



# Integrating GIS with Mosquito Control and Stormwater Management

By: Janice Pulver

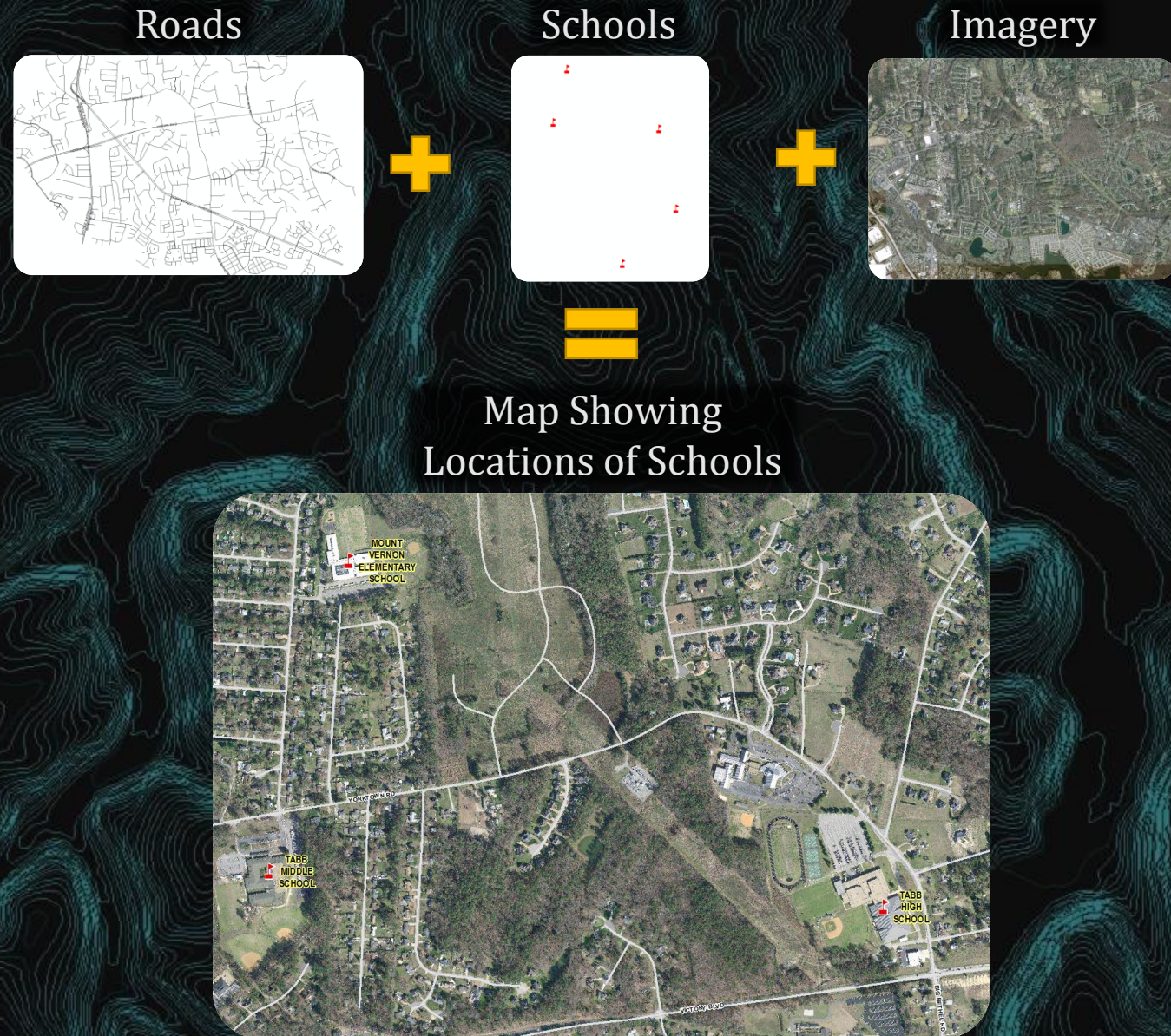
# Overview

- What is GIS?
- Software and Hardware Used
- General Process
- Project Examples
  - Stormwater Management
    - Mapping Maintained Ditches
  - Mosquito Control
    - Adulciding
- Mosquito Control and GIS Moving Forward?

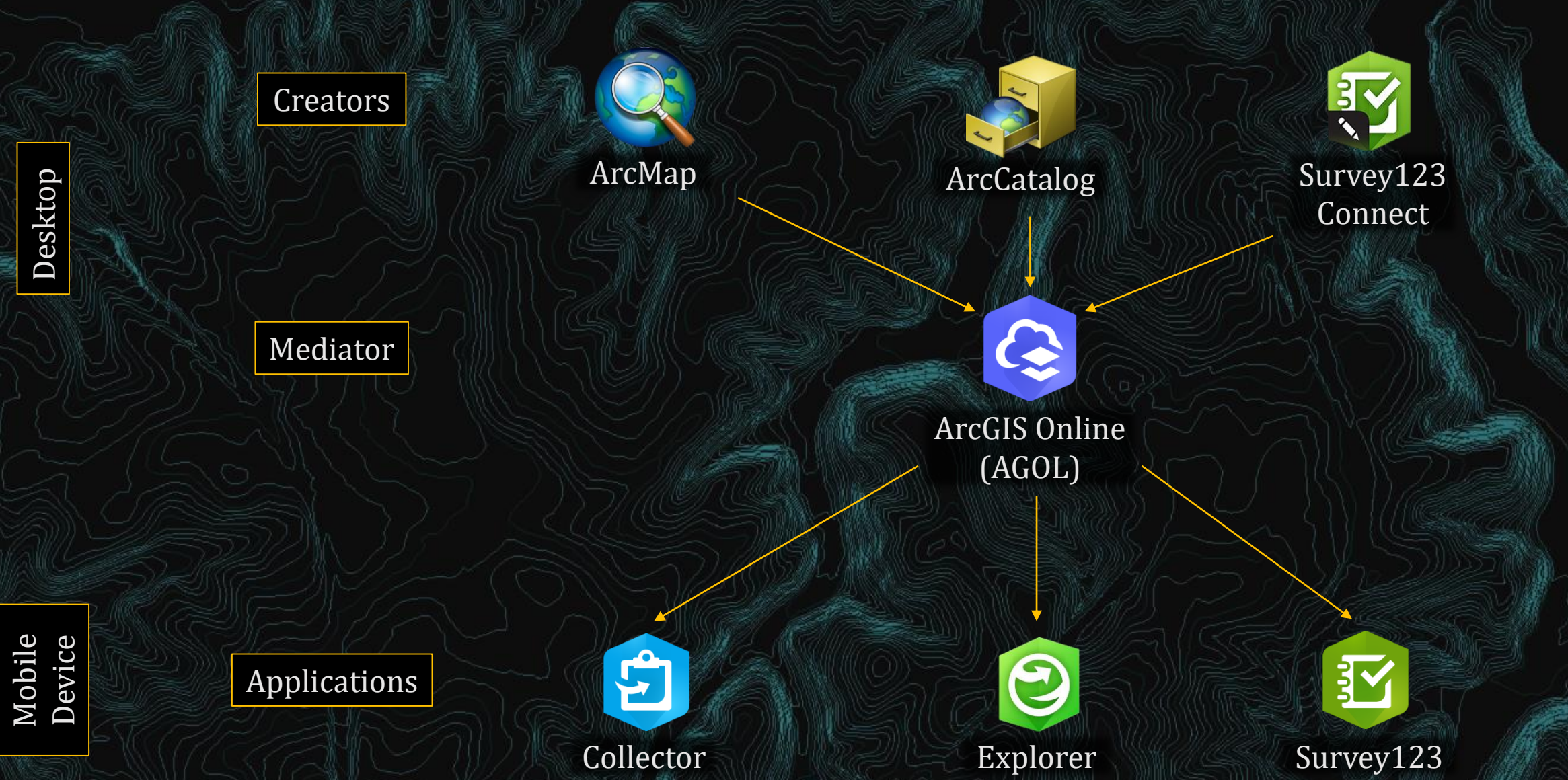


# What is GIS?

- 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

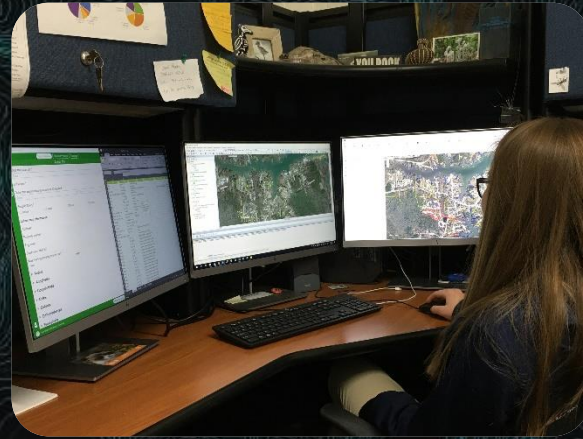


# Software Used



# Hardware Used

Desktop



Computer

Mobile  
Devices



iPhone



iPad



Mesa

Cellular Data

Wi-Fi

# Creators and Record Keepers



ArcMap

- Creating layers
- Editing
- Map making
- Analysis



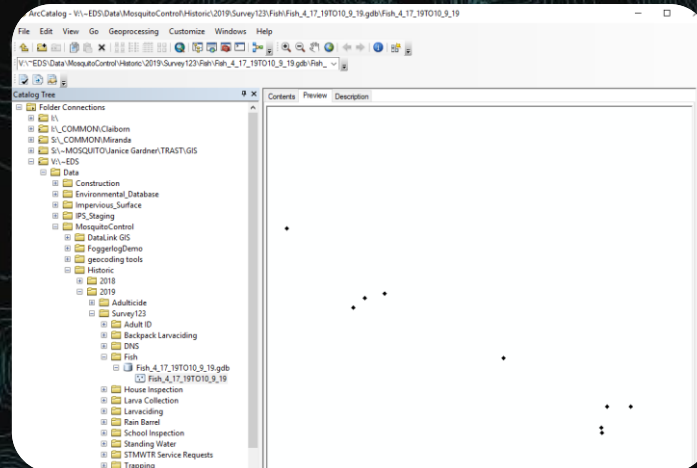
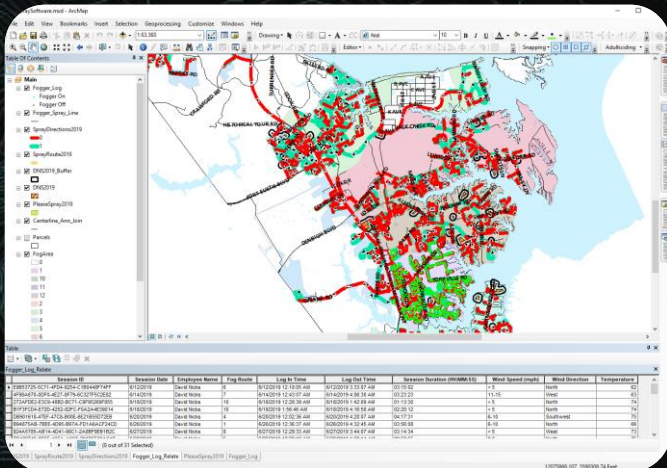
ArcCatalog

- 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

Janice

David

	A
1	EMPLOYEE_LARVICIDING
2	Janice_Pulver_#####-G

# Data Collection



## ArcGIS Online (AGOL)

- Manage and customize online maps, layers, and data



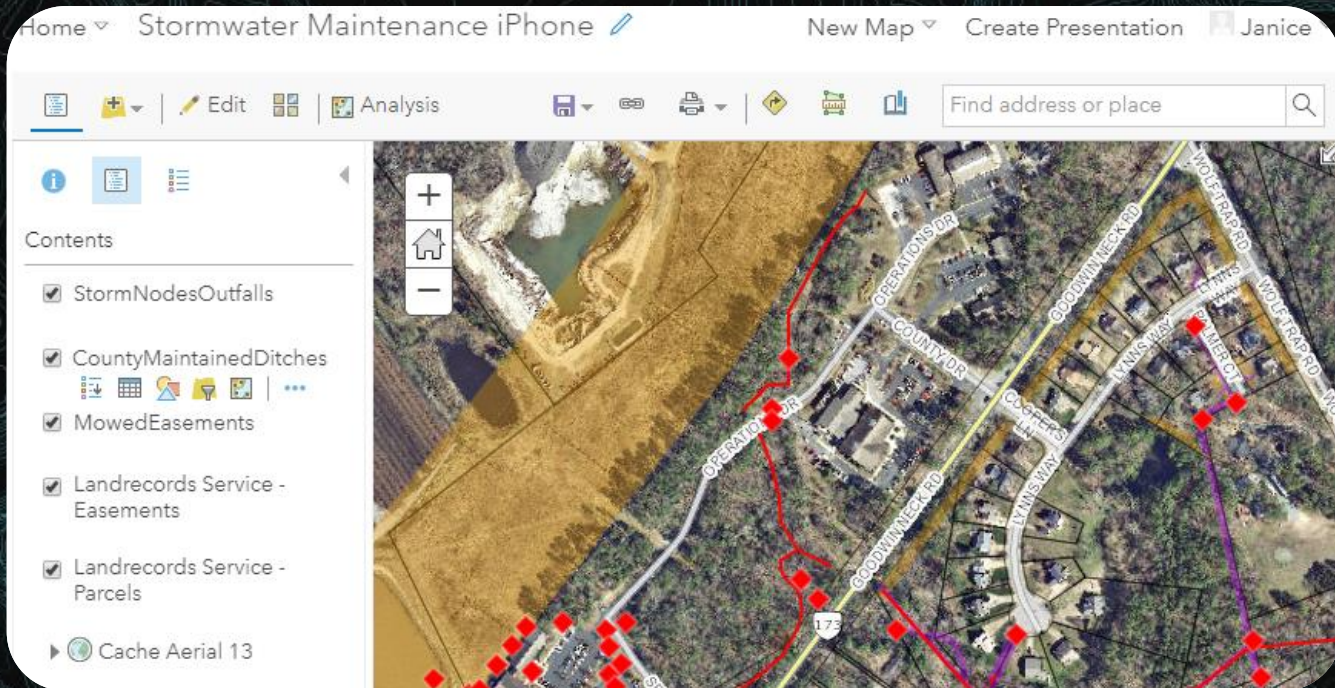
## Collector

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



## Survey123

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



The screenshot shows a Survey123 form titled 'House Inspection'. The form contains the following fields and options:

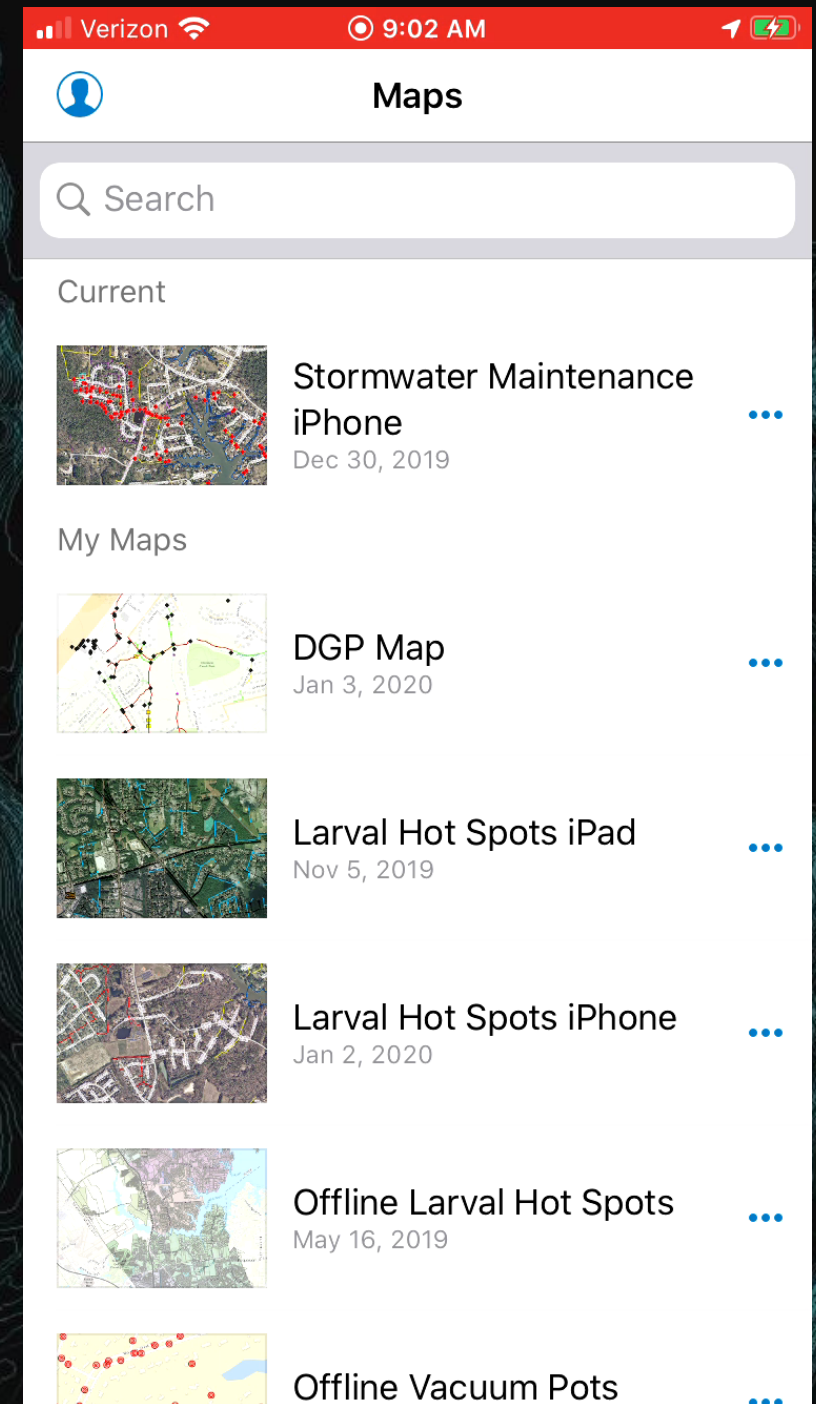
- Date of inspection \***: Tuesday, January 14, 2020 (dropdown), 7:47 AM (dropdown)
- Address:** (text input field)
- Property owner:** (text input field)
- Fog area:** (text input field)
- Supervisor district:** (text input field)
- Who is performing the inspection? \***: (dropdown menu)  
If "Other", enter in your First and Last name.
- Why were you called to the house? \***: (dropdown menu)
- Did you find standing water? \***:
  - Yes
  - No

# Data Collection cont.



Collector

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



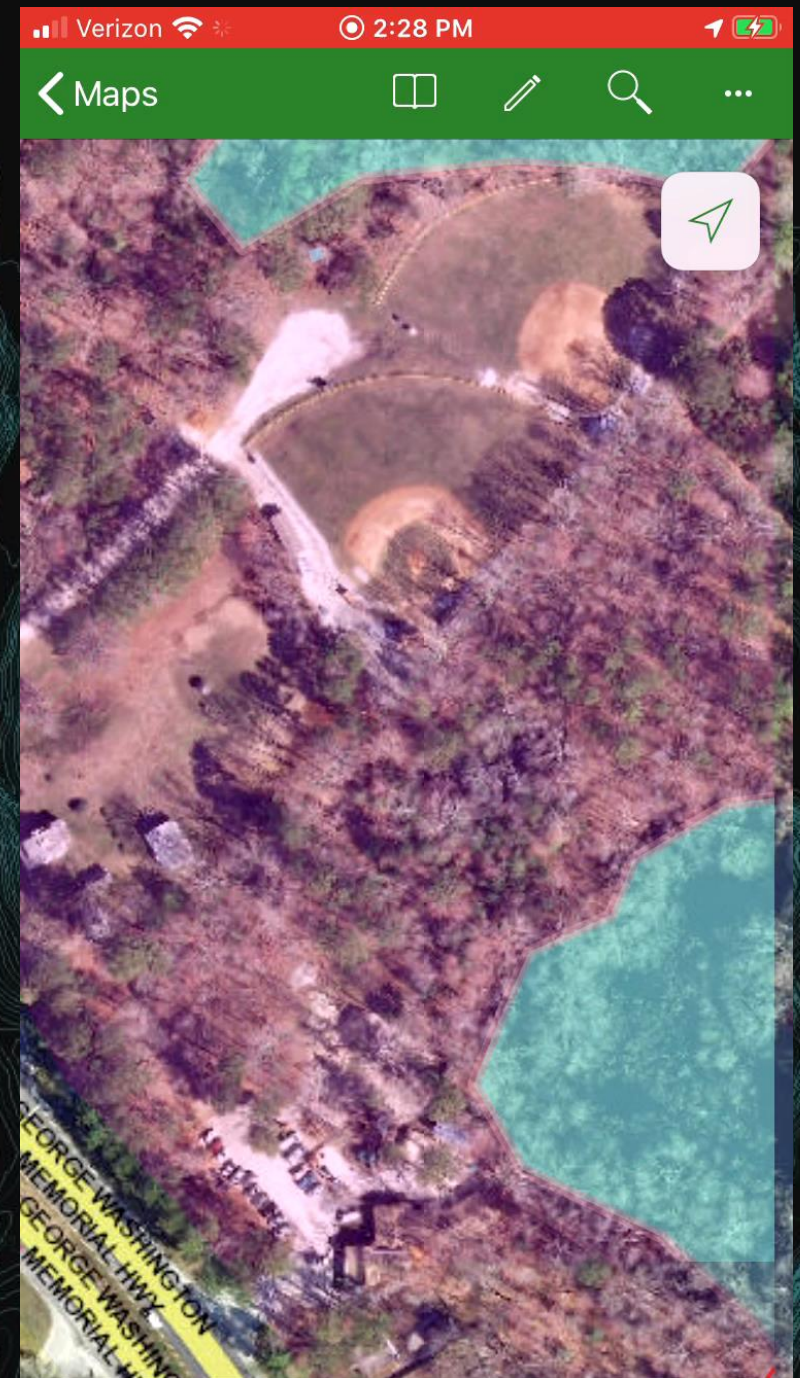
Collector



Explorer

Shows AGOL maps and associated data.

- 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

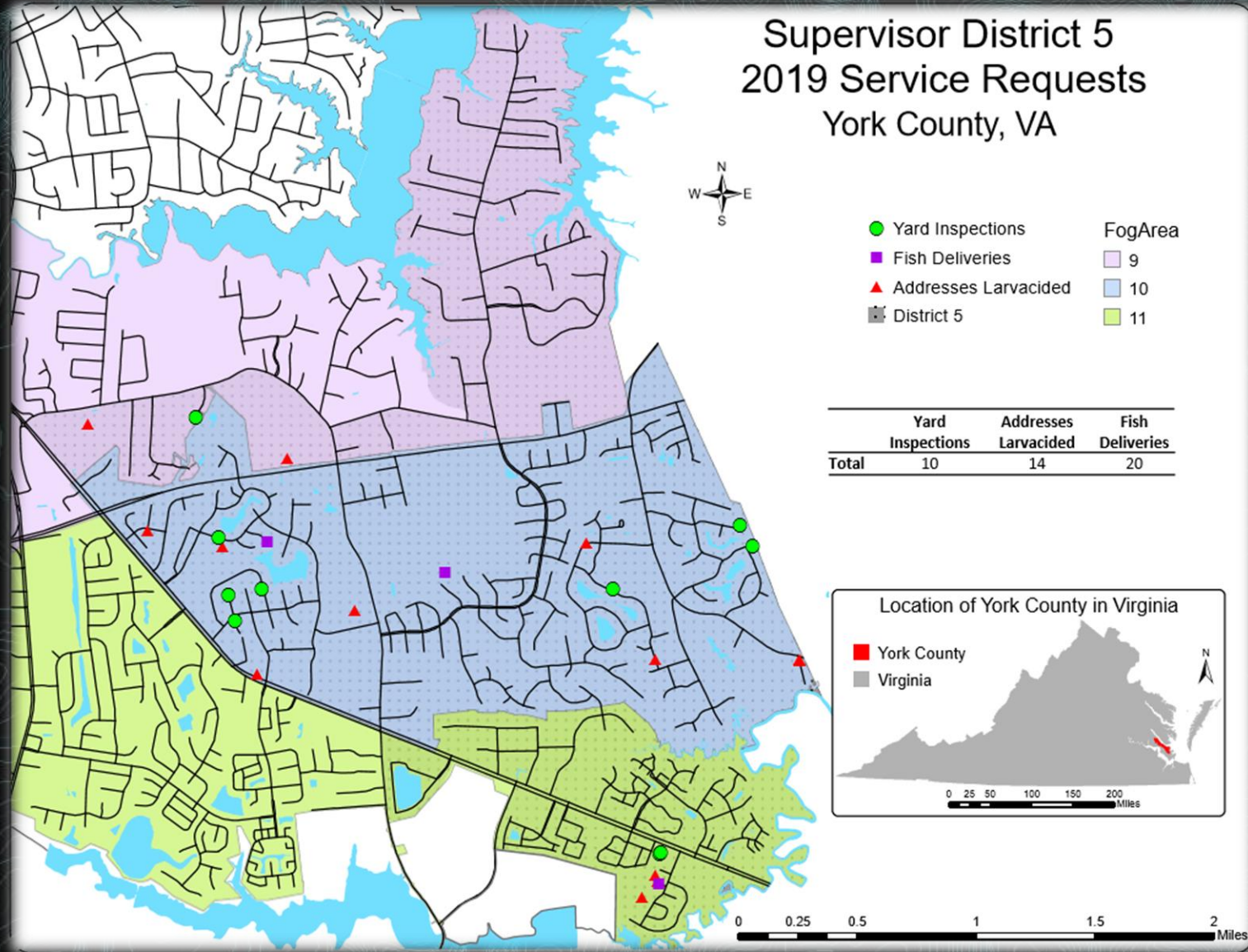


# Dissemination of Information



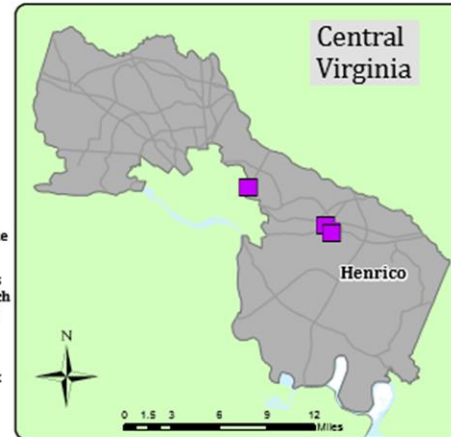
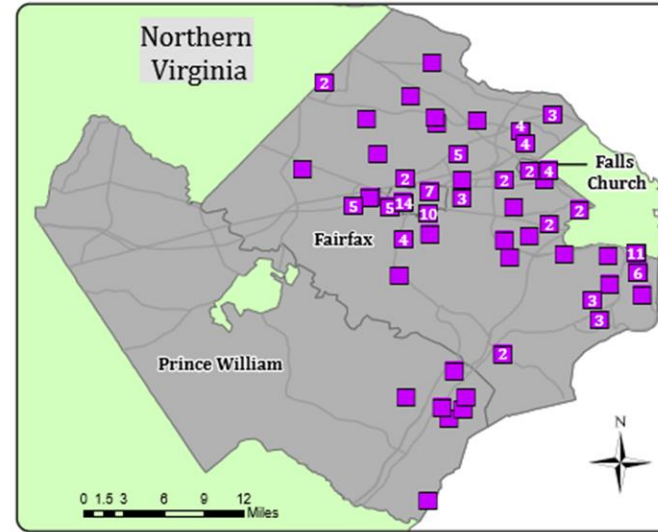
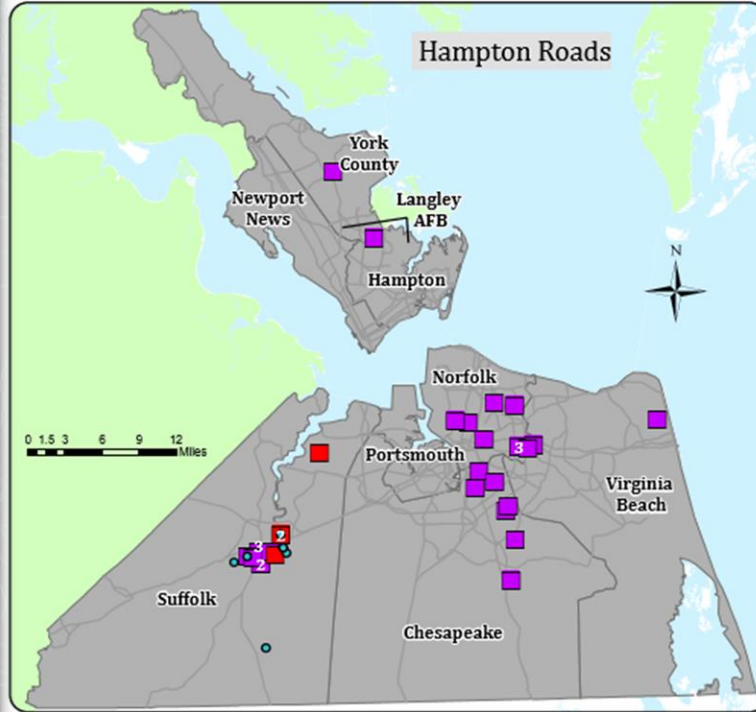
ArcMap

# Government Officials



# Mosquito Control Peers

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

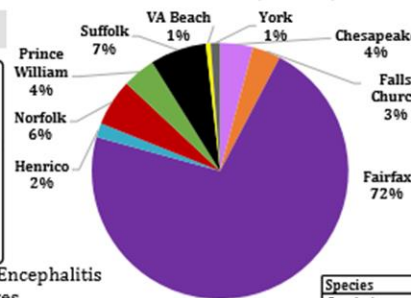


- EEE + Species\*
- *Cs. melanura*
- WNV + Species\*
- *Cs. melanura*
  - *Cx. pipiens/restuans*
- Roads
  - Water Bodies
  - Virginia Border
- \*Sites with >1 WNV positive labeled. EEE positive sites not labeled.

City or County Locations in Virginia



West Nile Virus + by Locality




Eastern Equine Encephalitis Positives

Species	Suffolk
<i>Cs. melanura</i>	8

Prepared by:  
Janice Fuhrer  
York County Mosquito Control  
November 2019

Species	Chesapeake	Falls Church	Fairfax	Henrico	Norfolk	Prince William	Suffolk	VA Beach	York	Species Total
<i>Cx. pip/res</i>	7	6	121	3	10	7	8	1	2	165
<i>Cs. melanura</i>	0	0	0	0	0	0	4	0	0	4
Total	7	6	121	3	10	7	12	1	2	169


# Citizens



York County  
VIRGINIA  
America's Future Since 1781

## Property Information

York County, Virginia



[Home](#)

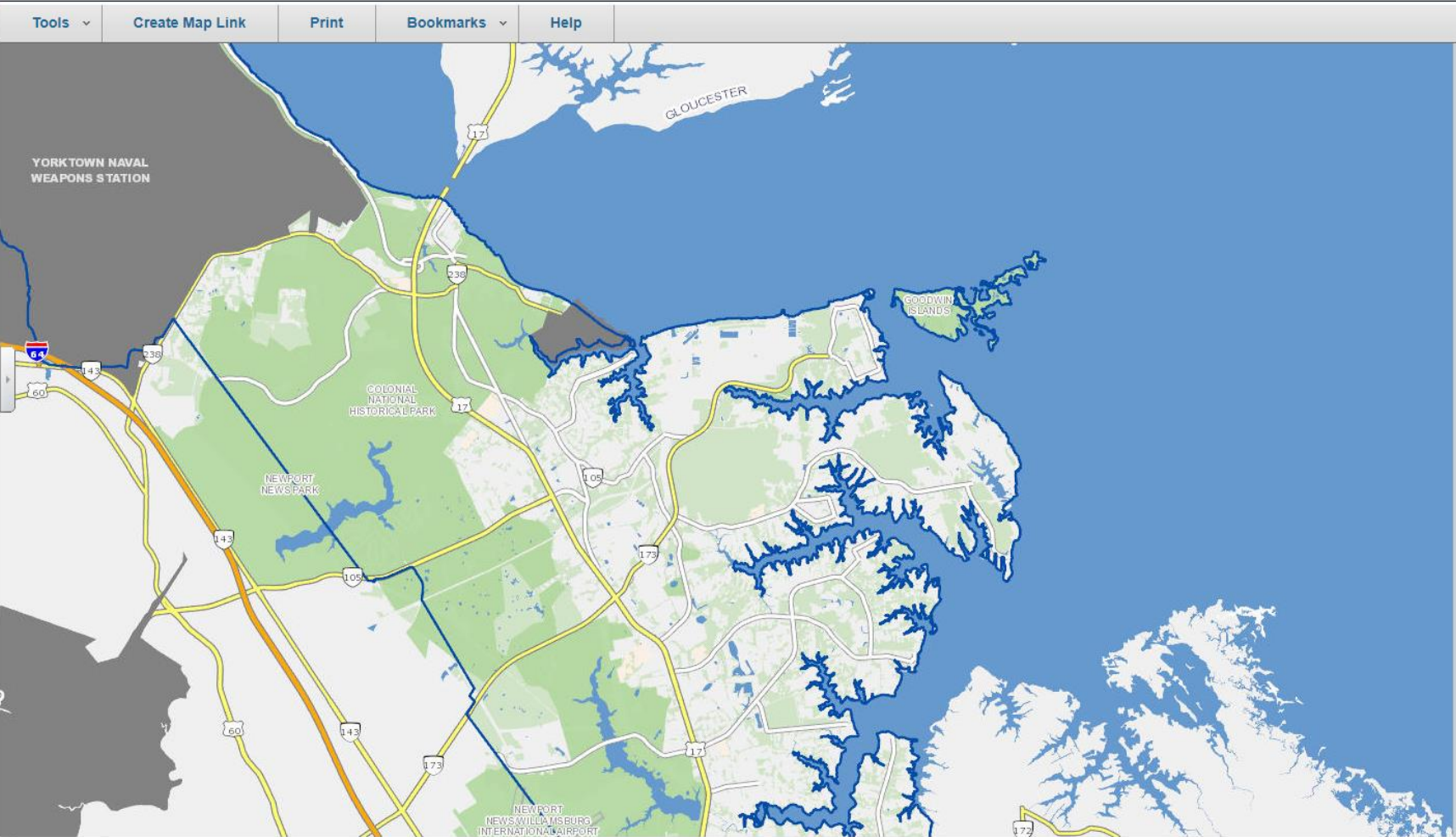
Search Results Details **Map**

**Map Layers** Results

- York/Public**
  - 20% Transparent
- Property**
  - Fire Hydrants
  - Parcel Boundary
- Property Text**
  - Lot Dimensions
    - Dimensions
  - House Number
    - Address
  - Lot Number
    - Lot Numbers
- Plat Link
- Proposed Development
- Buildings
- Survey Control Monuments
- Zoning

- Administrative**
- Election Districts (County & State)
- Elementary School Districts
- High/Middle School Districts
- State Senate Districts
- State House Districts
- Environmental**
- 4 Foot Elevation Line
- Hurricane Evacuation Zones
- Hurricane Storm Surge
- Flood Zone (Effective As Of 6/1/2012)
- Flood Zone (Effective As Of 1/1/2012)**
- Hydrologic Unit Code (HUC) 85010001
- WMP 200 Foot
- WMP 500 Foot
- Resource Protection Area
- Resource Management Area

Tools Create Map Link Print Bookmarks Help



Map showing York County, Virginia, including areas like Gloucester, Yorktown Naval Weapons Station, Colonial National Historical Park, Newport News Park, and Newport News Williamsburg International Airport. The map displays property boundaries and various overlays.

Planimetrics

Map Data not yet available

1 mi

Deg Min Sec Lon (X): 76° 35' 46.98"W Lat (Y): 37° 15' 44.08"N

The background of the slide is a topographic map with contour lines in a light teal color against a dark blue background. The lines represent elevation and are more densely packed in some areas, indicating steeper terrain. The overall appearance is that of a technical GIS map.

Stormwater Management GIS Project

# Mapping Maintained Ditches

# Stormwater Maintained Ditches

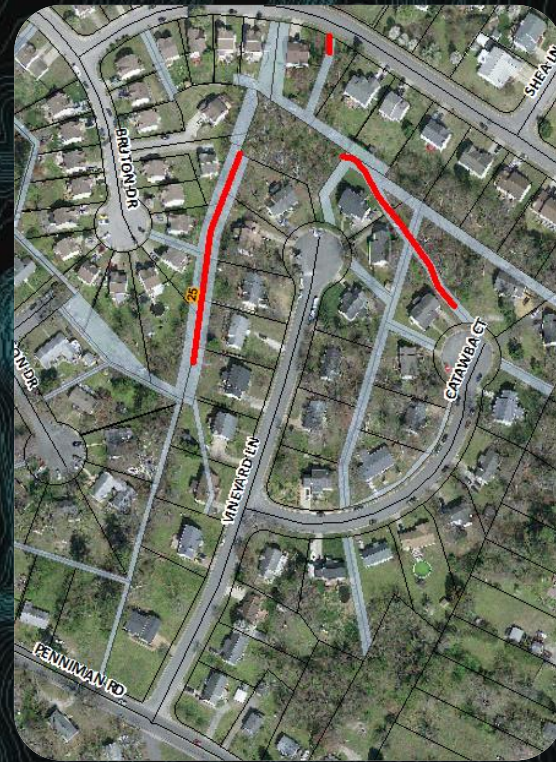
- All the maintained ditches were hand drawn into map books
  - Books were worn out and not updated with new developments
  - Hard to find ditches because the drawings were not that accurate



Map Book Drawings



Map Book Drawings  
Digitized



Phase  
1



Phase  
2

# 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

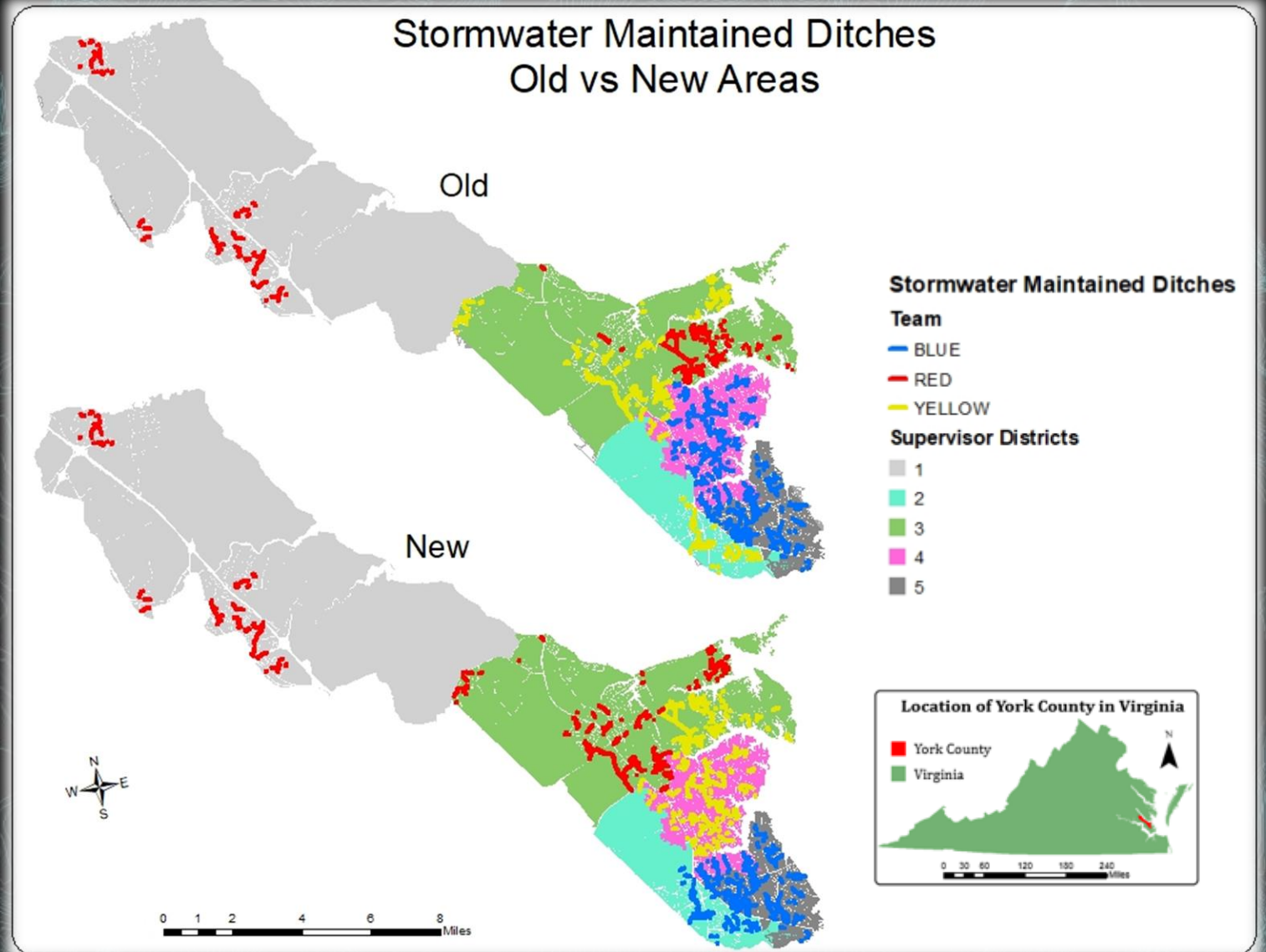




# Phase 1 cont.

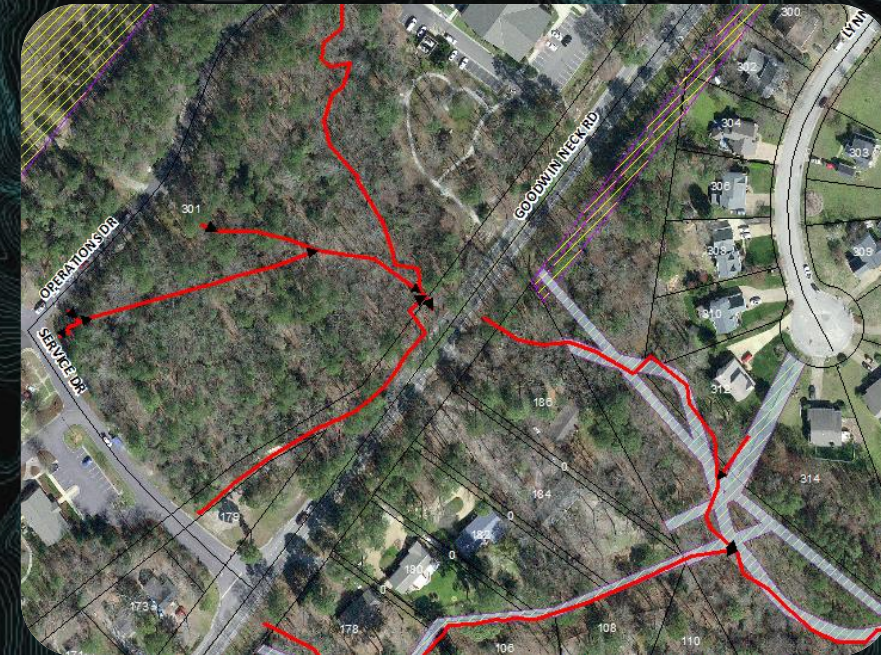
Team	Old Footage	New Footage
Red	103,496	126,473
Yellow	115,640	140,005
Blue	178,432	131,091

~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



The background of the slide is a dark, textured pattern resembling a topographic map or contour lines, rendered in shades of teal and black. The lines are dense and irregular, creating a complex, organic-looking pattern.

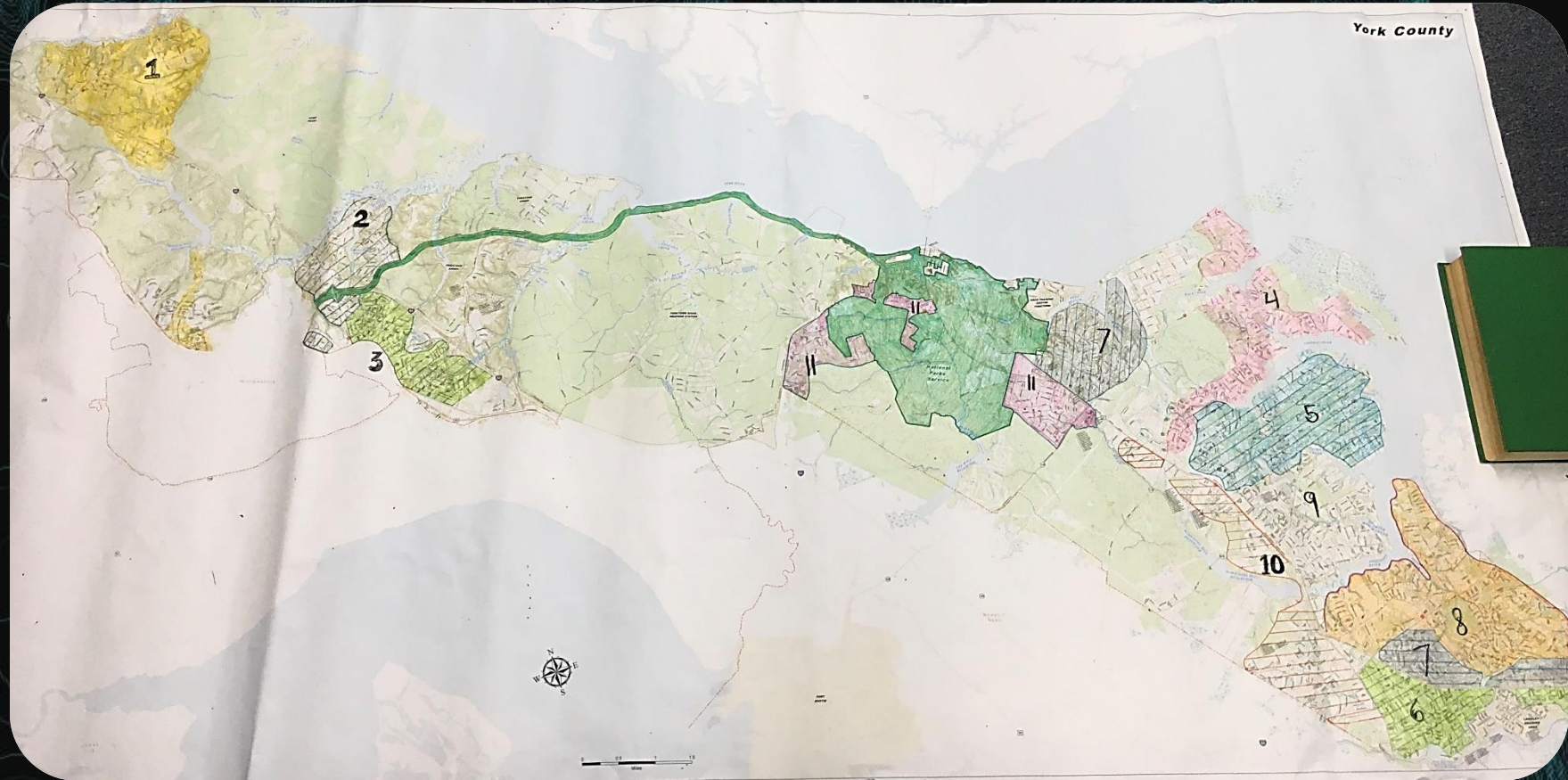
Mosquito Control GIS Project

Transitioning to  
Adulticiding Software

# Adulticiding Fog Areas

## Old York County Fog Areas

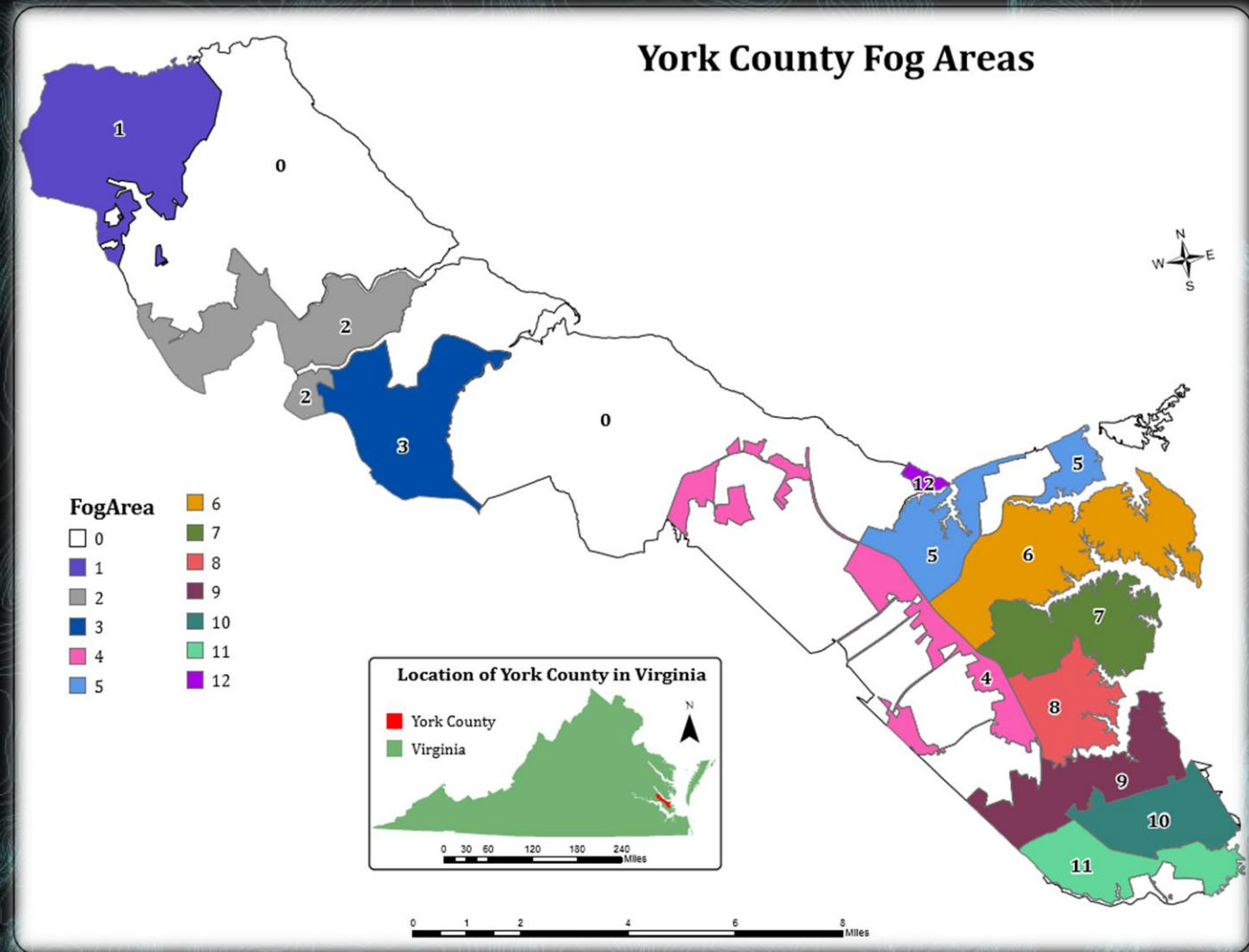
- Old areas did not go in order numerically
- The drive time was different for each
- Only hand drawn on a wall map



# Adulticiding Fog Areas cont.

New

- 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

LFT SKIMINO RD

**SKIP WILSON DR** **DON'T SPRAY 104 WILSON DR**

**TURN OFF SPRAYER AT 192 SKIMINO RD TO 202 SKIMINO RD (.196) DON'T SPRAY THE BEGINNING OF DEER PATH RD**

RT DEER PATH RD CUL-DE-SAC TURN AROUND

**TURN OFF SPRAYER AT 104 DEER PATH ROAD**

RT SKIMINO RD **START SPRAYER AT 208 SKIMINO RD**

RT FOREST LN CUL-DE-SAC TURN AROUND

RT SKIMINO RD TURN AROUND AFTER LAST HOUSE **TURN OFF SPRAYER AT 208 SKIMINO RD**

RT SKIMINO LANDING DR **START SPRAYER**

LFT DEEP WOODS TRAIL CUL-DE-SAC TURN AROUND

GO ACROSS SKIMINO LANDING DR TO LEVINSON PASS

RT BACK FORTY LOOP

RT THRESAS WAY CUL-DE-SAC TURN AROUND GO TO OTHER END AND TURN AROUND

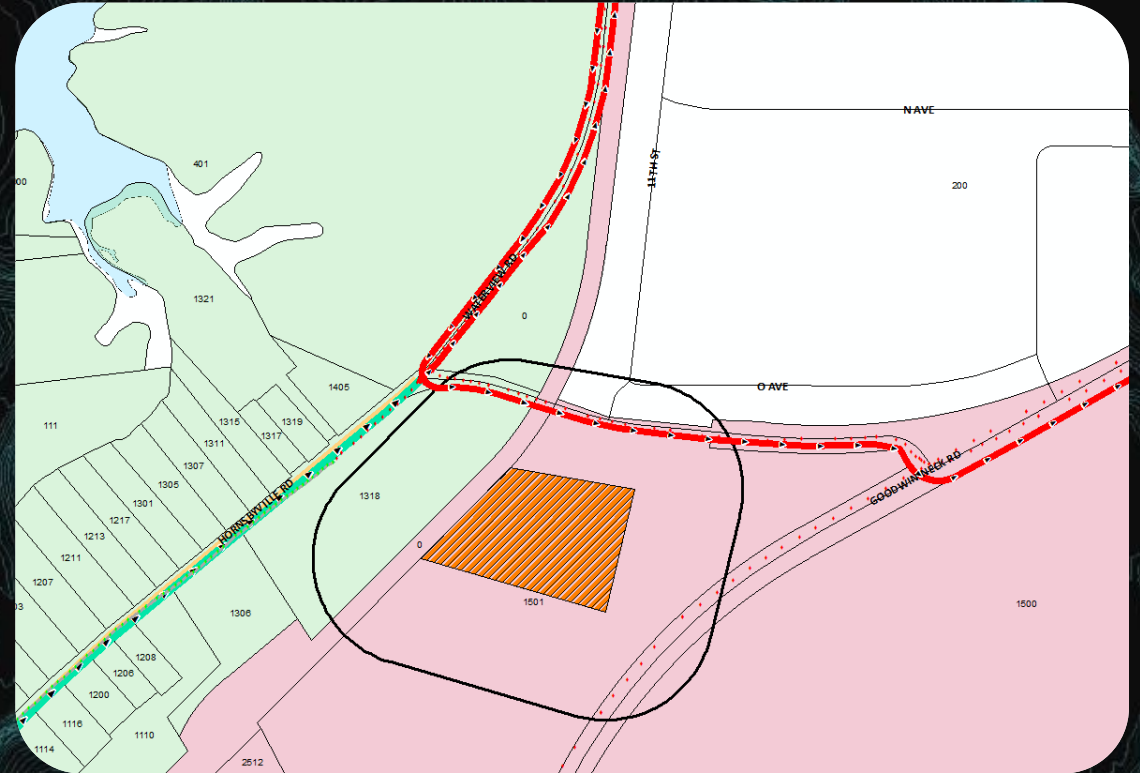
RT BACK FORTY LOOP CUL-DE-SAC TURN AROUND

RT TRAILS END CUL-DE-SAC TURN AROUND

**SKIP SKIMINO LANDING DR ON THE LEFT**

# 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





The background of the slide is a topographic map with contour lines in a teal color on a black background. The lines are dense and irregular, representing terrain elevation. The text is centered over this background.

# Mosquito Control and GIS Moving Forward?



Data Analysis

Reference

Keep

Create

Software

Hardware

Data



Years of trapping and  
adultciding 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

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

- 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



# Examples of Data Analysis

- Zou, Li & Miller, Scott & Schmidtman, Edward. (2007). **A GIS Tool to Estimate West Nile Virus Risk Based on a Degree-Day Model**. Environmental monitoring and assessment. 129. 413-20.
- McFeeters, Stuart. (2013). **Using the Normalized Difference Water Index (NDWI) within a Geographic Information System to Detect Swimming Pools for Mosquito Abatement: A Practical Approach**. Remote Sensing, vol. 5, issue 7, pp.
- 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?

