

## **Using GIS to Create an Exhibit for the Escondido (CA) Children’s Museum: “Your Community,” Putting GIS into Young Learner’s Hands**

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### *Abstract:*

The Escondido Children's Museum, in collaboration with the City of Escondido, Cal State University San Marcos, and SanGIS, features an exhibit designed to teach children about their local community through the use of GIS. The exhibit "Your Community," uses ArcGIS, ArcPublisher, and ArcReader software to present five points of view: from Space, an Airplane, or a Street Corner, and as a Field Mouse or a Rock. The exhibit emphasizes hands-on learning; each POV offers an interactive activity such as hyperlinks to NASA satellite images or the opportunity to manipulate local infrastructure data layers.

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**Introduction: Escondido Children’s Museum**

The Escondido Children’s Museum/ Museo Para Niños (ECM) is located in the City of Escondido in North Inland San Diego County, which is the southernmost county of California. The city, one of the oldest in the county, was founded in 1888 and exemplifies the diversity of southern California. The population of the city is 52 % white and 39 % Latino. In 2002, Escondido’s median income per household was \$43,328, slightly below the county’s median income per household of \$47,268 (City of Escondido). ECM serves this population and the region, which includes the cities and communities of Fallbrook, Valley Center, Ramona, Vista, San Marcos, Poway, Rancho Bernardo, and Rancho Santa Fe.

The ECM is a relatively young institution and first opened its doors in 2001. It is buoyed by a strong and vibrant sense of mission, which has attracted a lot of community support and volunteer hours. ECM’s mission is "to build creative minds in children through innovative and interactive exhibits and programs that celebrate family, a diverse society and the natural world" (Escondido Children’s Museum). Key toward this mission is contributing to geographic understanding of the region. Beginning in early 2002, the museum began working with the City of Escondido (COE), Cal State University San Marcos (CSUSM), and others to design and implement an exhibit which allows for hands-on exploration of the region’s geography through the use of computer technology.

Throughout 2002 the entities met to design the interface and contents of the interactive computer-based “Your Community” exhibit.

### **Putting Together the Exhibit**

Early on, we decided that the exhibit would have multiple layers of geographic inquiry that would draw children through small and large-scale views of their world. State-of-the-art computers can hold incredible amounts of data and they take the science of cartography to a whole new dimension. The data, stored in a Geographic Information System (GIS), enables the user to select and arrange “layers” of geographic information with much greater ease than by drawing. GIS technology is computer software and hardware which helps us to better understand and analyze the world around us by allowing the user to create maps and organize information. It also allows the combination of different media such as video, photography, and sound. Additionally, GIS technology makes the sharing of data much easier than ever before, and much more available to the public.

One of the organizing principles of the ECM is “learning through play” (Escondido Children’s Museum). We knew that we wanted to keep the “Your Community” exhibit fun, interesting, and highly accessible to as many children as possible, in spite of the fact that we would be using sophisticated software. This was foremost on our mind as we began to plan what children would see and learn in the exhibit. We decided that we wanted to create an exhibit which allowed kids to be able to pretend that they could see the earth from different scales.

From the roughly titled initial categories of small to large-scale views, which we called global, national, regional, and local, we devised more kid-friendly terms, which

more directly corresponded to the information we wanted to present in each view. Thus, the global scale became “from space”, the national scale, “from an airplane,” and regional and local views became, “from a street corner,” “as a field mouse,” and “as a rock.”

Figure 1 shows the computer interface awaiting the visitor to “Your Community”:

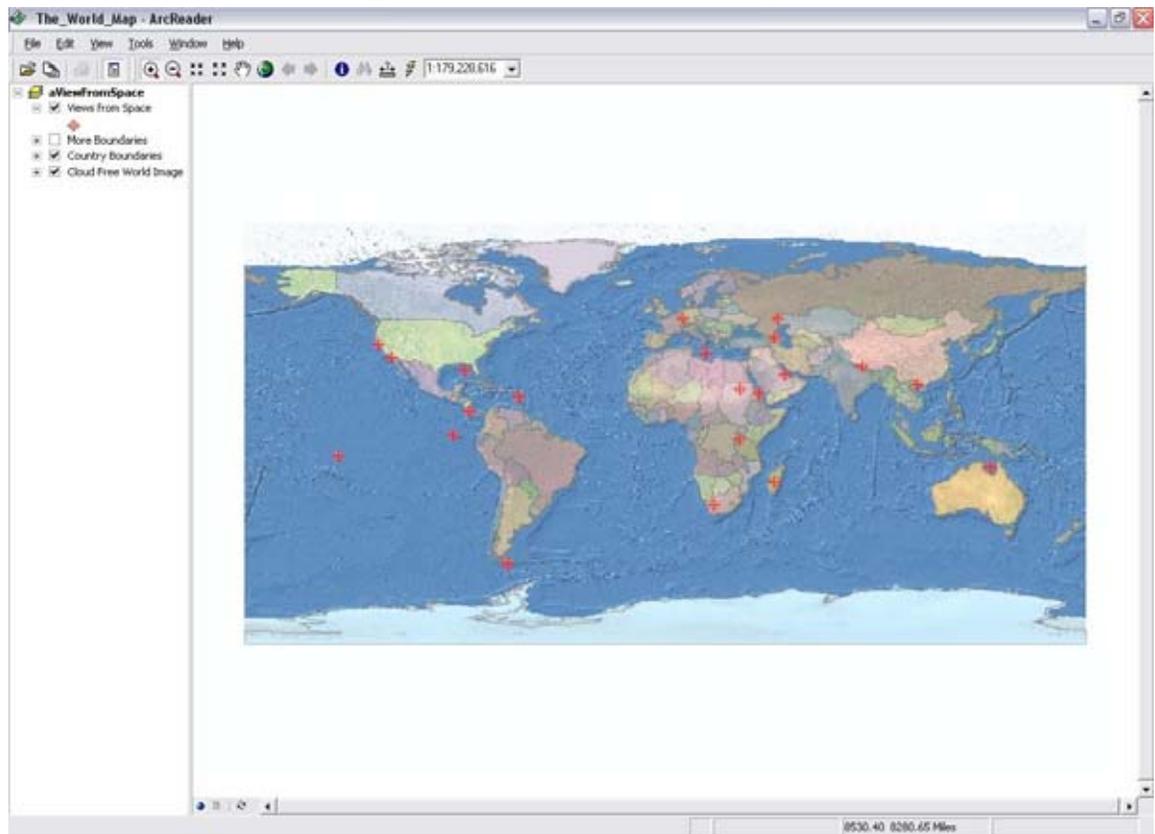


*Figure 1: Exhibit's Opening Interface*

As our discussion below will elaborate, we were concerned about matching our content to the National Geography Standards, but most simply our goal was to increase children's perceptions of space by facilitating an increased understanding of what the world looked like from different points of view. What would children see if they had the opportunity to look down on the earth from space or an airplane? What can be seen from a street corner in their town? What does the world look like from the point of view of a

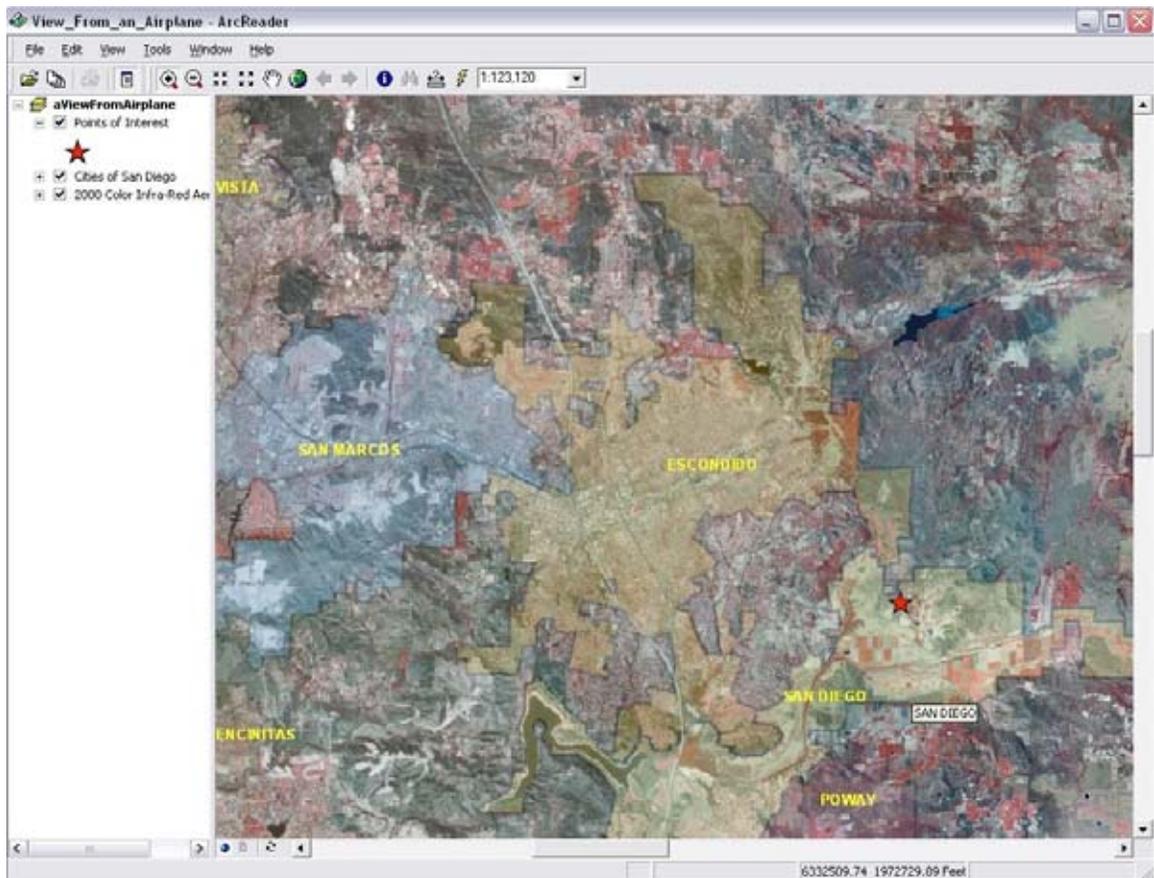
field mouse or a rock? Following is an elaboration of what the user/ child sees as they operate each view of the exhibit:

From Space (Figure 2): This view utilizes a relief map of the world and a country boundary file, both of which are packaged with ArcView. Visitors see a map of the world, with twenty hotlinks spread across the globe. As hotlinks are pressed, a NASA satellite image of that location appears. For example, a hotlink over the island of Monserrat in the Caribbean opens a satellite image (taken from the Space Station Alpha) of ash and steam hovering over the Soufriere Hills Volcano in Monserrat. All of the images used in this part of the exhibit were downloaded from NASA's Visible Earth website ([visibleearth.nasa.gov](http://visibleearth.nasa.gov)). Children can also use the "identify" button or hotlink file name to identify the location of the image.



*Figure 2: View From Space*

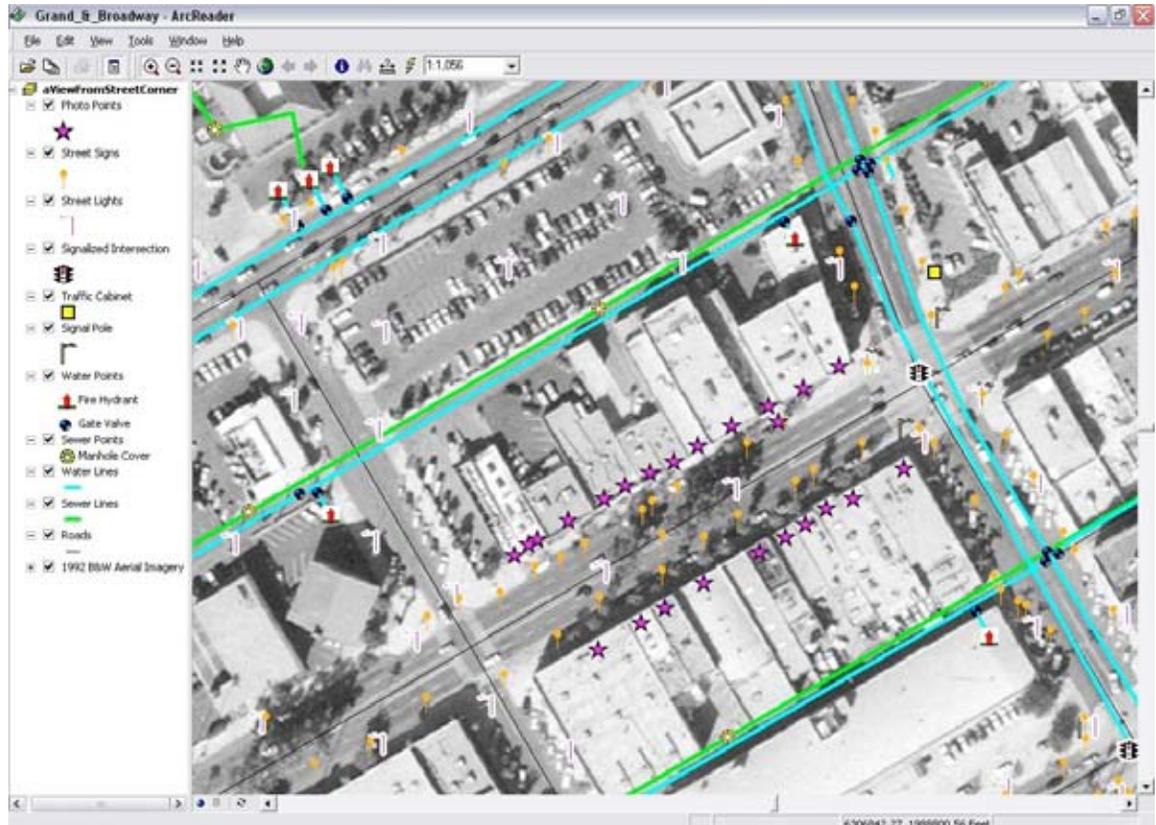
From an Airplane (Figure 3): This infrared aerial image intends to capture the sense of “If you flew over the county, this is what you would see” and shows all of Western San Diego County. Bookmarks indicate points of interest such as the San Diego Wild Animal Park, Sea World, Del Mar, the Birch Aquarium, and Balboa Park and includes a screen capture of the organization’s homepage.



*Figure 3: View From an Airplane*

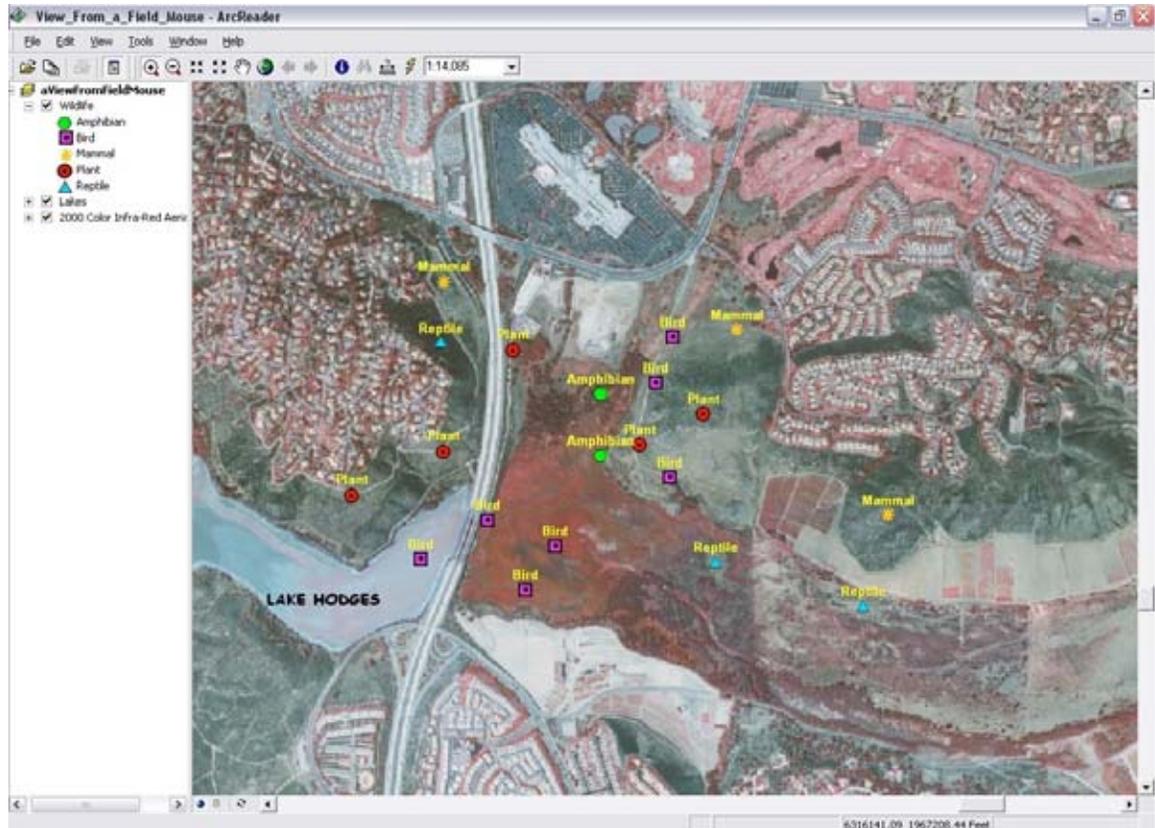
From a Street Corner (Figure 4): This view captures downtown Escondido at the intersection of Grand Avenue and Broadway Avenue, a spot near the current

ECM location. The view shows the locations for sewer lines, stoplights, and other infrastructure. Children can use the identify feature to click on a stoplight and identify its location. Clicking on hotlinks brings up digital pictures taken at street level of storefronts along Grand Avenue in downtown Escondido.



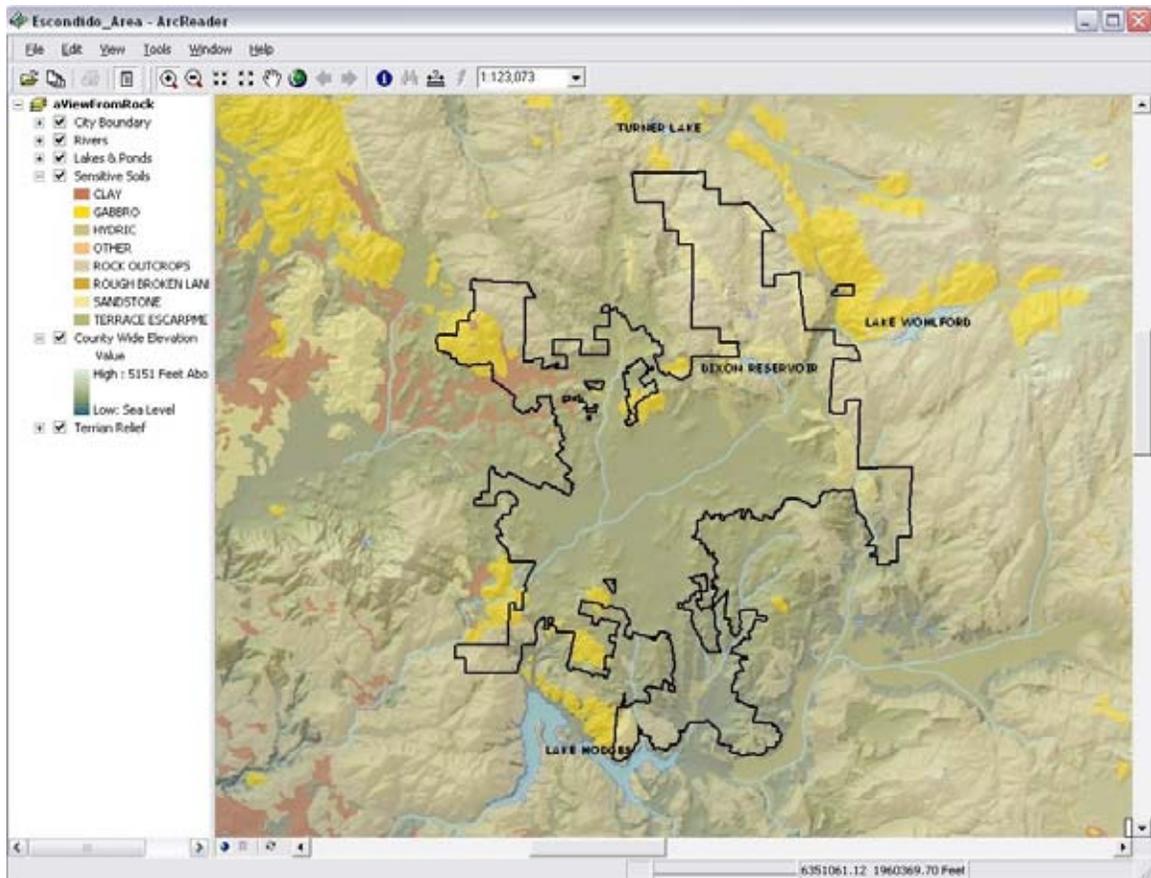
*Figure 4: View From a Street Corner*

As a Field Mouse (Figure 5): This infrared aerial image captures a localized and mobile point of view (What might a field mouse see?) and is designed to highlight local species, such as mountain lions, coyotes, and horned lizards, as well as some vegetation. Any of these plants or animals could be found in this area. There are also special icons for Amphibians, Birds, Reptiles, Mammals and Plants, which also act as hotlinks to digital photos of the species.



*Figure 5: View as a Field Mouse*

As a Rock (Figure 6): This view captures a localized, static point of view and shows Escondido area soils, which are typical for the region. The view also includes illumination and elevation grids and the city boundaries to give the user a sense of the terrain. Rivers, lakes, and sensitive soils are identified. The children can see that all soils in the region are known as sensitive soils. The “identify” tool provides elevation in feet as a pixel value on the elevation grid, and can identify the soil on the soils layer.



*Figure 6: View as a Rock*

As mentioned earlier, one of our goals was to align these views with geography standards. The Geography Education Standards Project identifies understanding the following areas within its Geography for Life Standards: the world in spatial terms, places and regions, physical systems, human systems, environment and society, and the uses of geography. The “Your Community” exhibit overlaps with many of the specific standards, including understanding:

- “How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective
- the physical and human characteristics of places
- the characteristics and spatial distribution of ecosystems on earth’s surface

- the processes, patterns, and functions of human settlement
- how human actions modify the physical environment
- and, how to apply geography to interpret the present and plan for the future (Geography Education Standards Project).”

### **Technical Collaboration**

The ECM is a developing institution and does not yet have the funds to put together elaborate exhibits. However, one of ECM’s greatest strengths lies in its collaboration with community partners. Strong collaboration between the other institutions and ECM was key because the other institutions held the valuable data, know-how, and software without which the ECM would not be able to create such an exhibit. Crucial to development of the project was the expertise of the GIS Division of the City of Escondido’s Public Works Department. The City has a depth of access and skill in GIS that many cities of its size do not enjoy. In addition, ESRI was willing to work with us on the software as we designed the project, and of course, the end user software used in the exhibit, ArcReader, is free software available from ESRI.

The original material for the five views was compiled using ArcView 3.3. This process consisted of layering data from various sources (detailed in the following section) and connecting data and imagery to layers. Those who have worked with this program can appreciate the work needed to align projections and symbology. As the exhibit developed we became increasingly concerned about the level of skill children needed to operate the views. We began simplifying the visible tools and menu items in ArcView’s interface. However, we were never able to get it to the level of simplicity required of a museum exhibit, or in other words, to a level at which a child could walk up to the

computer, figure out easily how to navigate the views, and not get lost. Initially, we worked with ESRI in an attempt to customize ArcView for this exhibit, but stripping such a complex program down so that exploring children would not run into trouble became problematic despite ESRI's efforts to whittle the program to its bare bones for the exhibit. At this point, ESRI suggested we try MapObjects, but we decided it would be too costly and time consuming to build our own application.

To simplify, we decided to "publish" the views and layers created in ArcView 3.3 with the ArcPublisher Extension of ArcGIS 8.3 for use in ArcReader 8.3, which is a free ESRI product designed to share already completed maps. The availability of this "freeware" made having a GIS exhibit highly accessible and feasible for an organization like ECM-- a new not-for-profit operating on a limited budget. We utilized the City's ArcGIS Publisher extension in ArcView to convert the views into published map files (.pmf's). This process allowed us to greatly simplify the interface that the children would see at the exhibit while retaining the dynamic capabilities of the maps.

We wanted to make it as easy as possible for children to transition from the initial interface they see on the screen (Figure 1). Therefore we used some Visual Basic code to program the initial interface to launch the ArcReader files from the interface's buttons. That way we could launch the published maps (\*.pmf) from the original interface instead of forcing the children to first launch ArcReader and then opening the file.

Even with the simplified interface of ArcReader 8.3, we still experienced some issues trying to make the program museum visitor friendly. For example, we eventually disabled the "Find" button because it was too complicated to expect children to understand how to pick a layer and a field within which they could use the find tool. As

we transitioned the views to ArcReader, we most wanted to keep the following tools: hotlinks, zoom in/ zoom out, pan, identify, and the ability to turn layers on and off. This would allow children some degree of manipulation yet eliminate some of the complexity and reduce the risk of children becoming lost in the program. The remaining tools offer children the opportunity to explore. For example, when you include a hyperlink in ArcReader, it can then be activated to launch a photo in Internet Explorer. This feature is used extensively in the Space, Airplane, Street Corner and Field Mouse views, where, for example digital photos saved as .jpg's are used in the Street Corner View. Hyperlinks can also launch a movie file. For example, the Field Mouse view includes a hyperlink which launches a panoramic view of Lake Hodges in a QuickTime movie file (.mov).

### **Data Collection**

The most difficult part of any GIS project is assembling and finessing the data layers. We combed local and national agencies for data that they might be willing to share which fit the views we were trying to shape. For example, the City of Escondido keeps information about streetlights and stop signs and many other landscape features in their own GIS. We have borrowed some of this information in creating "Your Community." Eventually, we collected so much data for the views that we had to purchase an external hard drive to help store it all. The following table (Table 1) is a list of data layers, data type, and data source for each View, which can be used as a guide for those who might want to create this kind of exhibit in their own locale:

<b>Data Layer</b>	<b>Kind of Data</b>	<b>Source</b>
<b>Space:</b>		
Geographic Locations	Digital satellite images	NASA Visual Earth website
More Boundaries	Polygon data, more detailed political boundaries	Packaged with ESRI software
Country Boundaries	Polygon data	Packaged with ESRI software
Cloud Free World Image	Relief image of world	Packaged with ESRI software
<b>Mouse:</b>		
Wildlife	Point data, provides hotlinks to flora & fauna images	Various website
Lakes	Polygon data	SanGIS
Background	2000 Color Infra-Red Aerial Imagery	City of Escondido
<b>Airplane:</b>		
Points of Interest	Point data, provides hotlinks to screen captures of websites pertaining to that location	Various websites
Cities of San Diego	Polygon data of city boundaries within San Diego County	SanGIS
Background	2000 Color Infra-Red Aerial Imagery	City of Escondido
<b>Rock:</b>		
City Boundary	Polygon data	SanGIS
Rivers	Line data	SanGIS
Lakes and Ponds	Polygon data	SanGIS
Sensitive Soils	Polygon data	San Diego Association of Governments (SANDAG)
County Wide Elevation	Elevation Grid	San Diego State University (SDSU), SANDAG
Terrain Relief	Illumination Grid	SANDAG, SDSU
<b>Street Corner:</b>		
Photos at Street Level	Point data, provides hotlinks to photos of businesses along Grand Avenue in Escondido	Photos taken by project authors
Street Signs	Point data	City of Escondido
Signalized Intersections	Point data	City of Escondido
Traffic Cabinet	Point data	City of Escondido
Signal Pole	Point data	City of Escondido
Water Points	Point data for fire hydrants and gate valves	City of Escondido
Sewer Points	Point data for manhole covers	City of Escondido
Water Lines	Line data	City of Escondido
Sewer Lines	Line data	City of Escondido
Roads	Line data	City of Escondido
Background	1992 Black and White Aerial Imagery	City of Escondido

Table 1: Data Components of "Your Community" Exhibit

## Creating the Manual/ Tutorial

We knew that the children who would be visiting the exhibit would be unfamiliar with GIS and that they would need a lot of guidance in using such complex software. Therefore, we thought it important to have someone who was not familiar with GIS write a manual/ tutorial to accompany the exhibit. A willing museum volunteer was found. The manual uses simple directions and icons and provides step-by-step instructions for children to navigate through the different views. Following is a sample page from the manual, which instructs the viewer on how to navigate the “View From a Street Corner:”

**FROM A STREET CORNER**

1. Check out the Table of Contents at the left of the screen to see the symbols used on the map.
2. Click on  (Table of Contents) to see more of Escondido.
3. Click  (Identify) on Tool Bar. Now move cursor to a  and click to see identity of that location.
4. Find the Street names. TIP: Click on , move cursor to the corner with the street light and drag cursor to make box around corner. Now move cursor to center street lines to view street names. Click  (Back) to restore map
5. Click on  (Pan) on Tool Bar. Now move cursor to the screen and while holding down the left mouse button move the mouse to view more area. TIP: Pull down the map to see City Hall. Move map back with  (Pan).
6. Move cursor to a  (star), to see the name of the business.
7. Can you find the Children's Museum? Now let's enlarge it: Highlight the  (View Ratio) in the tool bar, and type in "800" and press "ENTER" .
8. Now let's see a Picture of the Museum. Click on  (Hyperlink), move the cursor to center of blue dot in the sta. , (finger will show), click to view picture. Click on  (close) at right top of window to close picture window.
9. What other locations can you find? Did you see their picture
10. To exit this "View From a Street Corner", click on the  at top right corner of the screen to close window.

TO RESTORE MAP: Click on "View" in the Table of Contents, then Click on "**B**ookmark" in "View" menu, then click on "**S**TREET CORNER" .

Figure 7 “From a Street Corner” in GIS Manual for ECM’s “Your Community” Exhibit (Alter 2003)

## **Conclusion**

The “Your Community” exhibit is part of a larger ECM exhibit entitled “Small World.” The larger exhibit’s main theme is “Where Things Come From.” The exhibit will make “connections between our daily life and traditions, products, and history from around the world. Various hands-on kiosks open visitor’s eyes to the traditional and contemporary technology for imaging the earth (Escondido Children’s Museum 2). We are on the verge of unveiling and test driving “Your Community” and anticipate that we will have to tweak the exhibit as experience shows how children use and navigate the exhibit. This project has been an exciting one for ECM in that it embodies the museum’s mission, reinforces the National Geography Standards, and introduces many children to GIS technology. Because all children would benefit from greater exposure to geography and technology, we have shared our experiences developing this exhibit and hope that this kind of project is replicated in other locales with local data and resources.

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