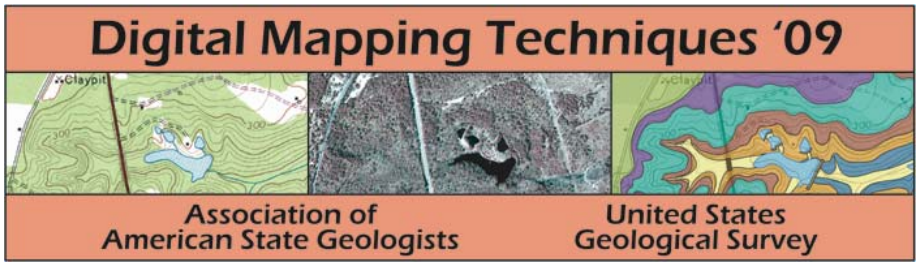

The following was presented at DMT'09 (May 10-13, 2009).

The contents are provisional and will be superseded by a paper in the DMT'09 Proceedings.

See also earlier Proceedings (1997-2008)
http://ngmdb.usgs.gov/info/dmt/

An Atlas of Unconventional Petroleum Resources: Demonstration Database and Internet Mapping Service

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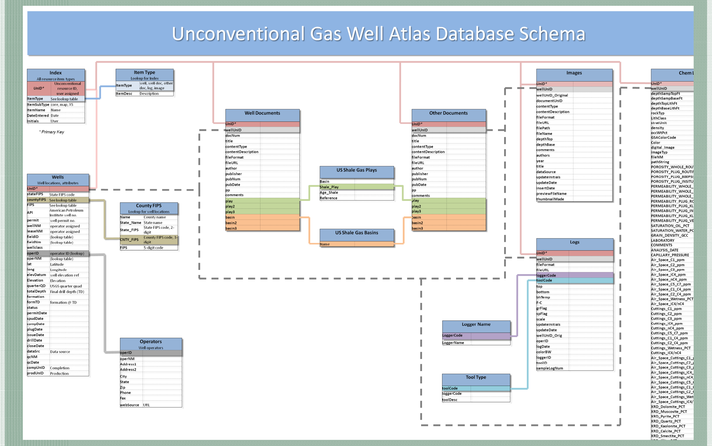
Introduction / Objectives

The Department of Geology and Geography at WVU is involved in U.S. Department of Energy (DOE) supported research pursuing two objectives: (1) Improved understanding of the geologic controls on production from unconventional reservoirs, and (2) Improved access to data from federally funded research on unconventional resources. The Atlas of Unconventional Resources is focused on improved access to and dissemination of data from the DOE's Unconventional Gas Research (UGR) program of 1976 – 1995, and previous U.S. Geological Survey (USGS) resource studies. Other WVU researchers are analyzing the geophysical aspects of unconventional reservoirs.

The West Virginia GIS Technical Center (WVGISTC) was tasked with incorporating archive data compiled by the DOE National Energy Technology Laboratory (NETL) in 2007, along with additional spatial and non-spatial information from the West Virginia Geological and Economic Survey (WVGES) and other sources, into a relational database and web map service.

The initial relational database structure is depicted in the graphic below.



Methods

Well attribute data, including spatial location, were entered into an ArcGIS (ESRI 2009) personal geodatabase feature class. This well header feature class became the core table of a Microsoft Access relational database. It was also used to build an ESRI internet mapping service (ArcIMS). While Access and ArcIMS are suitable for this demonstration project, the massive amounts of available well point data and related logs and other documents call for an eventual implementation using more robust / updated tools, e.g. Oracle and ArcServer.

The demonstration database was manually built and populated, but future implementations could, and should, take advantage of existing data sources, i.e. state agencies, etc., available over the internet. The resulting distributed information service has the potential to achieve currency equal to that of the individual sources.

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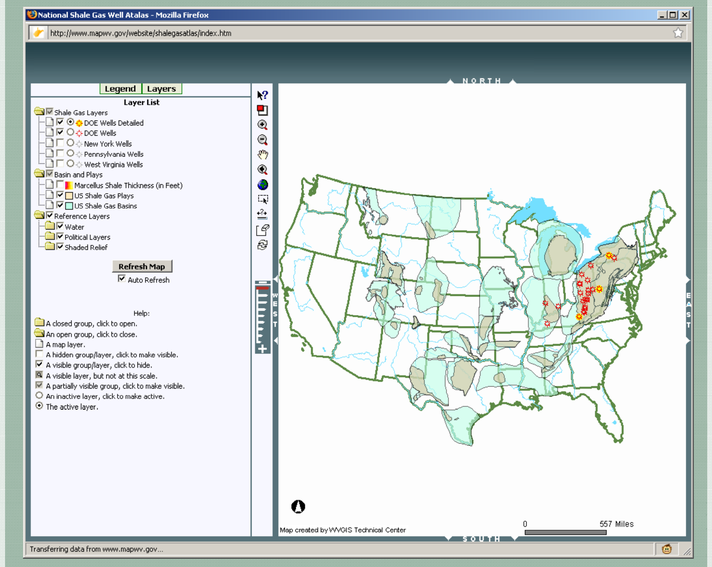
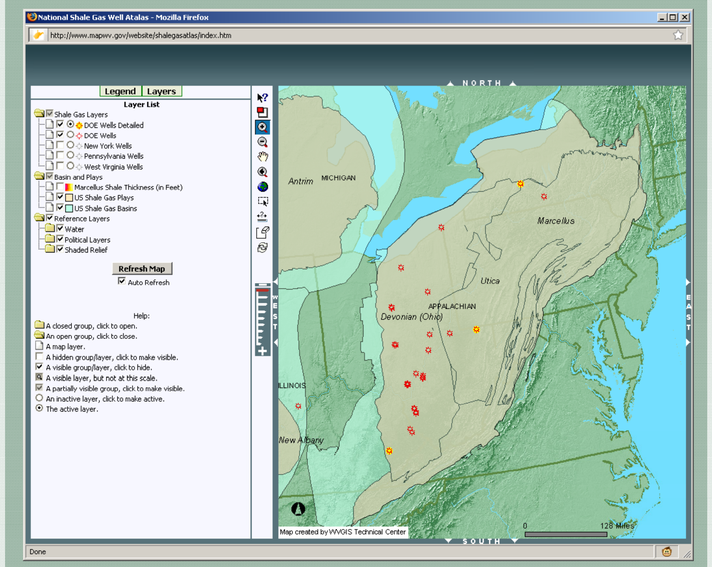
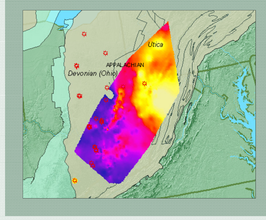
Implementation

The Atlas was built locally in ESRI ArcMap , and is presented online as an ESRI ArcIMS interactive map application. ArcMap allows for feature layers to display at specific map scales, or scale ranges (scale dependency), which helps avoid a cluttered appearance. The application opens at a continental U.S. extent, as shown in the following graphic.



As the user zooms in to finer scales, more detail is displayed automatically. Thousands of Appalachian Basin well points have been downloaded to the geodatabase, but only those included in the NETL Eastern Gas Shales data set are shown here.



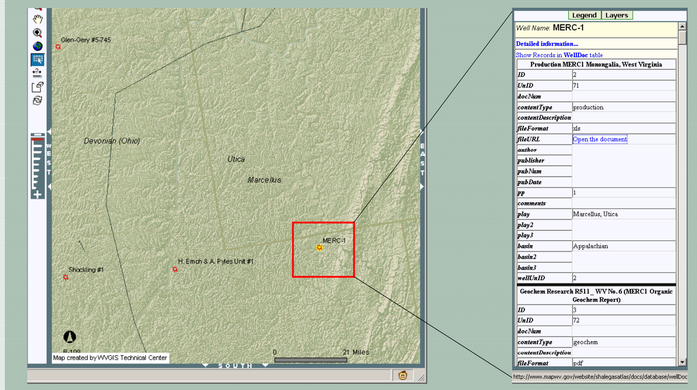


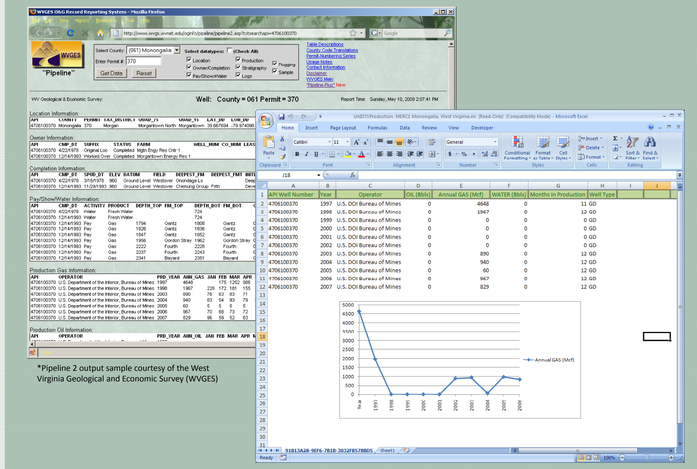
Map layers

Base map layers can be added as they become available. The example to the left shows a formation thickness or isopach map for the Marcellus Shale.

Querying the map service

One or more well points may be queried by using the ArcIMS selection tool to draw a box around the wells of interest, as shown below. ArcIMS will display available information from the database for the selected wells in the table of contents area on the left of the map page. The type of information available includes all logs, reports, core images, virtually any resource associated with the well. Most of this information is included in the Atlas database, but it could also be accessed from other web sites and services. In the example shown, the WVGES Pipeline 2* online database was accessed through the WVGES public web portal with the results shown in a separate window.





*Pipeline 2 output sample courtesy of the West Virginia Geological and Economic Survey (WVGES)

Conclusions

A web mapping service such as ArcIMS is an effective tool for disseminating geographic and non-geographic data and information about oil and gas wells. Archived records for unconventional gas wells were successfully incorporated into an online Atlas that is available to the public. An enterprise database solution is better suited to the larger data table sizes expected with the final implementation. ArcIMS is being replaced by ArcGIS Server, which will require migration of the project to the new software. ArcMap provides enough flexibility to maintain cartographic clarity while fulfilling overall project needs.

Acknowledgement

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NETL