Mobile GIS
at Washington State Department of Natural Resources

By Jeffrey Holden

https://www.dnr.wa.gov/
http://data-wadnr.opendata.arcgis.com
Washington DNR Lands

- 5.6 million acres of state land
- Agricultural Leases
- Aquatic Lands
Manage Forests for Schools

• $300 million annually for schools
Regulate Forest Practices
Manage State Aquatics Lands
Geology Survey
Fight Wildfire in Washington
Washington DNR Employees

- 1,500 employees
- 900 ArcGIS users
- 500 mobile devices
- Many different teams each collects different data
For Navigation

- Garmin 60 CSx
- Custom Map Source base map
For Editing in the Field

- ArcPad
- Trimble Nomad
- GPS devices
  - Trimble Pro XT, and XH
- Antenna
Steps to move to mobile

1. Prove the new technology works
2. Justify the cost
3. Maps for navigation
4. Develop the editing work flow
5. Train and enable staff
6. Mobile GIS Strategy
Prove the technology works

- Capitol Forest.
- Northwest Temperate Rainforest
Survey Points

1. Survey points know locations
Collect with GPS

2. Collect GPS location with each GPS device at each survey point
3. Repeat for many survey points
GPS devices tested

Collector running on:

- iPad
- Android
- Bluetooth receivers:
  - Trimble R1 GNSS receiver
  - Bad Elf Surveyor
  - Garmin GLO
4. Compare the GPS location at each survey point
Measure

5. Measure from survey point to GPS point
## Samsung Galaxy Tablet

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samsung Galaxy Tablet</td>
<td>$149</td>
<td>20 feet</td>
</tr>
<tr>
<td>Total</td>
<td>$149</td>
<td></td>
</tr>
</tbody>
</table>
# iPad Mini

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>iPad Mini</td>
<td>$399</td>
<td>30 feet</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$399</strong></td>
<td><strong>null</strong></td>
</tr>
</tbody>
</table>
## Summary of Devices

<table>
<thead>
<tr>
<th>GPS Device</th>
<th>Accuracy in feet</th>
<th>Cost</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trimble Pro 6H and Nomad</td>
<td>10</td>
<td>$6,700</td>
<td>Most Accurate</td>
</tr>
<tr>
<td>Trimble R1 GNSS and iPad</td>
<td>20</td>
<td>$2,500</td>
<td>Can be corrected</td>
</tr>
<tr>
<td>Bad Elf Pro+ and iPad</td>
<td>20</td>
<td>$679</td>
<td>Storage on Bad Elf</td>
</tr>
<tr>
<td>iPad Mini</td>
<td>30</td>
<td>$399</td>
<td>Embedded GPS</td>
</tr>
<tr>
<td>Samsung Galaxy</td>
<td>25</td>
<td>$149</td>
<td>Embedded GPS</td>
</tr>
<tr>
<td>Garmin 64s</td>
<td>20</td>
<td>$249</td>
<td>GPS only</td>
</tr>
</tbody>
</table>
Train and Encourage Staff

Mobile GIS Committee Meetings
- Show and share applications and ideas
- Develop Mobile Strategy
- Provide training and examples

ESRI Training
- Collector
- Survey 123
Provide Tools and Workflows

• Instructions
• Services for Collector
• Creating a Web Maps
• Collector workflows
• Tile Packages
Collector Groups

• Base Maps

• Feature Services
Services

• Feature Services
• Updated weekly
• For offline
A Web Map for Collector

Oracle Database

Services on Portal

DNR Shared Services on ArcGIS Online

Editable Services on ArcGIS Online

Web Map for Collector

DNR Custom Base Map

iPad or Android running Collector

Sync Edits
Collector Mobile Workflow

File Geodatabase → Create Feature Service → ArcGIS Online Service → ArcGIS Online Map for Mobile → Send to Mobile Device → Sync changes
Example Applications

- DNR has many different teams
- Mobile GIS Committee recommends
  - Base maps are developed by
  - DNR shared services
- Team GIS Analysts develop their own Web Maps and editable layers
- Editors gather data with Collector, Survey 123, or a combination.
Aquatics Geoduck

1. Dive route with Web App Builder Application.
2. Inspection forms are completed with Survey123
3. Dashboard and report
4. About 20 users
Aquatics Derelict Vessels

1. Derelict vessels
2. Located by County Marine Sheriffs
3. Stored on our GIS Portal
4. Reviewed by DNR
Urban Forestry

- Puget Sound Corps Crews
- Track Planting, Pruning, invasive species removal
- Shared with Cities and Counties
Land Owner Assistance Program

1. Land Owner Assistance
2. Thinning
3. Reduces forest fuels
4. Homes protected
Forest Resources

1. Measure timber volume
2. Plan the harvest
3. Plan regeneration
Forest Resources

1. Map the location of Forest Inventory Plots in Collector
2. Link to Survey 123 Form
3. Inventory with Survey 123
Geology

1. Create tile packages with LiDAR
2. Map past and potential landslide areas with Collector
Forest Practices

1. Roads, culverts, drainage, and road decommissioning
2. Link to Survey 123
3. Inspection with Survey 123
4. Custom tile packages
Bridge Inspections

1. Bridge location are shown Collector
2. Inspections completed with Survey 123
3. Updated in ArcGIS Online
4. Synced to Oracle Database nightly
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