GIS-Based Road Inventory Application for the USDOT FHWA

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Overview of Presentation

- Background
- Objectives of Pilot Project
- Challenges
- Review of Web-Based Prototype
- Summary
FHWA Eastern Federal Lands Highway Division (EFLHD) collects Road Inventory asset data, analyses and publishes this data, including pavement conditions, for the National Park Service.

- 254 parks containing over 11,000 miles of roadway
- Three year collection cycle - presently completing third cycle
Background Continued

- Traditionally time-consuming labor-intensive task to develop individual park reports and maps
- QA/QC processes for the spatial and location components needed improvement
- ELFHD desired new capabilities to display pavement condition changes across collection cycles and to provide more timely, dynamic content to NPS customer
- EFLHD upgraded to ESRI’s ArcGIS
Objectives of Pilot

- Develop GIS-based capabilities to display temporal variation in pavement condition concurrent with present condition data.
- Develop automated capabilities to translate data from the data collection contractor into standard report formats:
  - overview and detailed maps
  - representative images of route sections and parking lots
  - inventory attributes by .02 segment
  - summary data by mile
Investigate feasibility of using a web-based application to offer NPS customer to access to:

- Comprehensive Road Inventory Data in more timely manner over Internet with new query / analysis capabilities
- Road Inventory Data using GIS capabilities integrating spatial data including as bridges, campgrounds, topography, hydrology, park boundaries, etc.
- Traditional map booklets and reports in PDF format
Challenges

Some Project Challenges to be Discussed include:

– Data volume and quality
– Lack of well defined web application requirements
– PDF files over the web
– Access to images over the web
Challenges - Data

- Large volume of data - sampled every .01 miles including right of way assets and digital images of right-of-way and roadway
- Data rolled up to .02 segments for detailed map display at 1 mile increments
- Map, statistics and summary data automated for each 1 mile map display
Challenges – Data Con’t

- Past QA/QC procedures of raw data not rigorous enough to ensure accuracy and quality in high visibility maps and reports
- Problems typically found after production requiring reprint
- Developed procedures for GPS data and selected attributes used in thematic displays to identify problems upfront
- Developed tools in VB / ArcObjects to automate process of building various map book sections, displays and statistics for production
Challenges – Prototype GIS

- In-house GIS expertise especially in web design lacking
- No functional specifications for web prototype
- Used light weight methodology with spiral iterative approach
Challenges – PDF Files

- Complete Map Booklet for an average park is 30-40 megabytes in size in PDF format.
- Implemented web links using HTML and PDF files to break booklet into manageable sections allowing user to selectively download relevant sections.
Challenges – Digital Images

- High resolution images are several megabytes in size
- Customer desired ‘drive thru’ of images at simulated roadway speeds
- Implemented thumbnail approach with 640x480 image allowing user to request more detailed blowup
- Used AVI technology with real-time re-sampling of image and building of files for ‘drive-thru’ displays over web
Review of Web-Based Prototype
Display of Temporal Variations in Conditions
Integrated Statistical / Inventory Data with Map Display
Web-Based Digital ‘Drive Thru’

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Summary

- VB and ArcTools enabled rapid review of GPS and LRS data to avoid production delays.
- VB and ArcObjects tools enabled automation of map booklets to approximately 90%.
- Web offers FHWA and NPS staff rapid access to RIP data for review as well as enabling new analysis not provided through the traditional map booklets.
Summary Continued

- Users can download queries from web into XLS, HTML, Access, and XML formats
- Road images for left, right, forward, and underneath can be selectively viewed in thumbnail and full size
- Photo ‘drive thru’ using AVI dynamically created for downloaded over the Internet for viewing
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