ArcGIS Mobile: Implementing a Multi-Discipline Approach

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The Issue

• How to efficiently manage large field data collection efforts with:
  • Multiple field crews
  • Multiple disciplines
  • Running simultaneously
    • Wetland Delineations/Stream Surveys
    • Cultural Resources (Archaeology & Architectural Historians)
    • Threatened and Endangered Species
Considerations – “Field to Web”

• **Time Constraints:** “How much time do we have?”
  - Schedule determines # of crews, amount of equipment, QA personnel needed and reporting frequency

• **Survey Requirements & Base Map Needs for Each Discipline (field units/web viewer/hard copy map production)**
  - Largely the same across disciplines with some unique needs
    - Survey boundaries, project features, imagery, hydrology, transportation, land ownership and access, soils, elevation contours, jurisdictional boundaries
  - Form Development – repeatability

• **Survey Tracking**
  - Similar needs across disciplines
    - Where have crews been? Where do you have permission to go? Where do you plan to go? How does the client want progress reported and how often?
Considerations

• Managing Mobile Updates
  • Survey boundary changes
  • Landowner access updates
  • Viewing other crews’ data
  • Loading new base data

• QA Process
  • Define the teams and discipline leads, who needs to do what when? Do they have to necessary tools to perform their task?

• Reporting
  • What are the field results?
  • Automation of standard reports
  • Who needs to see the results and how often?
  • How to track resolution of issues between field and office QA?
**Field.Resource:** a centralized, GIS driven, data management system providing near real-time field data collection, reporting, and analysis solutions. Comprised of a custom ArcGIS Mobile field application, **Field.Suite**, and GIS viewer, **Field.Atlas**.
Field.Resource GIS Goals

• Develop an in-house application to streamline field data collection and QA processes
• Integrate common layers across disciplines to master geodatabase
• Expedite reporting (survey progress, results, deliverables)
• Increase data accessibility for all project personnel
• Provide common platform
• Create standard operating procedures across projects
• Reduce project costs
AECOM Field.Resource – Centralized Approach for Field Data Collection

Wetland and Streams
US Army Corps of Engineers Permitting & T&E

Ecology GIS Lead
Collects Data; Loads Data Into Master

Ecology Team Performs QA via ArcMap and Field.Atlas

Ecology Field.Suite Users

Master Geodatabase
SQL Server
Spatial Data Engine (SDE)
Document Management

Web Server
Field.Atlas Portal
ArcGIS Server Services

CRM GIS Lead
Collects Data; Loads Data Into Master

CRM Team Performs QA via ArcMap and Field.Atlas

Data Disseminated to Project Team via Field.Atlas GIS Portal

Data Updates Flow Both Ways

Portal utilized to maintain all relevant GIS data, tracking all permit locations and associated reports, mapping facility features and documenting project progress.

Reporting for Both Disciplines

Cultural Resources Permitting
Field.Suite

- Custom desktop/tablet application developed using ArcGIS for Windows Mobile API, MS Windows Forms & Telerik WinForms
- Captures GPS, field attributes, and photographs
- Library of forms for each discipline
- Custom reports
- Operates in disconnected or connected modes
- Windows OS/32 or 64 bit tablets
Field.Suite Wetlands and Streams

- USACE Wetland Determination reporting
- Tab Format/Lookups/Drop Downs/Default Settings for easy data entry
- Some geo-positional awareness, knows what USACE district you are in

Customizable / USACE Region
# Field.Suite Wetlands and Streams

## Image Description

The image shows a screenshot of the Field.Suite software interface, which is used for collecting, delivering, and deciding on wetland and stream data. The interface includes sections for general information, vegetation, soils, hydrology, summary, and photos.

### General Information
- **Stratum**: Herb
- **Percentage Cover**: 10%
- **Dominant**: Yes

### Vegetation
- **Species (2014 National Wetland Plant List)**
  - **Acer rubrum**
    - **Scientific Name**: Acer rubrum
    - **Common Name**: Red Maple
    - **Indicator**: FAC

### Plot Sizes
- **Sapling Plot**: 15
- **Shrub Plot**: 15
- **Tree Plot**: 15
- **Woody Vine Plot**: 15

### Other Vegetation Information
- **% Bare Ground in Herb Stratum**: [Field Input]
- **Morpho**: Yes

The software also includes a table listing various species with their common names, indicators, stratum, percent cover, and whether they are dominant or field species, along with a save and close button. The interface is designed to facilitate the collection and management of wetland and stream data efficiently.
Field.Suite Photo Management

- File Name: IMG_3038.JPG
- Direction: E
- Comments: General landscape view

<table>
<thead>
<tr>
<th>Photo Number</th>
<th>Comments</th>
<th>Direction</th>
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<td>IMG_3038.JPG</td>
<td>General landscape view</td>
<td>E</td>
</tr>
<tr>
<td>IMG_3037.JPG</td>
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<td>Down</td>
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</table>
Field.Suite Cultural Resources

Site Form

Shovel Test

Summary
Field.Suite Cultural Resources

![Field.Suite Cultural Resources](image)

**Field.Suite Cultural Resources**

**Site / Locus**

<table>
<thead>
<tr>
<th>General Information</th>
<th>Shovel Tests</th>
<th>Shovel Test Results</th>
<th>Summary</th>
<th>Photos</th>
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</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Begin Date:</td>
<td>Tuesday, November 12, 20</td>
<td>End Date:</td>
<td>Tuesday, November 12, 20</td>
<td>Project: Fort Polk</td>
</tr>
<tr>
<td>Site / Locus:</td>
<td>SA17B-3b b 05</td>
<td>Parish / County:</td>
<td>VERNON</td>
<td>State: LA</td>
</tr>
<tr>
<td>Original Location:</td>
<td>Area</td>
<td>Shovel Test No:</td>
<td>6</td>
<td>City:</td>
</tr>
<tr>
<td>Transect:</td>
<td>34</td>
<td>Recorder:</td>
<td>JB HD GH AM</td>
<td>Meterage: 150</td>
</tr>
<tr>
<td>Recorder:</td>
<td>A</td>
<td></td>
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<td></td>
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</table>

**Point Type:** Datum

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<thead>
<tr>
<th>Point Type</th>
<th>Longitude</th>
<th>Latitude</th>
<th>North</th>
<th>East</th>
<th>Zone</th>
<th>FR</th>
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<tr>
<td>Datum</td>
<td>-83.24232031</td>
<td>31.268311859</td>
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<td>476931.580223267</td>
<td>15</td>
<td>48</td>
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</tbody>
</table>

**Site / Locus Location and Context**

<table>
<thead>
<tr>
<th>Length (m):</th>
<th>Width(m):</th>
<th>Hectares(m):</th>
<th>Shape:</th>
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<tbody>
<tr>
<td>30</td>
<td>5</td>
<td>0.01</td>
<td>Irregular</td>
</tr>
<tr>
<td>Closest Drainage:</td>
<td>Unnamed drainage</td>
<td>Distance(m):</td>
<td>20</td>
</tr>
<tr>
<td>Closest Road:</td>
<td>Unnamed logging road</td>
<td>Distance:</td>
<td>400</td>
</tr>
<tr>
<td>Land Use:</td>
<td>Forested</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetation:</td>
<td>Planted Pine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Form(s):</td>
<td>Terrace</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elevation:</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Disturbance:</td>
<td>Moderate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site / Locus Delineation Methods:</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Survey Method:</td>
<td>Shovel Testing</td>
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<tr>
<td>Pedestrian Interval:</td>
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<tr>
<td>Shovel Testing Interval:</td>
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<tr>
<td>Delineation Status:</td>
<td>Complete</td>
<td></td>
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</tbody>
</table>

**Surface Viability (%):** 10

**Agent Type:** Timbosing
Field.Suite Cultural Resources

Typical Delineation Shovel Test Soil Profile

Northing: 1000
Easting: 1000
Depth of Deposit (cm): 50

Shovel Test Details

- Stratum: Stratum III
- Depth: 70-80
- Munsell: 7.5YR 6/8 reddish yellow
- Soil Texture: Sandy Clay

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Hue</th>
<th>Chroma Value</th>
<th>Color</th>
<th>Soil Texture</th>
<th>Depth</th>
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</thead>
<tbody>
<tr>
<td>Stratum III</td>
<td>7.5YR</td>
<td>6/8</td>
<td>reddish yellow</td>
<td>Sandy Clay</td>
<td>70-80</td>
</tr>
<tr>
<td>Mottled Wh</td>
<td>7.5YR</td>
<td>6/8</td>
<td>reddish yellow</td>
<td>Sand</td>
<td>20-70</td>
</tr>
<tr>
<td>Stratum II</td>
<td>10YR</td>
<td>7/4</td>
<td>very pale brown</td>
<td>Sand</td>
<td>20-70</td>
</tr>
<tr>
<td>Stratum I</td>
<td>10YR</td>
<td>4/2</td>
<td>dark grayish brown</td>
<td>Sandy Loam</td>
<td>0-20</td>
</tr>
</tbody>
</table>
Field.Suite T&E

American Burying Beetle (ABB)

- General T&E
- Migratory Birds
- Bald Eagle Nests
- Indiana Bat (IBAT)
Field.Suite

Ecology, what you see in the field: high resolution imagery, project layers, multiple base layers (streams, roads, parcels, soils, jurisdictions) and other teams’ results
Field.Suite

**Cultural Resources**: same base layers as Ecology with additional layers (archaeological probability, cemeteries, national register sites, previously recorded sites, other teams’ field results, survey progress)
What’s Next?
Make Data Accessible!

• How to manage QA/QC teams in multiple locations?
• Create teams by subject matter expertise and GIS capabilities
• ArcGIS users use ArcServer Geodata services for checking data in/out of SDE GDB
• For non-ArcGIS users provide a GIS web viewer allowing editing of QA progress and tracking issue resolutions
Field.Atlas: Custom GIS Viewer Built on ESRI Silverlight API

Tracks project features, field survey status, landowner access and consolidates all GIS mapping data for project

Highlights wetland locations and cultural resource avoidance areas

Tracks Survey Progress and Land Access Status
Field.Suite Cultural Resources QA

### Table of Contents
- Field Data
  - Survey Status - Archaeology
    - Centerline - Surveyed
    - Centerline - Surveyed, Previous
    - Centerline - Needs Survey
    - Survey Completed - Corridor
- Pedestrian
- Pedestrian, Disturbed
- Pedestrian, Slope
- Pedestrian, Wet
- Previously Surveyed
- Shovel Testing
- Shovel Testing, Disturbed
- Shovel Testing, Wet
- Survey Status - Architecture Hi
- Previous Recorded Sites
- Deep Testing
- Pipeline Layers
- Mileposts

### Site Type
- Archaeological Cultural Resource

### CulRes Class
- Class III (Documentary search of literature and

### Description
- Single rock pile 8 ft diameter 3 ft high

### NR Status
- Not Evaluated

### Phase
- Survey (Class I, II, or III)

### SHPO Date

### Modification Date

### Comments
1. FERC_March
2. FERC_March

### Verification Status
- Submitted
- Submitted

### Verification Date
- 6/1/2014 7:00:00 PM
- 6/1/2014 7:00:00 PM

### GIS Polygon Date
- 6/1/2014 7:00:00 PM
- 6/1/2014 7:00:00 PM

### CRM Reviewer
- CGL
- CGL

### Add Date

### Retire Date

### System
- Stone/Rock Pile
- Stone/Rock Pile

### Subsystem
- Structural Foundation
- Stone/Rock Pile

### Feature Type

### Editing layer: Archaeology Site Points

### Others:
- Records (1 out of 651 Selected)
Reporting

- Built into Field.Atlas for on demand reporting
- Centralization allows for integrated survey progress reporting across disciplines
Moving Forward: Needs Continue to Evolve

• Field.Resource has become a standard for several offices
• Used for all field surveys no matter size of project
• Consider & respond to user feedback
• Continue to develop Internet tools and reports
• Field.Atlas & Field.Suite – offer cross platform options
“Once a new technology rolls over you, if you’re not part of the steamroller, you’re part of the road”.

Stewart Brand
Editor of the *Whole Earth Catalog*

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