Integrating GIS with Mosquito Control and Stormwater Management

By: Janice Pulver
Overview

• What is GIS?

• Software and Hardware Used

• General Process

• Project Examples
  • Stormwater Management
    • Mapping Maintained Ditches
  • Mosquito Control
    • Adulticiding

• Mosquito Control and GIS Moving Forward?
What is GIS?

- GIS stands for geographic information system
- Designed to capture, store, manipulate, analyze, manage, and present geographic data
- Basically it is creating or pulling layers of specific features to build into what the user wants to reference or analyze spatially
Hardware Used

Desktop

Mobile Devices

iPhone

iPad

Mesa

Cellular Data

Wi-Fi
Creators and Record Keepers

ArcMap
- Creating layers
- Editing
- Map making
- Analysis

ArcCatalog
- View data
- Organize it
  - Topic
  - Time
- Manage the data
  - Add domains to layers

Survey123 Connect
- Create surveys
- “behind the scenes” data
- Pull data from layers
- Data in a consistent format

Who is larviciding?
- Janice
- Betsy
- David

Add domains to layers
Data Collection

ArcGIS Online (AGOL)
- Manage and customize online maps, layers, and data

Survey123
- Input and track tasks
- Data is viewable online
- Can be exported into a variety of file types

Collector
- Update or map new data in the field
- Keep track of what’s been inspected

Home > Stormwater Maintenance iPhone
Data Collection cont.

1. View map and all layers in it

2. Touch the feature you want to look at or update

3. Update data
   a. Drop downs are customized domains that restrict the data that can be entered

4. Submit Changes
   a. Customized it so changing particular data changes the symbology
      i. Helps keep track of what’s been updated
In-field Information

• If we get a new work order out in the field we can:
  • Search for the citizen’s address
  • See what fog area they are in
  • Show the extent of their property/parcel
  • Any easements, maintained ditches, or known larval hot spots near the property

Shows AGOL maps and associated data.
Dissemination of Information
Mosquito Control Peers

Tidewater Regional Arbovirus Surveillance Team
West Nile Virus and Eastern Equine Encephalitis Positives in 2019

City or County Locations in Virginia

Western Equine Encephalitis Positives

Hampton Roads

Northern Virginia

Central Virginia

Species: Cx. pipiens/restuans, Cx. quinquefasciatus

<table>
<thead>
<tr>
<th>Species</th>
<th>Chesapeake</th>
<th>Falls Church</th>
<th>Fairfax</th>
<th>Henrico</th>
<th>Norfolk</th>
<th>Prince William</th>
<th>Suffolk</th>
<th>VA Beach</th>
<th>York</th>
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</thead>
<tbody>
<tr>
<td>Cx. pipiens</td>
<td>12</td>
<td>12</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>5</td>
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<tr>
<td>Cx. melanura</td>
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<td>4</td>
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<tr>
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<td>7</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>6</td>
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</tbody>
</table>

*Data includes West Nile positive sites.
Citizens
Stormwater Management GIS Project

Mapping Maintained Ditches
Stormwater Maintained Ditches

- All the maintained ditches were hand drawn into map books
  - Books were worn out and not updated with new developments
  - Hard to find ditches because the drawings were not that accurate
Phase 1 - Stormwater Maintained Ditches

- Phase 1
  - Last winter, mapped the ditches based off the Supervisor’s memory, map book, and aerial imagery
    - Mapped by drawing lines in ArcMap and entering in the associated data

- Phase 1 result
  - Realized that the crews did not have an evenly distributed amount of footage to clean
    - Calculated footage based off of what was drawn in ArcMap
  - The crew areas were rearranged
    - Areas were divided spatially, not based off of County Supervisor Districts
  - Renamed and numbered ditches in a consistent format
### Phase 1 cont.

<table>
<thead>
<tr>
<th>Team</th>
<th>Old Footage</th>
<th>New Footage</th>
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<tbody>
<tr>
<td>Red</td>
<td>103,496</td>
<td>126,473</td>
</tr>
<tr>
<td>Yellow</td>
<td>115,640</td>
<td>140,005</td>
</tr>
<tr>
<td>Blue</td>
<td>178,432</td>
<td>131,091</td>
</tr>
</tbody>
</table>

~70,000 more feet!
Phase 2-Stormwater Maintained Ditches

- Phase 2a
  - Walk each maintained ditch and map it with Collector on the Mesa tablet

- Phase 2b
  - See if there is a ditch we should maintain in drainage or drainage/utility easements
    - Collect data on why we don’t maintain some drainage easements if someone calls

- Phase 2 result
  - Accurate footage
  - Know the direction water flows and ditch material
  - Mapped obstructions
Stormwater Mapping and Mosquito Control

- While out mapping ditches, we also come across things beneficial for Mosquito Control
- We have found three beehives that were not on our Spray Avoidance List
- Finding mosquito breeding areas
Mosquito Control GIS Project

Transitioning to Adulticiding Software
Adulticiding Fog Areas

- Old areas did not go in order numerically
- The drive time was different for each
- Only hand drawn on a wall map

Old York County Fog Areas
Adulticiding Fog Areas cont.

- New areas go in order numerically North to South
- Each route takes the same amount of time to complete
- Became the basis of the trapping routes
Adulticiding Spray Software

- Started using a spray software in 2017
- Before this, we could only track the driver by what they tell us and the GPS unit every County vehicle has
  - Gave us an estimated time when they went by houses
  - Didn’t let us know if the sprayer was on or off though
- Driver had to memorize or keep looking at papers for directions
Adulticide Spray Software cont.

- The current spray software uses GIS to display what we want the driver to see
- Gives the driver visual directions for the fastest way to complete the route
- Data is pulled from those layers to incorporate into reports
Mosquito Control and GIS
Moving Forward?
Years of trapping and adulticiding data

Access to public data: land cover, infrastructure, weather data, etc.

Mosquito Control employees don’t have the time, access to what we need, or experience

Data Analysis
Possible Answer to Data Analysis

- Other positives
  - Let college students know about our field
    - Possible interns
  - Project can be any length of time
    - One class, multi-semester project, etc.
  - Students are not restricted to specific cities or counties

- Reaching out to GIS Programs in Universities
  - Provide the data
  - Present to the students to help generate ideas
  - Students develop and work on a project
  - Students gain experience and Mosquito Control increases their knowledge
Examples of Data Analysis


- The examples, and what the students take on, has the potential to be used by numerous Mosquito Control Organizations

- Tools can be developed, time saving practices, general research, etc.
  - THE POSSIBILITIES ARE ENDLESS

- Hopefully, we can take advantage of GIS and use it to its full potential for the benefit of everyone
Thank You

Questions?