GPS & GIS
for
Hurricane Debris Removal

City of Miami
Miami, Florida

June 19, 2007
City of Miami, FL

- Location: Miami-Dade County, Florida
- Incorporated: July 28, 1896
- Population:
  - 2000: 362,470
  - 2019 (projected): 390,191
- Area: 35 Square Miles
- Climate: Subtropical
- Elevation: 12 Feet above Sea Level
- Temperature:
  - Annual Average: 75.9°
  - Average January: 67.2°
  - Average July: 82.6°
Hurricanes 2005

- **Katrina**
  - 8.25.05
  - Tropical Storm => Hurricane Level 1

- **Rita**
  - 9.20.05
  - Tropical Storm => Hurricane Level 1

- **Wilma**
  - 10.24.05
  - Hurricane Level 3
City Needs

- Assessment of tree damage caused by Hurricane Wilma
- Method to help monitor and coordinate tree debris collection
- Documentation of damage and debris removal for clean-up reimbursement by FEMA
Solution

- Collecting tree debris data using mobile GIS (Tree Debris Inventory)
- Compiling a comprehensive citywide tree debris database (Database Processing)
- Creating maps and reports visualizing and detailing tree debris information (Maps and Reports)
Tree Debris Inventory

- Trained 4 two-person field crews on inventory methodology and mobile GIS

- Crews equipped with laptop, GPS device, and digital camera

- Inventory consisted of field data collection, followed by nightly database synchronization
Tree Debris Inventory

• Developed ArcPad data entry forms to be used by the field crews

• Forms designed to collect information on:
  - Debris type (fallen tree, tree limb, property damage)
  - Trunk diameter; limb diameter/length (important for FEMA Eligibility)
  - Location address
  - Location coordinates (lat/long)
  - Photo ID
Tree Debris Inventory
Tree Debris Inventory

- Set up GIS database to be used by field crews

- Data derived from the Miami database includes:
  - City and district boundaries
  - Garbage collection zones
  - Street and address data
  - City-owned parks
  - Water features
  - Aerial imagery
Tree Debris Inventory
Tree Debris Inventory Results

- **Fallen Trees**
  - Citywide (in road right-of-way) 0760
  - Parks 0340
  - Total 1100

- **Trees with Hanging Limbs**
  - Citywide (in road right-of-way) 6166
  - Parks 0653
  - Total 6819

- **Property Damage**
  - Citywide (in road right-of-way) 87
  - Parks 05
  - Total 92
Database Processing

- Office staff managed master GIS database, workflow included:
  - merging individual uploads into one comprehensive debris database
  - Address matching (performing spatial join)
  - Checking for potential duplicate records
  - Picture matching
  - Screening of records for FEMA Eligibility
  - Screening of comments for additional information
  - Calculating lat/long coordinates
  - General QA/QC
Generating and maintaining comprehensive tree debris database
Maps and Reports

• Generated maps for individual City zones and districts detailing fallen trees, broken limbs and property damage

• Generated a series of Access™ reports detailing debris locations with corresponding attributes and photos
Maps and Reports

CITY OF MIAMI

Citywide Fallen Tree and Property Damage
District 1
Commissioner: Angel Gonzalez

Hurricane Wilma Debris Management

Legend
- Green Diamond: Fallen Tree
- Orange Circle: Property Damage
- Gray Lines: Federal / State / County Roads
- Dark Gray Lines: Streets
- Light Blue: District 1

Districts City of Miami Overview

HDR
### Maps and Reports

#### City of Miami

**Hurricane Wilma Debris Recovery**

**Fallen Tree Stump and Hanging Limbs Removal**

**FEMA No. 1605-DR, Florida**

**Report for Collection Zone: 111**

<table>
<thead>
<tr>
<th>Map ID</th>
<th>FEMA Eligible</th>
<th>Collection Zone</th>
<th>Date</th>
<th>Tree on Power Lines</th>
<th>Stump Diameter (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Y:</td>
<td>26.8703214118</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tree on Power Lines:</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Y:</td>
<td>25.8096200586</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tree on Power Lines:</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Y:</td>
<td>26.86012941790</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tree on Power Lines:</td>
<td>36</td>
</tr>
</tbody>
</table>

**Comments:**

- **FALLEN TREE**
  - **3-4 FEET DIAMETER FALLEN**
  - **DUE TO TREE / PLUS LINING**

  **Address:**
  
  **2405 NW 13TH CT**
  
  **MIAMI, FL 33142**

  **Picture:** Picture01.jpg

- **FALLEN TREE**
  - **BIG FALLEN TREE BLOCKING SIDEWALK / 4 FEET DIAMETER**

  **Address:**
  
  **1181 HICKS CAYNE BLVD**
  
  **MIAMI, FL 33140**

  **Picture:** Picture02.jpg

- **FALLEN TREE**
  - **FALLEN TREE / DIAM 3 FEET**
  - **PROPERTY DAMAGE / TREE RESTING OVER A FENCE, AND BLOCKING PUBLIC SIDEWALK**

  **Address:**
  
  **2415 NW 8TH AVE**
  
  **MIAMI, FL 33127**

  **Picture:** Picture03.jpg
Benefits

• Database helping the City:
  - Verifying reports from calling residents about tree debris
  - Updating existing tree inventory

• Reports and maps resulted in cost savings for the City by:
  - Serving as basis for debris removal contractors
  - Allowing the City to define amount and location of debris removal
  - Limiting the possibility of cost overruns by collecting out of scope debris
Benefits

• Reports and maps provided FEMA field staff with valuable information, facilitating FEMA workload and saving time and money
Lessons Learned

• Extensive training of field crews and standardized collection effort will reduce time and effort of data processing considerably
• Provide field crews with the latest master collection file in order to avoid potential collection of duplicates
• Standardizing and streamlining caption of pictures:
  - Unique picture names
  - No portrait pictures
  - 1st picture showing whole area of damage, 2nd showing a close up
Why GPS?

- Accuracy & Quality Control
  - Positional
  - Attribute
- Data Stakeholders
- Cost Efficient
- City Staff "existing experts"
Division of Forestry conducted a visual assessment of the City of Miami post hurricane damage in February 2006 during a mini-tour.

- 75% of the mature trees showed hurricane damage
- Tree Canopy (National avg.): 20%
- Tree Canopy for the City: 5%

2006 USDA Grant
The City of Miami received a 2006 Urban and Community Forestry Grant from the Florida Dept of Agriculture’s Division of Forestry for $25,000.

- **Hardware**  $45,140
- **Software**  $4,840
- **Total**  $49,980
- **USDA Grant**  -$25,000
- **City Match**  $24,980
2006 USDA Grant

- 6 Geo XT GPS handheld units
- 4 RICOH Pro G3 Cameras & WI-FI cards
- 1 Contour XL Ric Laser Rangefinder - bluetooth & hardware
- 1 Zephyr Antenna, Pole & hardware
- 1 GPS Analyst Extension (includes ArcPad 7 & GPS Correct software)
- 3 copies of ArcPad 7 software
- 5 copies of Trimble GPS Correct software
### Purchase Status

- **In the City procurement process**

- **Currently utilizing the following units borrowed from other Departments:**
  - Geo XM
  - Parks Dept
  - Geo XH
  - IT/GIS Dept
Project Staff

- **GIS Developers**
  - Regina Hagger – Public Works
  - Ruth Dagnan – IT/GIS

- **GIS/CADD Technician**
  - Martin Arteaga – Public Works

- **Parks Naturalists**
  - Juan Fernandez
  - Ernesto Martinez
Field Testing

1/12/06 GPServe, Inc. and
2/21/06 NEI, Inc.

- **Trimble GeoXH handheld with TerraSync software:**
  - Total # of structures collected: 35
  - Fire Hydrants – 4
  - Bus Benches – 3
  - Catch Basins/Inlets – 16 (City)
  - Catch Basins/Inlets – 2 (FDOT)
  - Trees – 10
  - Nature Trail – 1 mile
  - Accuracy:
    - Vertical: from 0.6 feet (8 inch) to 4.5 feet
    - Horizontal: from 0.4 feet to 2.8 feet

- **Trimble ProXRS backpack with Recon and ArcPad 7.0 software:**
  - Total # of structures collected: 27
  - Fire Hydrants – 3
  - Bus Benches – 2
  - City Storm Water Catch Basins/Inlets – 12
  - Trees – 10
## Field Testing Results

<table>
<thead>
<tr>
<th>Comment</th>
<th>Max PDOP</th>
<th>Max HDOP</th>
<th>PDOP Type</th>
<th>GPS Type</th>
<th>GPS Date</th>
<th>GPS Time</th>
<th>Update Site</th>
<th>Feature Name</th>
<th>BaseFile</th>
<th>Week</th>
<th>Pos</th>
<th>Filter</th>
<th>Rate File</th>
<th>GPS Week</th>
<th>GPS Second</th>
<th>GPS Height</th>
<th>Ve</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2.0</td>
<td>1.2</td>
<td>Postprocessed</td>
<td>Carrier Float</td>
<td>2001-06-03 11:07:38</td>
<td>New</td>
<td>point</td>
<td>R222111B</td>
<td>2</td>
<td>2</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>Geostation</td>
<td>1.63</td>
<td>2448020000</td>
<td>0.001</td>
<td></td>
</tr>
</tbody>
</table>
Field Testing Results
Hardware

- Trimble Geo XM
  - 1 – 3 meter GPS accuracy real time and Post Processing (PP)
  - Accuracy suitable for asset management (benches, news racks, bus stops, payphones, fire hydrants, trees...)
  - Price: $2,335 Hardware only
  - Software & Hardware Bundle Price: $3,150 (includes ESRI ArcPad & Trimble GSPcorrect software)
Hardware

- **Trimble Geo XH**

  - Sub-meter GPS accuracy in the field (sub 30cm Post Processed {PP})

  - Accuracy suitable for storm water infrastructure & asset management (catch basins, manholes, outfalls...)

  - Hardware Price: $ 4,765.

  - Hardware & software Bundle Price: $ 5,350 (includes ESRI ArcPad & Trimble GPScorrect software)
Hardware

Zephyr Antenna & Pole

- Why do you want this?

- ‘Canyon & Canopy’ effect
  - Assists in collecting in Urban canyon aka ‘Downtown’ and in Tree Canopy – Coconut Grove

- Antenna $2000
- Pole $235
- Bracket $175
Hardware

- Ricoh Pro G3 GPS Camera
  - Requires Compact flash
  - Price $870.00 (camera)
  - Speeds data collection by documenting actual condition of asset (tree)
Future Hardware

Lasercraft Contour Laser Rangefinder

- Why do you need this?
  - Measures heights of buildings, trees
  - Can collect many assets you may not be able to reach physically
    - Across canals, streams & rivers
    - Construction or industrial sites that are fenced, hazardous, or inaccessible
- $4,195 Rangefinder
- $200 Yoke Assembly
- $145 Bipod for Laser Pole
City Goals

- Plant 100,000 trees by 2010
- Inventory all trees in the Road Right of Way and on City Property using GIS
- Track current tree inventory
- Implement effective Tree Management practices
- Become a Tree City USA
- Annual City-wide Arbor Day Celebration
- Create an Urban Forestry Plan
GPS Pilot Project

- GPS Data Collection on Virginia Key
  - Collection of rare and endangered trees and shrubs on Virginia Key
  - Documentation of the habitat restoration project
  - NOAA Grant to The Parks Department
  - Started Data collection in July 2006 w/Geo XM
Software

ArcSDE 9.0
ArcGIS 9.1
ArcPad 7
Active Sync 4.2
ArcPad Application Builder 7
Trimble GPS Correct
# Database Fields

## Trees
- **Common Name**
- **Genus & Species**
- **DBH**
- **HT_FT**
- **HT_IN**
- **In ROW**
- **Condition**
- **Gender**
- **Insp_Date**
- **Insp_By**
- **Flowers**
- **Flower color**
- **Image**
- **Native**
- **Permit_NO**
- **TAG_NO**

## Shrubs
- **Common Name**
- **Genus & Species**
- **DBH**
- **HT_IN**
- **In ROW**
- **Condition**
- **Gender**
- **Insp_Date**
- **Insp_By**
- **Flowers**
- **Flower color**
- **Image**
- **Native**
- **Permit_NO**
- **TAG_NO**
Trees

- 131 Tree Types
- 52 Shrub Types
### Database Properties

#### General

<table>
<thead>
<tr>
<th>Domain Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Flowers</td>
<td>Are there Flowers?</td>
</tr>
<tr>
<td>Flower Color</td>
<td>Valid Flower Colors</td>
</tr>
<tr>
<td>Flowers</td>
<td>Do Flowers Exist?</td>
</tr>
<tr>
<td>Gender</td>
<td>Valid Tree Gender</td>
</tr>
<tr>
<td>Inspector</td>
<td>Valid Inspector name</td>
</tr>
<tr>
<td>Location</td>
<td>Valid ROW Locations</td>
</tr>
<tr>
<td>Native</td>
<td>Valid Native Plant</td>
</tr>
</tbody>
</table>

#### Domain Properties

<table>
<thead>
<tr>
<th>Field Type</th>
<th>Short Integer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain Type</td>
<td>Coded Values</td>
</tr>
<tr>
<td>Split policy</td>
<td>Default Value</td>
</tr>
<tr>
<td>Merge policy</td>
<td>Default Value</td>
</tr>
</tbody>
</table>

#### Coded Values

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
</tr>
</tbody>
</table>
### Field Name: Properties

#### General Tab

**Domain Name** | **Description**
--- | ---
Existing Flowers | Are there Flowers?
Flower Color | Valid Flower Colors
Flowers | Do Flowers Exist?
Gender | Valid Tree Gender
Inspector | Valid Inspector name
Location | Valid ROW Locations
Native | Valid Native Plant

#### Domain Properties

- **Field Type**: Text
- **Domain Type**: Coded Values
- **Split policy**: Default Value
- **Merge policy**: Default Value

#### Coded Values:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JS</td>
<td>Justin Schreiber</td>
</tr>
<tr>
<td>MA</td>
<td>Martin Arteaga</td>
</tr>
<tr>
<td>RH</td>
<td>Regina Hagger</td>
</tr>
<tr>
<td>RM</td>
<td>Roland Schnee</td>
</tr>
</tbody>
</table>

### Domains Tab

#### Domain Name: Properties

**Domain Name** | **Description**
--- | ---
Existing Flowers | Are there Flowers?
Flower Color | Valid Flower Colors
Flowers | Do Flowers Exist?
Gender | Valid Tree Gender
Inspector | Valid Inspector name
Location | Valid ROW Locations
Native | Valid Native Plant

#### Domain Properties

- **Field Type**: Text
- **Domain Type**: Coded Values
- **Split policy**: Default Value
- **Merge policy**: Default Value

#### Coded Values:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JS</td>
<td>Justin Schreiber</td>
</tr>
<tr>
<td>MA</td>
<td>Martin Arteaga</td>
</tr>
<tr>
<td>RH</td>
<td>Regina Hagger</td>
</tr>
<tr>
<td>RM</td>
<td>Roland Schnee</td>
</tr>
</tbody>
</table>
Software

ArcPad Application Builder 7
Future Software

ESRI GPS Analyst
Trimble Terra Sync
Lessons Learned

- Planning
- Batteries
- Aerials (think twice!)
- Consider doing a field test of equipment (hardware & software)
- Compare notes with a GIS network resource
- Borrow equipment form another Dept.
Suggestions

- Start with a geo-database
- Budget for storage space to store pictures
- Data Collection Teams minimum of 2 people
Presenters Information

Regina L. Hagger  
**GIS Developer**  
City of Miami  
Department of Public Works  
444 SW 2nd Avenue, 8th Floor  
Miami, FL 33130  
Phone: (305) 416-1749  
Fax: (305) 416-1278  
E-mail: rhagger@ci.miami.fl.us

Michael Schmedt  
**GIS Analyst**  
HDR Engineering  
315 E. Robinson, Suite 400  
Orlando, FL 32801-1949  
Phone: (407) 420-4257  
Fax: (407) 420-4242  
E-mail: michael.schmedt@hdrinc.com
End Notes

- All Photographs were taken by City of Miami employees or contractors, with the exception of:
  - Trimble Hardware & Software
  - ESRI Hardware & Software
  - Ricoh Hardware