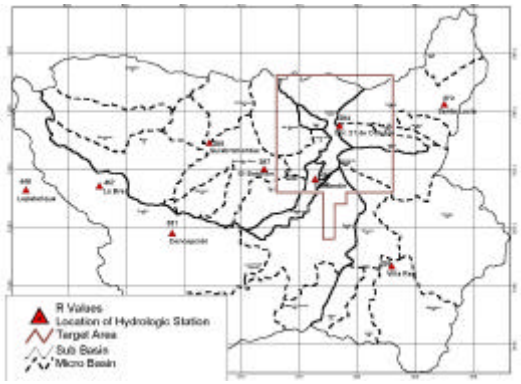
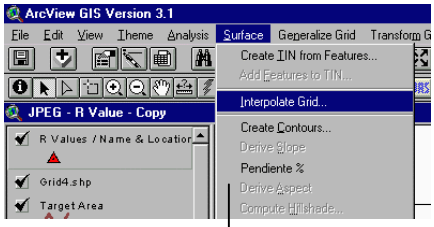
2) Operate

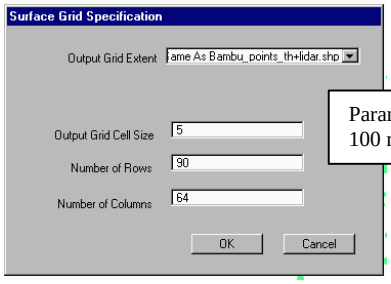
Note: For all the procedures and calculations in this specific aspect; Grid Databases of 100 m x 100 m Cell Size were used.

A. R value Interpolation Process

Add the R Point Values Theme and Choose Interpolate Grid from the Surface Menu
Set the parameters and choose the interpolation method.

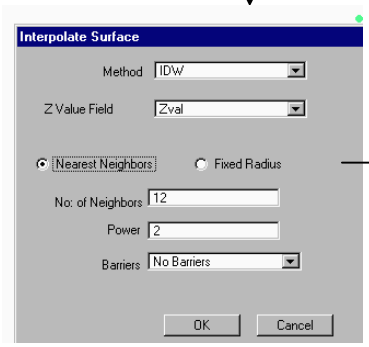


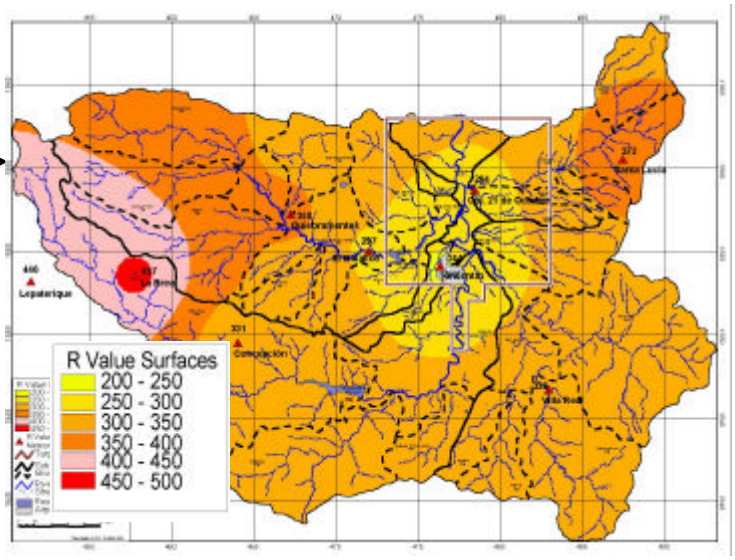




Parameter Setting Box
100 m cell size

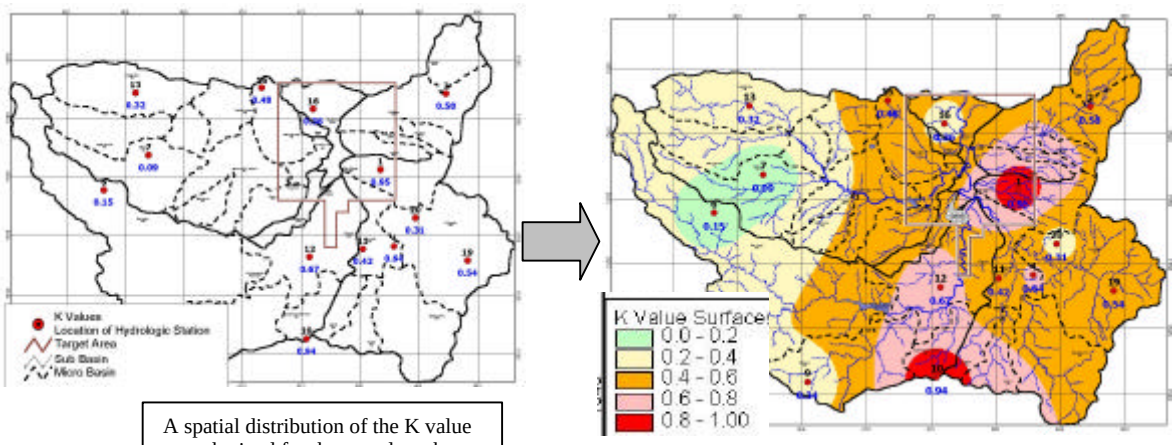
A spatial distribution of the R value was obtained for the meteorological stations being used for analysis.





B. K value Interpolation Process

Add the K Point Values Theme and Choose Interpolate Grid from the Surface Menu
Set the parameters and choose the interpolation method. (Same procedure as explained before)



A spatial distribution of the K value was obtained for the samples taken throughout the watershed.

C. LS value Calculation Process

The estimation of the soil loss can be obtained by the equation:

$LS = (L/72.6)^m \times (65.41 \sin^2 Z + 4.56 \sin Z + 0.065)$

Where:

L = slope length

Z = angle of slope

m = according to the following given values for slope %

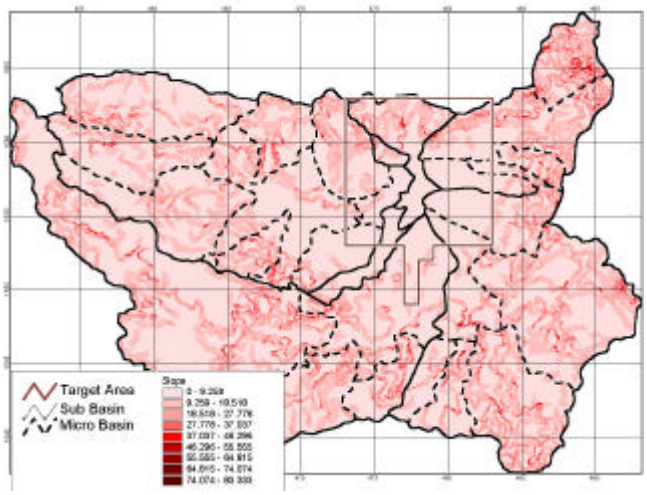
The following directions rule the general procedure:

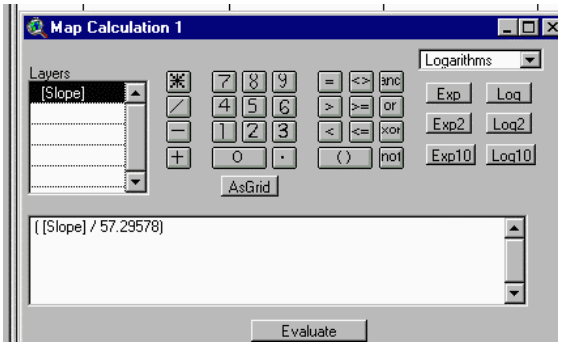
1. Add the Contours (100 m height difference interval) shapefile theme
2. Create a TIN from the contours
3. Generate a DTEM (Continuos elevation surface)
4. Derive Slope

The steps just mentioned have been explained before.

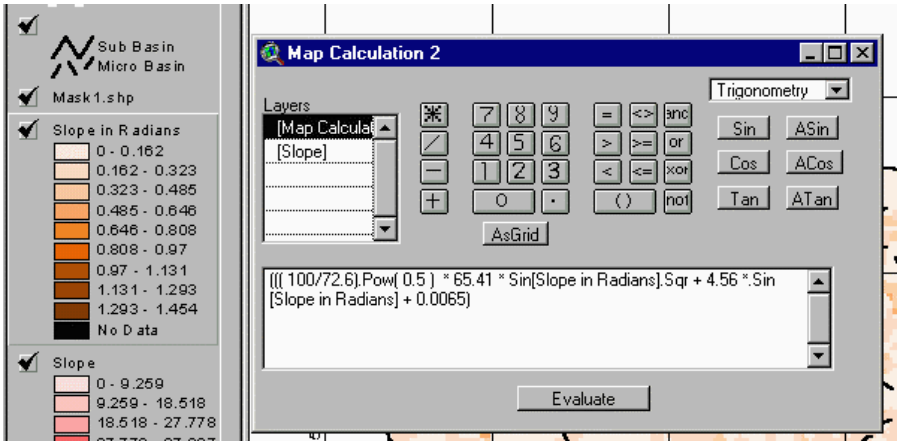
The resulting grid contains the slope angle in degrees. According to the formula, we need to calculate the trigonometric function of **Sine.** To get this we need to convert the slope grid in degrees to a slope grid in radians.

We use the map calculator as follows.





The resulting grid from the Map calculation will contain the slope in Radians. This grid dataset can be included in another map calculation that can give us the final LS values, as follows:



Explanation:

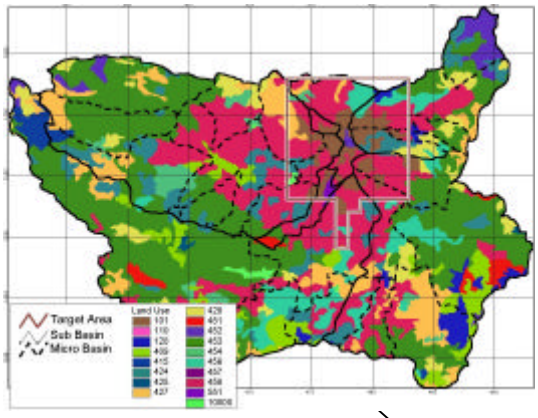
Use 100 for the slope length as it was the original grid cell size.

The resulting grid will contain the LS value for each cell.

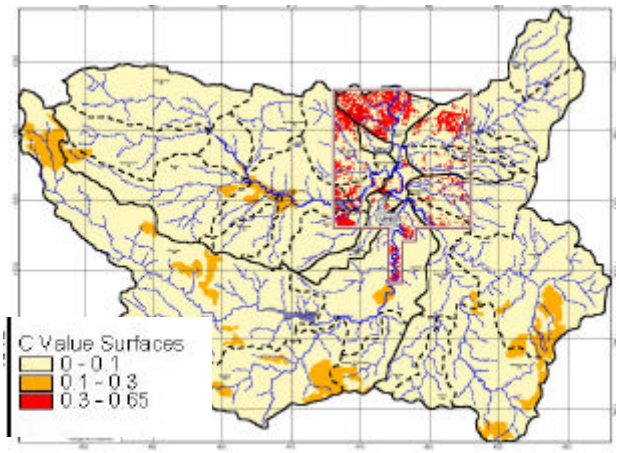
D. C value interpretation process

This factor depends entirely on the land use (forest, grassland, agriculture, etc) of the area being analyzed. A grid dataset containing the land use for the study area is available, so the only thing to do is to adjust the different values of land use to its corresponding C value.

Existing Land Use Value	Land Use Type	C Factor
101	Urban area, high density pop., capital city	0.01
110	Urban area, medium density pop., municipalities, main cities	0.015
120	Urban area, low density pop., town, hamlets	0.02
402	Citrics	0.01
409	Basic cereals	0.3
415	Basic grain and vegetable rotation	0.3
425	Natural pasture	0.032
424	Cultivated pasture	0.005
427,428	Basic grain pasture rotation	0.037
451	Pine Forest	0.021
452	Wide leaf forest	0.014
453	Mixed forest, pines predominant,	0.036
454, 456	Mixed forest, wide leaf predominant	0.023
457	Oak forest constituted by oak, though occasionally there may be pines	0.020
458	Thicket, wide leaf trees forest made up of many species with may be pines	0.087
460	Erosioned and vacant lands, landslides, etc.	0.65
10000	Water surfaces, reservoirs, rivers	0.000



The C factor value must be added to the land use grid database, this grid should then be reclassified (explained before) by using the C factor value field. The resulting grid would have the C value itself.

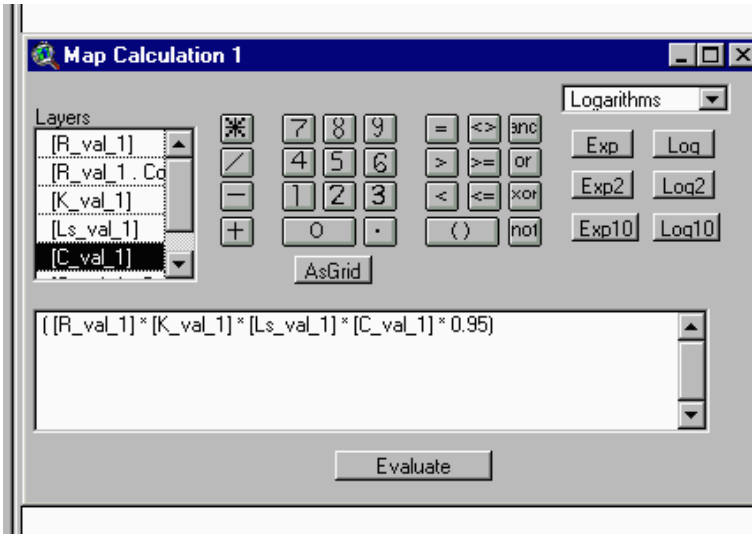


E. Final calculation of E (Potential Erosion) Value

At this moment the following Grid datasets should be present:

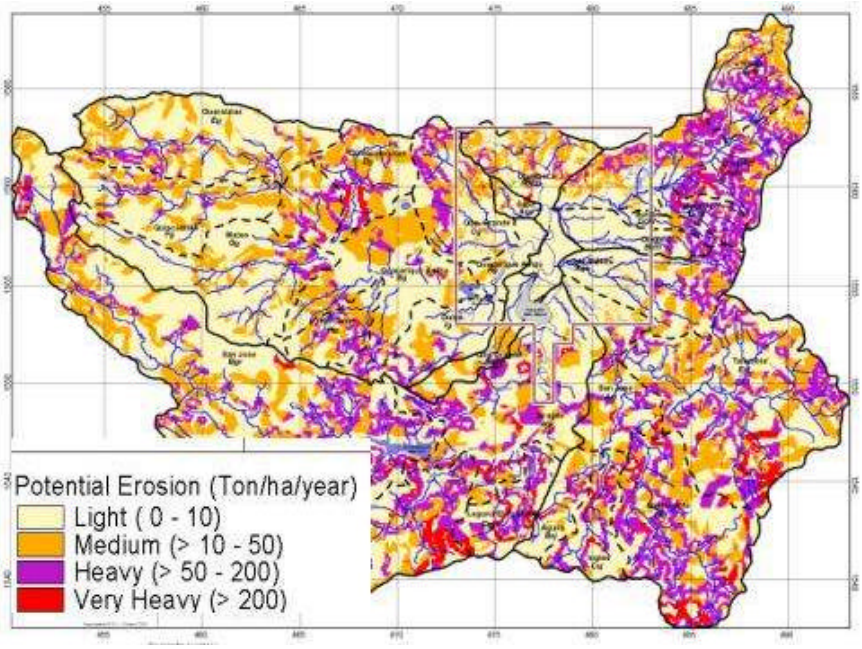
1. R value Grid
2. K value Grid
3. LS value Grid
4. C value Grid

Having the same parameters of output extent and grid cell size. The E value can be easily calculated using the Map Calculator as follows:



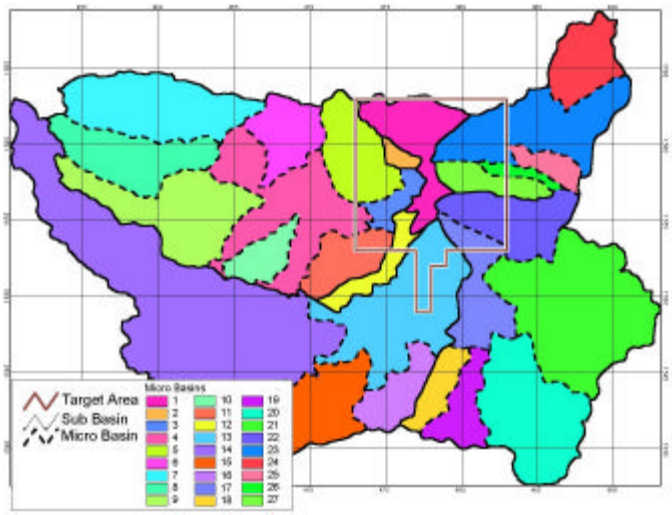
The resulting grid will give us the annual soil loss amount (ton/ha/year). This value being different for each cell.

For better orientation and explanatory purposes, the resulting grid can be reclassified (explained before) in more clearly ranges, as for example



F. Calculation of Potential Erosion by Micro Basin

For this particular watershed management study; the boundaries of micro basins were digitized and its database arranged, according to the nomenclature established.



Attributes of Micro_Basin

Codigo	Sub Basin	Micro Basin
1	Choluteca	Choluteca
2	Sapo	Sapo
3	Guacerique	Guacerique Abajo
4	Guacerique	Guacerique Arriba
5	Guacerique	Qda. Grande
6	Guacerique	Quebrabarrotes
7	Guacerique	Guaraleao
8	Guacerique	Quescamote
9	Guacerique	Mateo
10	Guacerique	Horcones
11	Guacerique	Dulce
12	Qda Grande	Qda Grande
13	Grande	Grande
14	Grande	San Jose
15	Grande	Oropora
16	Grande	Laguna El Pescado
17	San Jose	San Jose
18	San Jose	Aguila
19	San Jose	Ingles
20	San Jose	Sabacuante
21	San Jose	Talumble
22	Qda. Salada	Qda Salada
23	Chiquito	Chiquito
24	Chiquito	Trojas
25	Chiquito	Mololoa
26	Chiquito	Buras
27	Chiquito	Lomas

This grid should be combined (from the Grid Transformation Tools, explained before) with the resulting potential erosion grid and we can obtain a grid with the following database configuration:

Micro Basin Code	Soil Loss Amount	Hectares
5	97	695
5	1846	7
5	36	764
1	65	281
1	58	313
1	755	3
1	64	294
1	1579	66
23	35	1275
23	36	541
23	150	397
23	92	522
1	816	9
5	22	1233
5	1098	8
1	455	3
23	447	24
5	433	5
5	434	11
5	1446	2
1	1306	1
23	2453	1
8	22	3055
8	88	200

This database gives us the necessary information to perform summatories by micro basin and the corresponding amount of potential soil loss. Also, an analysis by area can be done, if so desired.

E. Land Use (Existing & Future) Analysis

1) Explain

The land use for the study area (819.65 Km²), was obtained originally from the Land Use Map scale 1:100,000 of ITS/C. Lotti & Associati, 1987, Proyecto Agua Subterránea y Montaña El Chile para Tegucigalpa, this map was digitized and then converted to a grid dataset. The corresponding land use for the target area was obtained by GIS analysis, some of the functions have already been explained before.

Further explanation of the methodology concepts and each layer's definitions must be consulted from the Land Use Study Report.

2) Operate

A. Target Area Present Land Use

This map is formed of multiple layers, its digital capture and adquisition was performed as follows:

Land Use Category	Digital Adquisition Procedure
Airport	Screen digitizing by orthophoto 1:10,000 & Digital Map
Cemetery	Screen digitizing by orthophoto 1:10,000 & Digital Map
Forest & Shrubs	Screen digitizing by orthophoto 1:10,000 & Digital Map
Industrial Areas	Screen digitizing by orthophoto 1:10,000 & Local inquiries to Metroplan Personnel
Military Facility	Screen digitizing by orthophoto 1:10,000 & Digital Map
Park & Green Areas	Screen digitizing by orthophoto 1:10,000 & Digital Map
Public Facility	Screen digitizing by orthophoto 1:10,000 & Local inquiries to Metroplan Personnel
Reservoir	Screen digitizing by orthophoto 1:10,000 & Digital Map
Sports Field	Screen digitizing by orthophoto 1:10,000 & Digital Map
Protocol & Business Area	Field identification and zoning of main business clusters & Local inquiries to Metroplan Personnel, the information was later screen digitized
Residential (R-1 ? R-5)	Built up areas population density assignment by its correspondig colonia database (Will be further explained)
River Reserve Area	Identification on the Digital Map of the Rivers mentioned in the municipal Decree Designation of construction free zones. Buffering around the rivers & streams selected (Will be further explained)
Commercial Areas	Field identification and zoning of main commercial clusters & Local inquiries to Metroplan Personnel, the information was later screen digitized
Roads & Streets	Buffering (20 m) of the main roads & streets (Will be further explained)
Vacant Spaces	After joining all the previous layers into one (Will be further explained), all the left out areas (without any land use) were considered as vacant spaces

A.1. Residential (R-1 ? R-5)

The colonia ' s database contains the information on population density (inhabitants per hectare) by each colonia; this value was used to assign the colonias a residential class (R-1, R-2, etc), which was later used to represent the built up areas within the colonia with the same residential class.

To do so, we need to combine (Grid transformation tools, explained before) the grids of colonia (setting the parameters value by the residential class) with the built up areas grid. The resulting grid will contain only the built up areas with its corresponding colonia residential class, thus our residential land use layer.