An Overview of Mobile GIS Apps for Field Data Collection

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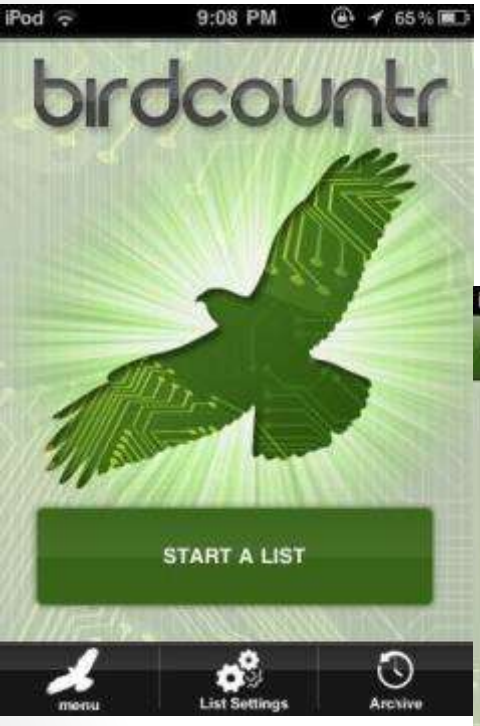
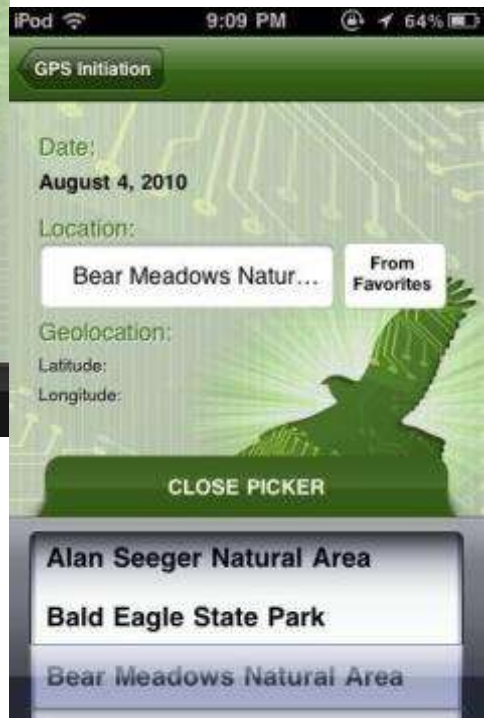
- 2010
  - iOS GIS Apps
  - No accurate GPS/GNSS *(TestedniPhone 6 and iPad Air = 6.5m [95% CI])*





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New Tech Opens New Doors

2012-*ish*

- BlueTooth External 2.5-meter GPS
  - Bad Elf Pro GPS
    - *(Tested 2.2m at 95% CI)*

  - Garmin Glo

  - Dual XGPS150

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Submeter GNSS Finally Arrives!

- iSXBlue II GNSS (2013)
  - Accuracy ≤ 0.60 meter

- Arrow 100 GNSS (2014)
  - Accuracy ≤ 0.60 meter

- Trimble R1 (2015)
  - Accuracy < 1.0 meter

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RTK Market Grows

- SXBlue III GNSS (2014)
  - Accuracy 1 cm

- Arrow 200 GNSS (2014)
  - Accuracy 1 cm

- CHC X91+ GNSS (2015)
  - Accuracy 1 cm

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Full Hardware Solution

iPad (or equivalent tablet)

- Waterproof case
- Strap system
- Apps Aplenty!
  - Mobile GIS
  - Plant Guides
  - Compass/Camera
  - PDF Reader
- External battery
- Cellular service (*optional*)
  - Real-time access to GIS server
  - Internet access

GNSS

- 2.5 meter GPS
- Submeter GNSS
- RTK

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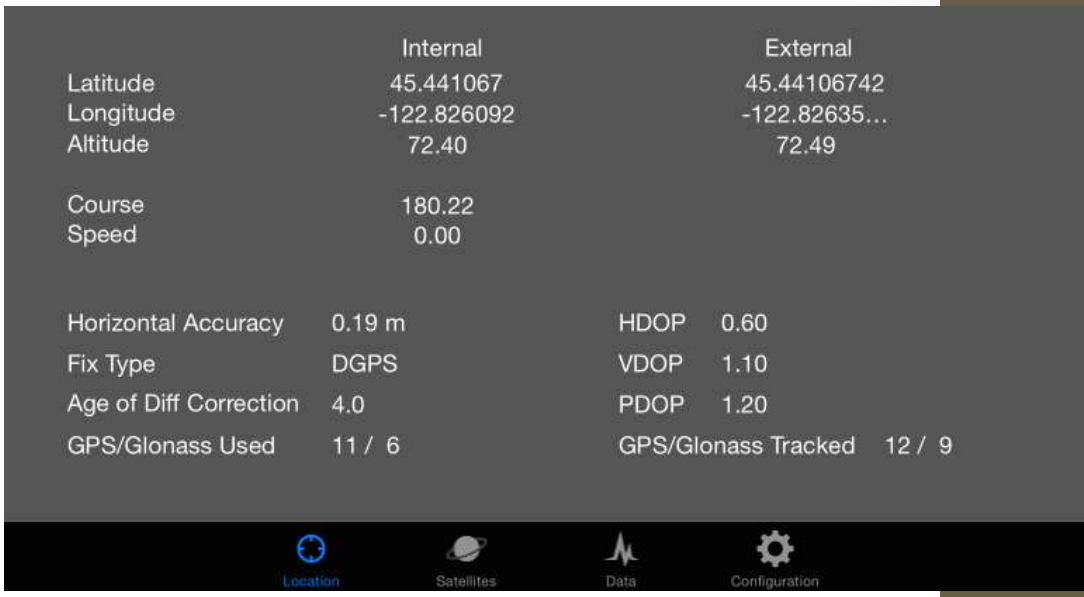
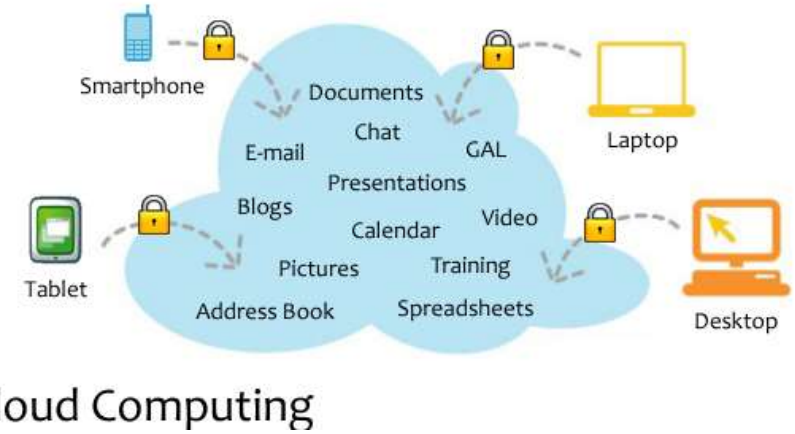
Workflow

- Tablet paired to GNSS
- Monitor GNSS “health”
- Mobile GIS App for data collection and export
  - Cloud server





Cloud Computing

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Successful Experiences

Projects

- 2012 – 1
- 2013 – 3
- 2014 – 18
- 2015 – 5

Types of Surveys

- Wetland Delineations
- Habitat Mapping
- T&E Species Surveys
- Aerial Raptor Nest
- Post-con Habitat Restoration Monitoring (*3 years*)

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iPad Benefits

TIME AND MONEY SAVINGS

1. Better Navigation
2. Helpful Aerial Imagery
3. Quicker Data Entry
4. Direct Photo Integration
5. Real Time Data Access (Cloud)
6. Long-term Asset Monitoring
7. Better Security (Passcode Lock)

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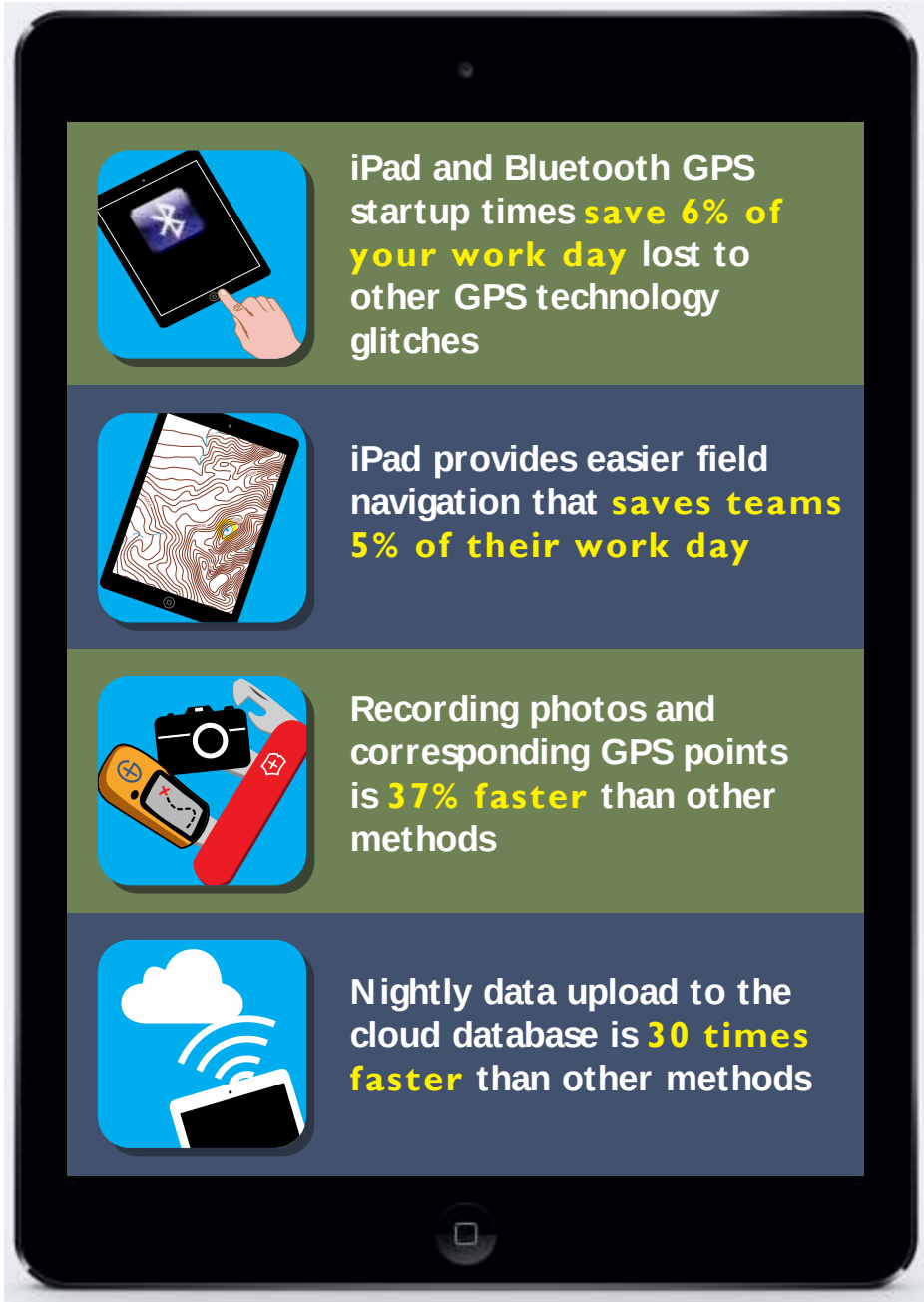
iPad Benefits

- Numbers based on general environmental field surveys in remote areas



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The Difficult Part

Software

- Multitude of Mobile GIS Apps
  - iGeoTrak
  - Collector
  - Fulcrum
  - GIS Pro
  - Wolf GIS
  - iCMTGIS
  - Theodolite
  - GeoJot+
  - TerraGo
  - Mapistry
  - Geospago
  - Avenza PDF Maps






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Date & Time: Wed Jun 25 09:20:59 PDT 2014
Position: 041.40014°N / 114.70380°W
Altitude: 5619ft
Azimuth/Bearing: 230° S50W 4089mils (True)
Elevation Angle: -05.2°
Horizon Angle: -01.1°
Zoom: 1X
WW-06-002-NE
Theodolite HD
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GeoJot+

Good Photolog Software

- Photos automatically linked to GPS point and compass bearing
- Eliminates manual photo loading
  - Saves on expensive office data entry time

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GeoJot+

Multiple formatting options

- PDF
- Word

Export KMZ with photos and attribute data attached

South Boulder Peak Trail Survey

File Name: Assessment of trail, signage, and structure condition_Map_Repair_5-8-2011.JPG

Attributes	
General Assesment	NA
Type	Map
Condition	Disrepair
Comments	NA
Action Needed	Repair
Title	South Boulder Peak Trail Survey
Elevation	6449 ft
Latitude	N 39° 56' 44"
Longitude	W 105° 17' 13"
Date Stamp	5/8/2011

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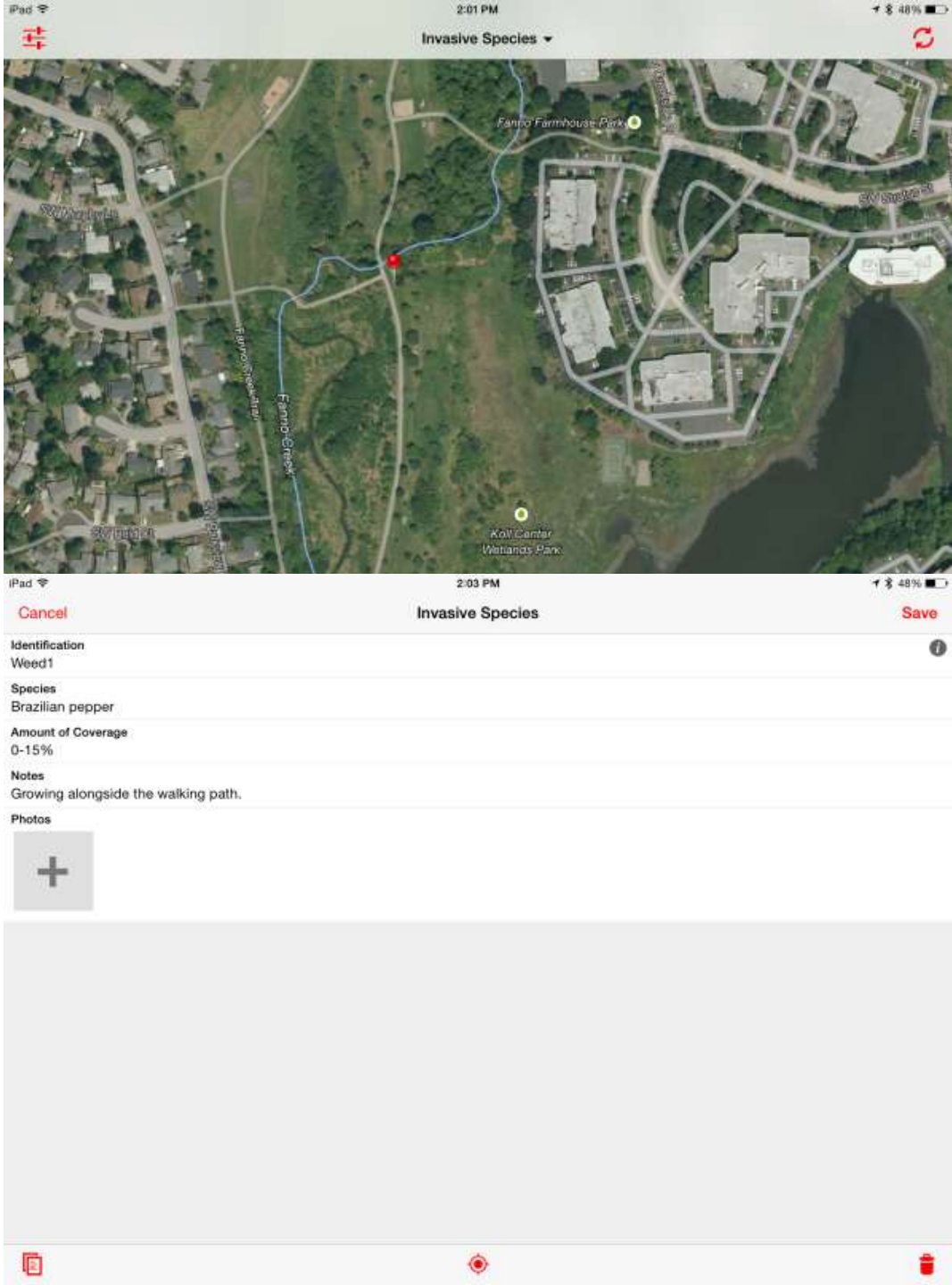
Fulcrum

Simple back end (HTML)

Multiple export options

- Shapefile
- CSV
- KMZ
- GeoJSON



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Fulcrum

Default report PDF export

Export reports customizable

T-2

Project	Mustang Run
Created	2014-03-20 21:32:25 UTC by Matthew Alexander
Updated	2014-04-02 14:32:25 UTC by Matthew Alexander
Location	36.7143845640001, -96.558241203

Bald Eagle Point Count Data

Point Count #	T-2
Date	2014-03-25
Observer	Sarah Rehme
Start Time Full Count	08:52
End Time Full Count	09:52

Bald Eagles Encountered

Birds observed 1

Eagle ID 1	NOHA
Start Time 1	09:44
End Time 1	09:45
Total Eagle Minutes Eagle ID 1	1
Age 1	Adult
800m Radius 1	In
Height 1	Low: 0 - 200 m AGL
Direction of Flight 1	NE
Behavior 1	Gliding
Notes 1	Northern Harrier

Weather Data

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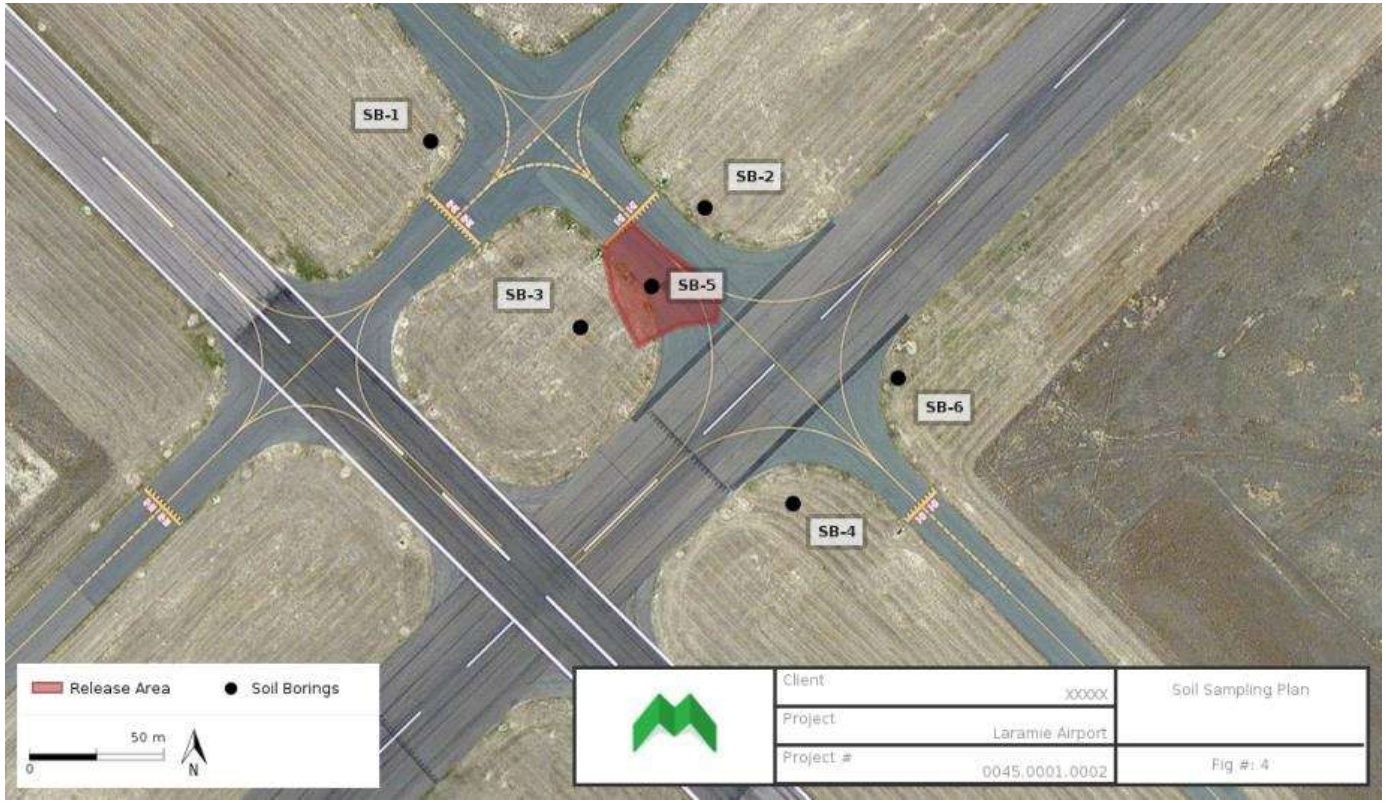
Mapistry

- Web browser based system for data collection
- Customizable legend and title box for simple map creation



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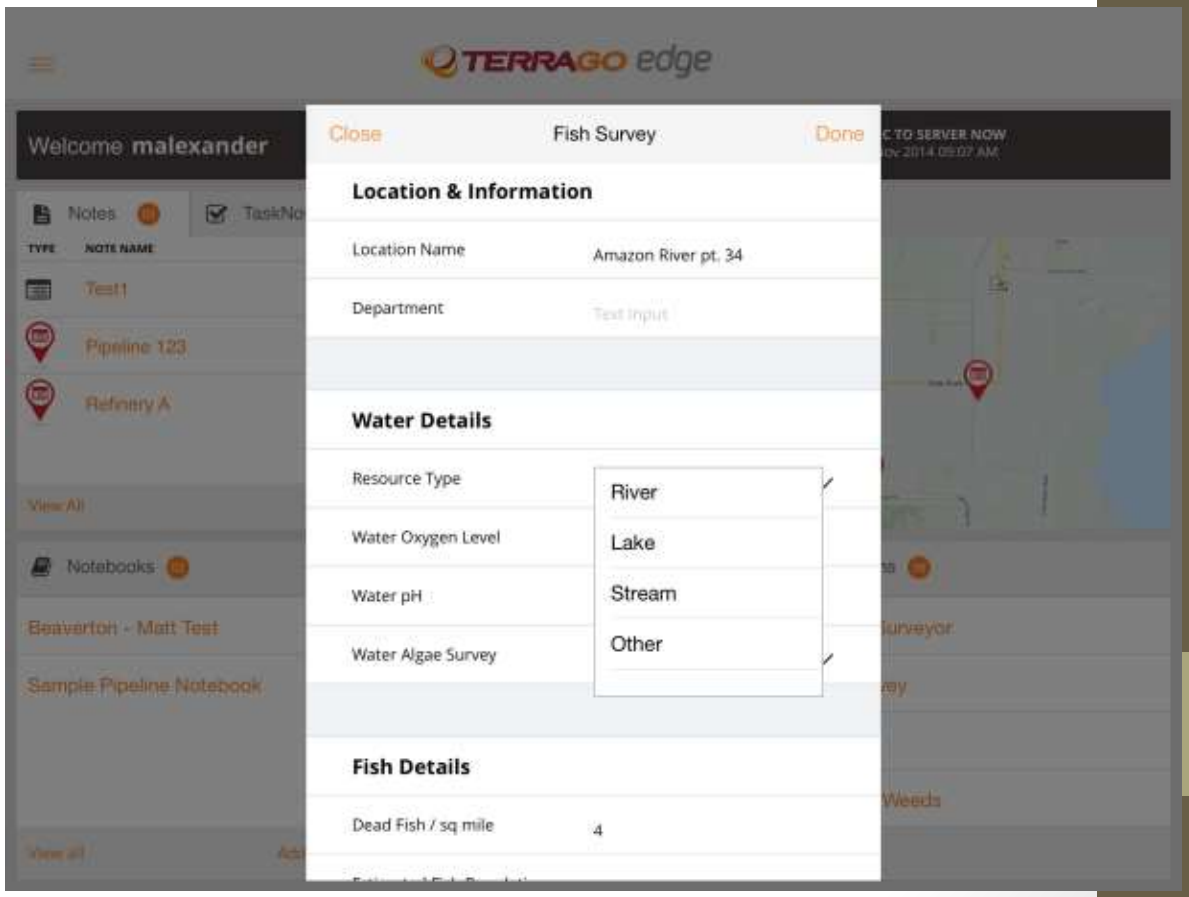
TerraGo Edge

- Custom offline maps
- Create “Task Orders”
- WMS feeds
- Record audio



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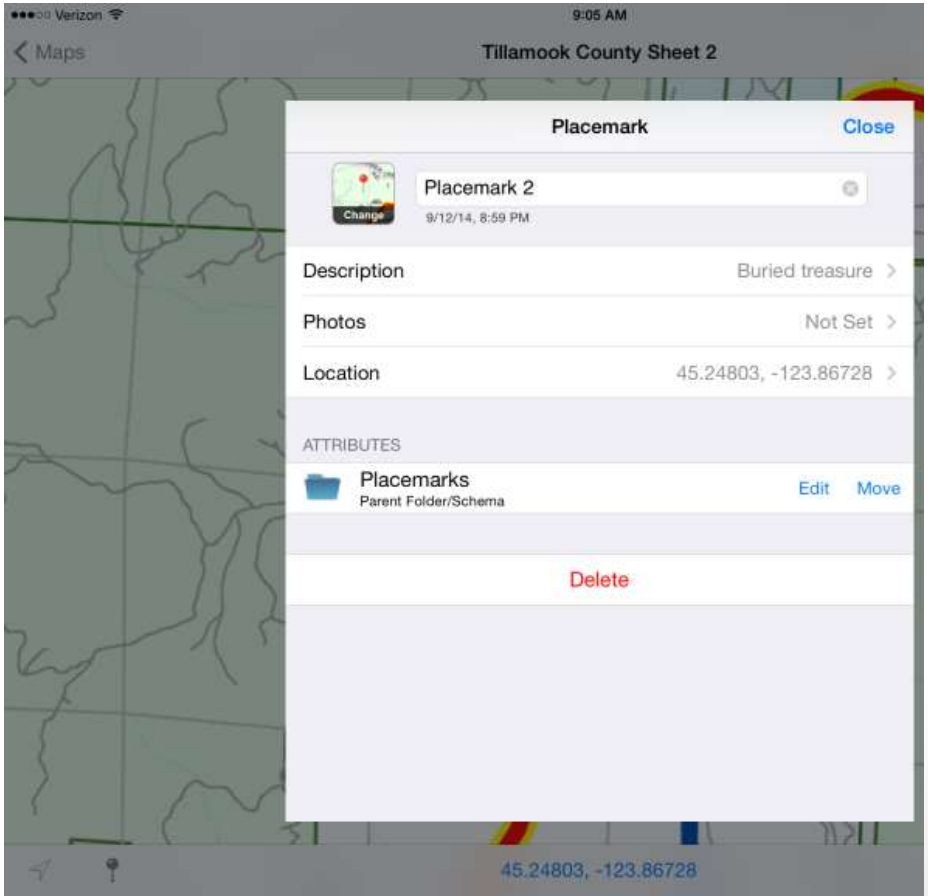
Avenza PDF Maps

- Buy GeoPDF's of USGS, USFS, and aerial maps
- Create simple attribute collection forms
- Pay for business



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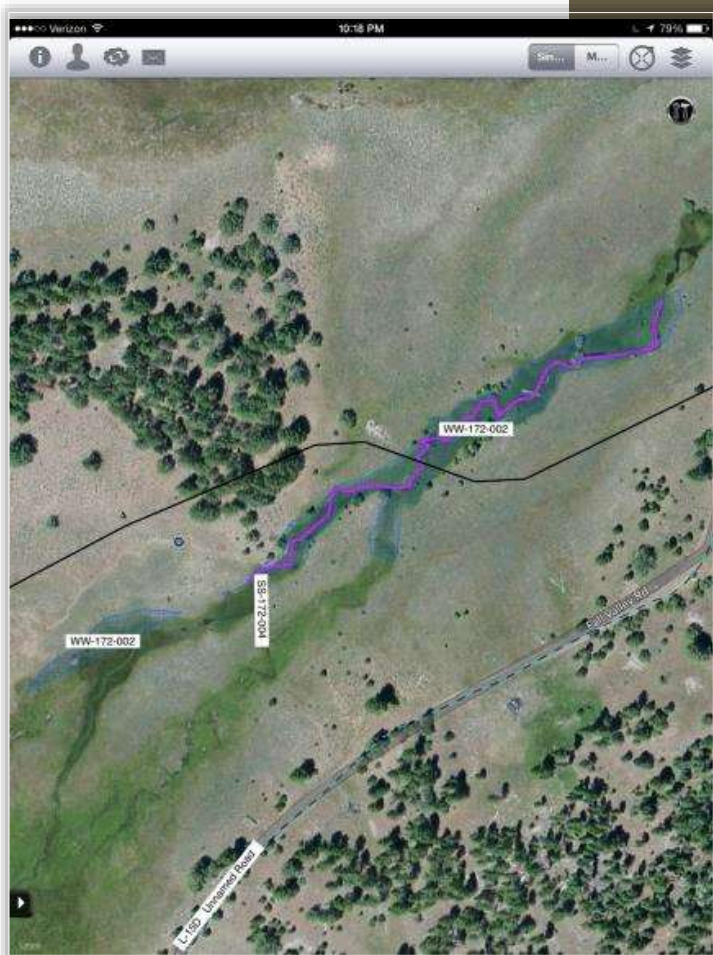
iGeoTrak

- Best mapping system: zoom *ANYWHERE* & offline image caching
- Direct integration of aerial imagery at all times
- Can upload additional imagery layers
  - NAIP satellite
  - UAV imagery
  - SSURGO soils data
  - USGS National Hydrography Data
- Points, Lines, Polygons
- Data syncs only DELTA
- SQL based system for robust database



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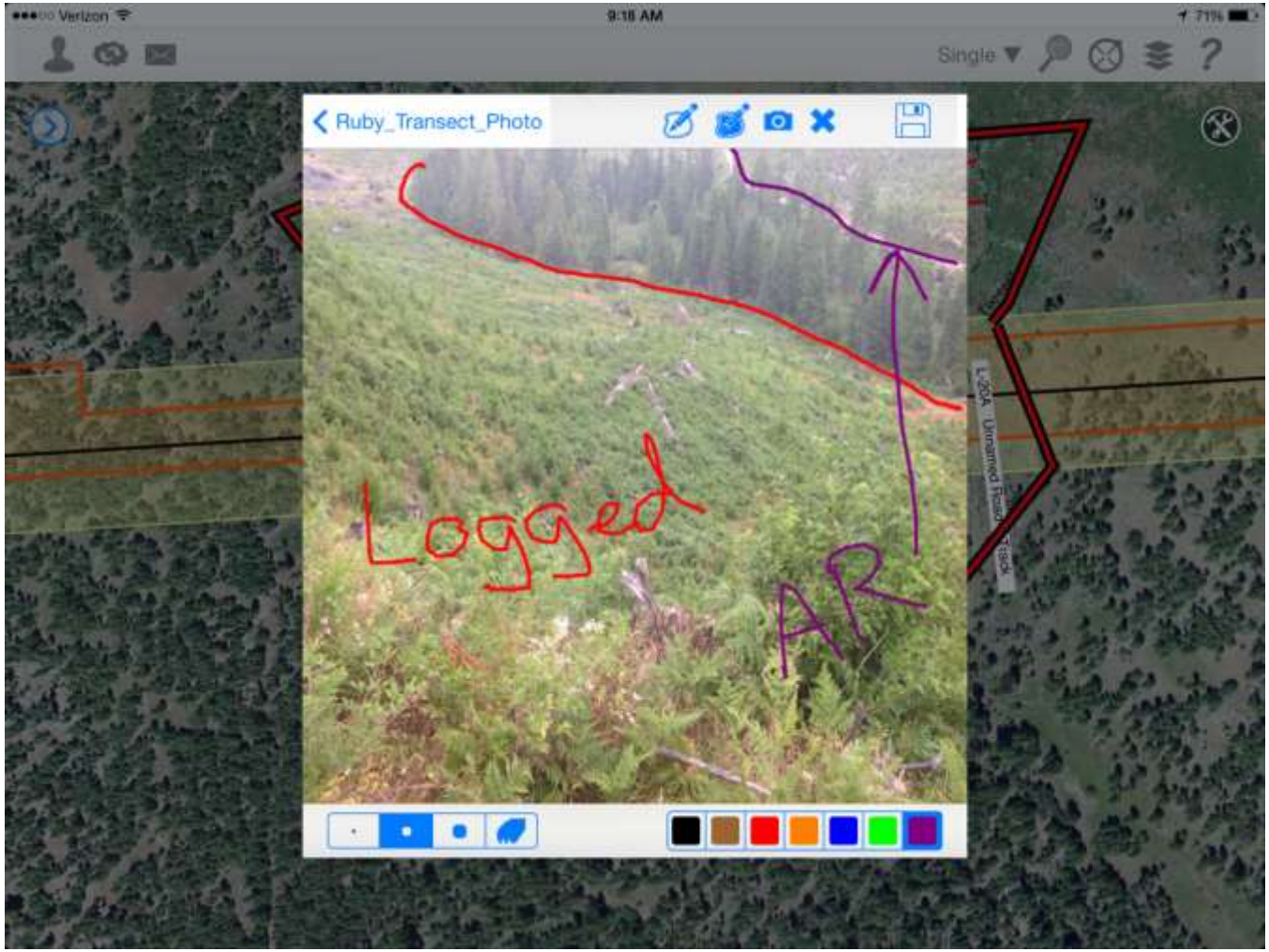
iGeoTrak



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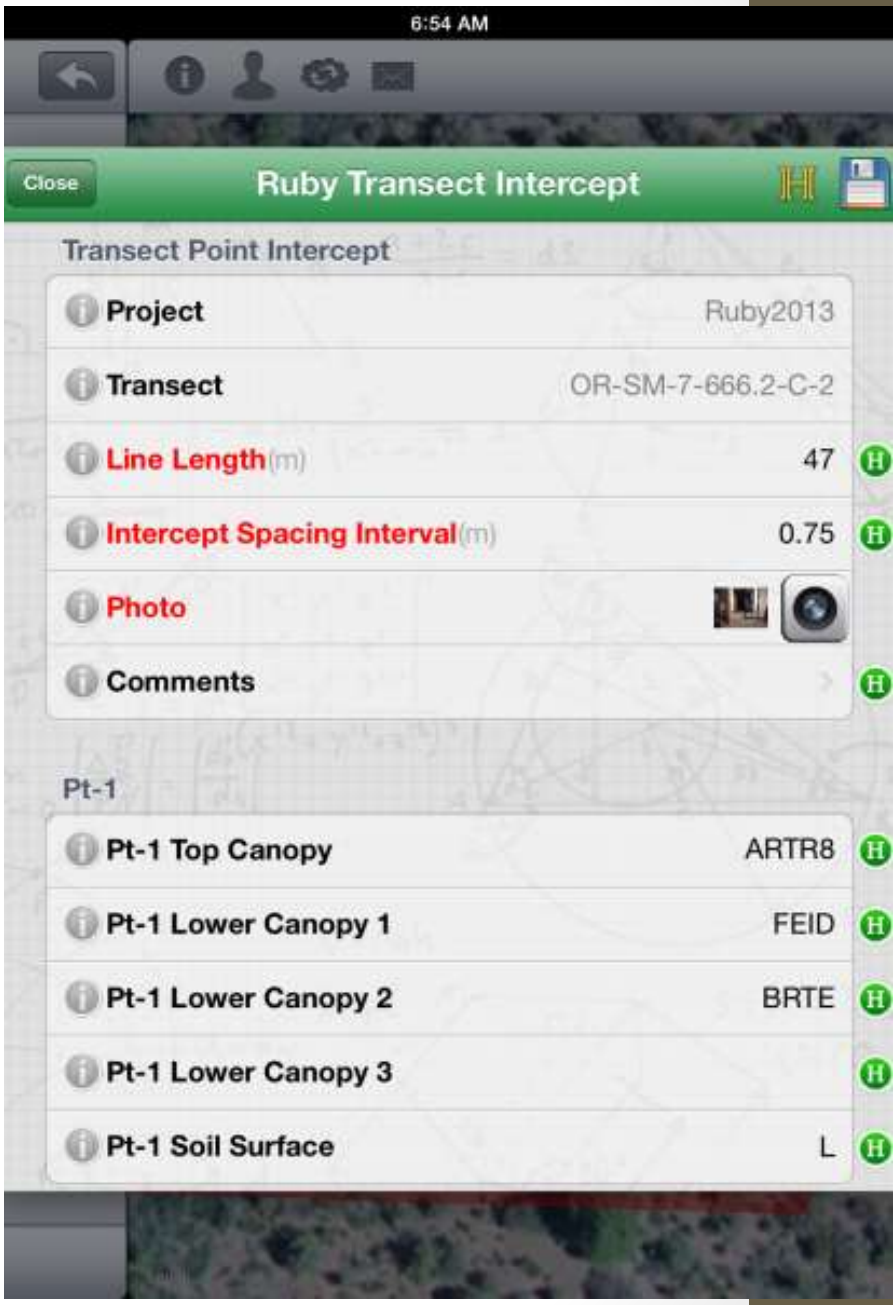
iGeoTrak

Customizable data collection forms (simple or complex)

- Multiple photo capture
  - Draw on photos
- Sketchpad
- Save map screenshot to point
- Dropdown picklists (5,000 species)
- Linked data fields
- Auto calculations
- Data history



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Post-con Habitat Monitoring Yr1

Old Field Data Management		iPad Field Data Management	
Activity	**Time**	**Activity**	**Time**
Photos: Trimble + Camera	24	Photos: iPad	14
Nightly download to laptop	2.5	Nightly synch to cloud database	0.2
Download new project files to Trimble	0.5	Synch new files to iPad	0.2
Weekly upload to FTP	1	Synch with cloud database	0.2
GIS data compilation	3	Data automatically compiled	0
Manual photo upload	4	Photos automatically linked to GIS features	0
Total hours per week	**31**	**Total hours per week**	**14.6**
Cost	**$2x**	**Cost**	**$x**

Time estimated per team per week for photo centric field work

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Habitat Monitoring Yr 2: All In

6 Field Teams

- All teams switched to iPads paired with external GPS and electronic data sheet collection and photos (*no paper*)

- Each team completed scheduled tasks 20 – 30% faster than estimated thanks to:
  - Field iPad
  - External GPS
  - iGeoTrak utilizing cloud interface
  - Cellular data plan when service was available (*mostly offline; very remote areas*)

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Additional Information

www.anatumfieldsolutions.com

Visit Field Talk Blog

- Discussions of Mobile GIS best practices
- Links to our Mobile GIS publications
- Interviews with:
  - iGeoTrak
  - Fulcrum
  - Mapistry
  - Avenza PDF Maps
  - Geospago

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Publications

- *Increasing the Efficiency of Aerial Surveys By Using Tablets for Project Siting*, March 2015

- *Using the Tablet in the Field: Pipeline Post-Construction Restoration Monitoring Case Study*, March 2015

Handheld GPS vs. Mobile GIS

- Handheld GNSS
  - ArcPad/Terrasync
  - GPS Correct (*needed for post-processing*)
  - Internal GNSS
    - System can use Real-Time Differential GPS and/or Post-Processing

- Mobile GIS: Tablet and External GNSS
  - GNSS
  - Manufacturer specific SDK
  - GIS App
    - System relies on Real-Time Differential GPS