

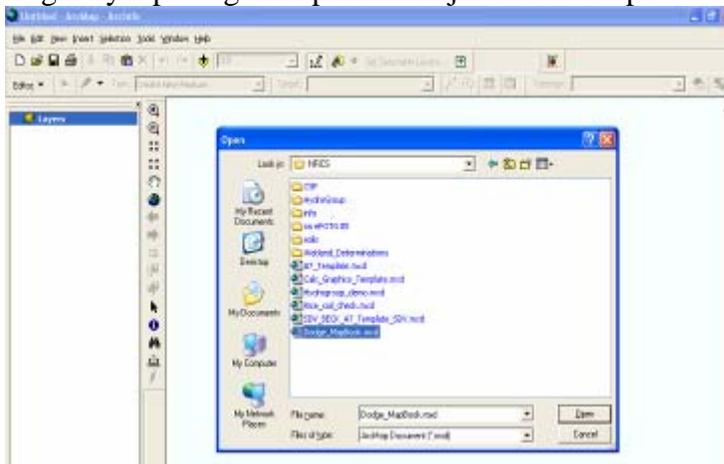
Determining Average Slope For Small Watersheds

Topics:

1. Define Watershed
2. Clip Contour Lines
3. Estimate Average Slope

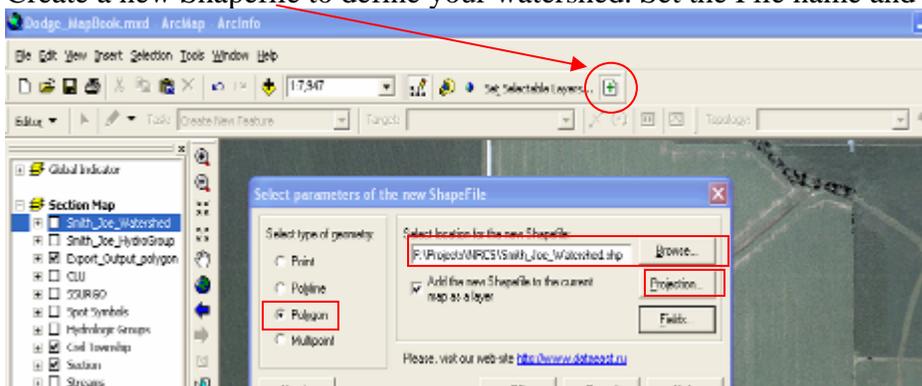
If you are missing any of the tools mentioned below, contact your GIS Specialist.

Begin by Opening a MapBook Project in ArcMap.

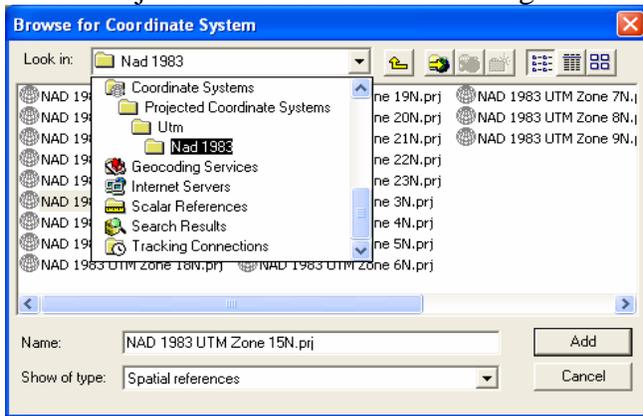


Define Watershed

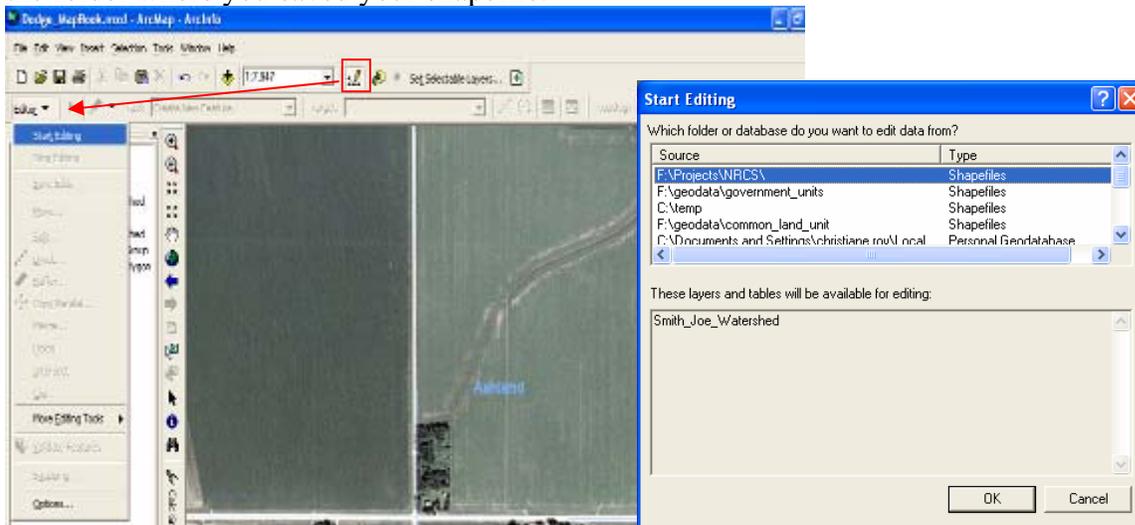
Create a new Shapefile to define your watershed. Set the File name and Projection.



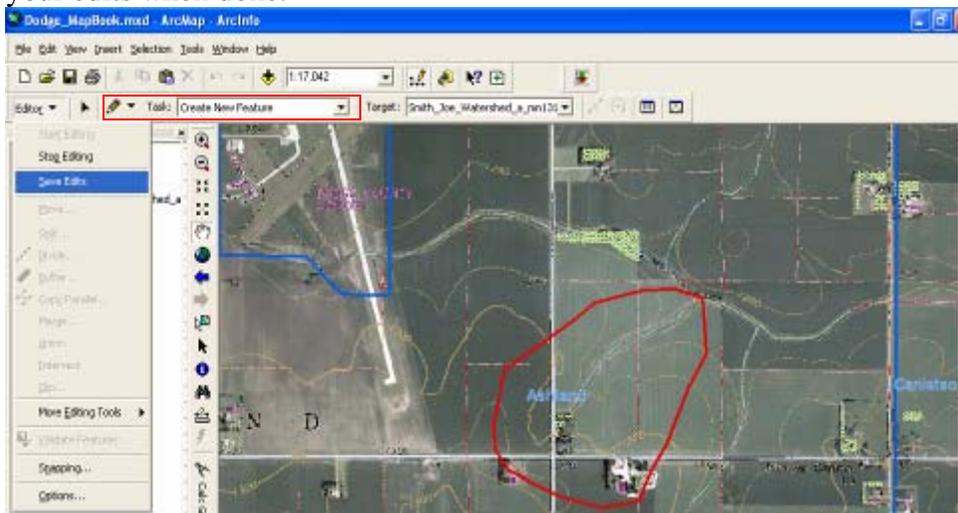
To set Projection browse to the following folder. And select the Zone 15N projection.



After your shapefile is added to your project, *Start Editing* to define your watershed and select the folder where you saved your shapefile.

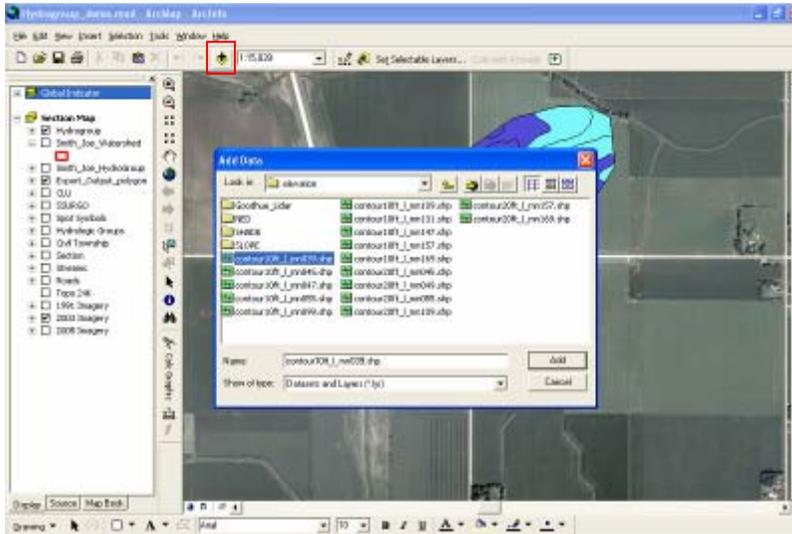


Using the ArcMap Pencil draw your watershed or drainage area boundary. Stop editing and save your edits when done.

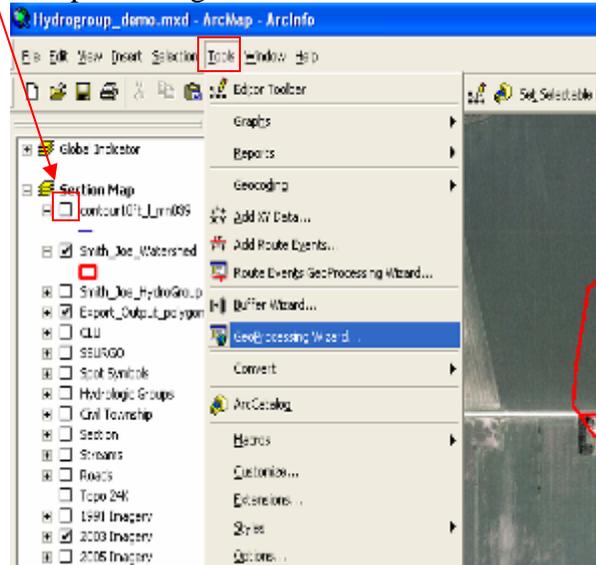


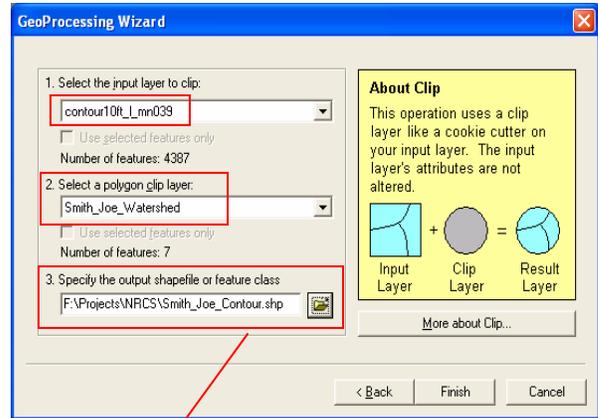
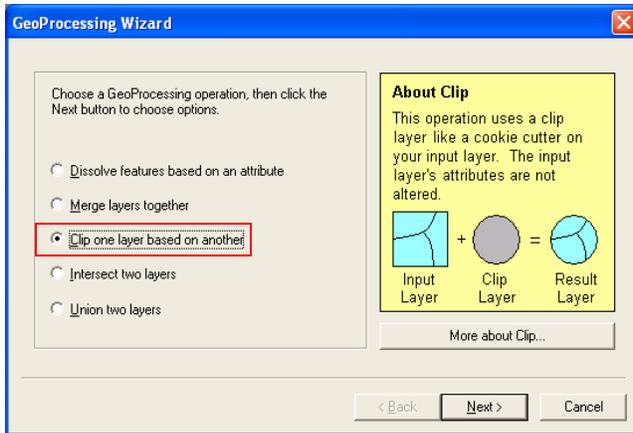
Clipping the Contour Lines

If the contour lines are not in your project add them from C:\geodata\elevation\. If you do not have this folder in C:\geodata\ copy it first from F:\geodata\ to C:\geodata. Otherwise the clipping process may be extremely slow.



You can **Check OFF** the Contour line layer as it is *Very Large* and slow to display. Then Open the Geoprocessing Wizard and follow the selection displayed below.





Make sure you change the file name at the bottom where the contours will be saved. Example:
 F:\projects\SWCD\Watersheds\customer name\Smith_Joe_Watershed_contour_Txxx.shp

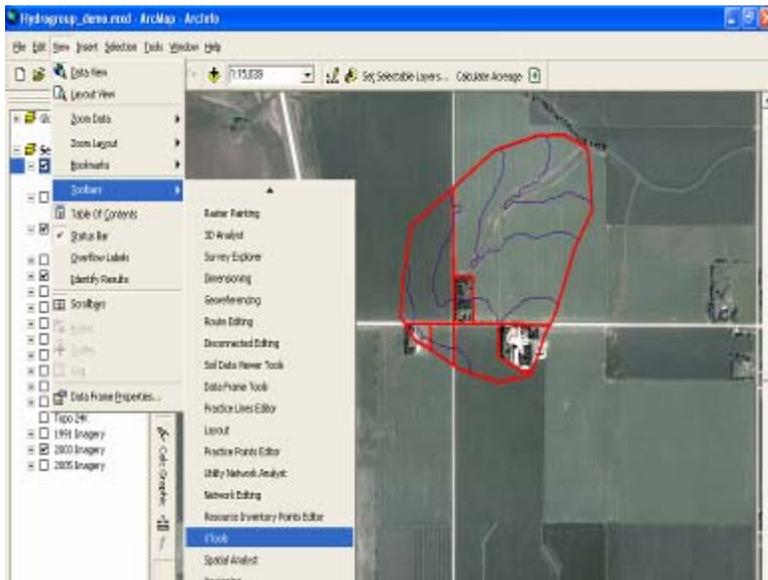
SAVE YOUR PROJECT in the same folder as above

Estimate Average Slope with Xtool

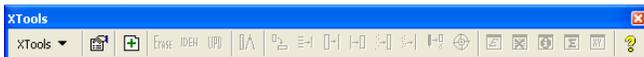
XTools is still the best tool outside of Toolkit to calculate Length.

If you use A/L tool (see below), the length are in meters. You will need to add a field and recalculate length in ft (1meter = 3.28083 ft)

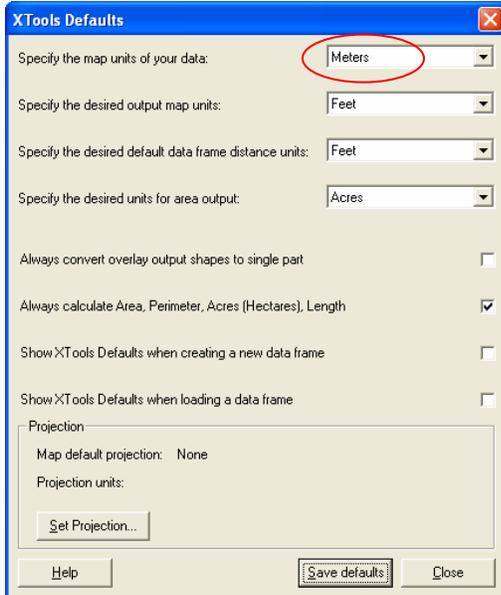
Open the XTools toolbar.



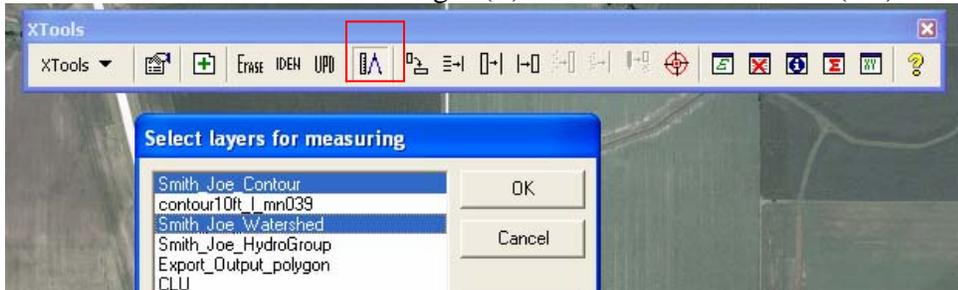
If all the buttons are grayed out go to Tools, Extension, and turn on the XTools extension.



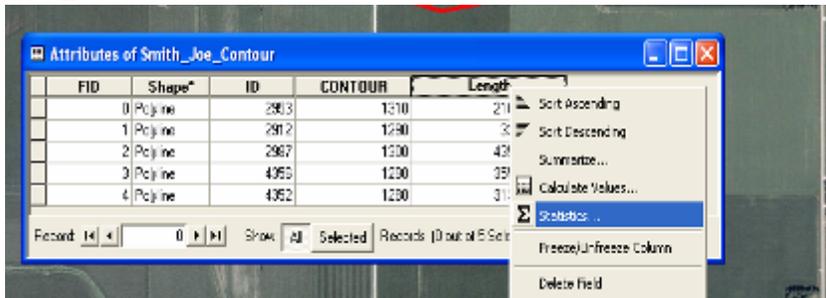
If you have never used XTools, you must set up the defaults  and save defaults. **The MAP UNITS are in METERS** (UTM coordinate system), NOT FEET, the output can be in feet.



Select both the Contour Lines length (ft) and the Watershed area (acr) to calculate.



Right Click on the Watershed Contour layer and 'Open Attribute Table'. The last field is Length
Right click on Length and select Statistics to get a SUM of contour lengths. Write the Sum value down.



Open the Watershed Attribute Table as well to get Acres for your Watershed.
Use Both Values in the Slope equation Below.

Slope Formula:

$$\frac{(\text{length of contour lines, ft})(\text{contour interval}^*)(100)}{(\text{watershed area , acres})(43560)}$$

*(contour interval): Depending on the contour shapefile you used this could be for example 10ft or 20ft. Lidar data may have contours with 2 ft intervals.

Estimate Average Slope with A/L tool

Once the contour layer is clipped, open the attribute table and add a field (Length_ft). Then right click on field and select calculate values.

The left screenshot shows the attribute table for 'contour10ft_L_0305_10p' with the following data:

FID	Shape	ID	CONTOUR	Length
0	Polyline	2402	1200	613.315
1	Polyline	2402	1200	150.952
2	Polyline	2504	1200	88.48
3	Polyline	2511	1200	4200.02
4	Polyline	2530	1200	14.734
5	Polyline	2557	1200	158.286
6	Polyline	2600	1200	3154.812
7	Polyline	2777	1200	296.033
8	Polyline	2825	1270	293.493

The right screenshot shows the attribute table for 'Attributes of contour10ft_L_0305_Clip' with the following data:

FID	Shape	ID	CONTOUR	Length	Length_ft
0	Polyline	2402	1200	613.315	
1	Polyline	2402	1200	150.952	
2	Polyline	2504	1200	88.48	
3	Polyline	2511	1200	4200.02	
4	Polyline	2530	1200	14.734	
5	Polyline	2557	1200	158.286	
6	Polyline	2600	1200	3154.812	
7	Polyline	2777	1200	296.033	
8	Polyline	2825	1270	293.493	

Double click on Length and type in the conversion values * 3.28083. Once your table is updated. Calculate SUM as above.

The Field Calculator dialog box shows the following configuration:

- Fields: FID, Shape, ID, CONTOUR, Length, Length_ft
- Type: Number
- Functions: Abs, Atn, Cos, Exp, Fix, Int, Log, Sin, Sqr
- Expression: Length_ft = [Length] * 3.28083