

**Walt Austin**  
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**PowerPoint Presentation will be used to**  
**illustrate map making process when giving talk**

## **ArcView and ArcEditor** **Help Arizona Farmers Manage Groundwater**

### *Introduction*

The Arizona Department of Water Resources (ADWR) was created in 1980 to help the state's residents have sufficient water supplies for future generations. The initial water use plan for agriculture gave farmers the right to an annual allotment of water for their irrigated fields, but this program had no incentives to use less water than allowed. Three years ago (2003), a program called Best Management Practices (BMP) Agricultural Program was started. The BMP Program gives farmers incentives to make the best use of water on their farms. Those who demonstrate good water conservation practices qualify for the program. They are then given greater latitude in the types of crops they can grow and the amount of water they are allowed to use. I was hired by ADWR to create digitized maps of the farms in the BMP program. They show the configuration and practices in use on the farms. I use ArcView to create and maintain my maps. Today, I will discuss how our maps were initially set up, the problems I encountered, and solutions for some specific problems. Then, I will show some examples of the kind of maps I make.

### *Creating the Maps*

When designing my first map, I created a folder for the map, then added different layers to the map for each feature. If more than one version of a map was needed, the map was saved as a new version with a different set of layers to preserve the new and old versions of the maps. I realized as soon as I started to create a map of a second farm that I would need to create new layers showing that farm's attributes and that making new layers and attributes for each farm would entail a great deal of duplicate work.

### *Solutions to Problems*

My solution for easily making successive maps was to create a personal geodatabase for all the features used on the farms. Step one in designing such a GDB is to create a Personal Geodatabase in ArcCatalog. For our use, “New Personal Geodatabase.mdb” is then renamed BMP\_GDB.mdb. Then, with a right-click, a New – Feature Dataset is added to the GDB and given a name. Clicking EDIT and IMPORT allows me to import a line map with the correct coordinate system and extents for our maps. Doing this gives the dataset a more accurate placement of features than the default GDB does. Right clicking on DataSet and clicking NEW, FeatureClass... brings up the setup box to Name the feature. Clicking Next twice allows the addition of fields to the feature. First clicking the SHAPE field name lets me set the “Geometry Type” that I need for this feature: point, line, or polygon; then I can add the fields we use for the farms.

As for creating the fields we need for our farms: first, I add a field for the AMA Name. In Arizona, the Active Management Area or AMA Name shows the area of a water basin in the state. This might seem confusing, as the Phoenix AMA covers most of Maricopa County, but not all, and it does cover parts of other counties as well. Since I wish to make maps of the farms in a given AMA, this field is added. Next I add a field for Farm Number. Since some farms are adjacent to others in the AMA, this keeps other farms’ features from showing up on another farm’s map. It also keeps the list of an attribute shown for any one farm to the farm itself. After the Farm Number, I add the Version fields. These are added so as different water rights are sold or purchased and the farm borders change, the farm can have new versions showing its current shape and still maintain the old version for later printing. A single farm version field would only show the latest boundaries. So I include Ver\_0, Ver\_1, and Ver\_2. This has been sufficient to date, although more fields can be added as needed. When added, the default for the version numbers is 1 so that a water right will show up unless it is changed to 0. I then repeat these steps for all the feature classes needed on the various farms.

Once all the features are added, I create layer files in the same directory as the database. Each layer file is given a name, then I designate its source as the feature class. After creation of the layer, its attributes are added. In the layer properties box, go to the tab labeled “Display.” Two of the layers of the farm maps are polygon shapes that are set here as 50% transparency. This allows the underlying image file to be seen. Next, is “Symbology,” where the features of the symbol are set. This makes sure that all farms have the same symbol for common features on those farms. The “Fields” tab shows the fields of the Feature Class. The “Definition Query” tab and “Query Builder...” button allow you to show only the features for a single farm. Once all the feature layers are complete, individual mapping can begin. I start by opening a map that has the common layers on it and save it as the new farm map in its new location. This allows me to have a beginning map, without starting from scratch for each new farm in the BMP program. I can then enter the water right number in the “Definition Query” tab of the properties for the water right layer and zoom to that location. This will be the view for the map. At this stage, I am ready to edit the new layers I have created. By direct observation in the field or from existing maps, I acquire information to add to this map. I set the “Farm Number” field to the farm number and the “Ver\_0” to 1 if it’s active in that version or 0 if it’s not. As a final check that the maps are correct, I give a copy to the farm operator. This map also serves as a reminder to the operator to call me with any updates to his farm. Any uncommon layers needed on a new map can then be dragged from the layer files into the map and edited to show the features of that layer.

### *Examples of BMP Maps*

Finally, let’s take a look at the results of this mapmaking process:

- The first example is Map 9, showing a simple farm of only 149 acres and one water right. The map’s Legend shows its symbols. Information about the configuration of the land is given at the bottom of the map. This includes the BMP #2.8 that tells how level the land is. It also gives the location of the district turnout, the fact that the canals on the farm are all Concrete Lined Ditches (CLDs), and the flow direction of water in

the fields. These are part of the attributes needed to determine whether a farm configuration qualifies for the BMP program or not.

- The second example, Map 22, shows a much more complex farm layout and demonstrates why we use digitized maps in the BMP program. Note the symbols used to keep up on the water rights, which are shown on their fields, on a farm. This map also shows CLDs that are Bidirectional, Tailwater Sumps, Sump Pumps, and Sump Pumpback Lines. Water pipes and non-irrigated land are also designated.
- The third map, Map 8, shows a farm's revised map, after the owner of one of the water rights sold his land for development. This not only changes the configuration of the farm, but may mean the farm's numbers need to be recalculated to determine if the farm still qualifies for the BMP program.

### ***Conclusion: ArcView Updates Wish List***

I do have a wish list for ArcView that would make map making easier for our needs. When adding text or using the editor, the program ought to assume the same action unless a different option is selected. When a text number is added and a new point on the map is clicked, you shouldn't have to select the text button again. Also, when editing the setting of "Modify Feature," it should not be replaced by "Create New Feature" every time the save button is pushed. It would also be helpful to have ArcView run on a more stable environment than Windows. Some features available on the Unix version are not yet in the Windows version or do not run very well there. But, overall, using ArcView allows me to readily customize digitized maps of the farms in our BMP agricultural program.