

# **An Enterprise GIS Solution for Bond Forfeiture Program in West Virginia**

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## Bio

Dr. Yueming Wu is currently a GIS Programmer Analyst and supervisor of the geospatial application development group at WVDEP.

Dr. Wu received his Ph.D. degree in Urban and Regional Planning from the University of Illinois at Urbana-Champaign in 2002. His research work focuses on advanced use of GIS technology in cross-functional and governmental lines, including geospatial application development, environmental planning, and risk analysis.

Dr. Wu possesses more than 10 years' practical experience in the GIS field and became a GIS Professional (GISP) in 2006.

# Abbreviations

- Geographic Information Systems → GIS
- Enterprise GIS → EGIS
- Information Technology → IT
- Surface Mining Control and Reclamation Act → SMCRA
- Office of Surface Mining → OSM
- West Virginia Department of Environmental Protection → WVDEP
- Bond Forfeiture program → BFP
- Technical Applications and GIS Unit → TAGIS
- Acid Mine Drainage → AMD

# Topics

- ❑ Purpose of Project
- ❑ Problem Statement
- ❑ Solution
- ❑ Development Approach
- ❑ Solution Components
- ❑ Conclusions & Discussion

# Purpose of Project

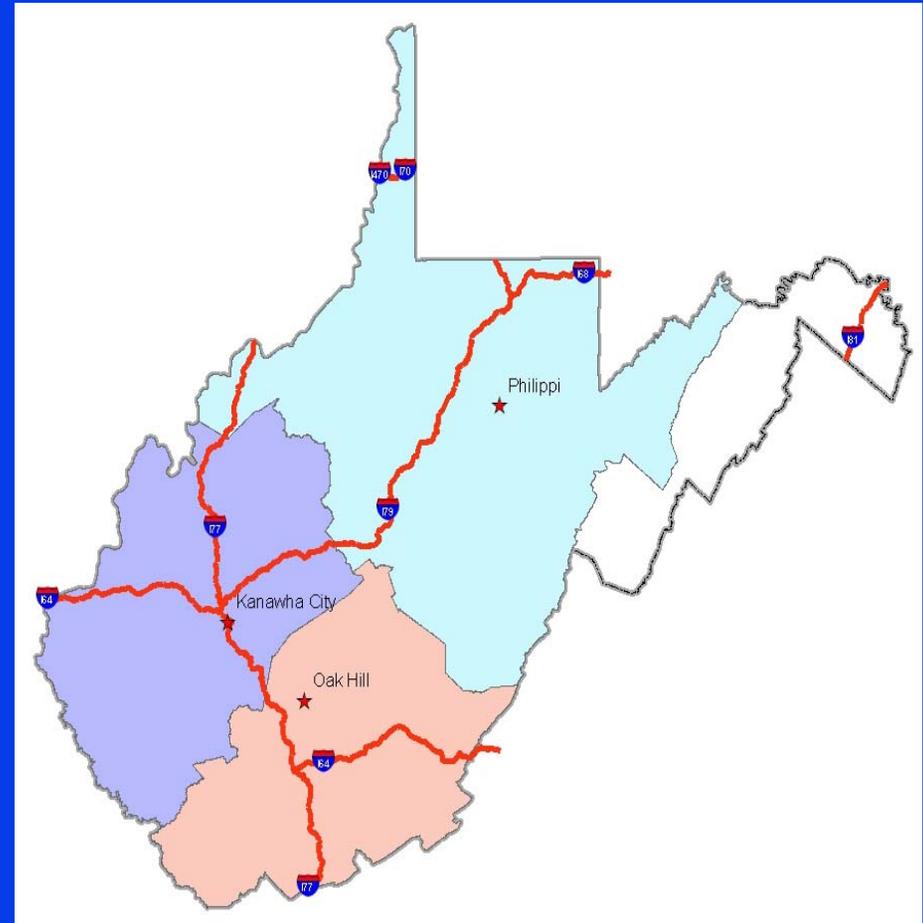
Develop a solution for BFP to integrate geospatial functions into its decision making

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# BFP

- An office at WVDEP to clean up forfeited mine sites and treat water polluted by mining
- Funded by forfeited bond collections, civil penalties, and the Special Reclamation Tax on mined coal
  - Special reclamation tax: 1c/ton (after SMCRA) → 3c/ton (mid-1990's) → 14c/ton (2001) → 7c/ton (2007)
- Three satellite offices statewide



# What can GIS do for BFP?

- ❑ Track forfeited site locations
- ❑ Track water sampling site locations
- ❑ Manage historic data
- ❑ Relate geospatial databases to WVDEP databases
- ❑ Assist treatment project design
- ❑ Help manage treatment sites
- ❑ ...

# Issues

- ❑ A tight budget
- ❑ No central geospatial data warehouse
  - ❑ One central Oracle database
  - ❑ Separate GIS datasets
  - ❑ Separate legacy spatial datasets
  - ❑ No spatial data accuracy
  - ❑ No data concurrency
- ❑ No user-friendly geospatial applications
- ❑ Few knowledgeable GIS users
  - ❑ Fewer GIS power users

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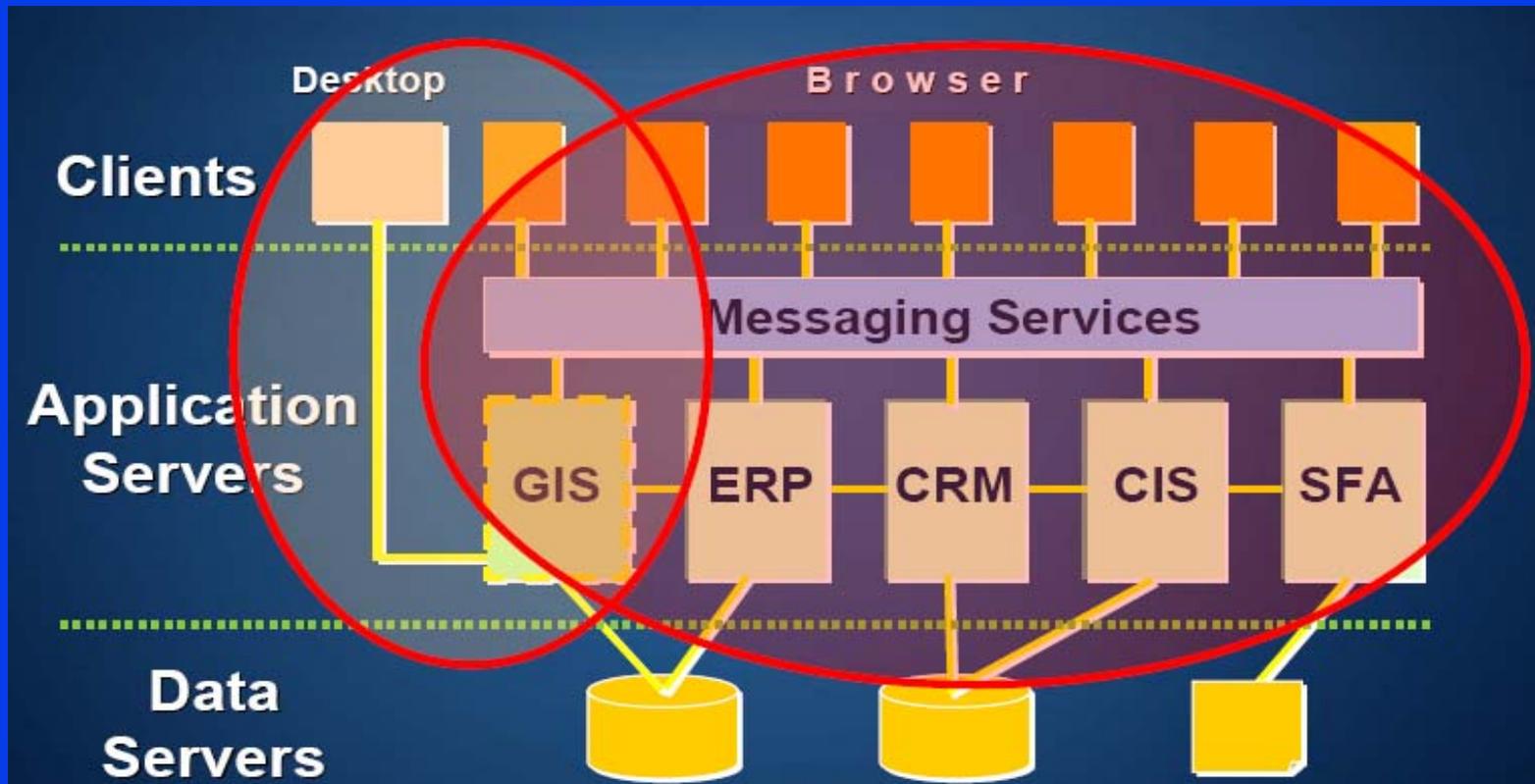
## What is the solution?

- A central geospatial data warehouse
- Easy-to-use geospatial applications
- A group of trained users



EGIS

# What is EGIS?



EGIS “is an architecture that integrates geospatial data and services and shares them across the organization. In more general IT terms, it can also be viewed as an infrastructure that extends and enables existing enterprise systems using geospatial data and services.” (ESRI, 2008a)

# Benefits of EGIS

- ❑ Broad access to geospatial data or data sharing
- ❑ “Reduced data redundancy
- ❑ Improved accuracy and integrity of geospatial data
- ❑ Efficient and timely data sharing
- ❑ Improved enterprise-wide knowledge management and decision support capabilities
- ❑ High level of interoperability between GIS and non-GIS applications
- ❑ More effective use of departmental GIS skills and resources
- ❑ Reduced overall GIS maintenance and support costs” (ESRI, 2008a)
- ❑ Improved performance
- ❑ Easier geospatial application development

# Challenges to EGIS

- ❑ High set up cost
- ❑ Substantial IT infrastructure demand

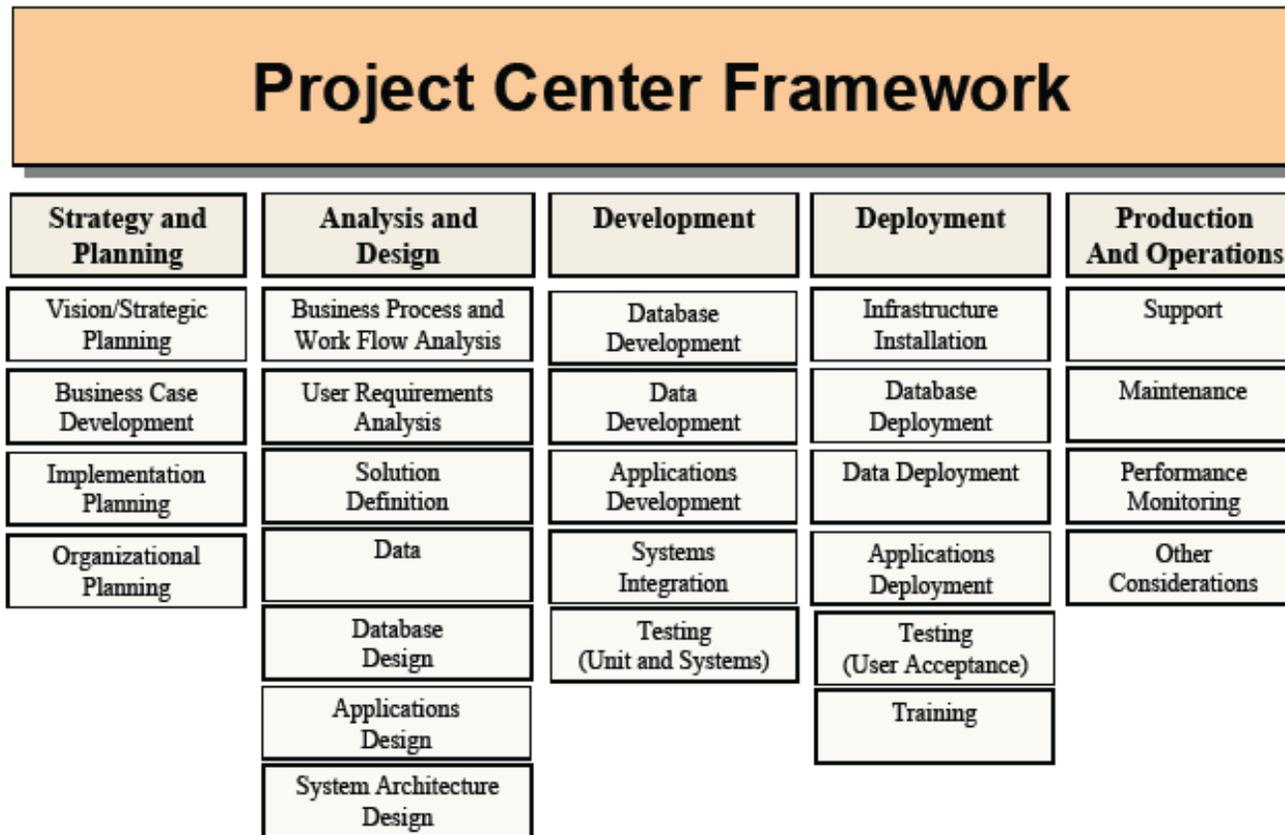
# What addresses the challenges?

- ❑ WVDEP IT infrastructure
- ❑ OSM/TIPS support
- ❑ Past success in GIS application development at WVDEP → 2005 ESRI SAG award

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# Development Approach



(ESRI, 2008b)

# Development Approach

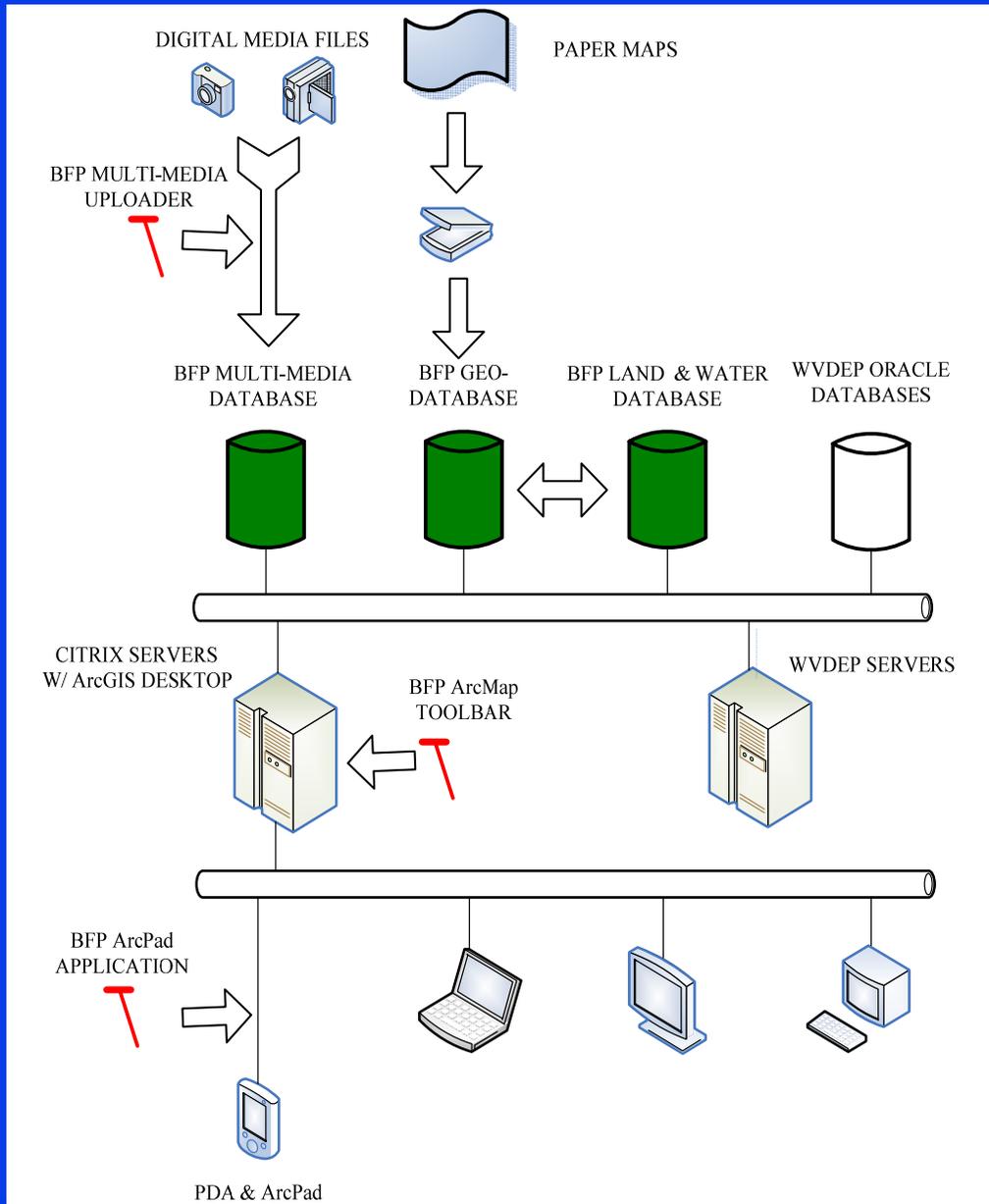
- A team of TAGIS & BFP
- Multi-phase project
- Each phase:
  - Project strategy and planning
  - Project analysis and design
  - EGIS development
  - **EGIS deployment: testing → training**
  - EGIS production and operations

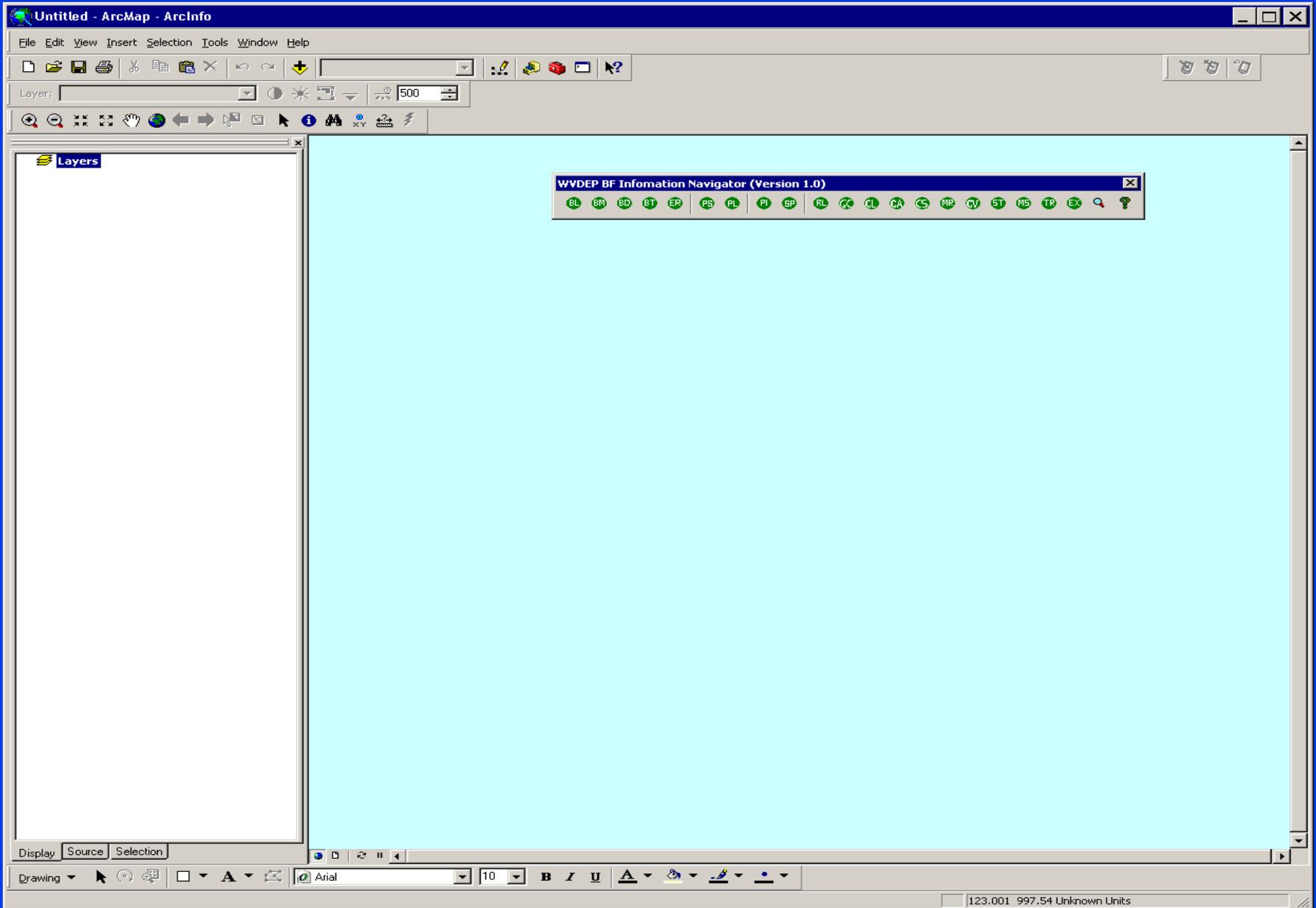
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# Solution Components

- Existing IT infrastructure
- Geospatial data warehouse
  - ArcSDE multiple user geo-database
  - BFP land & water database
  - Digital multi-media database
- Geospatial applications
  - ArcGIS desktop ArcMap BF toolbar
  - ArcPad mobile GIS application
  - Multi-media uploading tool

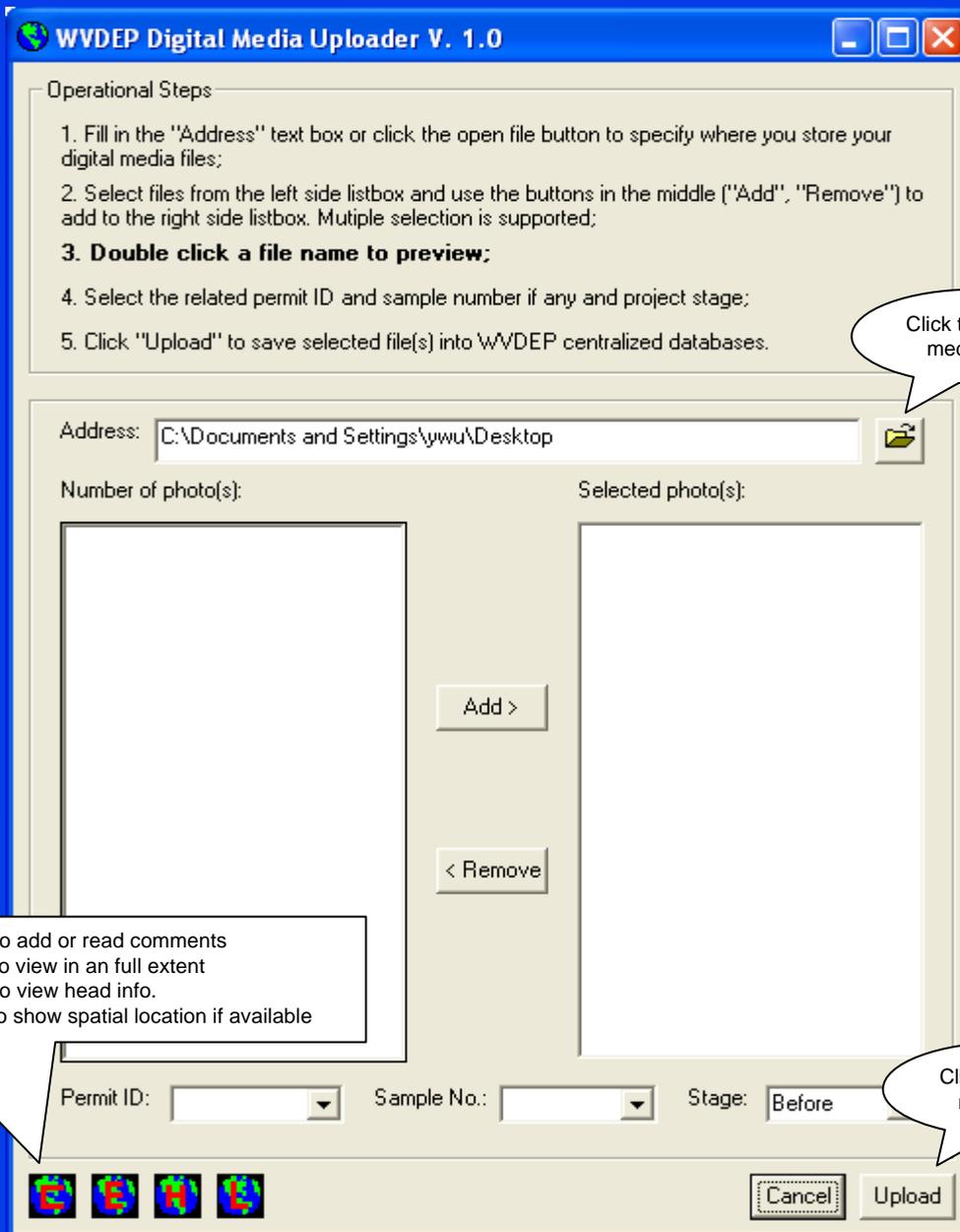




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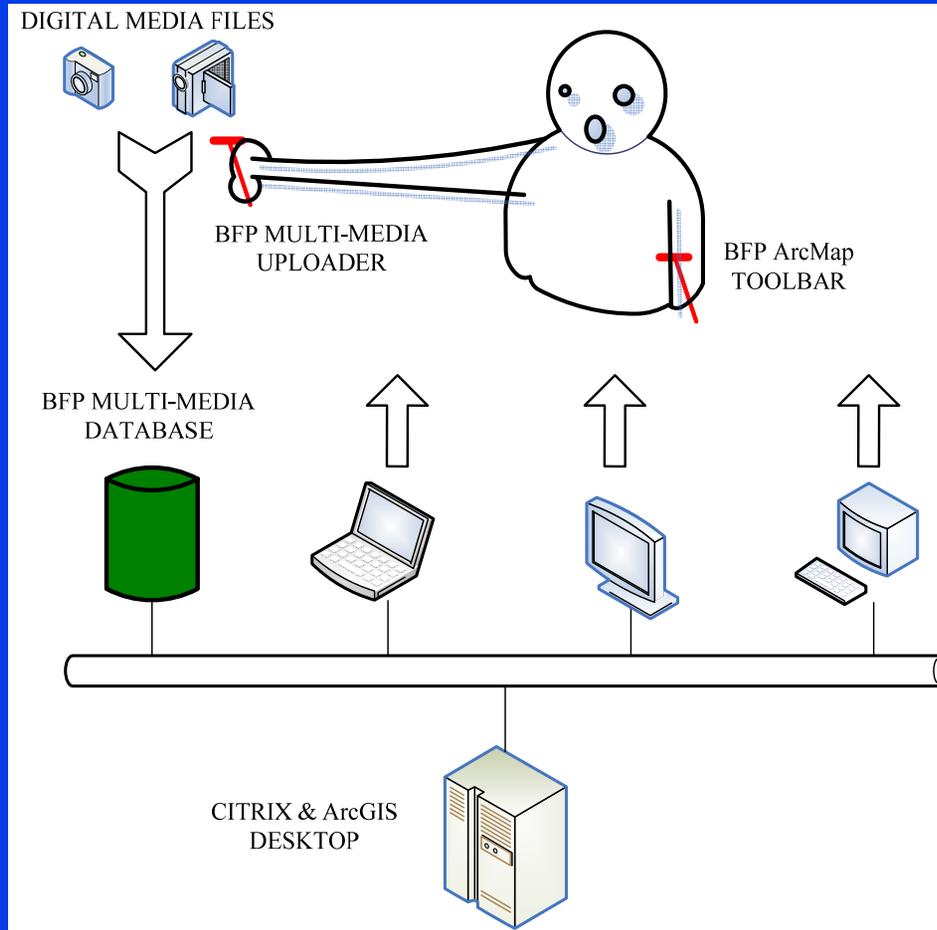
Operational Steps

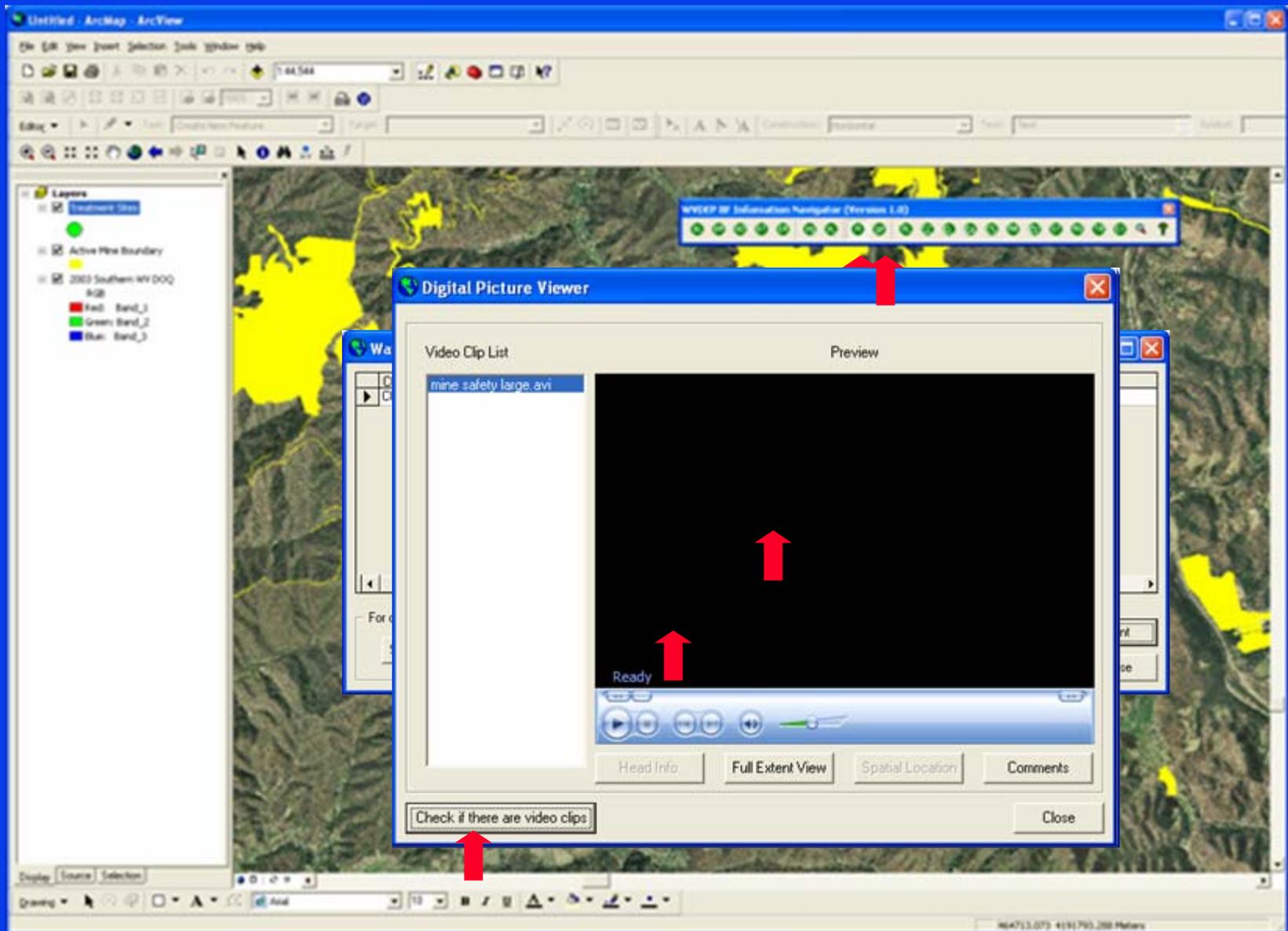
1. Fill in the "Address" text box or click the open file button to specify where you store your digital media files;
2. Select files from the left side listbox and use the buttons in the middle ("Add", "Remove") to add to the right side listbox. Multiple selection is supported;
3. **Double click a file name to preview;**
4. Select the related permit ID and sample number if any and project stage;
5. Click "Upload" to save selected file(s) into WVDEP centralized databases.

Click to browse media files

Button C: click to add or read comments  
Button E: click to view in an full extent  
Button H: click to view head info.  
Button L: click to show spatial location if available

Click to upload media files





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# Conclusions and Discussion

- Significance
- Uniqueness
- Lessons
- Future Work

# Significance of Solution

- Business
- Research
- Industry

# Uniqueness of Solution

- ❑ Cost-effectiveness
- ❑ Easy-of-use geospatial applications
- ❑ Multi-media database

# Lessons

- Administrative (e.g. interaction)
- Technical (e.g. small projects & performance)

## Future Work

- Incorporate new technologies (e.g. ArcGIS Server)
- Extend available functions (e.g. the ArcPad app.)



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YOU

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