Growing Up: From AutoCAD to ArcGIS

Ericka Witcher
• Non-profit research center
• 12,000 plants on 120 acres in Miami, Florida
• Sub-tropical zone
- MBC specializes in growing palms...
...and cycads
• tropical conifer collection is growing, too
Focus on wild-collected plants

- MBC uses population-based sampling to build collections
- 74% of our palms and 85% of our cycads are known wild-collected
- Stringent about permits
- 26% of our taxa are IUCN red-listed
Ex-situ conservation

• Botanical collections have become very important for ex-situ conservation
Corypha taliera - India

- Extinct in the wild
- only 20 known plants worldwide
- MBC has 13
Cycas micronesica - Guam

- Widespread devastation due to cycad aulacaspis scale (CAS)
- MBC has representatives from many different populations
Ex-situ conservation

• Botanical collections have become very important for ex-situ conservation
• In-situ conservation isn’t always likely or possible
Hemithrinax ekmaniana - Cuba

• Found in only one known location
Ex-situ conservation

• Botanical collections have become very important for ex-situ conservation
• In-situ conservation isn’t always likely or possible
• Recent paper contributed to by MBC demonstrated that a sample size of 15 can have a very high allelic capture
Generally speaking…

• We’re looking to maximize survival rates with analysis of current collections and records, both spatial and temporal
Data

• MBC maintains meticulous records
### Accession Number

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How we began – AutoCAD maps and tables

• a catalog of who was where, but not much more info
• within the map itself, the lines and symbols had no meaning
• maps for display, locating plants or utilities
Basemap showing plant locations
Basemap showing utilities
How we began – AutoCAD maps and tables

• basic integration of database (BG-Base) with AutoCAD through BG-Map
BG-Map: handy "driver" program for AutoCAD with BG-Base; doesn't store any actual info
How we began – AutoCAD maps and tables

- desire for something more powerful
- easy to use with a GPS unit
- myself and Michael’s previous experience
- ESRI Botanical Garden and Zoological Park (BGZP) grant
- TopCon TotalStation breaking clinched it – had to do a complete conversion
The napkin: what I had THEN (ca. ESRI UC 2008)
The napkin: what I wanted
The Process: from AutoCAD to ArcGIS
1. Certain monument points were GPSed; these corresponded to aerial photo markers and the CAD layer.
2. Once in Arc, exported individual CAD layers into shapefiles with same monument points

“Roads” layer turned on in AutoCAD with monuments

Saved dwg added to Arc, then converted to shapefile
3. Georeferenced the new shapefiles with the monument points

- This process was repeated for 23 different CAD layers and the 2008 aerial photo
- Not perfect, some skewing
- A lot of clean-up
The Process: from AutoCAD to ArcGIS

- GPSed/digitized other new things (e.g., new utilities, expanded rock areas, turf areas)

- Soon able to make up-to-date, basic new maps quickly for staff, researchers, etc
Protocols: new methods

how to do what we did before, but in Arc?

• Finding plants, etc for staff and others
Visiting Researcher vs. Curatorial Staff
Protocols: new methods

how to do what we did before, but in Arc?

• Finding plants, etc for staff and others
• Large format maps
• Inventory – process and maps
Don’t need too many layers - just enough to locate plants when printed in B&W

Only need ‘Acc#’, ‘Sp. Name’, and ‘Type’ fields for each quad report
Protocols: new methods

how to do what we did before, but in Arc?

• Finding plants, etc for staff and others
• Large format maps
• Inventory – process and maps
• Quadrant maps – the doozy
• MBC has 127 quadrants with plants, utilities, etc.
more about the Quadrant Map

• Quad maps are used for all field operations

• Lots of visual information must be displayed at once

• Text notes stored in AutoCAD map are essential: represent former and current employee knowledge about an area, guide decisions about everything
AutoCAD utilities annotation = 1000s of notes (10-15 years worth) with no digital connection to the line drawings
- had to leave as CAD and align with False Easting and Northing process; still a little off in places
- created Arc annotation for plants instead of trying to label
New napkin: what I have now (2010)
New napkin: what I have now
(2010)

PROBLEM
New napkin: what I have now (2010)

SOLUTION:
Human Intermediary

(i.e., I do double-data entry)
Onward & Upward
Onward & Upward

New!
Onward & Upward

- Many different study and assessment options now available
- Spatial: analysis with imagery, proximity studies
- Temporal: phenology data projection
• LiDAR provides clues for planting locations
Soil Map

• Critical importance for plants
• What do we have and where? Deep soil layer? Sand?
Development or management?
Resource allocation

- Determining investments of limited time and funds
• Some projects can now be performed by volunteers
In-depth scientific research: projection of data

- No direct link with database, so we query and export to an Excel table, then join in Arc
- Hope to do more with phenology data
What’s the point?

• It’s all about maintaining and improving the health of current collections and preparing for future additions
• ArcGIS lets us do that better than ever
Thanks