readily available from the Oregon State Service Center for GIS and could have been added as a subtle background to help with location.

As mentioned above there were actually several methods of compilation for the range maps. The need for a legend on each map to help clarify these different compilation methods would have been an aid in understanding the meaning of the different symbologies used. For example, the difference in the point symbols used in the solitary sandpiper (location from a scientific report) and the smooth general boundaries used for the big horn sheep (ODFW non-modeled range) in comparison to the very detailed range boundaries generated by the GIS modeling for the pronghorn are all very different in appearance but there is no legend to clarify the differences. By studying the introductory text, an explanation of the variation in symbology becomes clearer.

I feel there is a need to point out a minor issue in the citation regarding the first delineation of the physiographic divisions of Oregon. The author writes that " The physiographic provinces of Oregon were first delineated by Franklin and Dyrness (1973)...". Further searching reveals that Franklin and Dyrness *Vegetation of Oregon and Washington* (1969) cite Baldwin (1964) and Baldwin in *Geology of Oregon* (1964) cites Dicken's *Oregon Geography* "... The geology is discussed regionally following physiographic divisions outlined by Dicken (1955) ..." I hope future editions address this point.

Beyond the few weak points just covered the atlas is a great success. This atlas can be held up high as an example to many cartographers contemplating assembling a state wildlife atlas. In a broader context, this atlas serves GIS professionals as an excellent example of making accessible to a large audience a complex GIS database that was originally generated for a specialized research and planning project. The citizens of Oregon are very lucky to be the recipient of this comprehensive book. This atlas is an educational tool that could lead to a greater awareness and sensitivity among Oregon's human population of the other inhabitants in their state.

Note: To view the range map of the northern river otter you can go to the web site <http://bufo.geo.orst.edu/brc/temp> and open *nrottmap.gif*. It is also possible to obtain a copy of the map image through the ftp site <bufo.geo.orst.edu>, and log on as anonymous. Change directories to *pub*, and "get" either the compressed tiff-format files, nrottmap.zip for PC users, or nrottmap.tif.gz for UNIX users.

cartographic techniques

GIS Data Made Manageable for Cartographic Production

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Background:

The widespread adoption of Geographic Information Systems (GIS) technology by government agencies and the private sector has made vast quantities of digital data readily available to cartographers. Initially, the high cost of hardware and software, low to medium quality graphic output, and limited data sets made GIS less attractive to cartographers. The practice of scanning and tracing output from GIS plots or importing vector line work into graphics programs were the primary options offered to transform GIS data into a computer format for the production of high-quality map products. Most cartography labs adopted the use of graphic arts applications such as Adobe Illustrator® or Macromedia Freehand® as digital tools for map production. Even though these software packages were fully capable of importing the points, lines, and polygons from the GIS, these programs could not take advantage of the useful attribute information that is maintained in the GIS database.

At the NACIS XVI annual meeting in San Antonio, many attendees were introduced to Avenza Software, Inc.'s MAPublisher® through a workshop. The MAPublisher software developers addressed the issue of maintaining the valuable attribute data and manipulation power of a GIS within Freehand or Illustrator. MAPublisher version 2.1 incorporated 38 filters designed to import vector and raster data with complete attribute tables intact for several major mapping software file formats: ESRI ArcView shape, ESRI ARC/INFO generate, MapInfo mid/mif, USGS DLG and SDTS, AutoCAD DXF and geo-referenced TIFF and JPEG. In addition to basic import capabilities, MAPublisher enabled the user to change the native projection of the imported files and create supplementary graphic databases.

In April of 1995, the Florida Resources & Environmental Analysis Center (FREAC) began the second *Water Resources Atlas of Florida (WRAF)*. The editors and cartographers found that most of the data previously submitted by the authors via hard-copy maps and tables were now maintained in extensive GIS data sets. MAPublisher performed beyond expectation when addressing these new data formats. All GIS points, lines, and polygons were imported with their accompanying geographic accuracy and attribute tables without error. However, some obstacles beyond MAPublisher's control were discovered while importing GIS data.

Often the data were far too detailed for use within the atlas. The level of precision and number of points originally created in the GIS caused difficulty when importing files. Freehand 7's internal limit of 32,000 points, for example, restricted larger ARC / INFO coverages from being imported. The coastline files often required considerable simplification as the base maps in the *WRAF* were much more generalized. MAPublisher enabled queries to be performed separating data into useful groups. Attribute tables were created or edited within Freehand without having to edit in an external spreadsheet or database. Once the points, lines, and polygons were imported, Free-hand's simplify [*Xtras/Cleanup/Simplify...*] routine was applied to remove unnecessary points. The [*Amount: 0.25*] was realized as the optimal level of simplification, eliminating the most points while maintaining path shape. MAPublisher's functionality provided a means of streamlining the large GIS data set and making final maps more attractive and accurate.

The following example illustrates how MAPublisher assisted in the construction of a graphic for the WRAF. The production was done using a 200 MHz Pentium Pro workstation with 64MB RAM running Microsoft Windows NT® 4.0 operating system software, ESRI ArcView® 3.0a, Macromedia Freehand 7.02, and Avenza MAPublisher 2.1 application programs.

Method:

Note: all keyboard shortcuts are shown for the Windows / PC OS. For Mac OS use simply substitute the Command key for the Control key (Ctrl).

For this example, three ARC / INFO export files (.e00) were acquired from the South Florida Water Management District's planning / GIS division for a combined map. The files included a south Florida coastline (sf_shoreline), 1996-water quality data by hydrologic basin (complete_wq96) and point locations of hazardous waste sites (hazard) (FIGURE 1).

Once imported into ArcView, the coverages were converted to shapefiles. It is good practice to keep the component parts of the shapefile (.shp, .shx, and .dbf) together as MAPublisher's built-in routines search for them when importing.

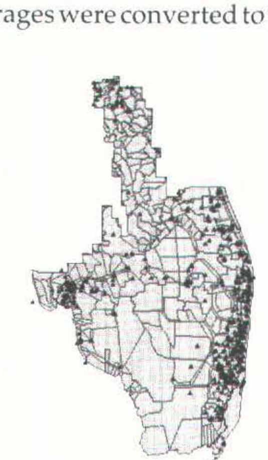

Figure 1. ArcView Display

Importing data through MAPublisher into Freehand was quite straightforward. The import menu [*Xtras/MAPublisher/Import...*] offers the options in logical pull-down menus (FIGURE 2). In addition to file format and feature type, the user must specify scale and page location for the element that is being imported. Within the pull-down fields the interface offers convenient browsing capabilities to locate files. In order to maximize the image, the default scale can be selected and the resulting image will fill the current page. For visual purposes, this was found most useful in the *WRAF*, as the graphics were to be re-scaled to standard basemaps.

To begin map construction, the shapefile of south Florida's coast-

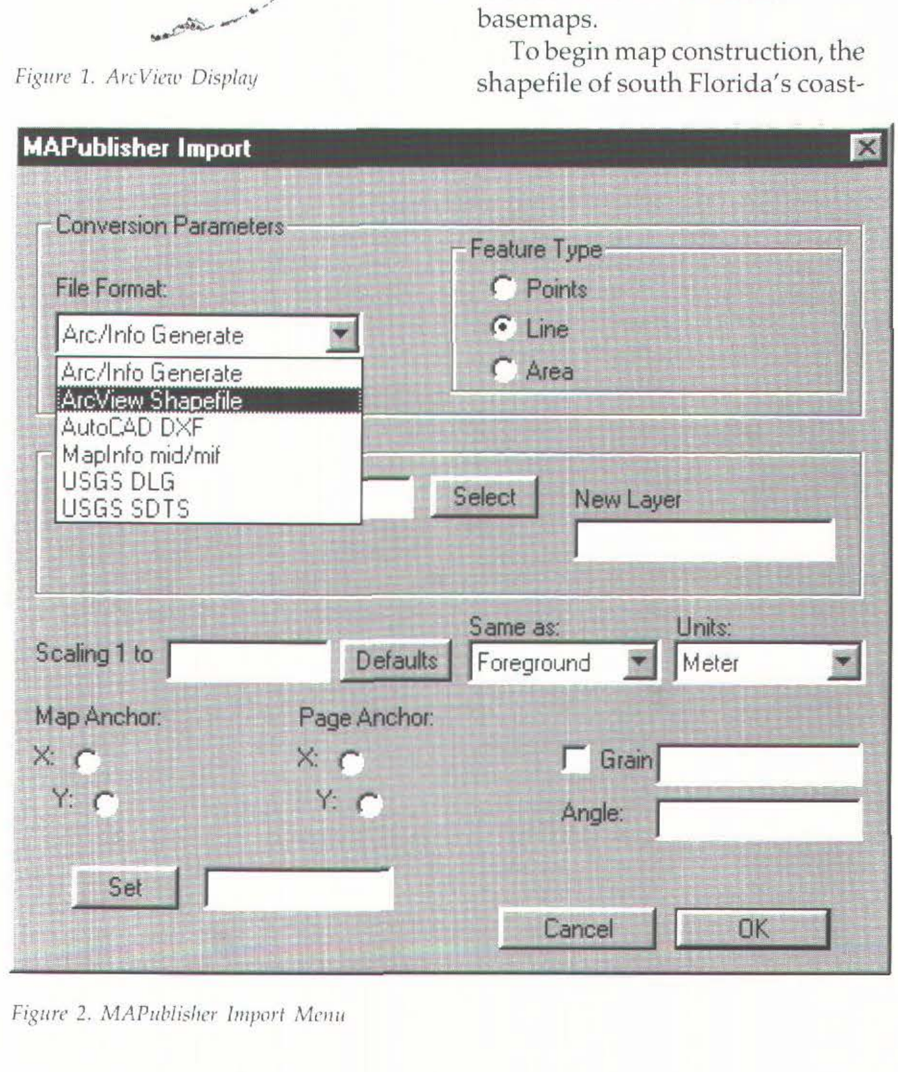

Figure 2. MAPublisher Import Menu

line was imported first for registration purposes and the establishment of default values (FIGURE 3). A search button complements the filename field of the menu making it

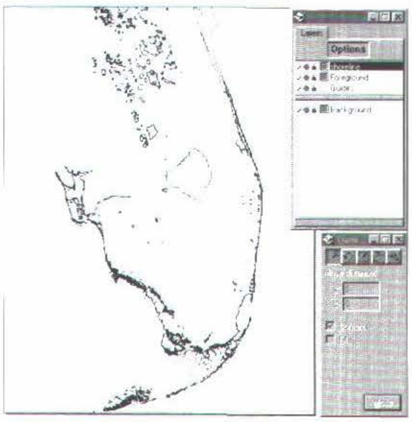

Figure 3. Imported Shapefile

unnecessary to commit the "8-dot-3" GIS filenames to memory. It is efficient to have each layer projected to the same coordinate system. However, re-projection of the data is possible using MAPublisher's projection editor [*Xtras / MAPublisher/Projection Editor…*]. Pull-down menus give access to 119 different projections and 42 ellipsoids contained in the filter (FIGURE 4). This feature was not used because the files in the sample were all projected to state plane coordinates. Default values were chosen for the scale, page and map anchor features so the data would be bound to the current page size. MAPublisher creates and labels the new layer the filename of the import by default. This can be modified, but it was found that for file management purposes, the default was preferred. For the waste site layer, the *shapefile* format and *point* feature type were specified. Once a file has been imported, the scale in which it was brought in becomes an option from the pull-down field. Selecting *Same as: sf_shoreline* commits the successive layers to the scale of that layer. This step is repeated until all of the shapefiles have been imported. It is recommended that all of the files be imported before any manipulation takes place. Premature resizing of an image or individual layer can result in inaccuracy.

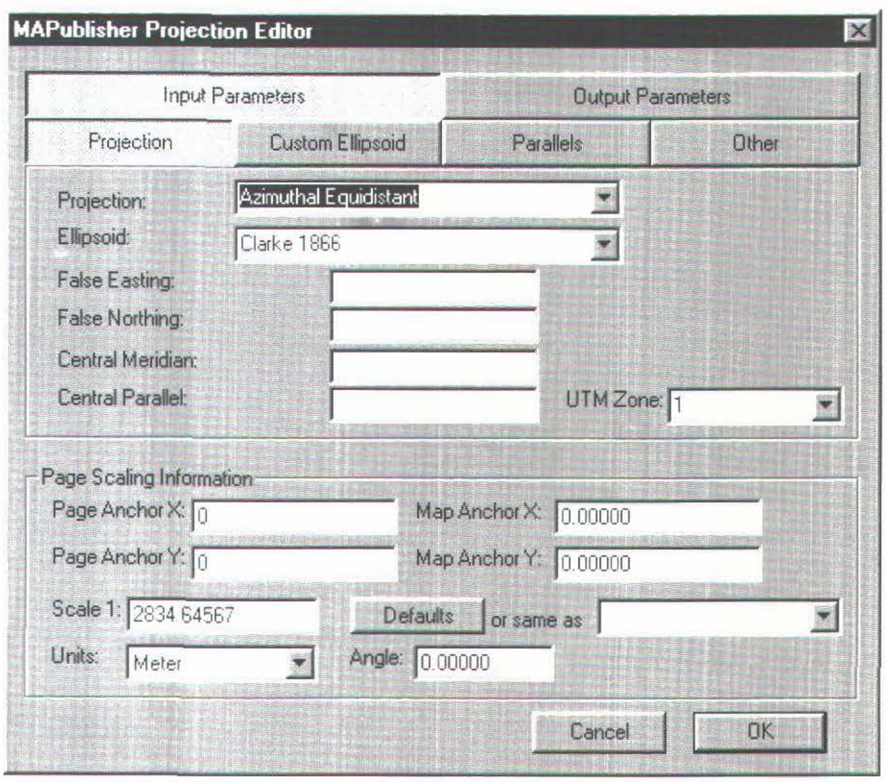

Figure 4. MAPublisher Projection Editor Menu

With the three shapefiles imported, it was determined that the individual types of waste sites and water quality values for the final map needed to be extracted. When the attribute tables of the imported shapefiles were examined, legend categories were established. The waste site coverage included three types of facilities: National Priority List (Superfund), state-funded, and landfills. Water quality was designated as either good, fair, poor or unknown. MAPublisher's query features [*Xtras / MAPSelect by Attribute…*] enable the user to create selections using SQL type logic statements (FIGURE 5). Because this was the first query for the layer, *Initial Selection…* was chosen. Although the user may enter an expression directly, pull-down fields simplify the task of creating an expression by using the attributes attached to the imported file. Once the *Current Expression:* included the necessary equation, *INSERT* was chosen transferring the formula to the recessed "expression area." Clicking *OK* completed the operation and returned the user to the document with the specified items selected (FIGURE 6).

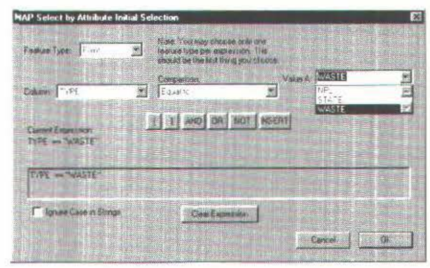

Figure 5. Attribute Selection Menu

For map construction, the selected elements can be modified for the cartographic presentation. It was found that cloning and moving the selection to a new layer allowed the user to keep the original imported file unaltered for further queries and created a buffer for unforeseen error (FIGURE 7). Once the map was completed, the original layer was deleted. In addition to the

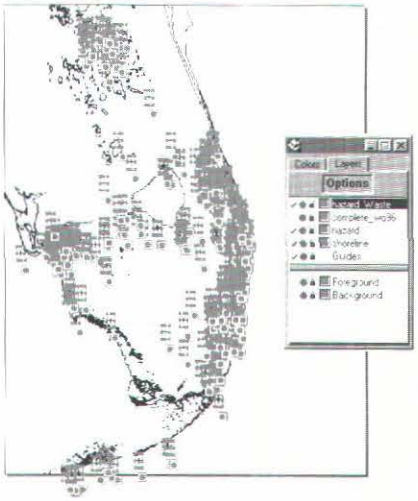

Figure 6. Text Elements Selected

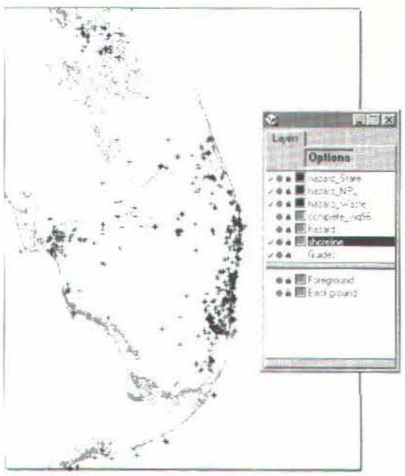

Figure 7. Converted Path Shapes

above technique, the efficient *MAP Legend* feature can separate elements while assigning legend information and color based on attributes.

MAPublisher imports GIS lines directly as vector line work; however, point symbols are imported as text plus signs. Freehand 7 can easily change the text to path shapes if these steps are followed:

Select all of the text [*Ctrl A*] and convert to paths [*Ctrl Shift P*]. Select one of the converted path shapes and copy it to the clipboard [*Ctrl C*]. From the *Edit* menu select *Find And Replace*, then choose *Graphics…* [*Ctrl Alt E*]. The *Attribute:* should be set to *Path Shape* and *Change In:* should be set to *Document*. Clicking *Paste In:* under *From:* inserts the converted plus sign shape into the white box. Return to the document leaving the *Find And Replace* menu open by clicking anywhere in the document window. Create a path shape (a closed path circle polygon was used for this example) on a new layer and copy it to the clipboard. Return to the *Find And Replace* menu and *Paste In:* the path shape for the *To:* field. Clicking on *Change* executes the replacement (FIGURE 8). *Note: any unlocked layer containing the element to be changed will be affected. The registration point for these elements is different in Freehand and Illustrator. In Freehand, it is the upper-left corner, while Illustrator uses the lower-left corner.*

The above steps were repeated for both imported coverages resulting in eight layers of discrete data (FIGURE 9). Once satisfied with the import, polygons were filled, line weights were changed and all of the layers grouped in preparation for refit to the atlas basemap. Due to the close fit of the imported layers to

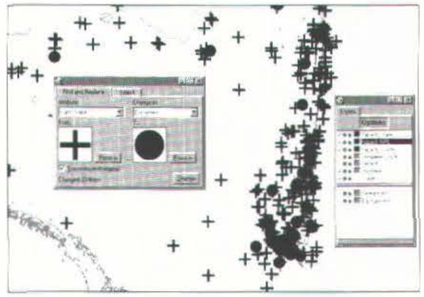

Figure 8. Find and Replace

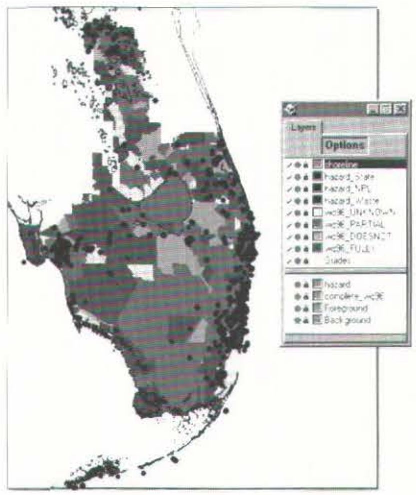

Figure 9. Completed Import

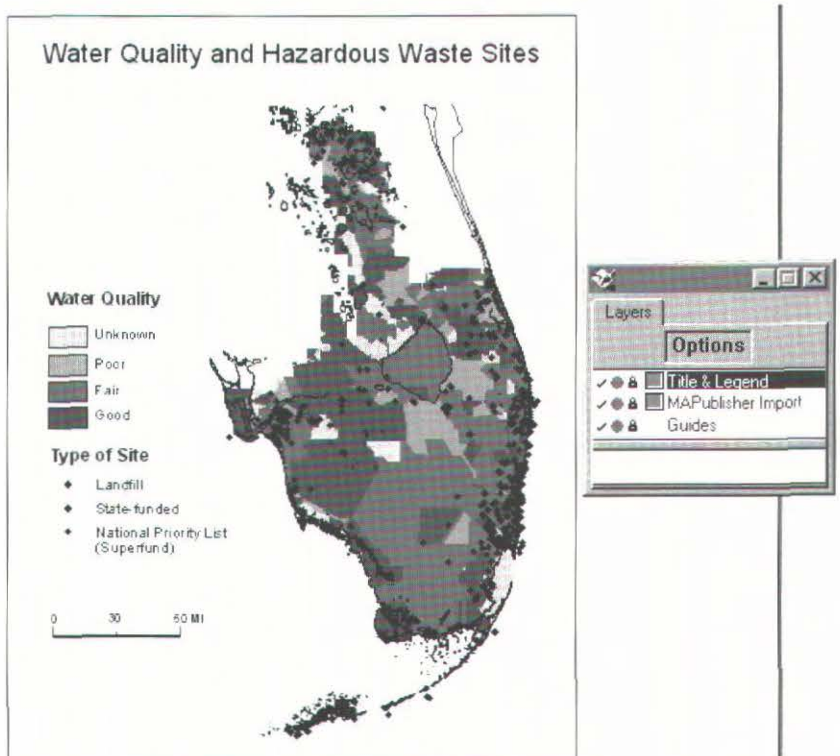

Figure 10. Final Map

the standard basemap for the *WRAF*, it was manually resized. Title, scale and legend were added to the map to complete the graphic (FIGURE 10).

Conclusion:

While MAPublisher did not directly affect the final look of the published maps in the atlas, it proved to be invaluable in converting the large quantities of data received for the preparation of maps into a useable form. The final maps are primarily the result of cartographic design decisions and the functions of the graphics software, but MAPublisher contributed significantly in several ways. First, the final printed maps are much more accurate in the geographic location of features due to the use of detailed GIS data. Second, the ability to take data sets from multiple sources and reproject them to a common projection allows the cartographer to combine layers and create custom maps. Finally, the time and cost savings from using this alternative method were essential to the completion of the project in a timely manner. In many instances, the alternative would have been to take printed output from the GIS, manually trace the line work in a more generalized form, scan the image, and retrace the line work in Freehand.

The utilization of MAPublisher for this project and the techniques that were developed that led to the production of final printed color maps has enhanced the ability of FREAC cartographers to produce high-quality maps for publication that are more accurate and more cost effective. More information about MAPublisher can be found on the website: http://www.avenza.com.

Note: Full screen versions of the graphics can be found at http://128.186.177.25/article.html

map library bulletin board

The Louisiana State University Cartographic Information Center

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The Louisiana State University Cartographic Information Center (CIC) is a significant research resource in the Gulf South region. The Center's collection containing over 280,000 maps and 81,000 aerial photographs makes it the largest map collection in Louisiana and ranks it among the larger academic map libraries in the United States. In addition to the many maps and aerial photographs, the collection includes several regionally unique cartographic resources which are available to the University community, state and local agencies, business and private patrons, as well as patrons from around the world.

The Cartographic Information Cen-ter is funded and staffed by the De-partment of Geography & Anthropology and is administratively and physically separate from the LSU Libraries. The CIC collection is comprised of materials in two categories distinguished by ownership. The majority of the material in the collection was acquired by LSU geoscience departments and is now owned by the Department of Geography & Anthropology. Additionally, the CIC houses materials deposited by the Army Mapping Service and the Federal Depository Library Program.

Although the Cartographic Information Center dates its founding to 1960, the collection is the product of both a broad scope of current scholarship and the rich seventy-year history of geoscience research at LSU. The Department of Geography & Anthropology collection reflects the department's teaching and research focus by concentrating on acquiring maps depicting historical and current Louisiana, the Gulf South, Latin America (with particular emphasis on Mexico), East Asia, and Europe. The specific research subjects supported by the collection include historical, cultural, economic and physical geography, anthropology, coastal and fluvial geomorphology, and geology. The regionally unique materials in the Department collection include the largest collection of original Louisiana Sanborn Fire Insurance maps outside of Washington, DC, the most complete set of historic U.S. Coast & Geodetic Survey hydrographic and topographic charts of the Louisiana Gulf Coast housed in the region, copies of historic maps depicting Louisiana, and historic aerial photographs of Louisiana dating from the 1930s to the 1980s.

Among the unique materials covering areas outside of Louisiana is a nearly complete set of original U.S. Geological Survey topographic quadrangle maps printed before 1940. In addition to maps of the United States, the scope of geoscience research at LSU over the past seventy years has brought materials depicting areas outside of the U.S. to the CIC. One example is a collection of over 3000 large scale (1:50,000) topographic maps of Mexico which provides over 96% coverage of the country. In addition to cartographic materials, the CIC houses the Dr. Robert C. West Latin American photograph collection containing over 6,000 black & white photographs and the Dr. Robert C. West Slide Collection of over 10,000 slides from around the world.

Complementing the material amassed by the geoscience departments are the Army Mapping Service depository material from the