Publishing Spatial Data in an Interactive Atlas

Adding Real Value for Property Managers

By Kevin Royal

The data management needs of modern production agriculture are staggering. Considering the records that must be kept for environmental regulations and the information that is generated by modern crop monitoring equipment, you can get swamped by bits and pieces of data in a hurry. While generating this data is easier, thanks to site specific hardware available from several companies, the ability to turn it into useful information for making sound agronomic as well as economic decisions remains difficult. I prepare many different types of data (CAD, vector, and raster) using a Geographic Information System (GIS) and image processing software package called TNTmips from MicroImages, Inc. of Lincoln, Nebraska. I find that I can use all of these data types on the properties where I have crops to manage. Each data type is better at some things than others, but they all must be organized in a way so that they can be used in combination with each other.

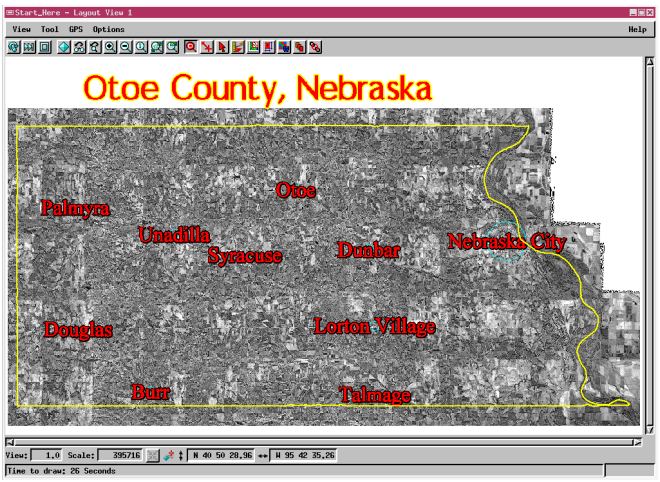
How would you distribute this data to the right people who need to manage the property? Remember that the most important consideration of the collected data is presenting that data to the crop manager, banker, or agronomist that makes decisions based on it. The free TNTatlas program allows you to distribute this data to the people who need it.

One use for CAD layers is tracking the details of a building site. In addition to the underground maze of wires, wells, and water lines that need to be accurately marked, all buildings, livestock, and grain facilities should be well inventoried. I have recorded several line maps in CAD form within building sites that are very useful when repairs need to be made, especially when trying to locate underground pipes or wiring.

Another type of data that I normally use in a GIS for farm management is soil type. These polygons can be georeferenced (located in the world) and the number of acres computed for each separate soil type. Other information can be attached to these vector polygons including soil structure, erosion factors, and crop yield potential. Once areas of each soil type are available, the productive potential of each farm can be derived by generating reports of the percentage of each soil type in each field. This soil inventory can be the starting point for determining the productive potential of my crop enterprises. It can also be very useful for doing farm appraisals and crop suitability studies for each field.

Yield maps are another type of vector data. I usually surface fit (contour) the collected yield point data into a raster form to help estimate or fill in the gaps between the actual sample points.

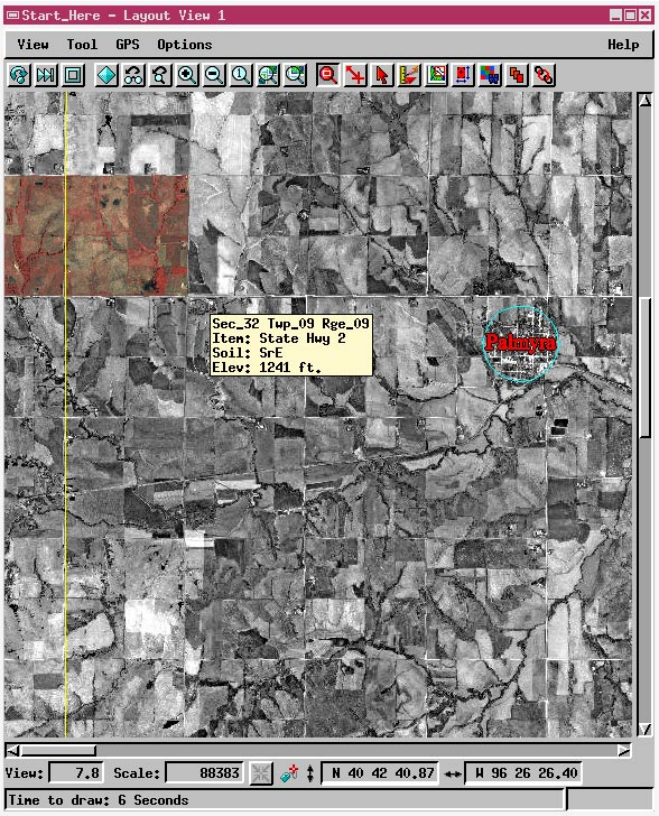
Rasters (images, air photos, and surface models) are the third type of data that I find very useful. Many sources of rasters are available, such as Digital Orthophoto Quarter Quads (DOQQs), Digital Elevation Models (DEMs), section centered air slides from the FSA, and satellite or air photos that are collected for measuring crop health. This imagery can



You may want to start out with an overview of the entire county or trade area where properties of interest are located. Many hidden buttons are available on this overview of Otoe County that take you to more detailed views.

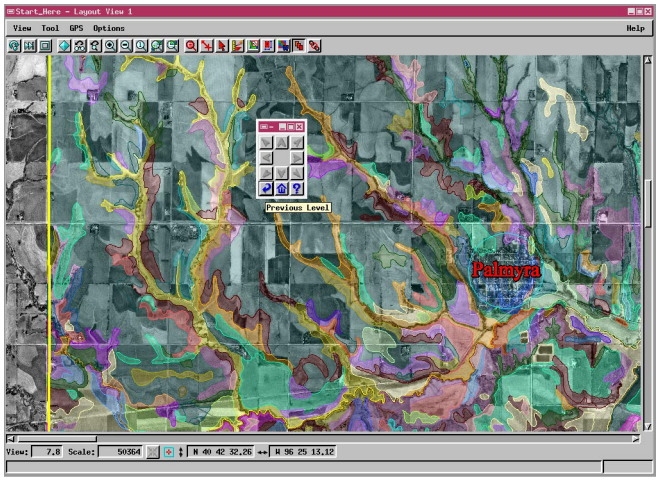
be classified within TNTmips if it is multi-band data, allowing you to rate a crop's canopy from the air. I have had good results with classifying color IR slides (as well as slides from the FSA) for determining different canopy ratings over a field.

Do not underestimate the data management needs of modern production agriculture. All of these data types need to be easily combined by a GIS to get a complete picture of their interaction. Only then can you turn your collected data into information that allows you to make intelligent agronomic and economic decisions.



Zooming up on an area of interest within the overview makes additional layers appear. The color IR slide was georeferenced by matching features of the slide to the gray digital orthophoto quadsheet layers. Clicking on this image will take you to a more detailed view of the fields that fall within this photo.

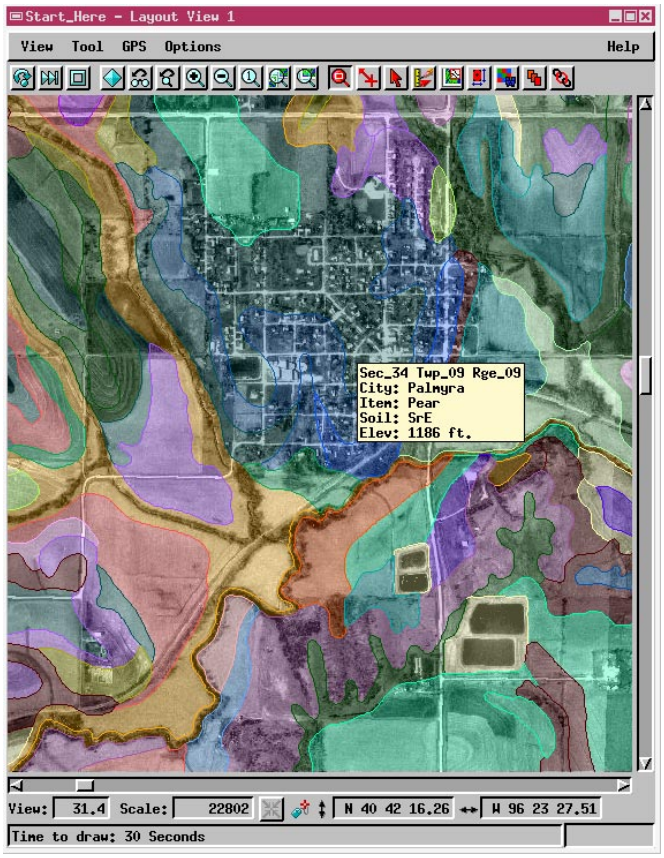
Organizing collected information in an easy-to-access and interactive way may be the most challenging data management problem. If all of the information described above (CAD drawings of buildings, vector information from field operations, and rasters from aerial photography) is collected over a couple of years, you quickly have several megabytes of spatial detail about your properties to organize. It cannot be locked up in a hard to use program or frozen and static on a printed map.



The HyperIndex Navigator window can help you navigate to other layers of stored information within the organized stack. Clicking the Previous arrow will take you back to the layer you just came from.

The HyperIndex creation option available in TNTmips allows you to create links between different types of information. Think of a HyperIndex as a better way to publish (rather than printing) a large collection of digital data. I organize a typical collection of field related information by starting with a view of each county where my fields are located. Along with all of the roads, towns, and other landmarks of the county, I also have small images of each field appearing in the correct place within the county. To get a closer look at one of the fields, I can simply click on its image with the mouse. The image is actually a button that links me to a closeup view of the field. Now that the view has changed to a closeup of the field, several layer options are listed that can be turned on and off. The list includes several different types of information in many different data formats. I may have several FSA slides, biomass indices, seeding populations, or yield maps. Some of the layers may contain vector information such as soil type polygons, weed maps, and tile lines. CAD type data may include grain bin capacities, building blueprints, and utility right of ways that cross the property.

Since the digital files organized by TNTmips in a HyperIndex retain their georeference, I can at-



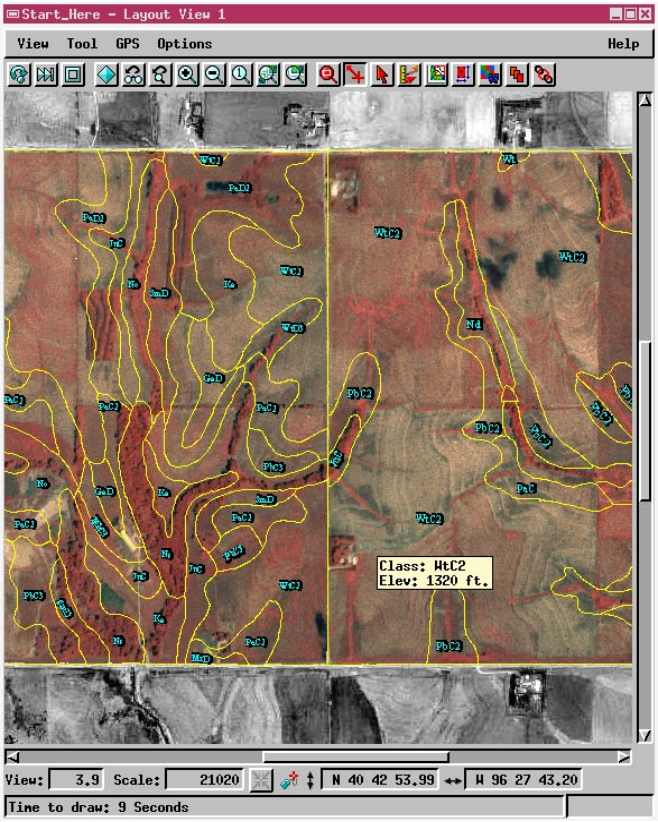
Many layers of information can be organized on screen, but not all layers need to be displayed at the same time to be useful. This image has the soil map layer "on", but several other layers can still be accessed by pointing at an area of interest with your cursor. The DataTip shows the Section, City Name, Street, Soil Type, and Elevation.

tach a GPS unit with NMEA output to my portable computer, load the CD containing the organized information, and navigate around the collected layers. This built-in feature of the free TNTatlas program allows you to distribute your geospatial data that is organized in a HyperIndex to anyone operating on the field, such as custom operators or agronomists.

Suppose I am interested in looking at the relationship between the yield map and the soil types. Since the view of my field includes a window that lists all of the layers of information I have collected about this field, I simply click the "on" button beside each layer to add it to my current view. The latest yield map along with the soil types appear on the screen. If I want to check on the details about a certain soil type, I can display the list of database tables attached to the soil type polygons. To do this, I simply click on the polygon and details about the selected soil polygon appear on the screen. I can turn on and off any layer in any combination, searching for relationships between any number of layers of information.

For example, if I notice an area that shows a low yield in a certain part of the field, I can use the Zoom tool to get a closeup view of the region. If I want to see just how large the area is, I switch to the measurement tool and draw a polygon around the image to determine the area of that region. If I want to look for causes of the low yield area, I can turn on any other layer to see if the region matches a feature of one of the other layers.

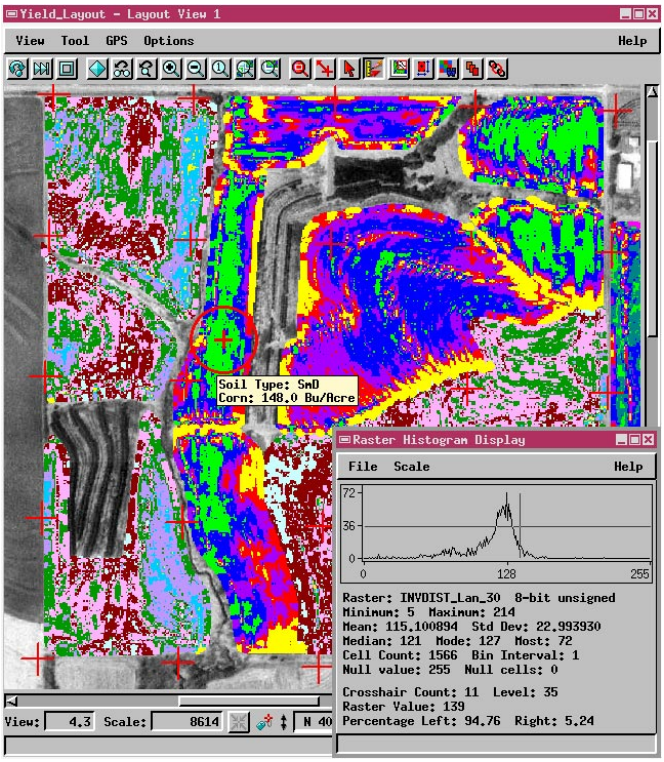
When considering what layers to add to a HyperIndex, don't forget about some of the other associated information you would like to link to each field. There is no reason you couldn't link scanned documents to each field. Scanned property titles, lease agreements, and net income work sheets of each



More details for the fields on which you have information are shown when you navigate to the lower levels of the TNTatlas you publish. Detailed soil maps and management practices can be stored at this level for easy access.

property can be easily accessed and attached to the correct field boundary.

Custom chemical applicators generate load sheets that can be attached to the field. I include photos of improvements made on each farm over the year. I use a video camera to collect images to capture to a computer image file. Photos of the growing crop can easily be created using some of the new digital cameras that directly create computer files, skipping film altogether. As long as the image can be converted to a TIFF file, it can be linked in the HyperIndex stack.



The bottom level of this TNTatlas contains the latest yield map for this farm. The Raster Histogram Display window shows the range of yields occurring within the red circle in the View window. You can check yield or other information by drawing around the part of the field that interests you. You can also check yield by using another layer, such as the soil type layer to compare the yield by soil type.

While all of thess data can simply be added as layers using the main program, publishing the information that has been organized by TNTmips as a spatial atlas (TNTatlas) has several advantages. Several farms' entire crop management history can be stored on a compact disk (CD) with the TNTatlas to allow easy viewing of the layers that are organized with the main program. The original information is left as usable, unchangeable file backups for the original program. You can play the Atlas CD on any computer that has a CD-ROM drive, using only a small amount of hard drive space. This allows anyone to view the CD, allowing you to demonstrate the crop management practices used on these farms. This is useful in arranging financing at a bank, discussing land improvements with a property owner, or making cropping plans with a tenant, agronomist, or custom applicator.

This type of spatial information management is just as useful for farm management companies and chemical applicators as well as an individual farm operator like myself. Entire counties within each group's operational territory can be organized for farm managers, agronomists, and producers to aid in record keeping and crop management needs. Do not be fooled into thinking that processing the spatial data and printing a pretty map is the end of the job. The data must be organized and presented as interactive information that can be easily accessed by the on-site decision makers to get real value from the hard-won megabytes of data collected and stored through years of hard work.

This article is paraphrased from the original article:

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About the author:
Kevin Royal is responsible for technical sales and product support for several dealers of TNT products worldwide. He is also the Technical Support Team Leader at MicroImages and farms near Palmyra, Nebraska.
He may be reached at 402-477-9554 (phone) or kroyal@microimages.com (email).