Web Based Tools
for
Large Scale Collaborative Assessments

Mike da Luz
Roundtable on Sustainable Forestry
Manhattan, KS
May 13, 2008
Introduction

• Observations
• Concepts of Web based technology and trends
• Case studies ... various scales, various needs
• Challenges & Opportunities
• Discussion
Observations

- Plenty of data, tools and applications – short of timely and relevant “actionable” information.
- Technology is evolving and not limiting. Success is driven by the defined business need.
- Planning is an iterative process, progress is defined by deliverables.
- Mixed ability to synthesize complex, current and relevant information for program administration.
- In natural resource management and conservation …it is all about spatial relationships and the need for “stewardship”.
Basic Ecological Concepts

- Dynamic vs Static
- Resistance to change
- Resilient to change
- Changes in energy budgets
- Micro vs macro scales
- Changes in successional paths
- Changes in patterns and associations
GIS Is Evolving—and Supporting the Enterprise

Exploiting Advancing Infrastructure, Architecture, and Application Technologies …

Legacy
Client / Server

Today
Web Services (Mapping & Visualization)

Emerging
Services Oriented Architecture

- Integrating Distributed Data and Applications
- Connecting Communities and Enabling Collaboration
- Supporting Real-time Operations
- Powering the Specialist—and Reaching the Generalist

... Entering the Mission Mainstream—a Foundation for Analysis and Decision-making
Enabling Infrastructure Technology

*Developments in*

- Faster Processing
  - Multi-core, Blades
- Increased Bandwidth
- Larger Storage
- Web Services Standards
- Mobile Technologies
- Real Time Networks

... *accommodate GIS demands* ...

- Unique imagery and mapping content, and a variety of data models/formats
- Very large, distributed databases
- Legacy systems built around computing and integration constraints

... *And Improve Our Ability To Process, Maintain, Share, and Distribute*
GIS Servers--Open And Interoperable

ArcGIS Server

Supporting Multiple Clients and DBMS

• Standards Based (OGC, ISO, W3C . . .)

• Open APIs

. . . Ensuring Geospatial Investments Can Be Leveraged
. . . Providing a New Platform for Geospatial Integration
Enterprise GIS Capabilities

Serving the Mission: Quality, Timeliness, Efficiency

Fuse Data/Knowledge

Location and Time

“Virtuous” Cycle

Systematize Analysis/Processing/Workflow

Share the Data, Knowledge, Workflow, and Decisions

Enable Intuitive Analysis and Decisions

Common Operational Picture
Enterprise GIS Business Architectures (1)

**Efficiency via Rationalization**

Independent Workgroups

- Consolidation, Integration, and Centralized Hosting, Acquisition, and Support

Enterprise Foundation

Apps

Data
Enterprise GIS Business Architectures (2)

Efficiency and Effectiveness via Rationalization and Transformation

Geocentric Workflows

Geographic information as the foundation of mission operations

Geospatially-Enabled Workflows

Infusing geospatial intelligence in enterprise IT systems

Geospatial Intelligence
Facilities and Asset Management
Land Records Management

Command & Control
Business Intelligence
Supply Chain
Basic SOA Components

Basic Logical SOA Components

Consumers

SOA Infrastructure

Producers
Enterprise GIS in a SOA

- Embed real-time feeds
  - Static to dynamic
- Integrate flexible workflow
  - “Broadcast” to interactive
- Serve multiple uses
  - Standard to custom
- Meet evolving requirements
  - Rigid to adaptive
- Exploit legacy systems
  - High cost to low cost

... incrementally
The Landscape Need

- Provide a common planning framework
- Identify joint areas of priority
- Provide a common means of displaying key information
- Provide program accountability
- Provide for shared databases
- Account for temporal and spatial variation
WebDET
Spatial Analysis Project (SAP)

...a forest stewardship model
USDA-FS State & Private Forestry
Stand Records

Activity Information

- Activity Type: Timber_Silviculture
- Activity Practice: Single-tree selection cut (UA/RN/NFM)
- Acres: 7
- Activity Year: 2008
- Activity Description: Selectively thin conifers in drainage in the northeast corner of stand.
- Priority: Medium
- Status: Planned
- Harvest Vol: 200
- Type Vol: Cords
- Product: Unknown
- Cost Share: Unknown Cost Share
- Mgmt Desg: NONE
- Comments: Fuelwood production

Buttons: Update, Delete, New Activity
A standardized approach for private land forest management planning

1) Maintain spatial relationships with geo-political attributes with common **business requirements**
2) Web based data entry tool for creating Stewardship Plans
3) Web based tool to track all State forestry activities
4) Utilize existing standards where they exist
5) Meet minimum standards
6) WinDet, a desk top version of the application
Business Performance & Technology in Forestry: A Proactive Approach

Nicholas Macdonald, Western Canada Region GIS Manager
Steven Hills, GIS-Certification Forester
Swan Valley Forest Resources Division
LP Canada Ltd.
Swan River, Manitoba Canada

www.lpcorp.com
Foresters use a combination of traditional techniques, satellite and digital air photos, along with a cutting edge forest ecosystem inventory to build Prescriptions.
Data is only entered once and then leveraged across multiple applications for specific purposes.
Final Comments

• End User requirements must drive the development.
• GIS and a flexible information management system are core to success in forestry in the digital age.
• Manager buy in and results are critical to project success.
• Keep your head up and always look for opportunities to streamline.

• $5 or $500,000 if it’s not used you spent too much.
The Asia Pacific Natural Hazards Information Network (APNHIN; http://apnhin.pdc.org)

Mr. Rich Nezelek
Mr. Chris Chiesa
Ms. Pam Cowher
Mr. Todd Bosse
PDC’s APNHIN Services

Pacific Island Imagery

Active Hazards

Maps/ Digital Raster Graphics
Change Detection
...an example of techniques and applications
Quantification of Lost/Recovering Infrastructure

Study Areas
Quantification of Lost/Recovering Infrastructure
Quantification of Lost/Recovering Infrastructure
NDVI Time Series

6 Months After Tsunami
Change Detection

NDVI change between Pre-tsunami image and 6 months after the tsunami.

NDVI change immediately after the tsunami.

Pre-Tsunami

Immediately After Tsunami

6 Months After Tsunami

NDVI change

- Increase in NDVI
- No Change
- Decrease in NDVI

Values:

-1
-2
-3
-4
-5
-6
-7
Change Detection

Pre Tsunami - Immediately After

Pre Tsunami – 6 Months After

NDVI change
- Increase in NDVI
- No Change
- Decrease in NDVI
-1
-2
-3
-4
-5
-6
-7

NDVI change
- Increase in NDVI
- No Change
- Decrease in NDVI
-1
-2
-3
-4
-5
-6
-7
United States Forest Service
S&PF Redesign Spatial Assessment Model

Prepare Data | Prepare Themes | Analyze Data

DATA
&
THEMES

ANALYZE
WEIGHT & RECLASSIFY

ANALYSIS
ASSIGNED DATA + SELECTED SCENARIO

State and Private Forest Management Potential

Management Potential

Value
High 31
Low 0

[Map of Florida with color-coded management potential]

[Map of the United States with global overlay]
Demo: National Assessment Model

Conceptual Overview

Data Layers

- Fragmentation
- Population Growth
- WUI
- Fire Potential
- Insects and Disease
- Biodiversity
- Water Quality
- Proximity
- Jurisdictions
- Policies
- Watersheds
- Others

Themes

- Conserve Working Forest Landscapes
- Protect Forests From Harm
- Enhancing Other Forest-Related Benefits

Output
The foundation for the Redesign approach is a National Assessment of conditions, trends, and opportunities relevant to forests of all ownerships.

The Assessment will be used to assist the planning, prioritization, and resource allocation at the national and regional levels, as well as to assess and visibly communicate outcomes achieved "on-the-ground".

Use existing national and regional data to:

- Display current conditions
- Identify trends that impact the ability to provide a diverse range of sustainable public benefits
- Identify opportunities to align federal resources in a way that improves delivery of public benefits and address SPF national priorities.
## Prepare Layers

### Data Layers

<table>
<thead>
<tr>
<th>Data Layer</th>
<th>Aliases</th>
<th>Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Layer_Development Risk</td>
<td>National Layer_Development Risk</td>
<td>No</td>
</tr>
<tr>
<td>This data layer shows housing density and potential risk in land development.</td>
<td>Reclassify</td>
<td>Edit</td>
</tr>
<tr>
<td>Add New Layer Alias</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Layer_Fire Potential</td>
<td>National Layer_Fire Potential</td>
<td>No</td>
</tr>
<tr>
<td>This layer indicates the impact of fire on forests as a major disturbance factor.</td>
<td>Reclassify</td>
<td>Edit</td>
</tr>
<tr>
<td>Add New Layer Alias</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Layer_Insects and Disease</td>
<td>National Layer_Insects and Disease</td>
<td>No</td>
</tr>
<tr>
<td>This layer represents a compilation of forest insects and disease activities mapped from aerial detection surveys of forested areas</td>
<td>Reclassify</td>
<td>Edit</td>
</tr>
<tr>
<td>Add New Layer Alias</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Layer_Clip Layer</td>
<td>National Layer_Clip Layer</td>
<td>No</td>
</tr>
<tr>
<td>This is a sample layer for Clip</td>
<td>Reclassify</td>
<td>Edit</td>
</tr>
<tr>
<td>Add New Layer Alias</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Automated Output Example

State and Private Forest Assessment
Scenario Report – Scenario rkd_11132007.doc
Tuesday, November 13, 2007
12:27:52 PM

Analysis Output, Metadata, and Classification
Recognize that Enterprise GIS is *Different*

<table>
<thead>
<tr>
<th>Key stakeholders</th>
<th>Workgroup</th>
<th>Enterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Users</td>
<td>Senior executives, officials, business and IT managers</td>
</tr>
<tr>
<td>.. evaluate</td>
<td>Application functionality</td>
<td>System capabilities, cost, scalability, stability, security</td>
</tr>
<tr>
<td>.. select</td>
<td>Products, Applications</td>
<td>Solutions and platforms</td>
</tr>
<tr>
<td>.. design &amp; develop</td>
<td>Workflow</td>
<td>Architecture, integration, data mgt (and workflow)</td>
</tr>
<tr>
<td>.. implement</td>
<td>Project</td>
<td>Program</td>
</tr>
<tr>
<td>.. support</td>
<td>Functional Capabilities</td>
<td>Continuity of Operations</td>
</tr>
<tr>
<td>.. and want</td>
<td>Vendors</td>
<td>Partners</td>
</tr>
</tbody>
</table>
Challenges and Opportunities

- Multiple, geospatially supported business areas and data/application nodes
- Ancillary role for GIS (source of maps, imagery, data)
- Data center consolidation for data maintenance, common services
- Consider potential for:
  - Mission area synergies
  - GIS as foundation for analysis and decision-making (geocentric or geo-enabled workflow)
  - Common application services—analysis and modeling, tradecraft capture

Consider whether …

Forest Management
- Inventory
- Transportation
- Harvest
- Silviculture
- Roads
- Fire Mgt.
- Regulation

Forest Conservation
- Ecological Assessment
- Species Mgt.
- Watersheds
- Vegetation
- Urban Impact
- Fire Ecology
- Habitat Mgt.
- Land Use
- Carbon Sqst.

Ecosystem Services
... lay the groundwork before you start ...

- Are a solid business plan and associated strategies well defined and understood?
- Is there a clear understanding of the broad user objectives driving the project?
- Are the workflow and related business processes effective and well designed?
- Are the business stakeholders engaged and supportive?
- Does anyone regard this as merely a technical exercise?

*Important for Enterprise GIS Rationalization*

*... Essential for Rationalization and Business Transformation*
Conclusion

• Information Technology is available & evolving
• Planning perspectives on utilizing information needs to continue to evolve
• Merging trends:
  – Mobile applications and links
  – Server information & data streaming
  – User access & expectations
  – Information synthesis
  – Global links, interest & redefining time frames
Discussion