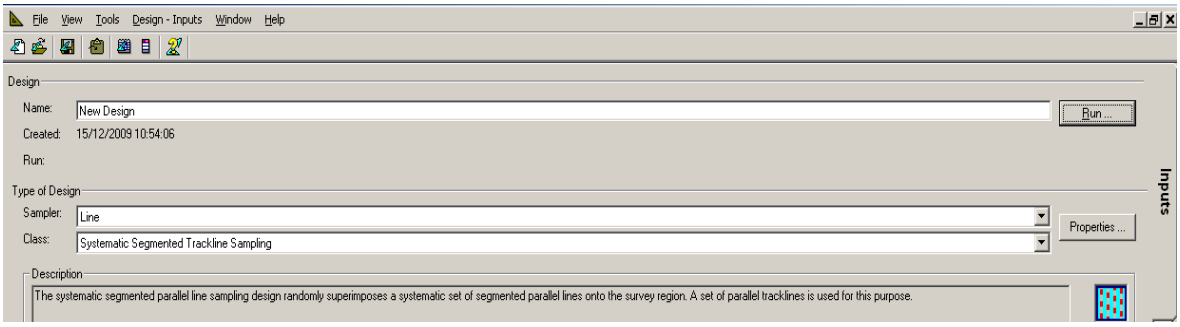
In the above example, 30 transects of 2.5 km length, are spaced by 4.5 kilometres. The transects are at 35^0.

46. If each stratum has a different sampling effort (it usually does), then deactivate the "Same effort for all strata" button. Click on "Ok", then "Run".

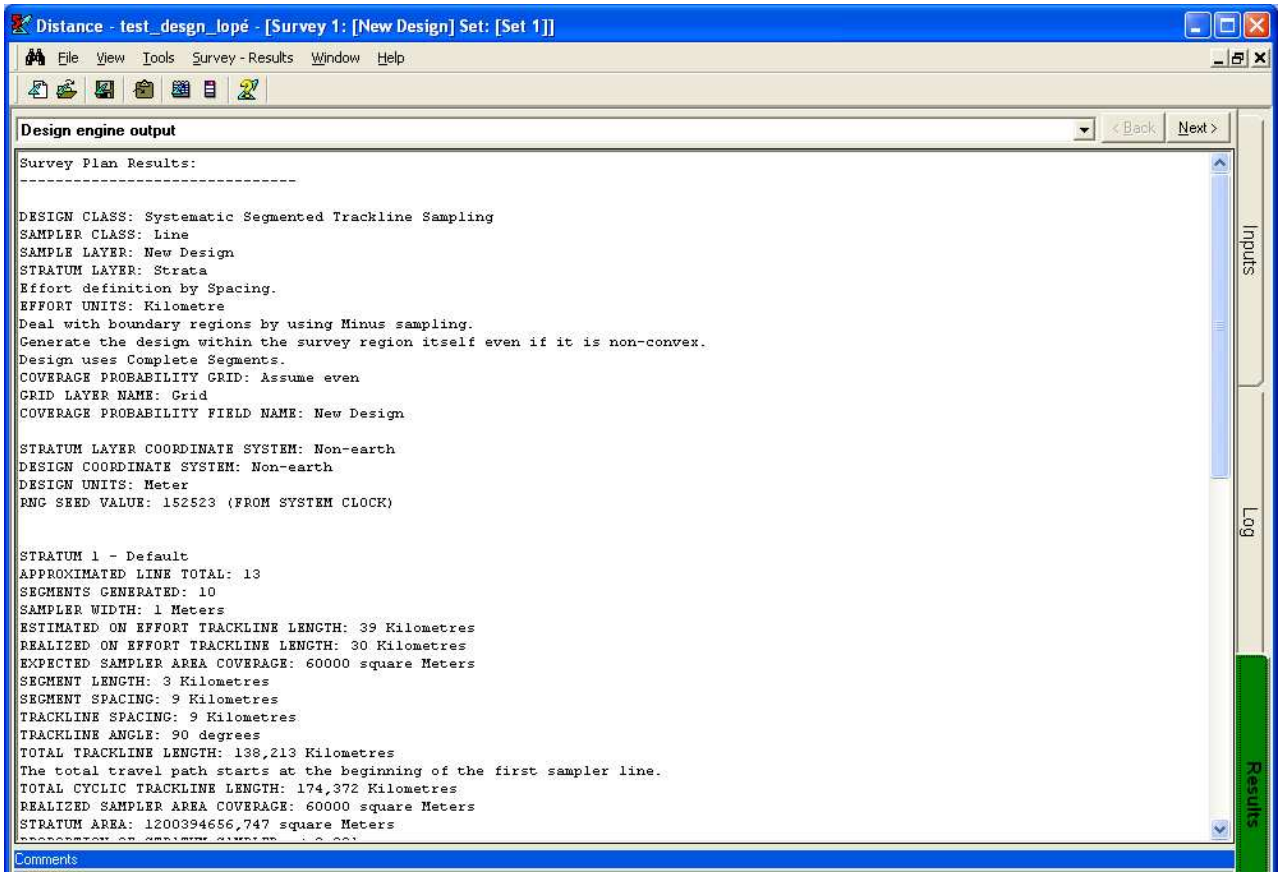
47. This dialogue box appears. Click on the second button "Create a new survey and generate a new sample data layer for the survey, based on this design", and then "Ok" ;



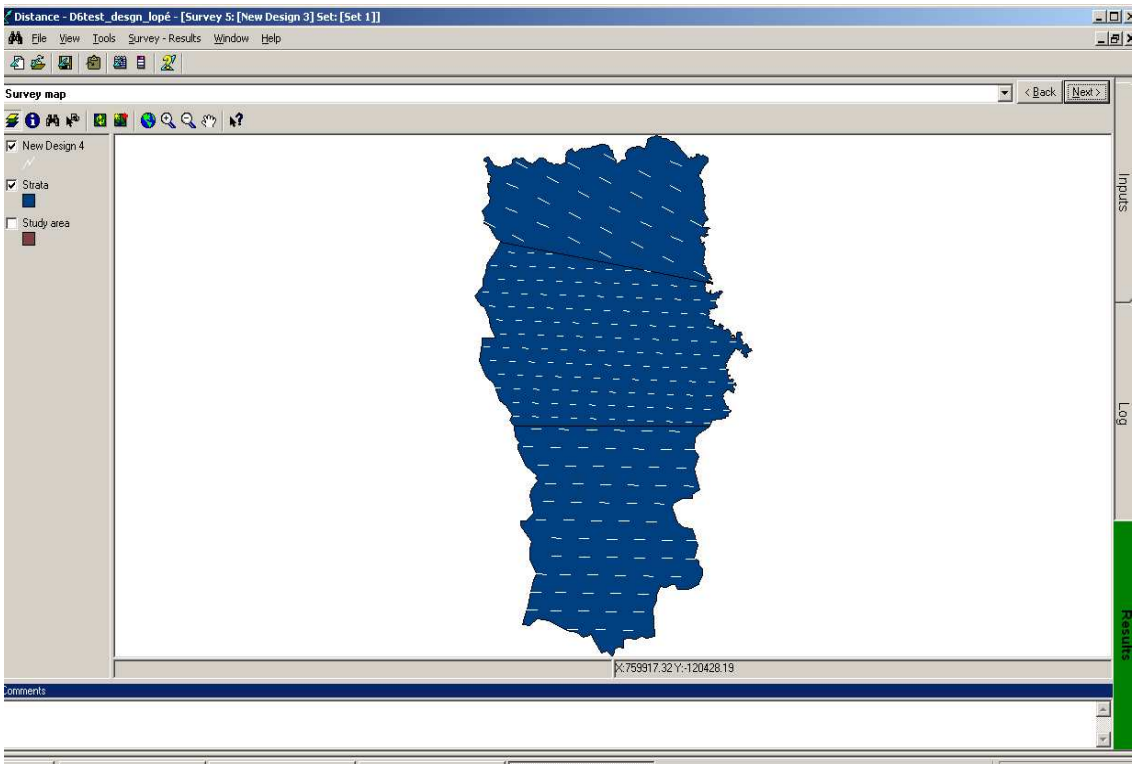
48. Then “Run”



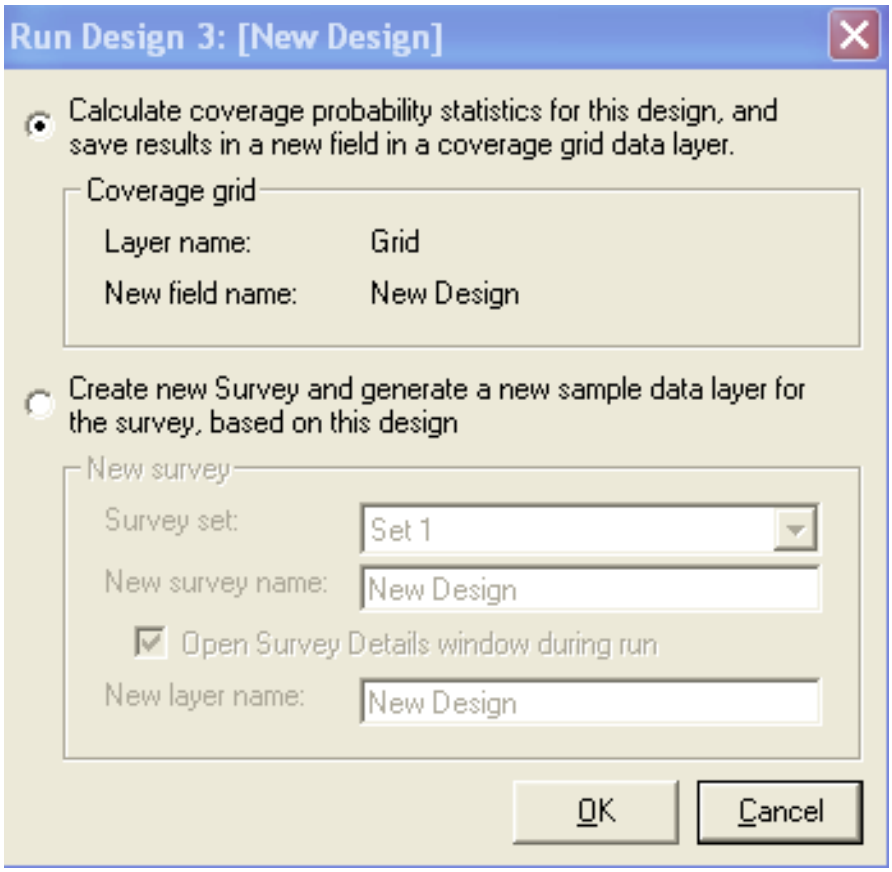
49. You should get this:



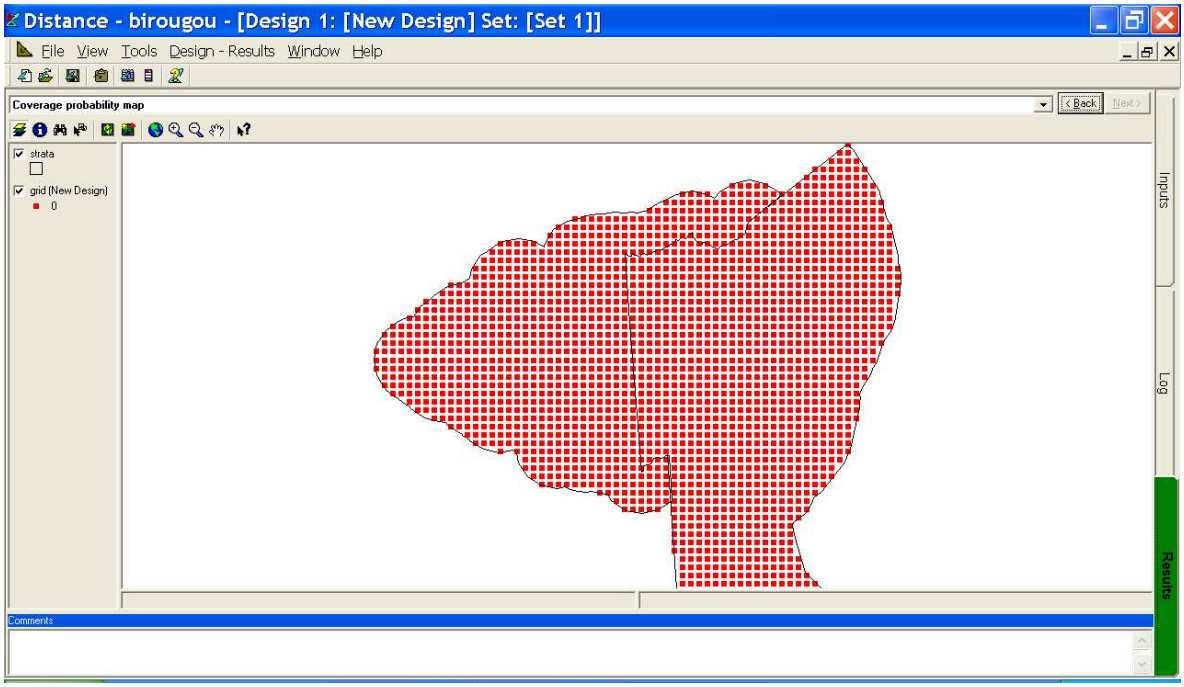
50. If you click on “Next” you see the first draft of your study design. Are the angles what you expected? The lines are stored as a shapefile in the *.dat folder of the Distance project, and the shapefile for the final design that you decide on can be added directly into an ArcView project later on.



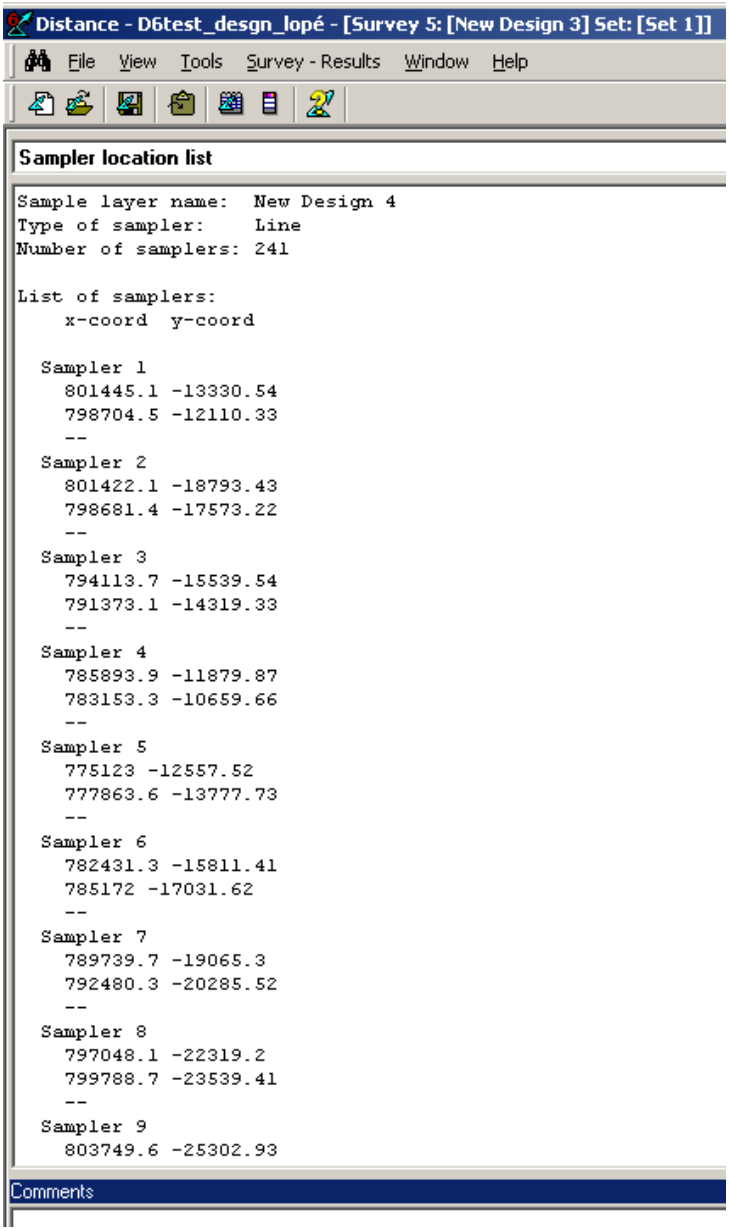
You need to check the evenness of the probability of the whole zone being equally sampled, using the first button:



Here is an example for the Birougou area in Gabon. All areas have the same probability of being sampled.



51. When you are satisfied that the total sampling effort in the design is what you had calculated for your target coefficient of variation, and that the transect angles are correct, click on the third page, (using the “Next” button after the map) and the waypoints of the beginning and end of each transect are displayed. They are in UTM.



52. You need to select them all (Ctrl+A) and copy them (Ctrl+C), then paste them (Ctrl+V) into an Excel file. Make sure that the data have the following fields in the Excel file : Stratum (if there are several), Waypoint number, Transect number, X coordinate, Y coordinate, Start/End of Transect. If the field teams work in Latitude and Longitude, you will have to ensure that there are these coordinates in the sheet as well (this can be done

by using an ArcView Script later on). The first example shows the initial Excel sheet (in French). The second one below shows one where there are also Lat-Long coordinates.

Microsoft Excel - Classeur1

	A	B	C	D
1	Sample layer name: New Design 5			
2	Type of sampler: Line			
3	Number of samplers: 33			
4				
5	List of samplers:			
6	x-coord y-coord			
7				
8	Sampler 1			
9	800887.6 -17036			
10	796319.9 -15002.32			
11	--			
12	Sampler 2			
13	777697.2 -16562.68			
14	782264.9 -18596.36			
15	--			
16	Sampler 3			
17	790486.8 -22256.99			
18	795054.6 -24290.68			
19	--			
20	Sampler 4			
21	801414.6 -27122.36			
22	805982.3 -29156.04			
23	--			
24	Sampler 5			
25	766683 -21510.57			
26	771250.7 -23544.25			
27	--			
28	Sampler 6			
29	779472.6 -27204.88			
30	784040.4 -29238.57			
31	--			
32	Sampler 7			
33	792262.3 -32899.2			
34	796830 -34932.88			
35	--			
36	Sampler 8			
37	766095.5 -3[illegible]0.74			

Feuil1 / Feuil2 / Feuil3

Prêt

Démarrer | Lopé | Panneau de

Microsoft Excel - waypoint debut et fin transect dd

	A	B	C	D	E	F
1	TRANSECT	WAYPOINT	DEBUT_FIN	UTM__X	UTM_Y	
2	1	1	Debut	801445.10	-13330.54	
3	1	2	Fin	798704.50	-12110.33	
4	2	3	Debut	801422.10	-18793.43	
5	2	4	Fin	798681.40	-17573.22	
6	3	5	Debut	794113.70	-15539.54	
7	3	6	Fin	791373.10	-14319.33	
8	4	7	Debut	785893.90	-11879.87	
9	4	8	Fin	783153.30	-10659.66	
10	5	9	Debut	775123.00	-12557.52	
11	5	10	Fin	777863.60	-13777.73	
12	6	11	Debut	782431.30	-15811.41	
13	6	12	Fin	785172.00	-17031.62	
14	7	13	Debut	789739.70	-19065.30	
15	7	14	Fin	792480.30	-20285.52	
16	8	15	Debut	797048.10	-22319.20	
17	8	16	Fin	799788.70	-23539.41	
18	9	17	Debut	803749.60	-25302.93	
19	9	18	Fin	806490.30	-26523.14	
20	10	19	Debut	801793.60	-29905.22	
21	10	20	Fin	799052.90	-28685.01	
22	11	21	Debut	794485.30	-26651.33	
23	11	22	Fin	791744.60	-25431.12	
24	12	23	Debut	787176.90	-23397.43	
25	12	24	Fin	784436.30	-22177.22	
26	13	25	Debut	779868.50	-20143.54	
27	13	26	Fin	777127.90	-18923.33	
28	14	27	Debut	772560.10	-16889.65	
29	14	28	Fin	769819.50	-15669.44	
30	15	29	Debut	765251.80	-13635.75	
31	15	30	Fin	762511.10	-12415.54	
32	16	31	Debut	760640.90	-17056.04	
33	16	32	Fin	763381.50	-18276.25	
34	17	33	Debut	767949.30	-20309.93	
35	17	34	Fin	770689.90	-21530.14	
36	18	35	Debut	775257.60	-23563.83	
37	18	36	Fin	777998.30	-24784.04	

waypoint debut et fin transect

Prêt

Démarrer | Study design | Panneau de configuration

Microsoft Excel - waypoints-tous-strata-2010.xls

	A	B	C	D	E	F	G	H	I	J	K	L
1	Stratum	Waypoint	Transect	Start_End	Lat_deg	Lat_min	Long_deg	Long_min	Lat_dd	Long_dd	Utm_x	Utm_y
32	Lac Tele Nord	31	16	Start	1	17.366	17	15.79	1.28943	17.26317	751836.9	14263
33	Lac Tele Nord	32	16	End	1	18.134	17	15.029	1.30223	17.25048	750422.7	144047
34	Lac Tele Nord	33	17	Start	1	21.281	17	11.907	1.35469	17.19845	744624.4	149845
35	Lac Tele Nord	34	17	End	1	22.049	17	11.145	1.36749	17.18575	743210.2	151259
36	Lac Tele Nord	35	18	Start	1	25.198	17	8.023	1.41996	17.13372	737411.9	15705
37	Lac Tele Nord	36	18	End	1	25.966	17	7.261	1.43276	17.12102	735997.7	158472

Sheet1 / waypoints-plan-b

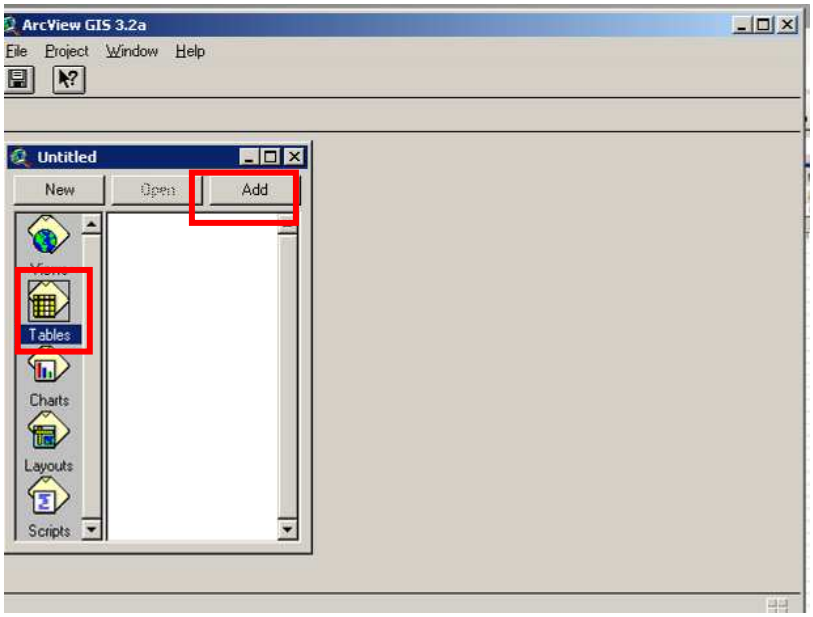
Ready | Sum=111173171.9

53. Save the Excel file. Save a second copy as a text file, ready for ArcView;

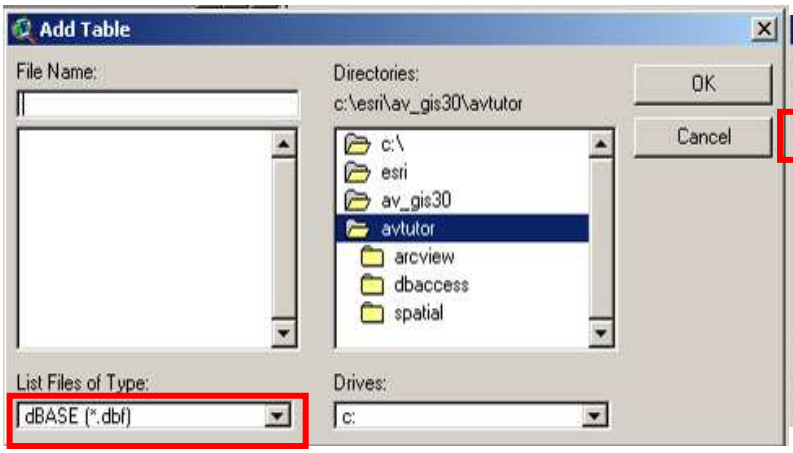
54. Open ArcView 3.2, click on “Cancel” and go to “Table”

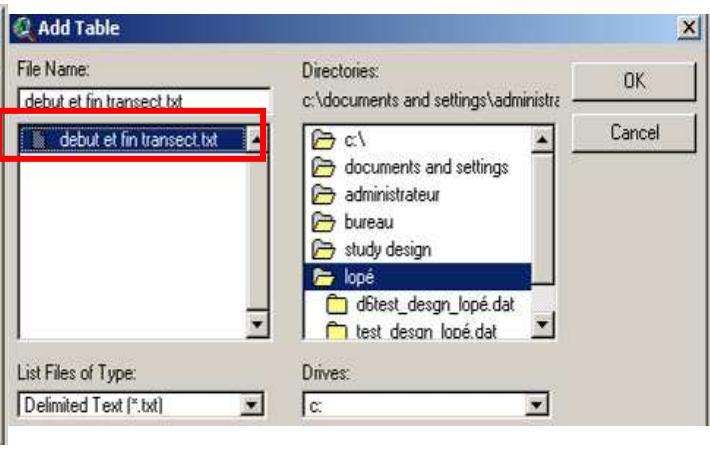
, then “Add”

;

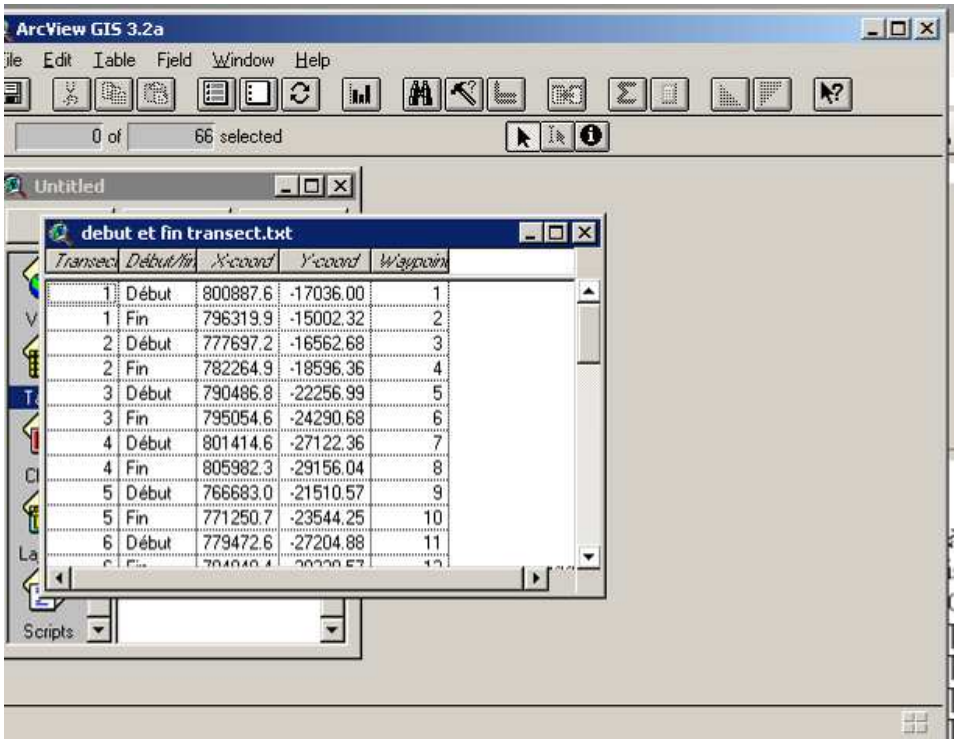


55. In the new dialogue box, navigate to the text file, ensure that under “List Files of Type” you choose Delimited text (*.txt). (The default is dBase (*.dbf)





56. Click on the table and then click on “Ok”

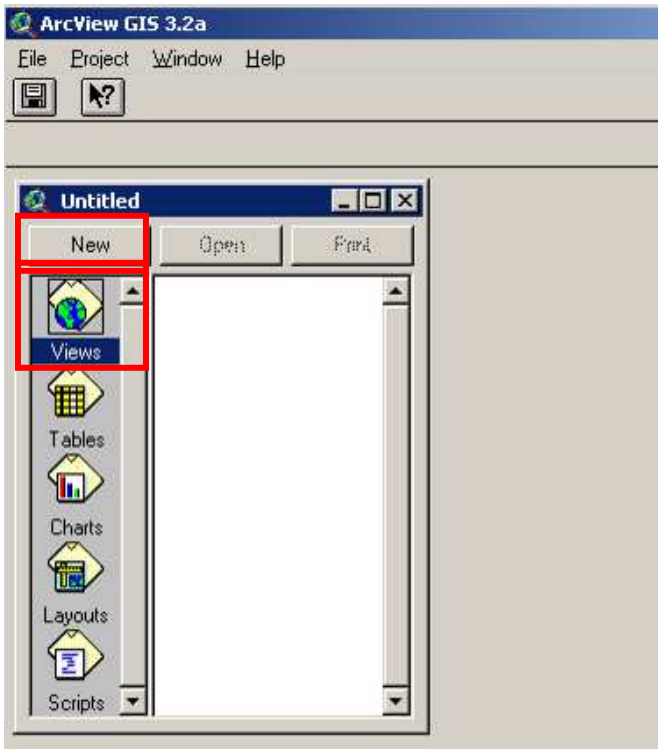


57. The table should appear in the ArcView screen. Close the table.

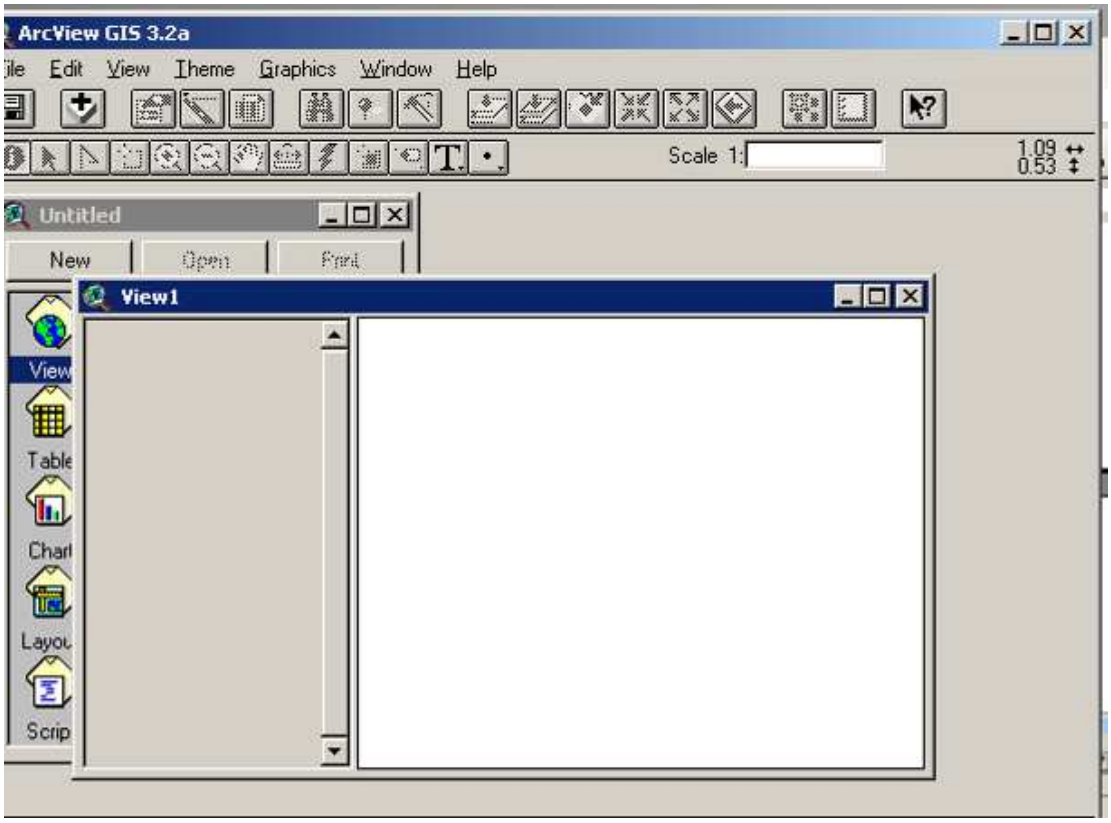
58. Click on “View”

, then “New”

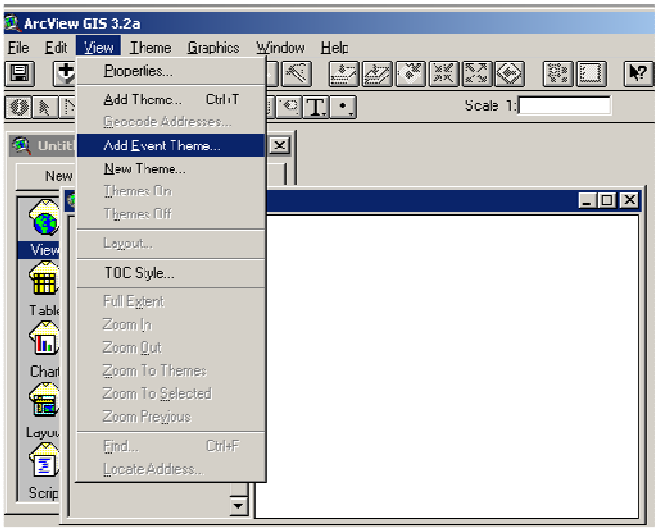
;

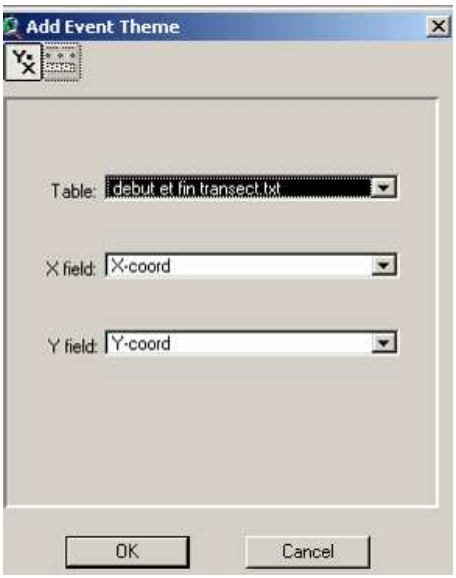


59. You should get this:

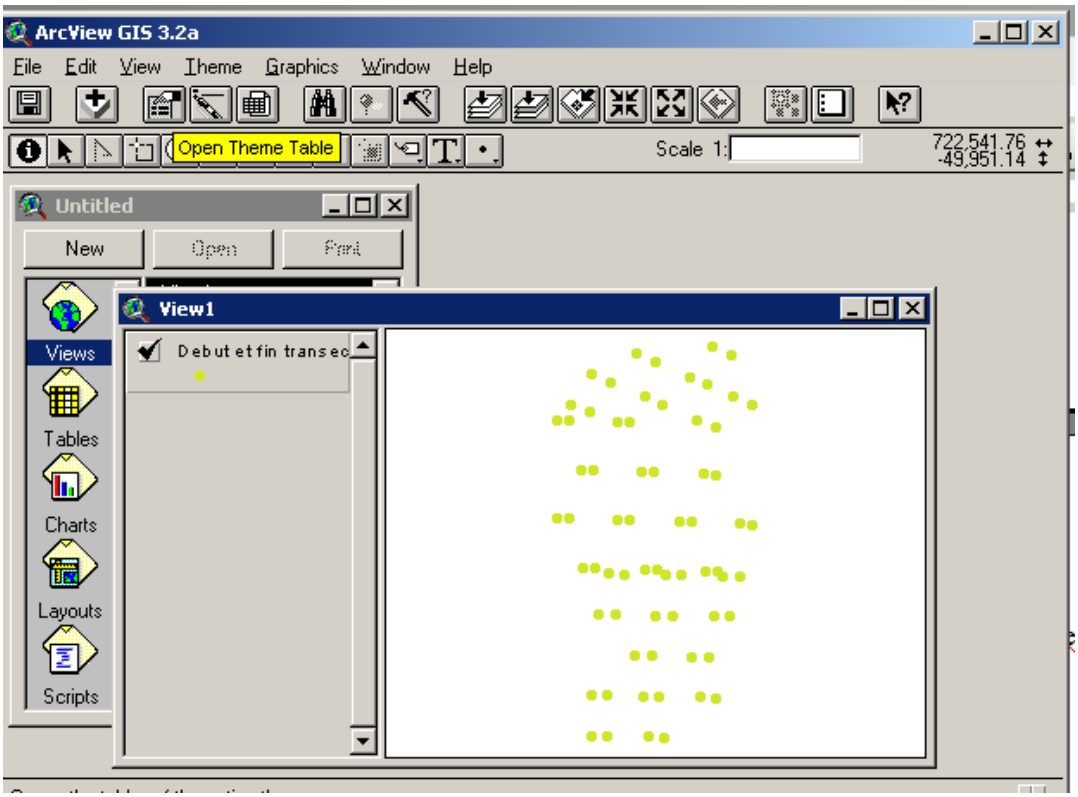


60. Now go to “View” on the Menu bar, go to “Add Event Theme” and click on it. In the new dialogue box, choose the text table that you have just added and the appropriate “X Field” and “Y Field”, then click on “Ok”





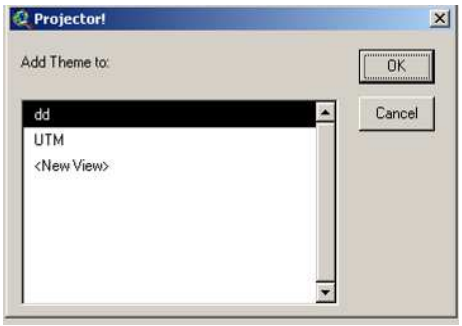
61. Open the attribute table by first clicking on the theme and then on the “Open Theme Table” icon.



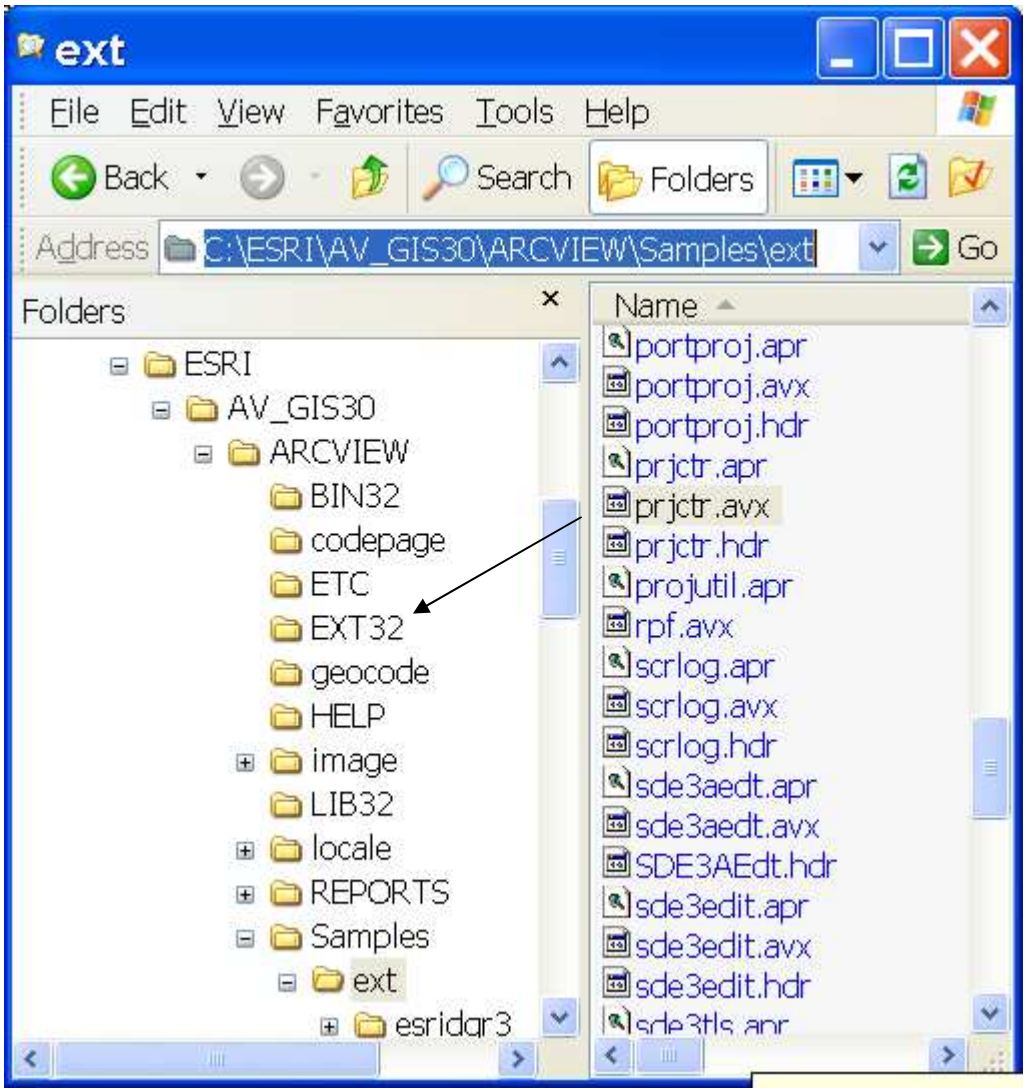
62. Name the View “UTM” (in View Properties)

63. Now create another View, and call it ”dd” (Decimal Degrees).

64. You can now reproject the UTM theme into a decimal degree theme (most field teams work using maps in Latitude Longitude, rather than UTM). First the Projector! Extension needs to be activated (under “File” then “Extensions” ; Choose (Projector !).

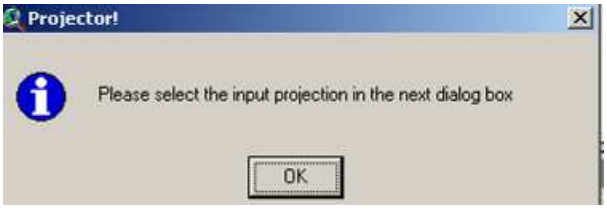


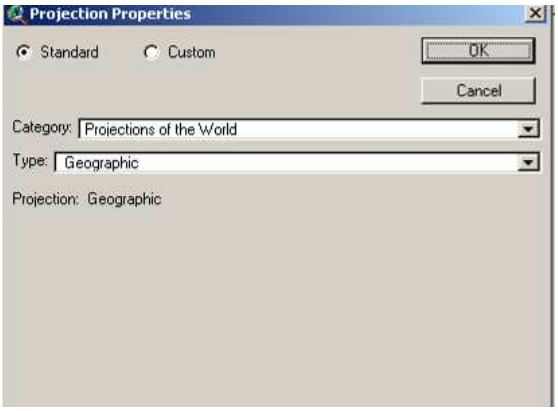
[Note: If Projector! is not already loaded into your ArcView, it can be found under the path "C:\ESRI\AV_GIS30\ARCVIEW\Samples\ext" and should be copied and pasted into the EXT2 directory]



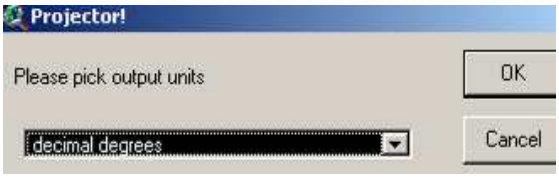
65. Click on the theme and on the “Projector” button on the menu br. A dialog box will appear asking you to select the input projection. Click OK. The default will appear (where “Category” is “Projections of the World” and “Type” is Geographic”.

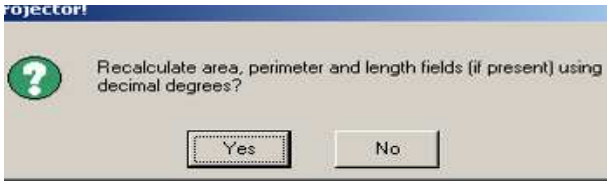
66. On “Category”, use the drop-down menu to choose UTM 1983 and on “Type”, choose the Zone. It is UTM 32 for this example (Lopé). Then click “Ok” ;





67. For the output projection, choose “Decimal degrees” and “No”, and then “Yes” (the last adds the new file to a View)

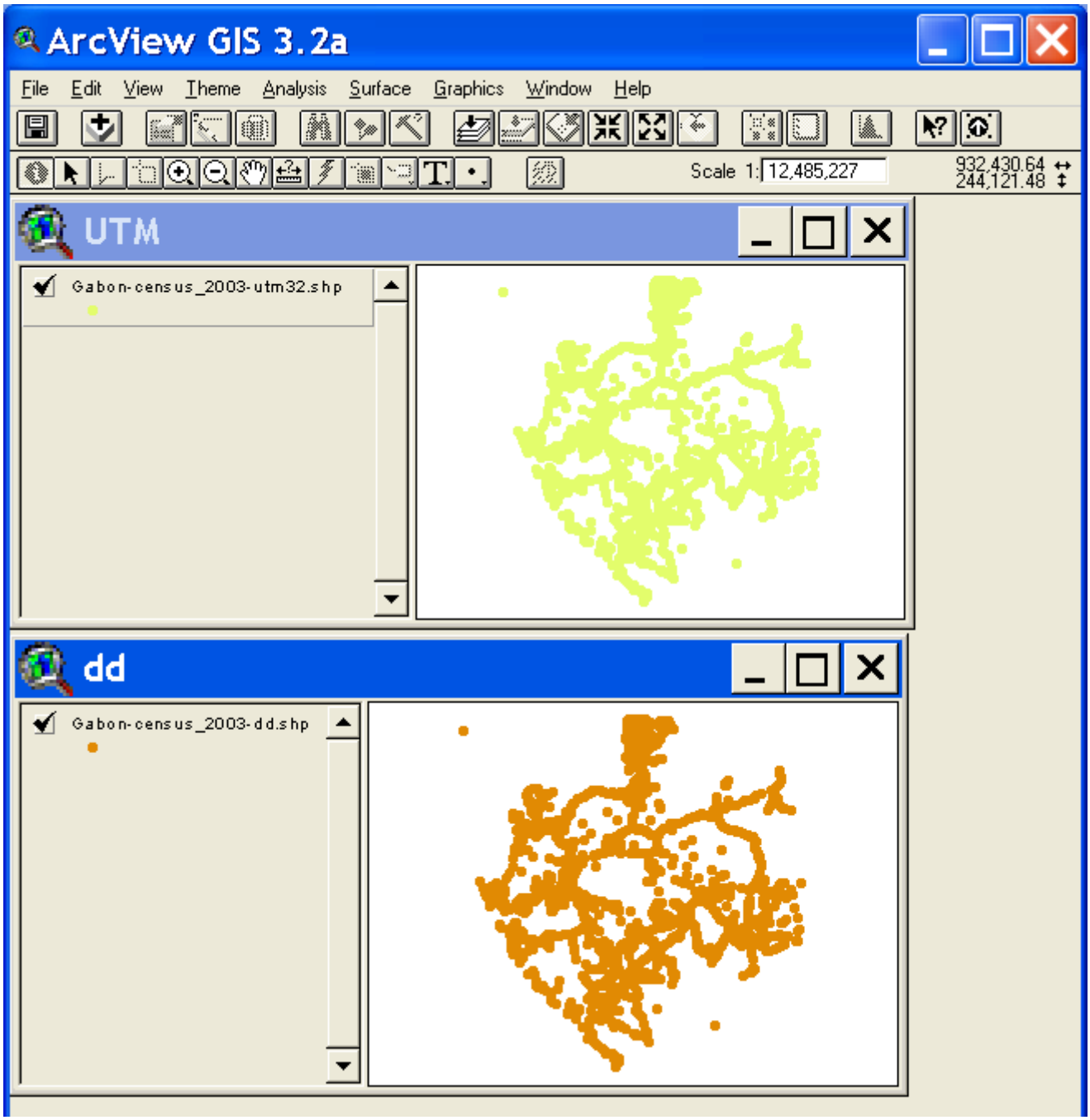




68. Add it to the “dd” View, and then navigate to where it should be stored and give it a name. It is good practice to add “–dd” to the end of a geographic shapefile name (and “–UTM32” to the end of a shapefile projected in UTM32, for example). See example below

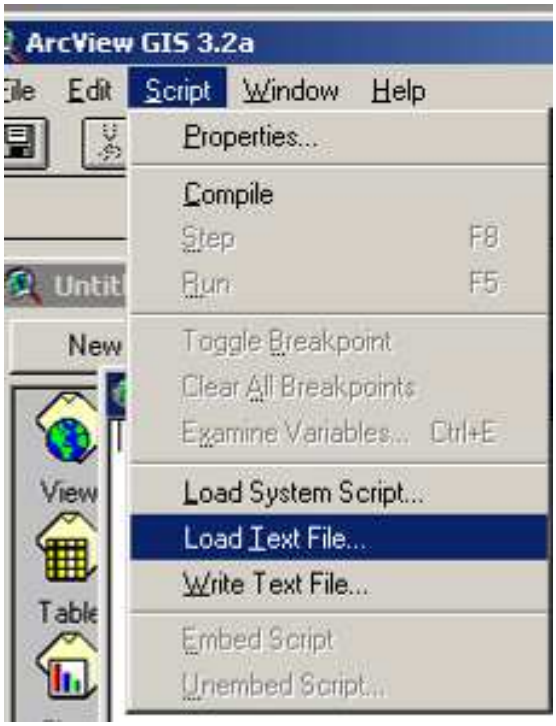
where two shapefiles have the same name except one ends with the UTM32 and one with dd. The Projector! Button is the one to the extreme right of the menu bar.

.

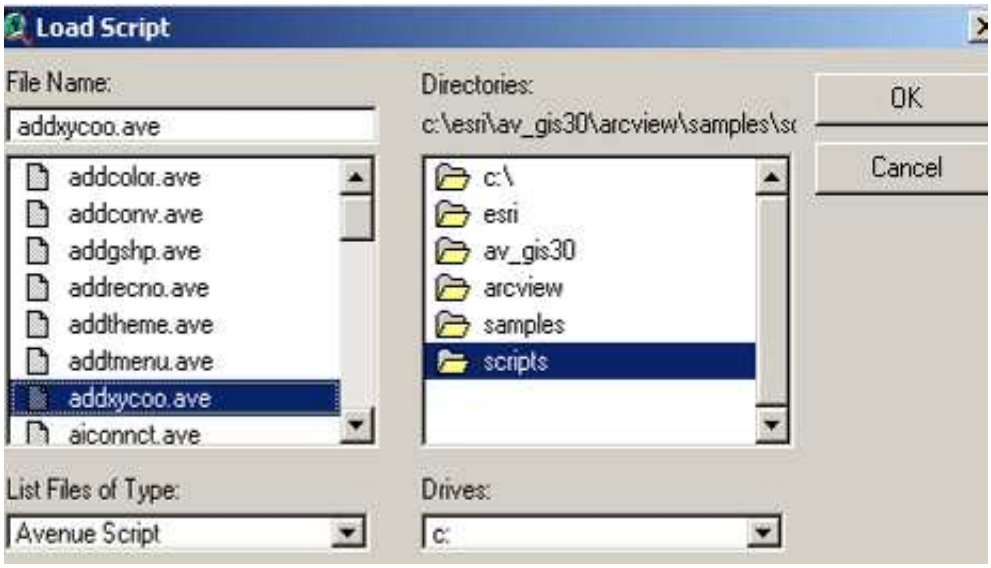


69. Geographic coordinates can now be calculated for each point using a Script. You need to click on “Scripts” in the ArcView project page

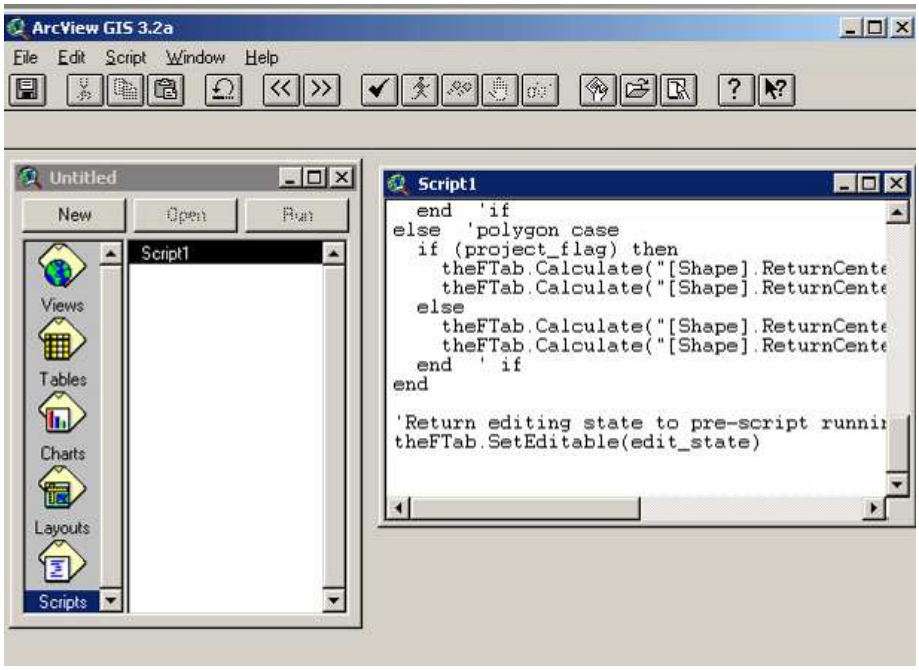
, then “New”. Click on Scripts on the menu bar , then “Load Text File”



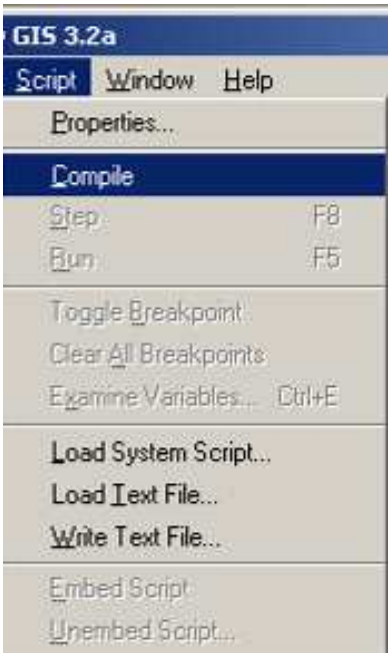
70. In the resulting dialogue box, in the "Directories" address, navigate to C\esri\av_gis30\arcview\samples\scripts. In the "File Name" box, choose "addxycoo.ave", then click on "OK" ;



71. The script appears. It is a macro (set of instructions to the computer) that will calculate the x and y coordinates of a point shapefile, and add them in appropriate fields. It does this in any projection.

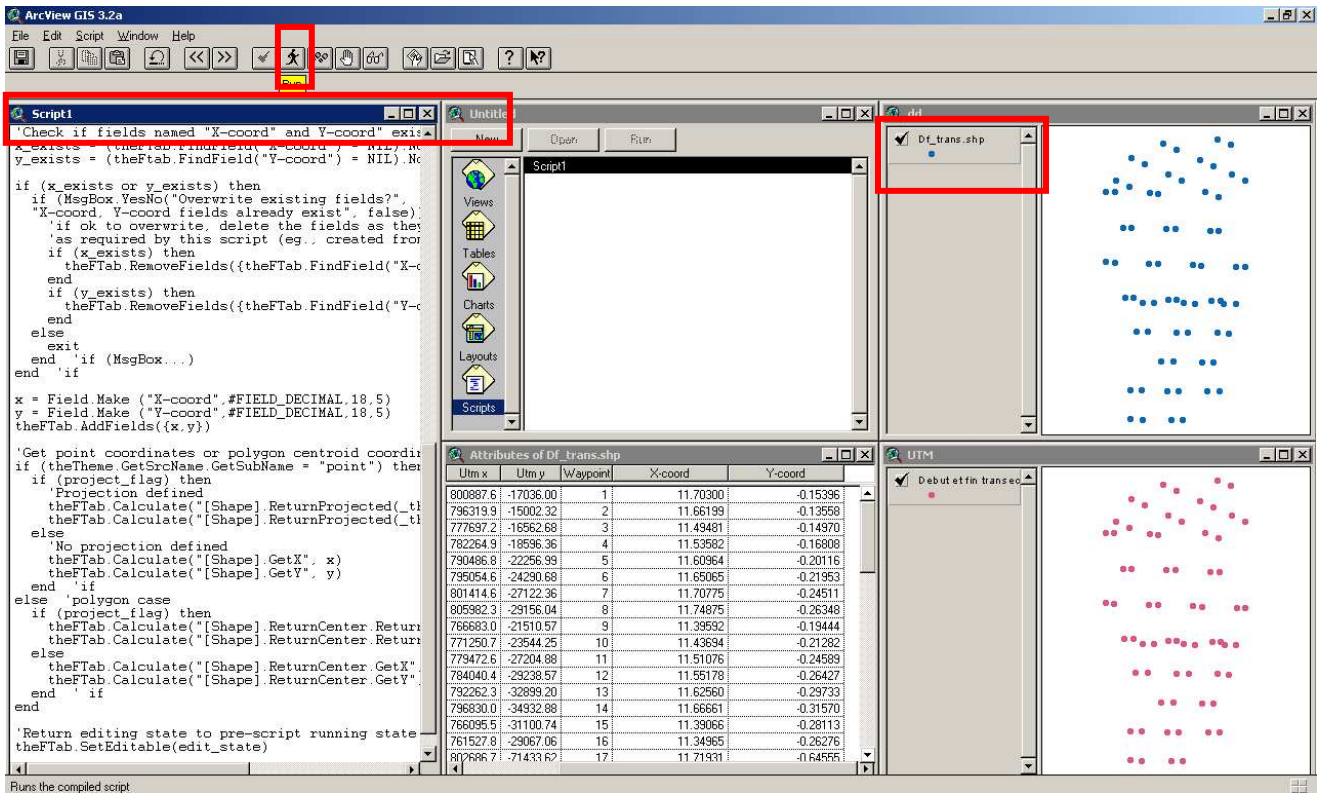


72. Compile the Script by going to “Script” on the Menu bar, then “Compile”.



73. Or there is a “Compile” button available on the menu bar as well .

74. Then , click on the theme in the View, then on the “Script” then “Run” . The script adds the X and Y columns to the attribute table.



75. Add two more columns “Lat dd” and “Long dd” to the attribute table (use “Start Editing”, then “Add Field”, and ensure there are 5 figures after the decimal point for each column. Two empty columns will appear, with their names “Lat dd” and “Long dd”;

76. To add the coordinates automatically, click on the header of one of them (for example the Long DD column) and then click on the “Calculate” button ;

77. In the dialogue box that appears, double click on the column containing the appropriate data that you wish to be in the column (in our example below, the X-coord data should be in the Long DD column, so you should double click on “X-Coord”. The destination column (in this case Long DD) will be automatically populated.

78. Make sure both Lat DD and Long DD columns are populated and that they are correct (the right way round!) Then you can delete the X-coord and Y-coord columns.

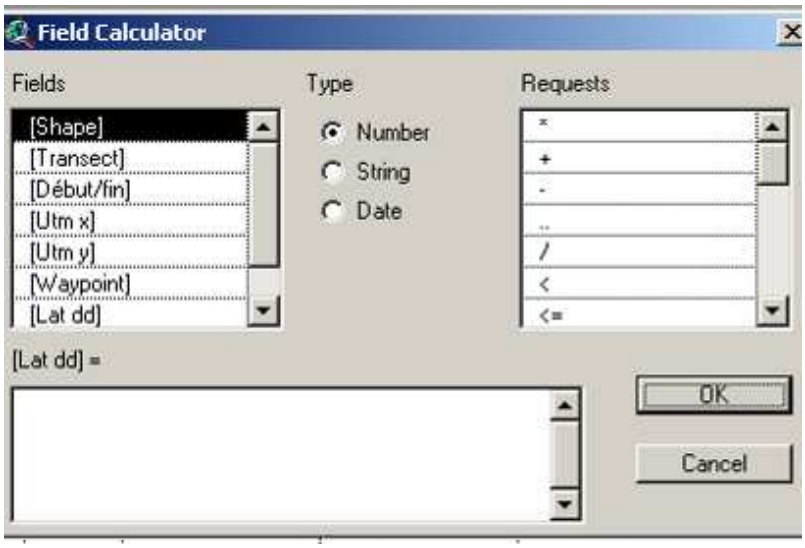
ArcView GIS 3.2a

File Edit Table Field Window Help

0 of 66 selected Calculate

Attributes of Df_trans.shp

Shape	Transect	Début/fin	Utm x	Utm y	Waypoint	X-coord	Y-coord	Lat dd	Long dd
Point	1	Début	800887.6	-17036.00	1	11.70300	-0.15396		
Point	1	Fin	796319.9	-15002.32	2	11.66199	-0.13558		
Point	2	Début	777697.2	-16562.68	3	11.49481	-0.14970		
Point	2	Fin	782264.9	-18596.36	4	11.53582	-0.16808		
Point	3	Début	790486.8	-22256.99	5	11.60964	-0.20116		
Point	3	Fin	795054.6	-24290.68	6	11.65065	-0.21953		
Point	4	Début	801414.6	-27122.36	7	11.70775	-0.24511		
Point	4	Fin	805982.3	-29156.04	8	11.74875	-0.26348		
Point	5	Début	766683.0	-21510.57	9	11.39592	-0.19444		
Point	5	Fin	771250.7	-23544.25	10	11.43694	-0.21282		
Point	6	Début	779472.6	-27204.88	11	11.51076	-0.24589		
Point	6	Fin	784040.4	-29238.57	12	11.55178	-0.26427		
Point	7	Début	792262.3	-32899.20	13	11.62560	-0.29733		
Point	7	Fin	796830.0	-34932.88	14	11.66661	-0.31570		
Point	8	Début	766095.5	-31100.74	15	11.39066	-0.28113		
Point	8	Fin	761527.8	-29067.06	16	11.34965	-0.26276		
Point	9	Début	802686.7	-71433.62	17	11.71931	-0.64555		
Point	9	Fin	798687.3	-71363.80	18	11.68341	-0.64494		
Point	10	Début	788688.8	-71189.28	19	11.59364	-0.64341		
Point	10	Fin	784689.4	-71119.48	20	11.55774	-0.64279		
Point	11	Début	774690.9	-70944.95	21	11.46796	-0.64126		
Point	11	Fin	770691.6	-70875.14	22	11.43205	-0.64065		
Point	12	Début	768358.9	-80835.95	23	11.41115	-0.73070		
Point	12	Fin	772358.3	-80905.76	24	11.44706	-0.73131		
Point	13	Début	782356.8	-81080.28	25	11.53684	-0.73283		
Point	13	Fin	786356.1	-81150.09	26	11.57275	-0.73344		
Point	14	Début	796354.6	-81324.62	27	11.66252	-0.73497		
Point	14	Fin	800354.0	-81394.42	28	11.69842	-0.73558		

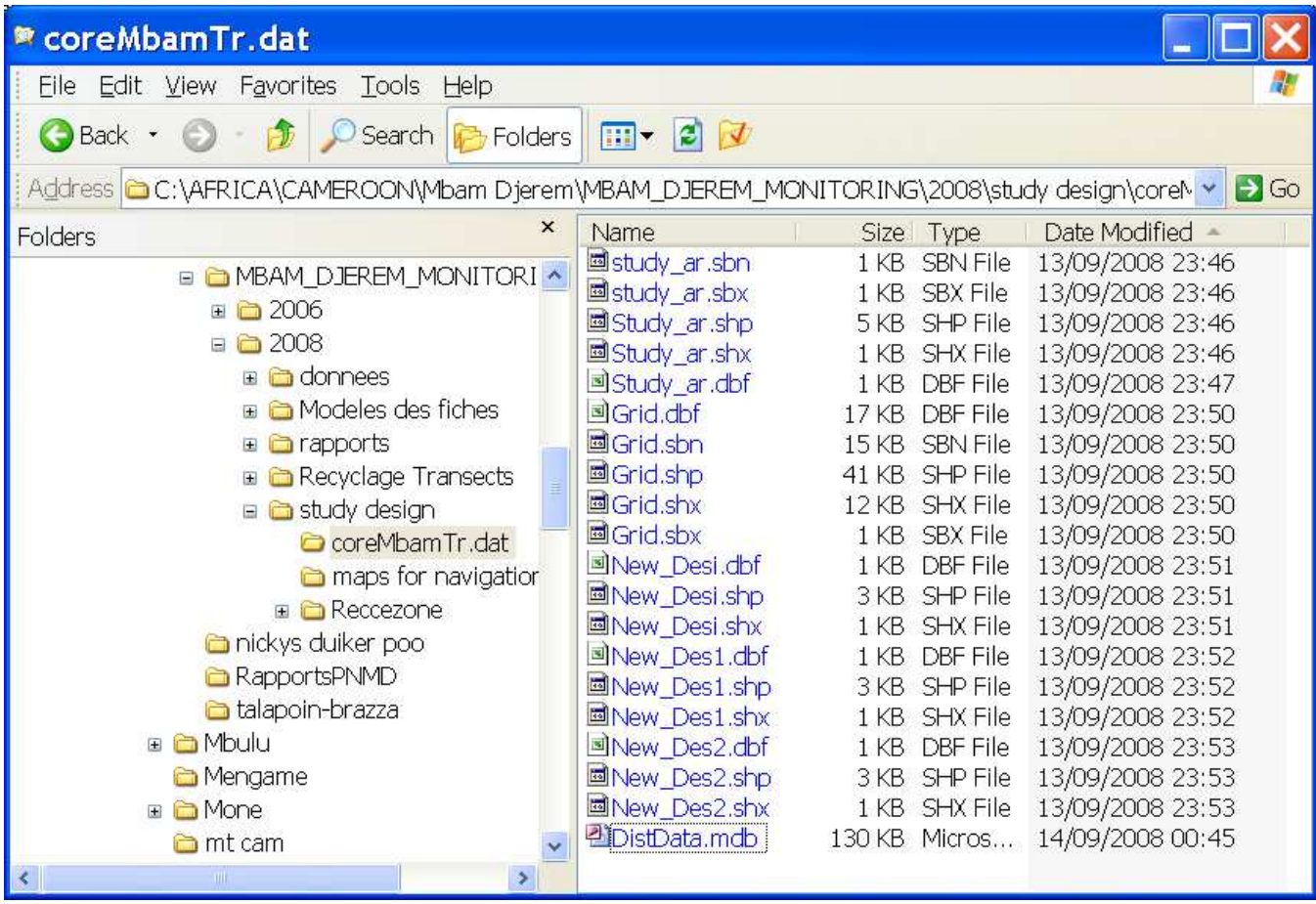


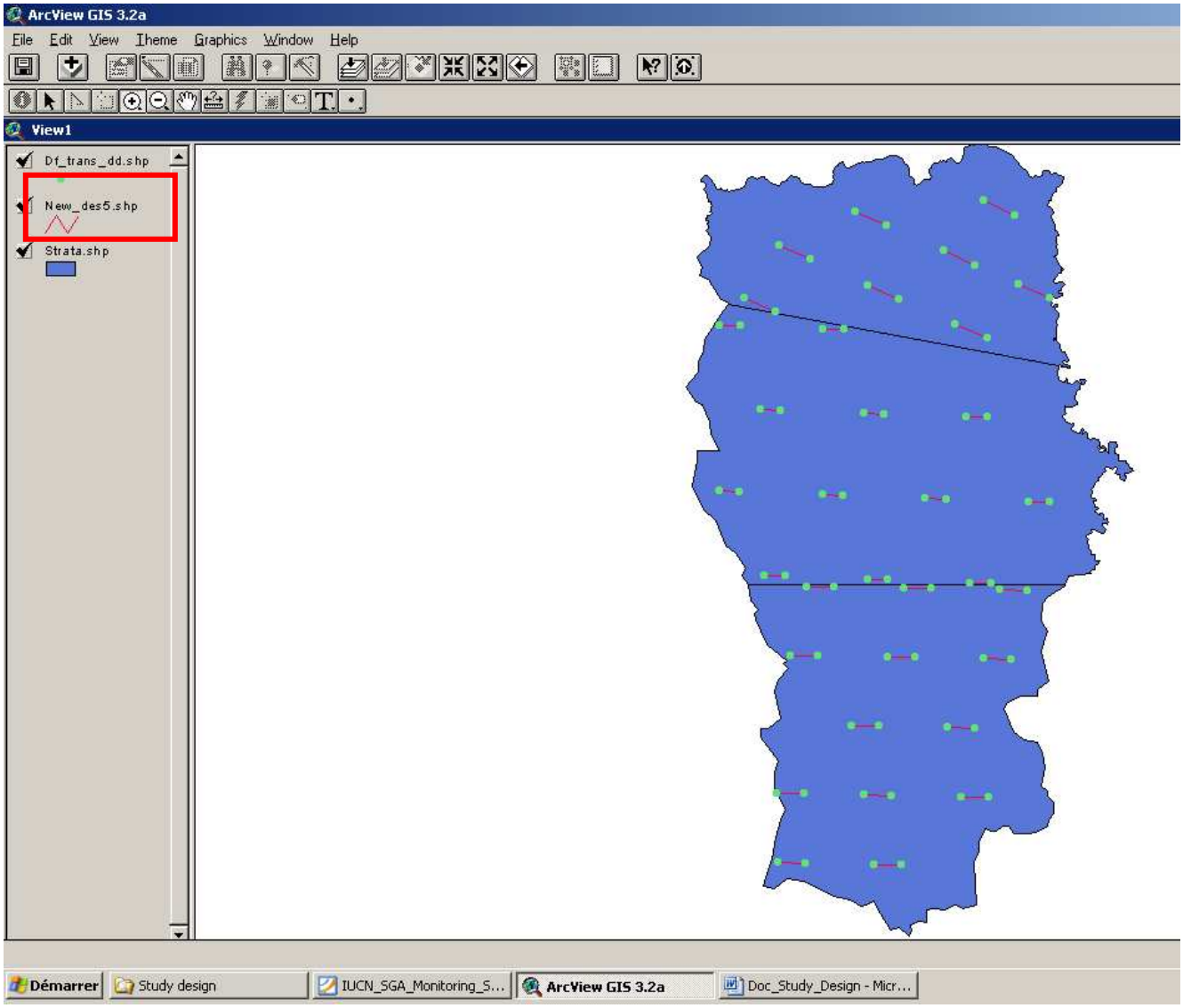
79. The resulting table can now be re-exported as a text file (use “File” on the menu bar, then “Export”).

80. Navigate to the destination folder of the exported table, give it an appropriate name (“Waypoints-Lope-2010 » for example) and ensure that the type of export is a text file (DelimitedText)

81. The shapefile of the lines themselves are found in the *.dat folder. Often there are many designs after the creation of a new project. Choose the most recently created (or ensure

that it has an appropriate name when creating it in the Distance program). In the example below, the transect line shapefile is called New_Des2.





The transects can be added directly to the ArcView View.

This map can then be used to create navigation maps for the field teams.

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