

CARTOGRAPHIC (ANALYTICAL) MODELING

Overview

Solving problems with GIS is often a multi-step procedure. When you are first learning GIS it is often unclear what the next step is. Mistakes are often made. This can be overwhelming at times. Take heart. The following is a means by which you can plan out your analysis in advance of doing anything. It is also a way to keep track of what you actually did.

In order to solve a problem with minimal pain, the following is required:

1. Clear understanding of the objectives.
2. Familiarity with the data to be used.

Step 2 is 'what you have' and step 1 is 'what you want'. Before attempting any analysis you should be clear on both the objectives and the raw data to be used.

3. **A flow chart** (a.k.a. cartographic/analytical model) that maps out a route of how to get from *what you have* to *what you want*.

As you conduct the analysis you may find that your plan has to be altered. This is common (especially for those new to GIS) and it should neither surprise nor concern you. Further to this, sometimes a *trial and error* approach is required. You will likely try some analytical functions that are not exactly appropriate. This is okay too. At this stage it is part of the learning process. However, if you do not keep track of what you are doing then it can become confusing and even frustrating. The solution, create ...

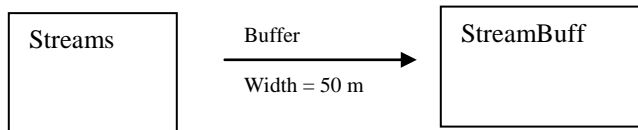
- a cartographic/analytical model of what you plan to do, and
- edit the model to keep track of what analyses you actually did.

Modeling Basics

Cartographic models are sketches that represent all the individual analytical operations conducted to complete the analysis. Some of the basic elements of the model are

- boxes that represent a theme or data layer, and
- arrows that represent an analytical operation.

Thus, in its simplest form an analytical model will have an input data layer (raw data), an operation, and an output layer, as depicted below. Note the map name is given in the box, the analytical operation is above the arrow and any parameters are given below the arrow.



An Example

For example, suppose new environmental legislation is passed that requires areas near streams and lakes to be managed in a special manner. You are asked to produce a map that delineates this *Special Management Area* (SMA) and a table that shows how landowners are affected. This is a statement of your objectives (as per step 1 above).

Next we need to look at the data available (as per step 2). For such an analysis we would need the following:

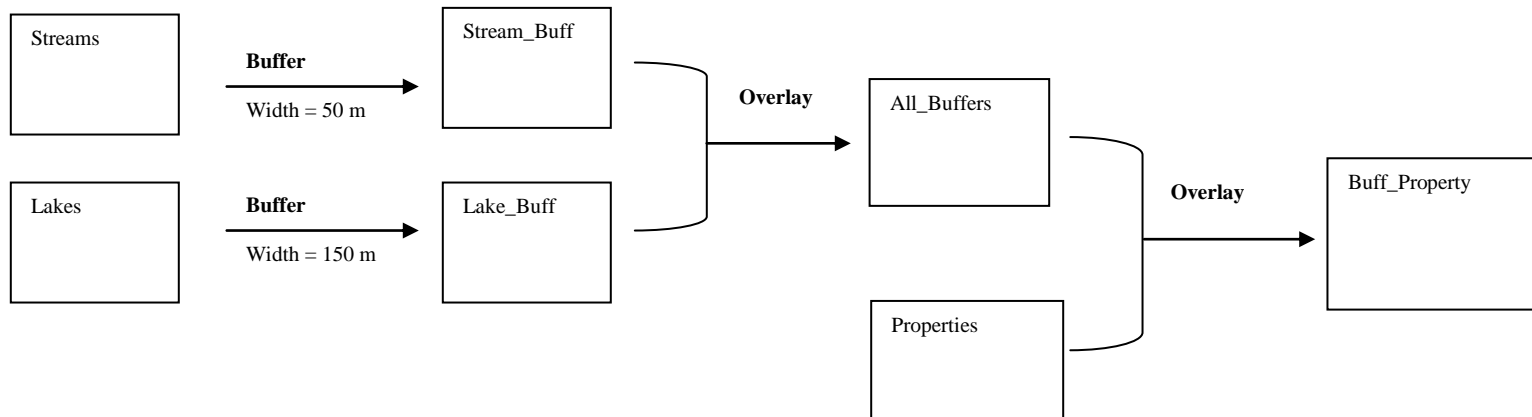
- a line/network map of streams,
- a polygon map of lakes, and
- a polygon map of properties.

It appears simple enough. Perhaps a first draft of the analysis would be:

1. Buffer the streams (50m).
2. Buffer the lakes (150m).
3. Combine the two buffers (using overlay-union).
4. Overlay-clip the buffers on top of the properties.

Refer to figure 1 for a model of these four steps.

Figure 1: Cartographic Model – THE PLAN



The basics of modeling have now been covered:

- Boxes represent data layers
- Arrows represent actions
 - Name of action is on top of arrow
 - Details (if there are any) are below the arrow

However, as often happens in a GIS project, a revision to the planned operations is required. After creating the All_Buffers map layer it was noted that there are areas where lake and stream buffers overlap (refer to figures 2 and 3).

Figure 2: A circle lake and a stream running east-west

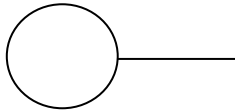
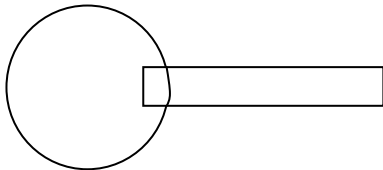
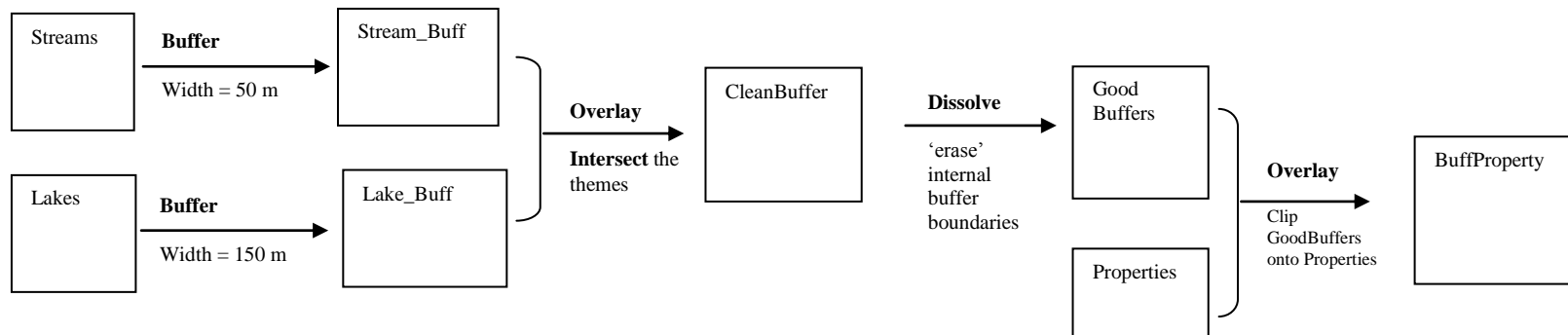


Figure 3: Buffers on lake and stream overlap



We actually have 3 buffer polygons when there should only be 1. The 3 polygons should be dissolved into a single polygon. (Actually the image above looks like Pinocchio's profile ... "*I'm not a buffer, I'm a real boy!*"). Thus a step (i.e. dissolve) has to be added to the model (see figure 4).

Figure 4: Cartographic Model - ACTUAL



Summary

- A cartographic/analytical model is a “road map” (or flow chart) that shows the map layers and the operations needed to carry out a GIS analysis.
- It is a good idea to come up with a plan before doing any operations.
- Also realize that you may need to alter the “road map” if unforeseen results occur.