
GIS Excellence Awards
2017
COUNTY OF FAIRFAX
1742
VIRGINIA
Fairfax County, Virginia
December 7, 2017

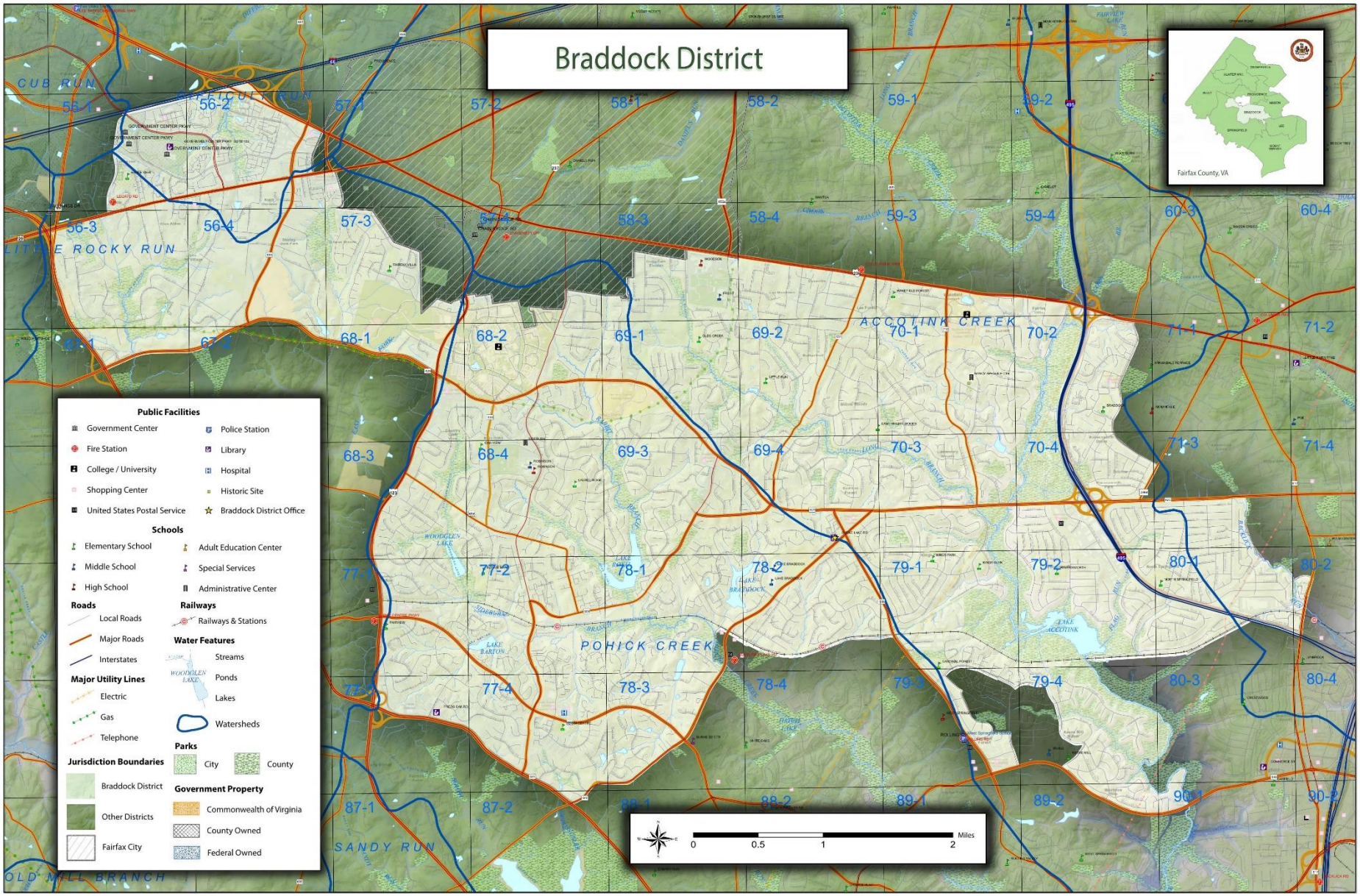
CARTOGRAPHIC CATEGORY

Third Place

District Reference Map

Chip Galloway, Jasdeep Saini, Emma Gutzler, Chad Crawford

Department of Public Works & Environmental Services - Stormwater Management



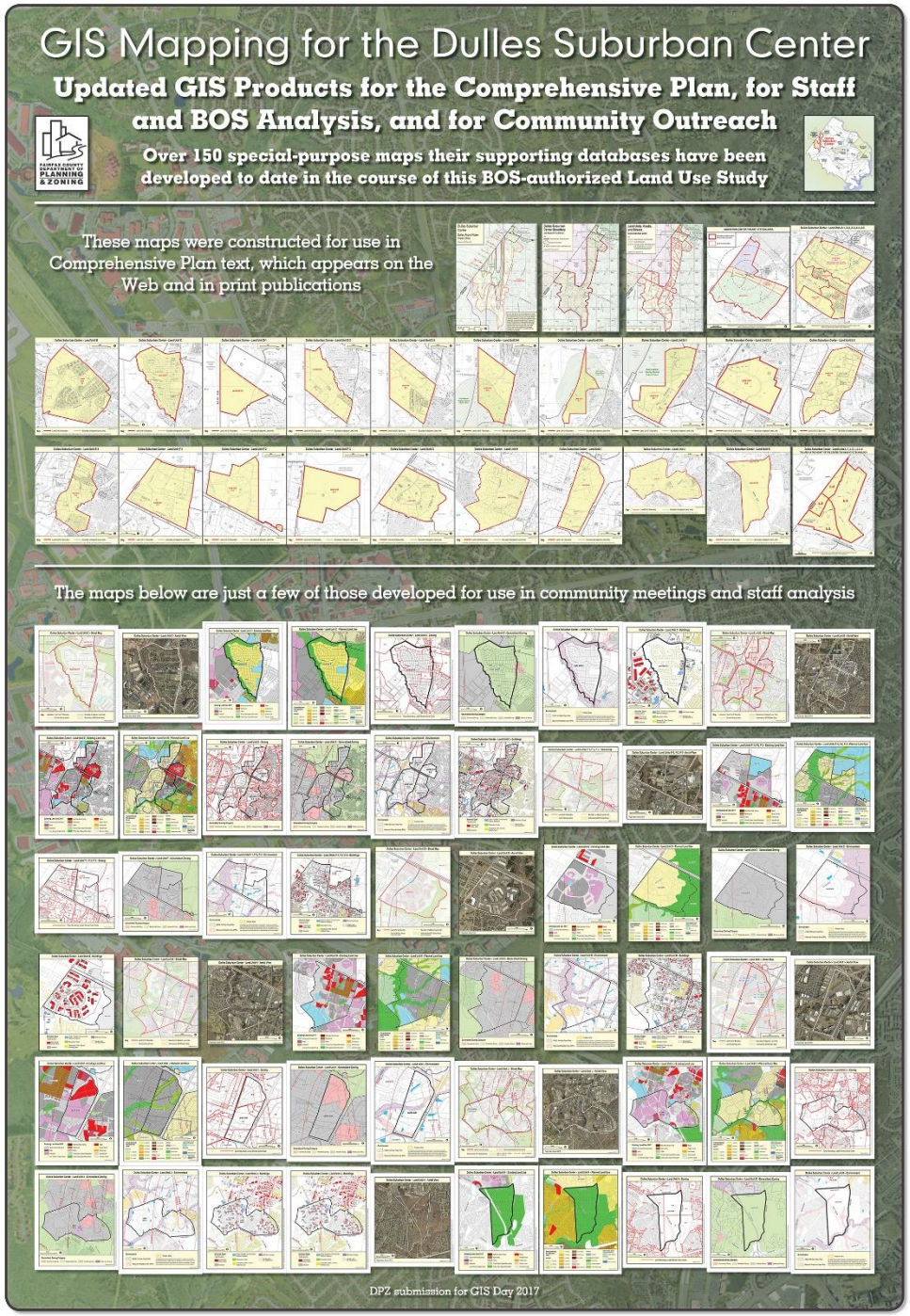
CARTOGRAPHIC CATEGORY

Second Place

GIS Mapping for the Dulles Suburban Center

Harry Rado, Clara Johnson, Katrina Newtson, Roger Dindyal, Leanna O'Donnell, Mike Van Atta

Department of Planning and Zoning



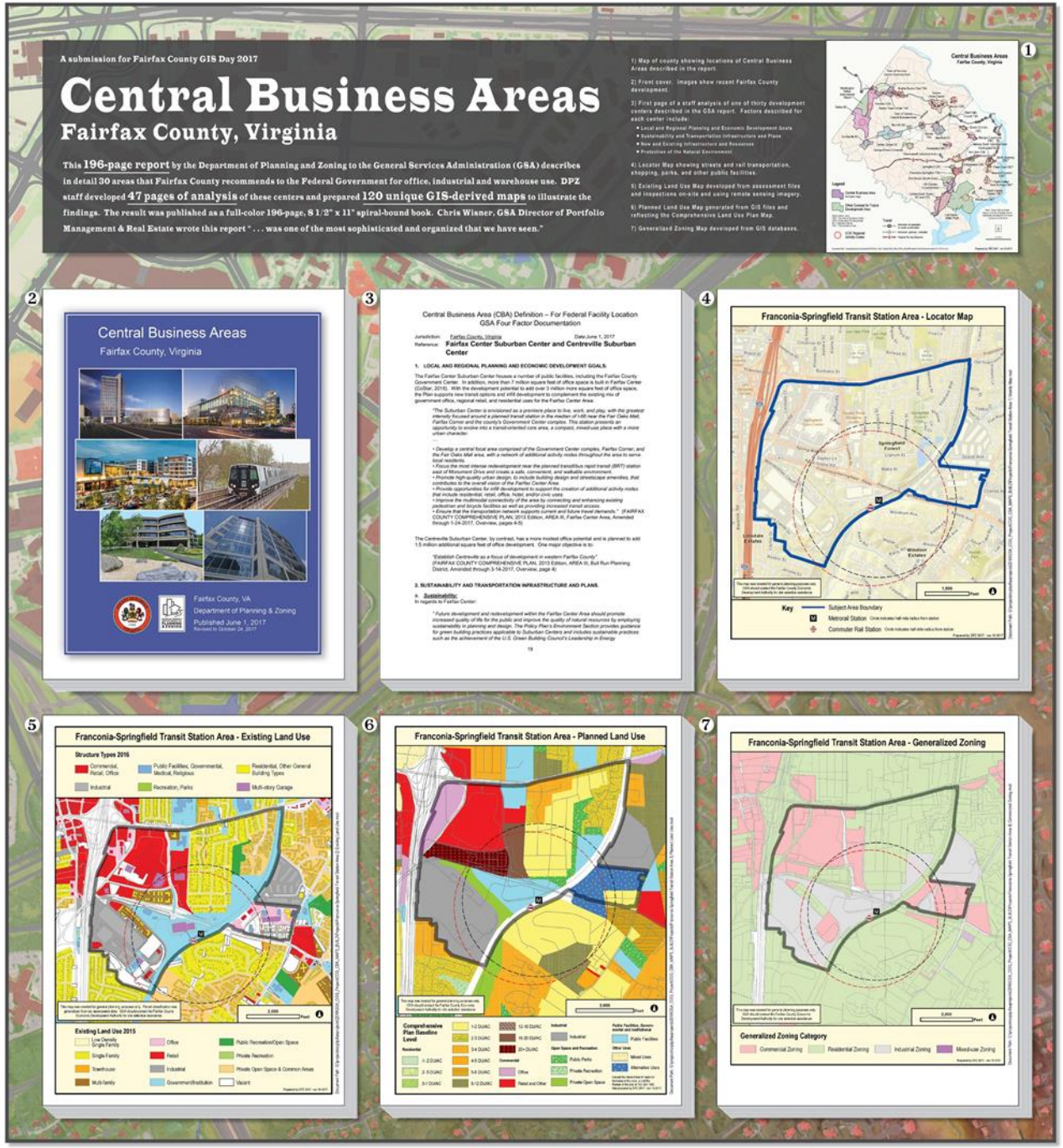
CARTOGRAPHIC CATEGORY

First Place

Central Business Areas Report for General Services Administration

Harry Rado, Kristen Hushour, Indrani Kompella, Lilian Cerdeira

Department of Planning and Zoning



ANALYTIC CATEGORY

Third Place

Hot Spot Analysis for Fairfax County Assessments

Yorka Crespo

Department of Tax Administration

Hot Spot Analysis for Fairfax County Assessments

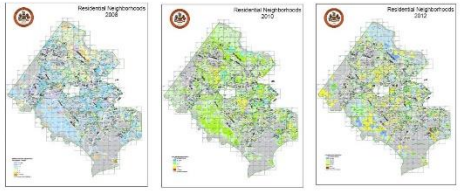
Department of Tax Administration

Category: Use of GIS for Analysis

Problem / Question

The Department of Tax Administration (DTA) has provided maps of basic statistical assessment data after file roll each year for quite some time. Can DTA complete an additional level of spatial analysis that would assist in the interpretation of historic assessment data and allow groups such as the County Executive and economic organizations to review changing assessment values over time, while interpreting how these changes relate to the various economic drivers within the county?

Examples of Map provided to the Board of Supervisors in the past:



Abstract

Hot spot maps use statistical analysis to identify geographic clusters of activity. In this analysis, the Hot Spot (Getis – Ord Gi*) tool was applied to the aggregate percent change in assessed value by tax neighborhood. The analysis generates an output feature class that is automatically added to the project table. This feature class contains p-values and z-scores that indicate where features with either high or low values are spatially clustered.

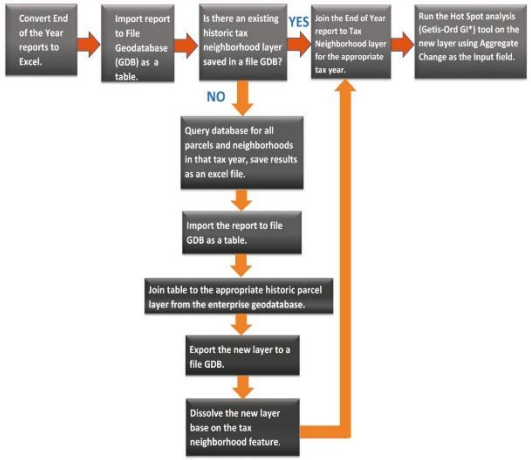
The intensity of colors on the map identifies the level of probability that the observed spatial pattern was not random. For each tax year, two sets of data output must be produced, one for commercial tax neighborhoods, and the other for residential.

Data

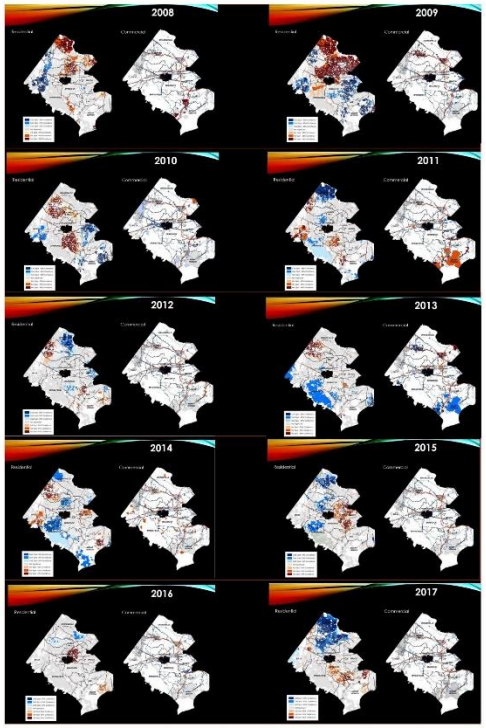
Aggregate change is a year to year comparison of total assessed value of a given tax neighborhood. DTA records for this data has been saved in yearend reports from as far back as tax year 2008. The reports are created at file roll from the January 1st assessment value. They are the most reliable source of historic assessment data.

Tax neighborhoods can change over time. Parcels get consolidated or broken down, new subdivisions emerge, neighborhoods change as old properties get torn down and new ones are constructed. When dealing with historic data such as this, the tax neighborhood layer in the enterprise geodatabase cannot be used. Fortunately, for the most part historic tax neighborhood layers have been saved in file geodatabases throughout the years. In years where no tax neighborhood layer was saved, a query was run using the Discoverer reporting tool to generate a list of parcels in each tax neighborhood. This list was joined to the appropriate historic parcel layer in the enterprise geodatabase and parcels were aggregated based on their neighborhood number using the Dissolve tool in ArcMap.

Procedure



Results



Conclusion

Hot Spot Maps are a simple way of producing an additional level of spatial analysis for historic assessment data. The layers produced can be reviewed on their own to determine what areas of the county were increasing or decreasing in value, and how commercial assessment changes relate to residential assessment changes. Hot spot layers can also be overlaid on top of other existing enterprise geodatabase layers for further analysis. These layers could include Development Centers, Supervisor Districts, Metro Stations, Zoning or they can be viewed with layers yet to be created like level of permitted construction activity.

ANALYTIC CATEGORY

Second Place

Embark Richmond Highway Viewshed Analysis

Gayle Hooper, Elizabeth Elliott, Paul Ngo
Park Authority

Interactive mapping application:
http://arcg.is/2zITRTP

EMBARK RICHMOND HIGHWAY
VIEWSHED ANALYSIS

PROJECT BACKGROUND

EMBARK RICHMOND HIGHWAY is a Fairfax County initiative focused on creating a revitalized, multimodal future for the Richmond Highway corridor. Along with the integration of a Bus Rapid Transit (BRT) system, the concept envisions six areas of mixed-use development with a grid of streets that enhances vehicular as well as pedestrian movements.

The envisioned transportation improvements and planned densities will transform the character of the corridor - currently typified by commercial development in strip shopping centers, stand-alone establishments, and small individual businesses - to create vibrant neighborhood centers. Increased density and building heights, however, could mean that future development might be visible from Woodlawn Plantation and Historic Huntley, two historic properties located in proximity to the Richmond Highway corridor. Such visual intrusion into the viewshed from these historic homes could diminish the ability to interpret the history of these properties. Although future development envisioned with the Embark study would lie outside of the Historic Overlay Districts that seek to protect the county's historic resources, sensitivity to potential impacts to the viewsheds from these homes was a factor carefully considered as part of the Embark planning process.

CORRIDOR LEGACY

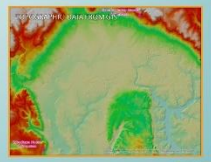
The Richmond Highway corridor has many remnants and reminders of Fairfax County's heritage, representing human activity in the area from Native American societies, to early colonization, to the founding of our county and country, to more contemporary history. Several prominent features are noted along the corridor, including Mount Vernon, George Washington's Grist Mill, Gunston Hall, Woodlawn Plantation, and Historic Huntley. Constructed in 1800 and 1825 respectively, the Woodlawn and Historic Huntley homes were sited at elevations that permitted their owners to have dramatic views of their property and beyond to the Potomac River. Despite approximately 200 years worth of development in Fairfax County, the views from these home have surprisingly little intrusion from surrounding development, even though the view is quite different than the homes were when first constructed. The ability to protect the viewsheds of these properties will allow these sites to continue to share our county's heritage in a unique way, enhancing understanding, interpretation, and tourism.

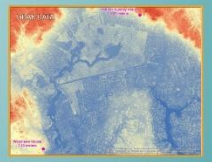
The technical analysis provided through this study established a non-biased method of assessing potential impacts to viewsheds without needlessly restricting development potential along the corridor to allay concerns. Baseline analysis indicated that future development would not be visible from Mount Vernon, Gunston Hall, or George Washington's Grist Mill. There appeared to be potential visibility from Woodlawn Plantation and Historic Huntley of future development within the Woodlawn and Hybla Valley CBCs. More in depth analysis was provided to assess the areas of potential visibility.

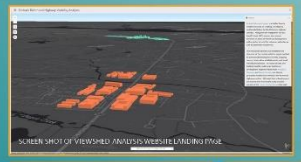
VIEWSHED ANALYSIS

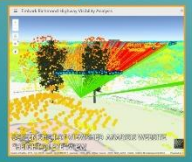
To fairly evaluate how future development might be visible from the historic properties, the analysis integrated topographic information from GIS, conceptual massings of what future development might look like (SketchUp), and Light Detection and Ranging (LiDAR) data.

- SketchUp massing models of conceptual redevelopment were converted to ESRI Multipatches.
- Building vertices were converted to 3D points to serve as targets for sight line creation from Historic Huntley House and Woodlawn Plantation toward each of the proposed building developments.
- Four sets of 3D sightlines (2,106 in total) were automatically generated to represent the four combinations of visibility analysis scenarios:
  - Historic Huntley to Hybla Valley CBC conceptual redevelopment
  - Historic Huntley to Woodlawn CBC conceptual redevelopment
  - Woodlawn Plantation to Woodlawn CBC conceptual redevelopment
  - Woodlawn Plantation to Hybla Valley CBC conceptual redevelopment
- The 3D Analyst Line of Sight tool was run against a LiDAR point cloud to determine visibility from the two historic sites. Outputs included lines symbolized as visible/not visible and points showing the first location of visible obstruction, if any, along each site line. The use of LiDAR ensured that trees would be included as possible visibility obstructions since the relatively flat terrain in the study area provides little or no visibility screening.









PROJECT IMPACT

The completed analysis indicated that future development would not be visible from the Woodlawn Plantation home. The analysis also indicated the possibility that limited areas in which future development may be visible from Historic Huntley.

The completed analysis has helped to shape Comprehensive Plan recommendations for those areas where the potential for visibility was noted relative to maximum building heights, guidance that future development provide additional viewshed analysis as part of the rezoning process, and recommendations related to building materials to minimize visual intrusion.

The analytical basis of the viewshed analysis provided a rational basis for discussion of potential impacts.

The completed analysis was published as a 3D web scene in ArcGIS Online. This allowed interested members of the community to examine the basis of the analysis directly with the ability to navigate freely throughout the space of the study area as well as to quickly view the results from preset vantage points. This promoted a sense of transparency with the community and expanded the ability to gauge the validity of the analysis.

Beyond the immediate benefit of informing plan text decisions for the Embark Richmond Highway Study, the ability to assess viewshed impacts of planned development will be of great benefit to future Comprehensive Plan recommendations.

ANALYTIC CATEGORY

First Place

Risk Assessment and Prioritization for Fairfax County's Integrated Sanitary Sewer System

Matthew Doyle, Jonathan Okafor, Colleen Block, Lana Tran

Capital Facilities

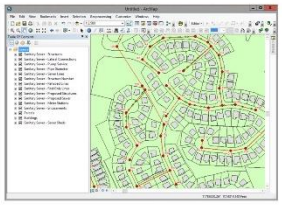
Risk Assessment and Prioritization for Fairfax County's Integrated Sanitary Sewer System

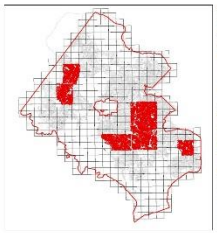
Department of Public Works and Environmental Services - Capital Facilities and Wastewater Collection Division

Background:

Fairfax County owns, operates, and maintains over 3,400 miles of sanitary sewer pipelines that date back to the 1940's. The 25+ Geographic Information System (GIS) wastewater layers have been an extremely valuable asset for many years.

The GIS displays well over 100,000 sewer pipes within the 3,400 miles in the wastewater collection system. To put that into perspective, if all the sewer pipes in Fairfax County were laid out in a straight line, it would stretch from Washington DC to Juneau, Alaska.





Significant Questions:

Question #1: With a very large sewer system that is nearly 70 years old, the County needs to inspect and repair the pipes routinely, however with 3,400 miles of sewer pipes how do we prioritize?

Question #2: Which pipeline needs to be clean and inspect first?

Question #3: Which pipes would have the biggest impact to the general public heath and safety if a sewer pipe collapse were to occur?

Question #4: What is the cost of the needed repairs?

In years past, we inspected our pipelines via a Tax Grid pattern, however this never gave us the ability to prioritize our inspection based on the likelihood of failure and the consequence of the failure. Looking for a major pipe defect is like looking for a needle in a haystack.

Solution:

To manage a sanitary sewer system with over 100,000 individual assets, a GIS-based asset management toolset is integral in reducing the labor-intensive efforts of evaluating overall risk and prioritizing work orders, capital improvement projects, and Operations and Maintenance (O&M) decisions for such a large collection network.

Project Benefits:

The resulting cost information and various maps and figures developed by GIS allows a plan to be established that includes the locations of pipes in critical need of improvement, cost projections for those improvements, and recommendation of various potential problem areas that should be monitored.

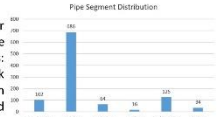
Because of this successful pilot project, it is anticipated that the same methodology and tools can be used to evaluate other drainage basins in Fairfax County to keep the sewerage system functioning reliably. GIS will continue to be a tool used in this process.

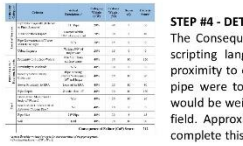
Basic Steps:

STEP #1 - USE A GIS BASED SOLUTION:
The Wastewater Collection Division (WCD) started with a pilot test area that contained large diameter sewer segments in Fairfax County's Arlington/Alexandria Sewershed, which is comprised of 224,000 linear feet of large diameter sewers ranging from 16" to 66" constructed between 1942 and 2013. This area was chosen due to the wide range of asset sizes, materials, and conditions, as well as the necessary supporting GIS and inspection data to implement a standardized condition and risk assessment.

STEP #2 – INSPECT STUDY AREA:
WCD cleaned and closed circuit television (CCTV) inspected all 224,000 linear feet of sewer piping in the pilot area. Each pipe was given a standard National Association of Sewer Service Companies (NASSCO) coding. The NASSCO coding system assigns a grade of 1 to 5 (5 being the most severe condition), to each coded defect. The NASSCO PACP coding system breaks the structural family of observations into 13 groups.

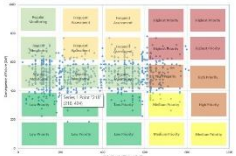
STEP #3 - DETERMINE THE LIKELIHOOD OF FAILURE:
WCD determined the Likelihood of failure (LoF) for each pipe segment and gave it a score. The LoF score is calculated based on three Criticality Categories: Asset Characteristics from four GIS data layers, Work Order History and Condition Assessment Data. Each category subsequently consists of several weighted criteria.

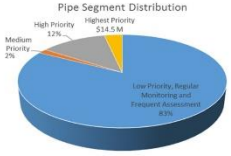




STEP #4 - DETERMINED THE CONSEQUENCE OF FAILURE:
The Consequence of Failure (CoF) was determined by using scripting language and geoprocessing tools to define the proximity to critical features in the County. For example, if a pipe were to fail in a stream or under a major highway, it would be weighted higher than a pipe in the middle of a corn field. Approximately 50 different GIS layers were utilized to complete this task.

STEP #5 - RISK EVALUATION AND PRIORITIZATION RESULTS: A risk matrix was developed by charting the LoF against the CoF. Each pipe segment was placed in one of the six categories from high to low. The pipes in the "Highest Priority" category are the first sewer pipes to be repaired or replaced.

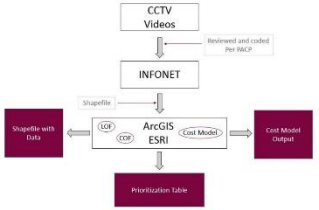




STEP #6 - RECOMMENDATIONS AND COSTS:
Recommendations were made and costs were automatically developed using GIS scripts. The cost of replacing pipes can vary greatly based on, but not limited to, ground cover, depth of pipe, diameter of pipe, soil types, transportation impact, water body crossings, proximity and type of buildings, wetlands, and RPAs. Approximately fifty other GIS layers were quarried to determine rehabilitation costs.

Model-Builder:

InfoNet allows for the exporting of data to a shapefile that is used in the Criticality Model. The Criticality Model developed for this project was coded in ESRI ArcMap using Python Scripts. This ESRI-based Criticality Model uses the shapefiles generated from InfoNet as one of several inputs. Other inputs include geospatial data from Fairfax County, Arlington County, Alexandria County, Fairfax Water, and other databases. Much of this data is also used in the Cost Models to generate budgetary cost estimates for the replacement, rehabilitation, and repair of pipe segments. In addition to the InfoNet data, the Criticality Model uses many other geospatial data sources to score and prioritize each pipe segment.

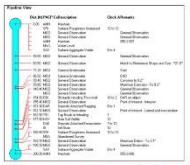


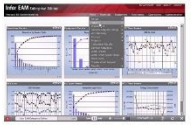
Use of Tools:

Designed to operate on an individual asset for the entire WCD collection network, the models allow the user to designate particular system assets they want to analyze. Since the models are designed to integrate data from several different systems (InforEAM/Enterprise GIS/Infonet), a standardized interface is provided as an ArcToolbox which is accessed via the ESRI ArcDesktop platform. These tools are built upon a series of Python Scripts that analyzes data to determine the CoF, LoF, and estimated program costs based on selected WCD assets. These results are used to prioritize CIP planning, O&M operations, and general system awareness. They also provide a platform to validate and cross-check observations in the field against both current and historical data. The models provide output in GIS formats (feature classes), database tables, and excel reports in order to document the findings of particular model runs.

Complexity of Analysis:

In order to integrate over 25 different geospatial layers, tabular data, inspection data, and service call information, the model is required to ensure that all of these unique data sources are able to "talk" to each other. These data-intensive processes are able to rapidly process millions of decisions through a series of functions, data geoprocessing tasks that prepare, transfer, cleanse, and produce actionable data. In order to create a common shared language, the model logic converts each dataset to compare against each other whether comparing the asset to real-world topography, observed soil samples, or determining if pipe CCTV defect codes support cleaning and rehabilitation or replacement of a pipe. If a pipe passes below a house, what is the impact to the risk of that pipe failing? What about two or three houses? Models allowed WCD to determine the "what if" factor and then rate each asset on a specified severity scale. After determining the risk and likelihood of an asset failing, WCD was also able to provide these findings in a standardized format to support program decisions and prioritize the thousands of pipes found all over Fairfax County.





Ingenuity/Creativity/Originality of GIS Methods:

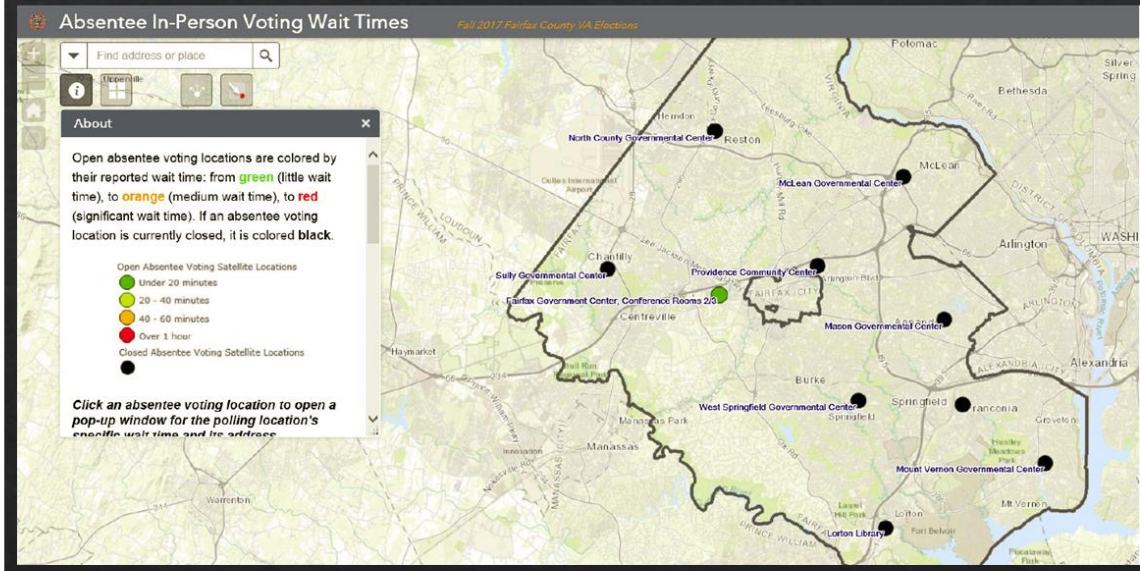
As pipes are rehabilitated, replaced, and cleaned, their properties and conditions are in a constant state of change. In order to leverage the dynamic data available to WCD, the model should be operated in a repeatable, defendable, and efficient process. In order to better reflect the occurrences of system impacting events, sanitary sewer overflows and service calls are geocoded and associated with gravity mains and factors such as frequency, severity, and the date of the event to accurately depict and represent where county resources were being allocated. In order to support the reporting of model findings, map production is automated to produce mapbooks which incorporate prioritization, scoring, and county-related data.

BEST WEB APPLICATION

Second Place

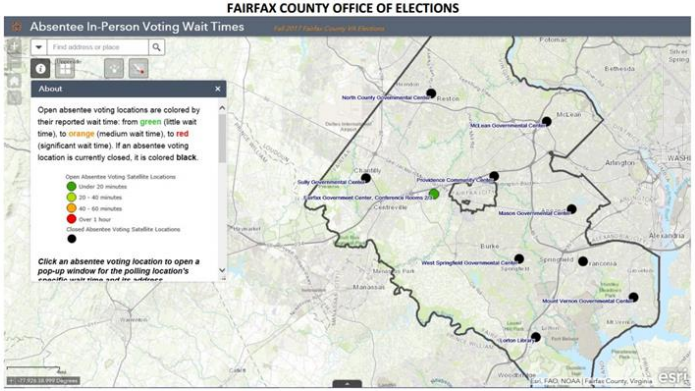
Absentee Wait Time App
George Panagakos, Travis Potter, Victoria Kinsman, Simran Singh

Electoral Board



2017 GIS Excellence Awards Submission: Web Application — Fairfax County Office of Elections

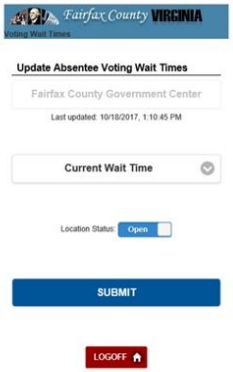
ABSENTEE WAIT TIME APP
FAIRFAX COUNTY OFFICE OF ELECTIONS



Fairfax County Office of Elections (OE) partnered with Fairfax County GIS & Mapping (GIS) to implement, design, and manage an absentee voting wait times web application for the 736,652 served by the November 2017 General & Special Elections in Fairfax County, Virginia.[1] OE sought this application in an effort to provide voters dynamic wait time updates and map services to better account for sudden changes to the voting process.

The project involved the use of a public-facing web page co-written by OE and GIS to display absentee voting schedules, locations, and location wait times, an ArcGIS Web Application managed by GIS to visually display location wait times through color scales and the use of location services, and a web-based entry application scripted by GIS and managed by OE per use of County-surplus devices as reported from the county's 10 absentee voting locations.

The project remained active over a span of 25 days, from October 11, 2017 through November 4, 2017.



November 7 - Absentee Voting In-Person at the Government Center

Fairfax County Government Center, 12000 Government Center Pkwy., Fairfax, VA 22035, Conference Rooms 2/3
- (Estimated wait time [as of 2:01:54 PM]: 5 Minutes)

[1] Registered voter count recorded as of September 20, 2017

BEST WEB APPLICATION

First Place

STEM Opportunities for Youth

Terry Reardon, Theresa Benincasa, Robert O'Quinn, Ted Kavich, Margaret Kositch, Scott Settar, Ji Ahn

Neighborhood and Community Services

http://arcg.is/2BPspAV

STEM OPPORTUNITIES FOR YOUTH MAP VIEWER

Goal 5.4 of the Strategic Plan to Facilitate the Economic Success of Fairfax County states: Expand STEM and STEAM training and preparation. Encourage the County's educational institutions/partners to identify where investments are currently being made in Science, Technology, Engineering and Math (STEM) as well as the Arts (STEAM) activities in Fairfax County; and, quantify and prioritize resources needed to sustain or expand the most effective programs and partnerships.

Opportunities for Careers

According to the Northern Virginia Technology Council's 2016 Workforce Needs Assessment, between 2012 and 2022, the greatest growth in jobs in Fairfax County will be in STEM-related fields. However, only 16% of youth (nationally) are interested in pursuing a STEM career.

The STEM map viewer will be a key element in a larger effort to tie together the promotion of STEM opportunities for youth, establishing career pathways for youth and workforce development activities in order to meet the growing need for a STEM-focused and STEM-proficient workforce to maintain Fairfax County's status as a national hub for STEM industries. Additionally, the map will shed light on equity issues around STEM program provision and be a tool to expand participation in STEM activities for all youth.

Opportunities for Partnerships

There are partnership opportunities for businesses and other community stakeholders throughout the county's STEM environment, such as mentoring, scholarships, job shadowing, internships and other activities.

Currently, many STEM opportunities are provided through partnerships between a government agency, nonprofit organization or school and corporations or foundations offering various types of support. However, there is limited coordination or collaboration of these activities county-wide and overlap sometimes occurs.

The map viewer will provide a central location for those interested in partnering in STEM programs to find these opportunities.

Audience

- Students and families
- School career and guidance counselors
- Program planners throughout the county
- County decision makers
- Businesses seeking to sponsor or mentor STEM activities
- Nonprofits and other program partners
- Any parties interested in providing STEM programming in Fairfax County
- Employers seeking highly trained job candidates with a range of STEM skills

Opportunities for Participation

One of the findings of the STEM Snapshot was the lack of participation by girls and minority students. The majority of STEM participants are White and Asian males.

Girls often lose interest in the STEM disciplines by the 5th grade, yet girls tend to outperform boys in STEM earned credits in high school.

The STEM map viewer will serve as a central resource for information about the wide variety of STEM programs in the county including Environmental and Natural Sciences, Health Sciences and Creative Arts Technology. There is a STEM program for almost every interest and the map viewer will make them more accessible.

Opportunities for Equity

The need to ensure that all youth in Fairfax County have access to STEM opportunities is an important aspect of this work. County decision makers are committed to removing barriers to equitable participation in STEM and other activities.

Cost, family participation and lack of transportation are frequently cited as barriers to participation for some families in out-of-school STEM activities.

There are many STEM activities in Fairfax County that are provided free of cost in schools, parks, libraries, teen and community centers and through some private programs and facilities. However, participation in some of the more advanced activities, such as camps and competitions, can be very costly.

To ascertain the fair distribution of STEM opportunities across the county, the Free and Reduced Lunch (FRL) GIS layer is available in the viewer. The FRL program is often used as a proxy for family income.

Purpose – Outreach

The STEM Opportunities for Youth map viewer is an outreach tool that is targeted at students and families who have an interest in STEM, as well as those students who want to learn more. The map viewer will be hosted on a web page or portal that will contain additional resources intended to nurture the concept of STEM as a career rather than just a hobby.

The viewer will be a direct way to inform county decision makers about STEM opportunities throughout the county, providing awareness of programs in their districts as well as any underserved areas.

County business and community leaders in the STEM industry who wish to partner in a variety of ways including programming, sponsoring and mentoring, will be able to quickly determine where their resources will be best allocated.

Background and Content

The development of the STEM Opportunities for Youth map viewer grew out of work supporting Goal 5 of the Fairfax County Strategic Plan to Facilitate Economic Success (see above).

The Goal 5 Implementation Team sponsored an extensive survey of well over 100 government, business, academic and community stakeholders to determine the extent of STEM opportunities in the county. This information was developed into a database called the STEM Snapshot.

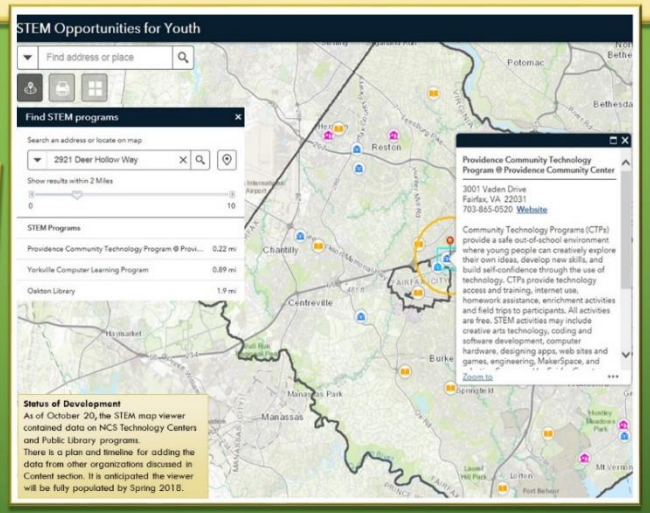
A workgroup of stakeholders led by Office of Public Private Partnerships (OP3) and Countywide Service Integration and Planning Management (CSIPM), with representatives from Fairfax County Public Schools (FCPS), Fairfax County Public Libraries (FCPL), and the Department of Neighborhood and Community Services (NCS) was formed to develop a mapping application of the Snapshot data.

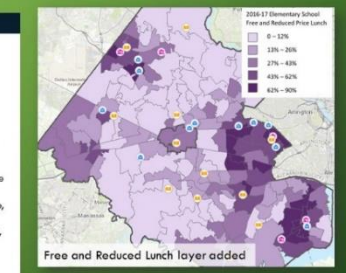
To determine which specific data elements in the STEM Snapshot would produce a map that would be useful to the widest audience while supporting ease of maintenance, the mapping work group evaluated the more than 100 programs detailed in the Snapshot. It was decided to focus first on public programs provided by NCS, FCPS (out-of-school programs, not standard curriculum) and FCPL. The viewer will be expanded in stages, eventually including information on programs and activities provided by Fairfax County Park Authority, nonprofit providers, such as Children's Science Center and First Robotics, academic partners including George Mason University, Northern Virginia Community College and Virginia Tech, and many business and corporate sponsors of STEM opportunities, activities, camps and competitions.

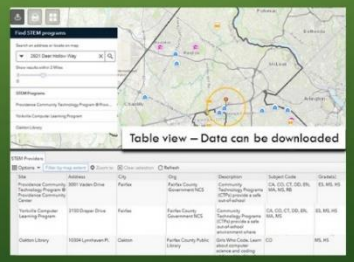
The STEM Viewer will be hosted and maintained by a collaborative effort among several Snapshot survey participants.

Stakeholders

Office of Public Private Partnerships
Dept. Neighborhood and Community Services
Office for Children
Fairfax County Public Schools
Fairfax County Park Authority
Fairfax County Public Libraries
First Robotics
Leidos
Northrop Grumman
Cox Corporation
MITRE
Refraction
Virginia STEM
Northern Virginia Community College
George Mason University
Children's Science Center
Community Foundation for Northern Virginia
NOVA Labs
Project Lead the Way







Technical Specifications

The STEM viewer was built using the Esri ArcGIS Online Web App Builder, a customizable online mapping application. In addition to the standard interactive map functionality of turning layers on and off and clicking features on a map to see more information about them, configurable "widgets" add more complex capabilities.

The "Filter" widget limits the visibility of features in a layer. Several filters are configured for the STEM viewer, allowing the user to narrow the display of programs to those which meet any combination of grade level and STEM subjects, as well as include or exclude those that are hosted at a school or require a fee.

The "Near Me" widget finds sites within a radius of a defined address or other location. In the viewer, users may search for STEM programs at Fairfax County addresses, schools, libraries, ZIP codes or Supervisor Districts within a specified radius. If the STEM programs have been filtered, that filter applies to the search results as well.

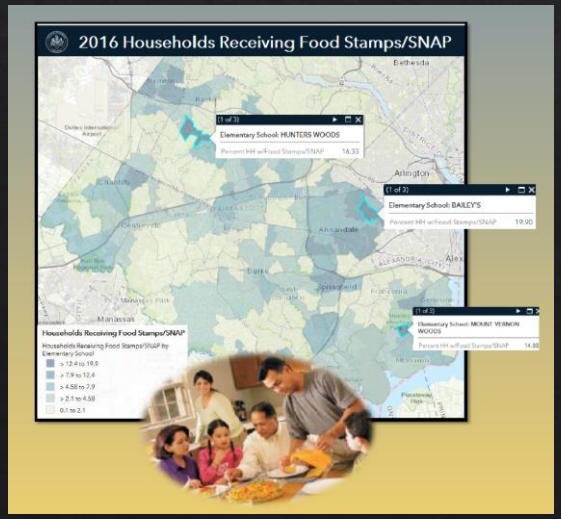
These widgets provide the user with a robust tool for locating STEM activities by geography, target audience and program content.

https://www.fairfaxcounty.gov/ncs/csipm/stem/stem.htm

MOST SIGNIFICANT DATA CONTRIBUTOR

Key Data Indicators Aggregated to Fairfax Count Geographies

Neighborhood and Community Services



Key Data Indicators Aggregated to Fairfax County Geographies

The Fairfax County Health and Human Services (HHS) system has increased its use of data for planning and decision-making in recent years.

For example, one data source that is often used as a proxy for identifying households with low income and high human services needs is the Free- and Reduced-Price Lunch data reported by each school in Fairfax County Public Schools. However, other data types and sources such as demographics data did not align with school boundaries. American Community Survey (ACS) data at the census tract or ZIP code level, used extensively by HHS staff, lacked an "apples to apples" comparison with the Free- and Reduced-Price Lunch data.

Esri Business Analyst software was identified as having the capability to aggregate data to custom geographies.

Staff obtained Census-based data related to demographics, income and other variables important to health and human services such as households receiving Supplemental Nutrition Assistance Program (SNAP; formerly known as food stamps).

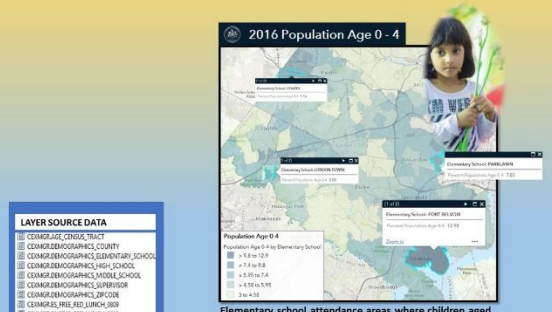
Data were obtained from Esri and aggregated to the FCPS elementary school attendance areas using Business Analyst.

Fairfax County elementary school attendance areas where 15% of households or more receive SNAP benefits.

HHS significance: Knowing more precisely where these families are located allows HHS staff to tailor services to those areas.

With the custom county data that were aggregated and loaded into the Fairfax County enterprise geodatabase and made accessible through the Data Loader, staff can use ArcGIS or ArcGIS Online to view the data geographically and quickly answer questions such as:

- Which areas of Fairfax County have a greater concentration of pre-Kindergarten students that may need additional early childhood education services?
- Do the locations of existing services for older adults align with where county residents aged 65 and older live?



Elementary school attendance areas where children aged 0 to 4 years are approximately 8% or more of the population.

HHS significance: These areas may require additional early childhood education services

Fairfax County Supervisor Districts with greatest percentage of residents 65 years and older.

HHS significance: Are senior centers located in these areas to provide for the social engagement of older adults?

Geographies and Data Indicators

Geographies
- ❑ Supervisor Districts
- ❑ Elementary School Attendance Areas
- ❑ Middle School Attendance Areas
- ❑ High School Attendance Areas
- ❑ ZIP Codes

Income
- ❑ Median Household Income
- ❑ Households with Income under $50,000
- ❑ Households Receiving Food Stamps/SNAP
- ❑ Households Below Poverty Level
- ❑ Housing Cost-Burdened Renters

Health-related
- ❑ Age 18-64 without Health Insurance
- ❑ Households with 1+ Persons with a Disability

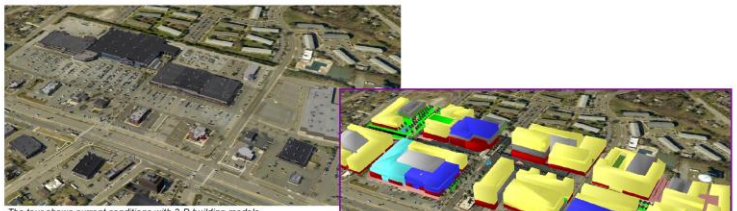
Demographics
- ❑ Population Age 0-4
- ❑ Population Age 5-19
- ❑ Population Age 65+
- ❑ White Population
- ❑ Black/African American Population
- ❑ Asian Population
- ❑ Multiple/Other Race Population
- ❑ Hispanic Population

BEST USE OF GIS FOR PUBLIC OUTREACH

An Immersive and Interactive 3-D Tour of Mount Vernon Supervisor District

Thirty years ago, former Mount Vernon District Supervisor Gerry Hyland started a tradition in the Mount Vernon District of Fairfax County that has roots from his small hometown in Massachusetts. Growing up, Mr. Hyland, his family and friends would attend annual town hall meetings, a community forum where residents could have dialogue with elected officials. When this tradition was brought to Mount Vernon, Supervisor Hyland would inform the residents of future developments in the area by giving them a "bus tour", which was not actually a physical tour on a bus, but rather a presentation using pictures at each stop (mostly new development).

On February 3, 2017, the 30th Mount Vernon District Town Hall Meeting took place with a new District Supervisor, Dan Storck. Mount Vernon residents and Supervisor Storck admired Supervisor Hyland's bus tour; it's what brought people back to the annual event and kept them there for its entirety because the bus tour was always the last event. However, this time, Supervisor Storck wanted to utilize and showcase the County's GIS capabilities. Using Terra Explorer, better known as Virtual Fairfax, a GIS tool available for all county residents to use, Supervisor Storck introduced 300 residents to a new style of "bus tour" called the Mount Vernon District Fly Through.



The tour shows current conditions with 3-D building models.

The tour is also able to show 3-D development proposals in the same environment.

What started as a hope and dream, transformed into one of the most futuristic presentations that was ever given at a Mount Vernon District Town Hall Meeting. A dramatic entrance and 360-degree view of Mount Vernon Estate launched the presentation with oohs & aahs. There were 45 stops on the Virtual Fly Through presentation, and with the help of TerraExplorer, residents got a sweeping view of the district and had a better understanding of where the proposed development and issues in the community were located. The Virtual Fly Through was also live on Channel 16 during the event so that people could tune in on their TV at home and on Facebook Live.

Viewers can visualize proposed development layouts.

Expereince the Reagan National Aiport flight path over the district including sounds of the jet engine's roar.

Since the 30th Mount Vernon District Town Hall Meeting, Supervisor Storck has used the Virtual Fly Through presentation to explain his vision and goals for the District when meeting with the Mount Vernon-Lee Chamber of Commerce, Northern Virginia Association of Realtors, and many other organizations and individuals. The Virtual Fly Through presentation is available on the County website, through Channel 16 Video On Demand, and on Supervisor Storck's Facebook Live archive.

Mount Vernon Historical Site

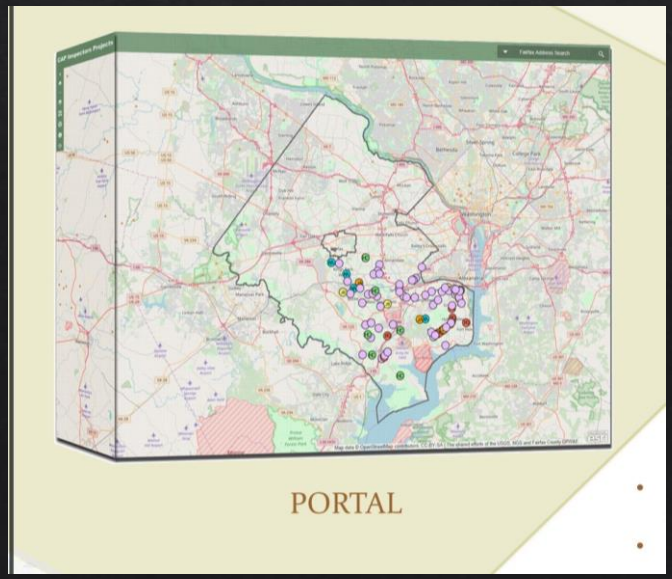
Mount Vernon District Virtual Fly Through

Board of Supervisors

Interactive mapping application:
www.fairfaxcounty.gov/gisapps/virtualfairfax/

BEST GIS INTEGRATION

Inspector Projects Data Layer
Capital Facilities



INSPECTOR PROJECTS DATA LAYER

Traditionally, Utilities Design and Construction Division-Inspections tracked construction projects on a spreadsheet.
The Supervising Inspector would manually map inspectors' projects in order to visualize the project locations.

Ms. Vega trained the Supervising Inspectors on how to use ArcMap and the GIS Portal to access the map using Citrix, project data, Supervisor District, route numbers. Once the distribution of projects assigned to each inspector became 'visual', the Supervising Inspector could use his staff more effectively, and reassigned some projects based on the 'visual' knowledge.

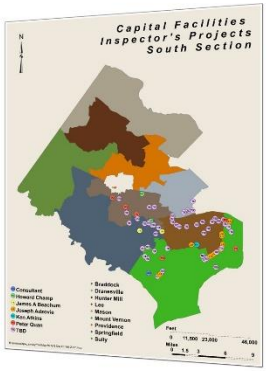
The Land Survey Branch supported Utilities Design and Construction Division-Inspections by creating a data layer to house the projects as map pins, with color coding that allows easy identification of Tax Map, Project Name, Contract Number, Project Number, Contractor Information, Inspector, Project Engineer, and Remarks.

PORTAL

The Supervising Inspector can easily use Portal to view the locations and assign inspectors based on location. Ultimately, this allows more efficiently planned inspections, maximizes the Senior Engineering Inspector time used for inspections versus travel, reduces wear and tear on county vehicles, and lessens our environmental impact of vehicle miles.

Benefits of the GIS application:

- Makes logical geographical assignment easier.
- Eliminates driving all over the county if a project is right around the corner from a Senior Engineering Inspector; allows bundling of assignments.
- Helps to assist the contractors with route numbers & street names for VDOT requirements for Lane Closure Advisory Management System (LCAMS) on a daily basis.
- Has detailed information for upper management if complaints come in or if general concerns or issues arise.



ARC MAP

Capital Facilities Inspector Projects Data Layer

GIS Day 2017

DPWES – LAND SURVEY BRANCH

This effort will continue to help the Utilities Design and Construction Division-Inspections; the plan is to extend the practice of mapping the location of the projects in the North County area. When both areas are in the GIS Portal and each Supervising Inspector feels confident using this GIS tool, we can move forward using "Workforce for GIS" to integrate office and field data.
The Supervising Inspectors will be able to:

- Achieve real-time awareness of staff.
- Plan and optimized Senior Engineering Inspector driving routes.
- Collect and maintain accurate daily reports for the office and the field.

BEST GIS INTEGRATION

Utilizing ArcGIS Online, ArcGIS Pro, and Collector for Stream Project Scoping

Department of Public Works & Environmental Services - Stormwater Management

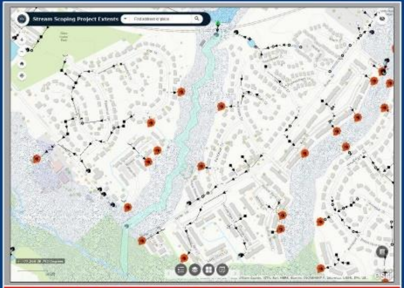
Utilizing ArcGIS Online, ArcGIS Pro, and Collector for Stream Project Scoping

Background:

The Stormwater Planning Division's Watershed Project Implementation Branch (WPIB) and Watershed Assessment Branch (WAB) are tasked to select and prioritize projects each year. Projects either come from the Watershed Management Plans (WMPs) or were nominated for potential implementation (additional projects). Data for the WMPs was already kept in the Proposed Watershed Management Plan Potential Projects Layer (PWMPPL).

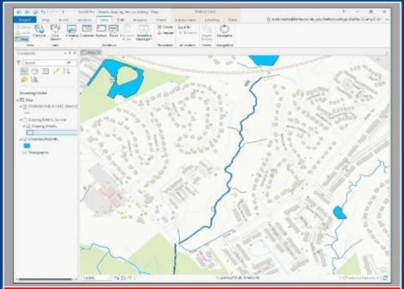
Project Scoping is performed each year by interdisciplinary Stormwater Planning teams to rate projects for viability. In order to streamline scoping, this process was developed to ease data collection in the field and incorporate the project nomination process into PWMPPL. This is where Unique Identifiers and Project Names are assigned and projects extents are digitized. Candidates for stream scoping are selected from this layer, and any new nominations have to be added before they can be scoped.

We had already assigned ArcGIS Online accounts to the majority of Stormwater Planning staff for other Collector projects. This was the perfect opportunity to utilize ArcGIS Online for something other than just the Collector App and open everyone's eyes to the possibilities of Web GIS. We set up several training sessions for staff and worked together to develop the following workflow.



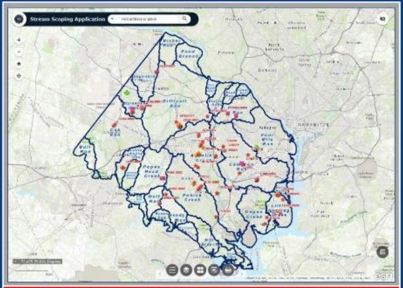
Step 1: Nominate projects for 2018 scoping.

An ArcGIS Online Web Application was created with a hosted feature service named Project Extents. The projects that already existed in PWMPPL were added to the new Project Extents service. The WPIB staff, who nominated WMP projects, used the app to verify that the project extents were correct and made edits accordingly. The WAB staff, who nominated new projects, used to app to draw the extents of the additional projects in the app.



Step 2: Update PWMPPL with updated extents of existing projects and create new projects.

The PWMPPL data manager added the hosted service to his project in ArcGIS Pro. He then updated PWMPPL with the new project extents and assigned Unique Identifiers and Project Names according to PWMPPL naming conventions.

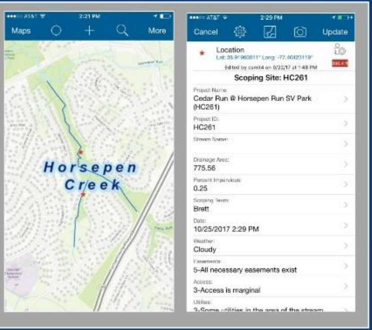


Step 3: Add all projects to the Stream Scoping Web App and perform Desktop Review.

The centroid of the PWMPPL project extents is then loaded into Stream Scoping Feature Service in a Web Application with the Unique Identifiers and Project Names populated. The Stormwater planning engineers then use the Web Application to perform a desktop review of the proposed projects 2018 scoping. The desktop review includes populating attributes that can be assessed from the GIS layers available in the web app. (ex. easements, access, and owner.)

Step 4: Use Collector App to perform field scoping.

The scoping teams use the Collector App on iPads in the field with access the Stream Scoping Web Map. They use the scoring criteria set up in the app to rate each project site (point feature). Then they draw in as many stream reaches (line feature) as they determine necessary for each site and rate each one. The reaches are a related feature to the project site.



Step 5: Export the data and analyze.

Once the scoping is complete for the season it can be analyzed in GIS or exported to excel for score calculation and further analysis by Stormwater Staff.

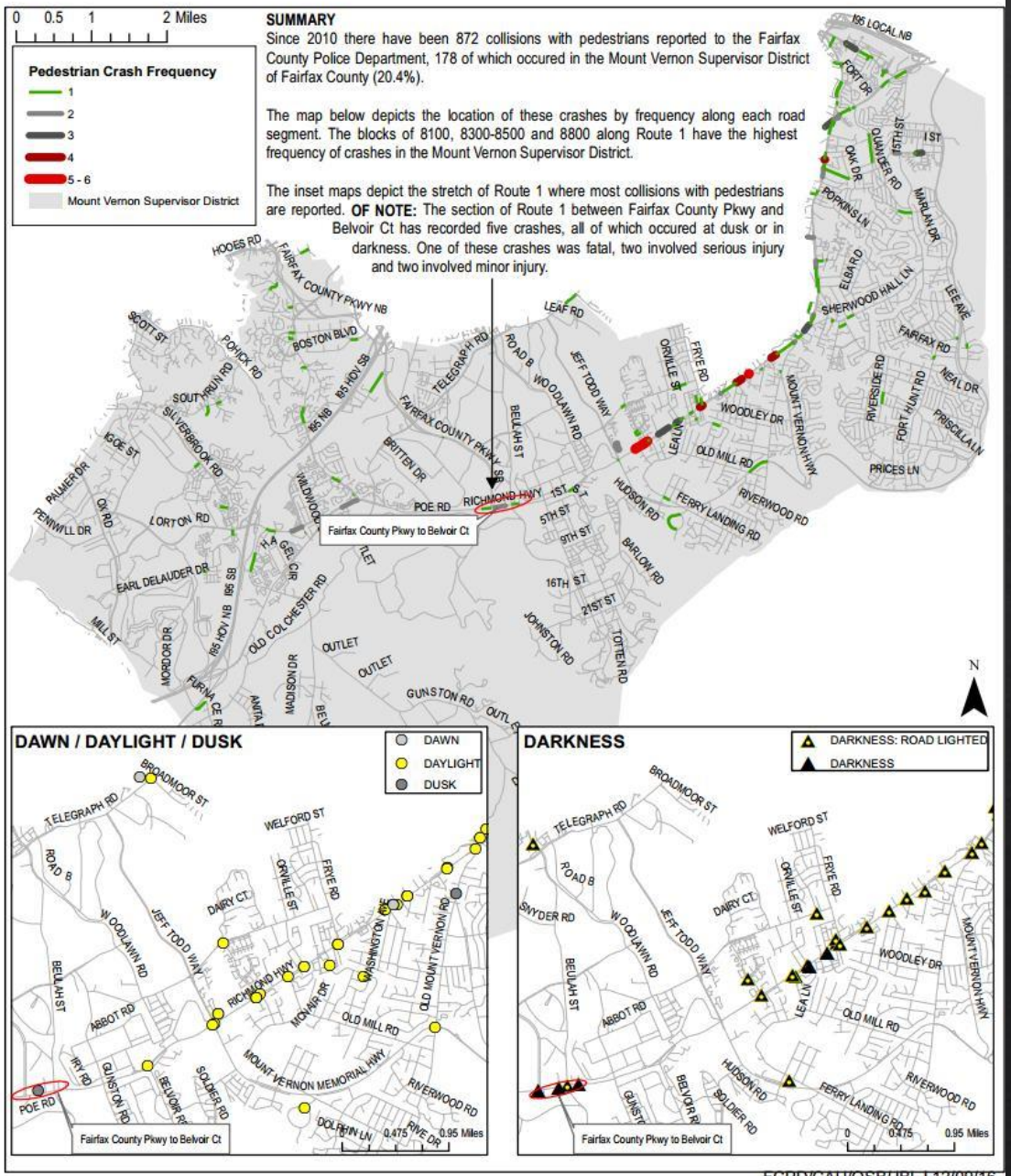
Project Name	Project ID	Stream Name	Mag. District	Drainage Area	Percent Impervious	Scoping Team	Date	Easements Score	Access Score	Utilities Score	Ownership Score	Stream Order Score	Planning Score
Long wood knolls/veering lane Max	Pc9120	Peyton run	springfield	0	0	Sc, de, jp	2016-11-01	5	5	0	3	5	18
Scotts Run South (Stream Valley Park)	SC[illegible] 232	Scotts Run	Providence	383		MM, CS	Previous	3	4	3	5	5	20
Snakeden Branch	DF92102	unnamed tributary to Snakeden Branch	Hunter Mill	212.2		DK, EG, LA	12/4/2014	4	5	3	3	5	20
Belle Haven Park Max	DF9200, 9203	Quander Brook	Mount Vernon	282	42	Danielle Wynne, Dave Anglin, Justin Pistore	2016-10-28	3	5	3	3	5	19
Paul Spring Branch - Segment 2 @ Hollin Hills (LH82-0002) Max	LH82-0002	Paul Springs Branch @ Marthas Rd	Mount Vernon	23.61	16.7	Michi, Jon Witt, Meghan F, Megan M, Charles	2016-08-08	1	3	1	3	5	13

Conclusion: We are currently in our second season of project scoping with the Collector Apps. We implemented this workflow in the second season and Stormwater Planning staff have been pleased with the results. The integration of ArcGIS Online allowed us to involve everyone in the selection process saving a great deal of time while also increasing the accuracy of PWMMPL. The program will be reassessed after the completion of fall 2017 Scoping and any necessary improvement will be implemented.

Stormwater Planning Division

Fairfax County Public Works and Environmental Services

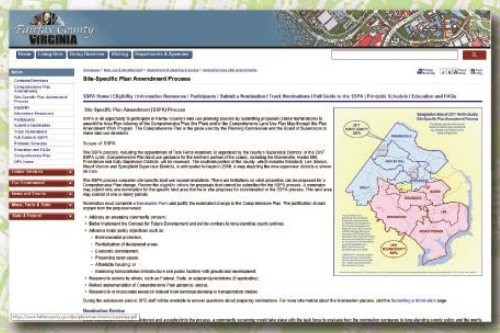
Fairfax County Police Department
Pedestrian Crashes Within 500 Feet of the Mount Vernon Supervisor District
January 1, 2010 through December 8, 2016

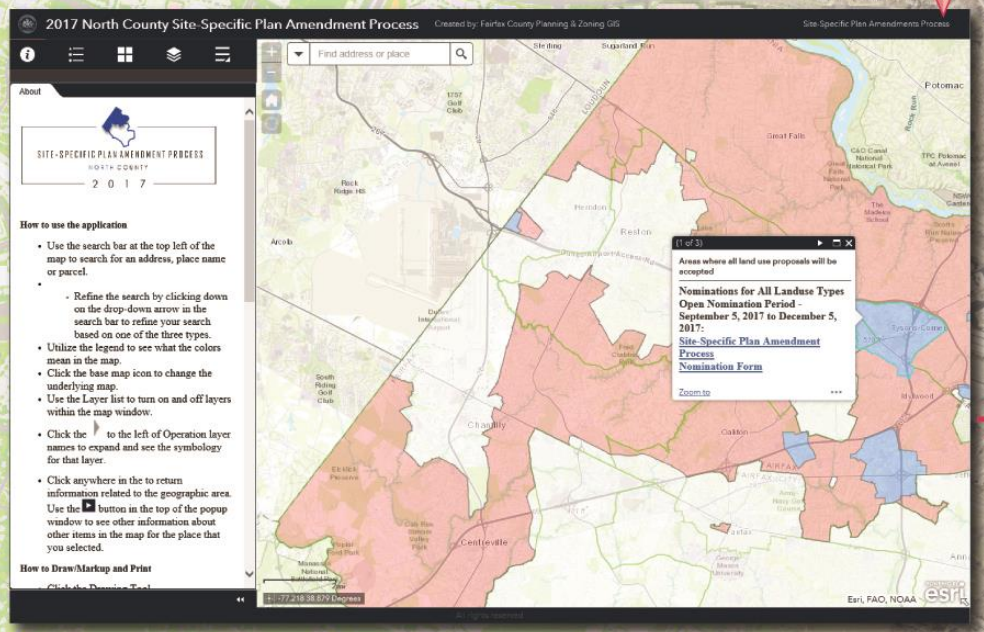


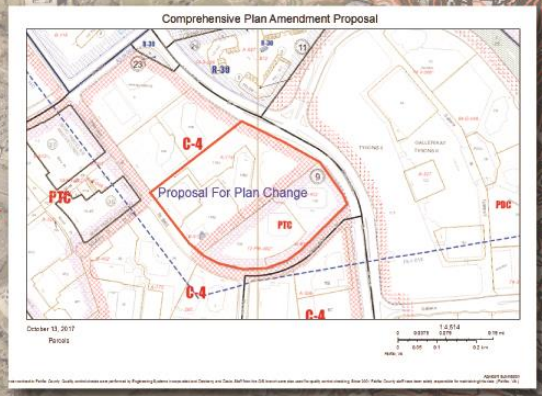
FCPD/CAU/OSB/JBL | 12/09/16

Site-Specific Plan Amendment Process
2017 North County Web Map Application

Fairfax County
Department of
Planning & Zoning







The Site Specific Plan Amendment Process

This is a public facing map application with an information section that describes in detail, how to use the application, how to draw, markup and print a document that can be used for their nomination.

Interacting with the map will give the user information on the types of proposals that are currently being accepted along with links to a detail page about the comprehensive plan amendment process and a link to the nomination form

Interactive mapping application:
http://arcg.is/2AdkrUq

Urban Rodent Survey - Wilton Woods and Virginia Hills

Fairfax County Health Department

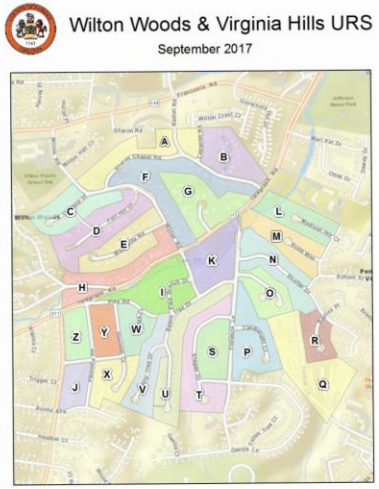
Lauren Lochstampfor, Enivronmental Health Specialist III

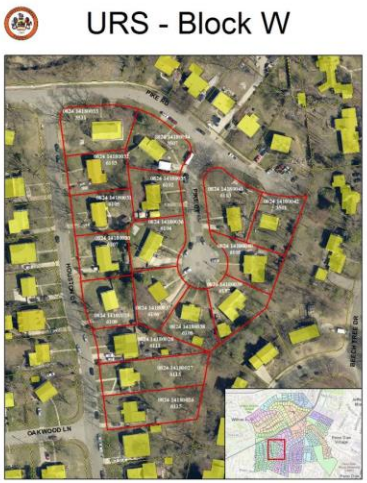
Background

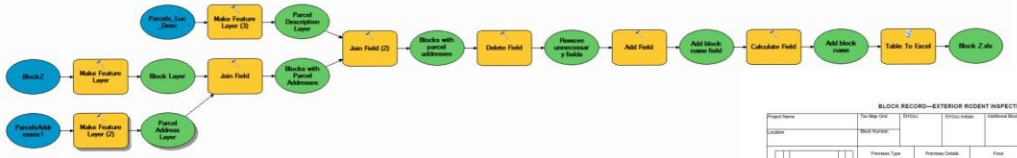
On Friday, September 22, 2017 the Fairfax County Health Department (FCHD) received a rat sighting complaint from a property in the 6000 block of Pike Branch Drive, Alexandria, Virginia. An investigation was initiated on Monday September 25, 2017. Environmental Health (EH) began with this property and then proceeded to adjacent lots in the "Wilton Woods & Virginia Hills" community. The property that was the subject of the complaint was found to be unoccupied.
The residents of Wilton Woods Estates Civic Association & Virginia Hills Civic Association expressed concerns regarding a significant rat problem and requested information on ratcontrol. To better understand the community's concerns about a possible rat infestation, EH began an Urban Rodent Survey (URS) on September 26, 2017.

Study Design and Analysis

A study was designed to characterize the extent of the rodent problem and assess its environmental causes. The study method is based on the Center for Disease Control and Prevention's (CDC) Integrated Pest Management: Conducting Urban Rodent Surveys (2006). A field survey form was adapted from the CDC to capture field observations of rodent activity indicators and community conditions that provide food, water and harborage (nesting and hiding areas).
Given that the area in question is suburban, the extent of the survey boundaries was determined by delineating a 500-meter radius from the subject street. Individual survey blocks were defined by natural and/or physical boundaries.
The field investigation was conducted on September 26 and 27, 2017. The field investigation used twelve (12) teams of two (2) environmental health specialists to evaluate the properties and note observations on the field survey form.
The field observations were captured on individual field survey forms and data was compiled using the summary form. The GIS analysis of properties with evidence of recent rodent activity was done by using a GIS layer over the property map for the community.







Block W

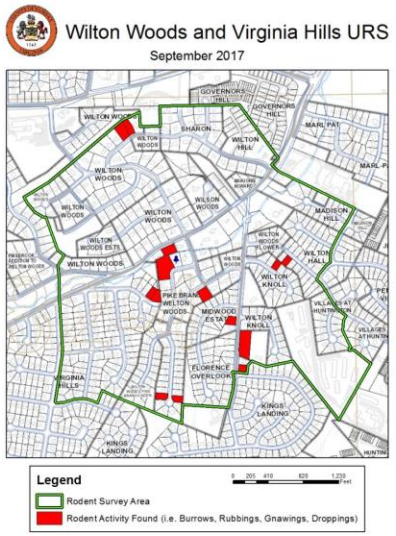
Index	Block	PIN	Address	Location Description
1	Block W	0824 14180033	3511 PIKE RD	Single-family, Detached
2	Block W	0824 14180027	6113 HOUSTON CT	Single-family, Detached
3	Block W	0824 14180041	6103 PIKE CT	Single-family, Detached
4	Block W	0824 14180032	6103 HOUSTON CT	Single-family, Detached
5	Block W	0824 14180028	6111 HOUSTON CT	Single-family, Detached
6	Block W	0824 14180042	3501 PIKE RD	Single-family, Detached
7	Block W	0824 14180031	6105 HOUSTON CT	Single-family, Detached
8	Block W	0824 14180037	6106 PIKE CT	Single-family, Detached
9	Block W	0824 14180039	6107 PIKE CT	Single-family, Detached
10	Block W	0824 14180029	6109 HOUSTON CT	Single-family, Detached
11	Block W	0824 14180035	6102 PIKE CT	Single-family, Detached
12	Block W	0824 14180040	6105 PIKE CT	Single-family, Detached
13	Block W	0824 14180038	6108 PIKE CT	Single-family, Detached
14	Block W	0824 14180036	6104 PIKE CT	Single-family, Detached
15	Block W	0824 14180034	3507 PIKE RD	Single-family, Detached
16	Block W	0824 14180030	6107 HOUSTON CT	Single-family, Detached
17	Block W	0824 14180026	6115 HOUSTON CT	Single-family, Detached

Planning the Survey

Each team of Environmental Health Specialists participating in the survey were provided with a block locator map, a block field map, and a list of parcels located within the assigned block.
Using a 500-meter radius, blocks of parcels were identified and assigned shapes. Within each of those blocks, a list of the parcel identification numbers (PIN's), MAR address, and property description were generated. A basic model was developed to quickly export the information for each block to a Microsoft Excel file.

Results

The purpose of this study was to identify the conditions that could contribute to supporting a rodent infestation, and identify any pattern of rodent activity. Signs of rodent activity in a parcel were symbolized on a map of the survey area. Based on the survey results, the defined target area of the study has rodent activity, but does not have conditions supporting rodent infestation.



Summary of Observations

Number of Premises Inspected	549
Premises Type – Residential (%)	515 (93.8)
Premises Type – Commercial (%)	3 (0.5)
Premises Type – Vacant Lot (%)	32 (5.8)
Premises Type – Commercial/Residential (%)	1 (0.2)

Category	Condition	Number (Percent)	Confidence Interval
Food	Unapproved Refuse Storage	27 (4.9)	3.1%-6.7%
Food	Exposed Garbage	19 (3.5)	1.9%-5.0%
Food	Animal Food	36 (6.6)	4.5%-8.6%
Food	Other Food & Plants	129 (23.5)	20.0%-27.0%
Water	All types	74 (13.5)	10.6%-16.3%
Harborage	Abandoned Vehicles	14 (2.6)	1.2%-3.9%
Harborage	Abandoned Appliances	8 (1.5)	0.5%-2.5%
Harborage	Lumber/Clutter	128 (23.3)	19.8%-26.9%
Harborage	Other Large Rubbish	26 (4.7)	3.0%-6.5%
Harborage	Outbuildings	120 (21.9)	18.4%-25.3%
Harborage	Board Fences & Walls	52 (9.5)	7.0%-11.9%
Harborage	Plant-Related	339 (61.7)	57.7%-65.8%
Entry/Access	All Types	87 (15.8)	12.8%-18.9%
Active Signs	All Types	14 (2.6)	1.2%-3.9%

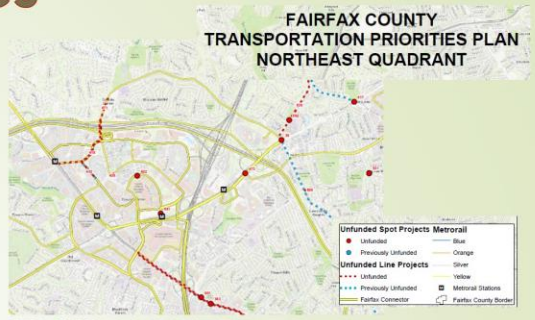
Transportation Project Priorities

Fairfax County Department of Transportation

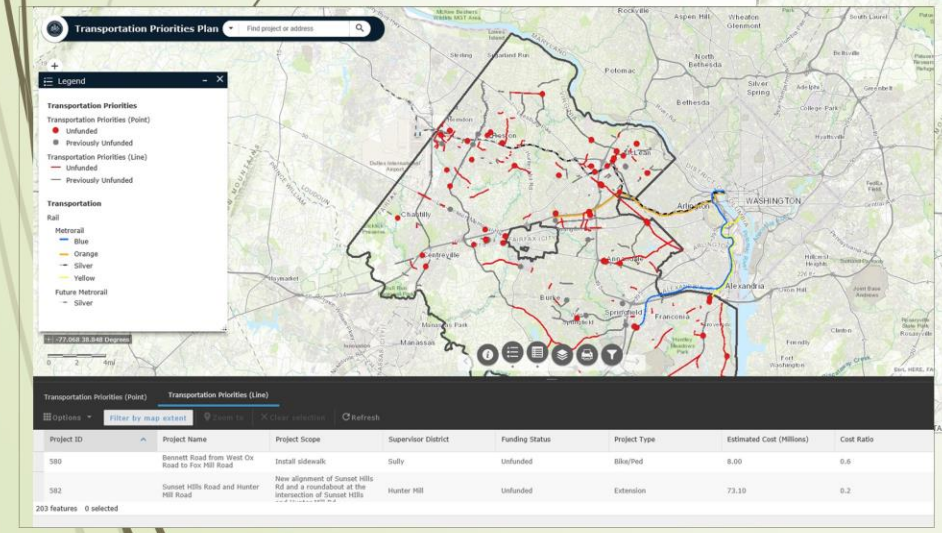
Public meetings were held through the month of October as part of the Fairfax County Department of Tranportation (FCDOT) Transportation Priorities Plan (TPP) to collect community input to prioritize unfunded transportation projects in the county. There are over 100 unfunded capital and operating projects important for improving the efficiency and safety of the county's transportation network, but limited funding is available for these proposed projects. These unfunded projects would provide new capacity and include interchange improvements, roadway extensions, spot improvements, roadway widenings, transit, and bicycle & pedestrian improvements.

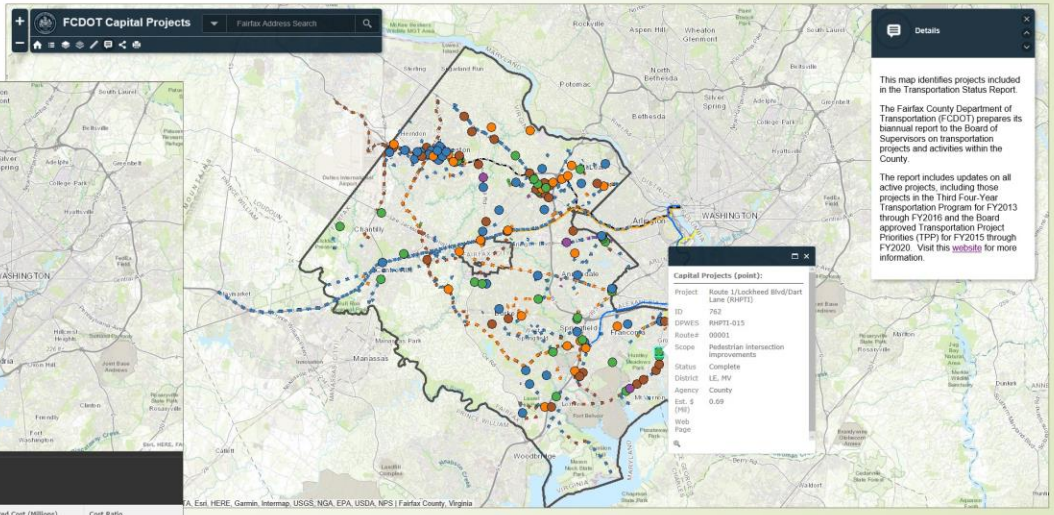
An interactive map was created allowing residents to search for their neighborhood or other points of interest to see projects in their chosen area. Along with presenting a visual location, the map includes project information regarding scope and estimated funding costs, information that had previously been kept in a table devoid of visual representation. Unless one is very familiar with street names and locations within the county, it could be difficult to determine if a project would affect your area without the assistance of a map.

Once the TPP results are collected and funding is approved by the Board of Supervisors, projects that receive funding will be updated in this map as well as becoming part of the Transportation Status Report (TSR) and its associated interactive map. As projects move through stages of study, design, and construction, their status will be reflected on this map allowing the public to track their progress. To date, approximately 300 projects since 2014 have moved through this system of public outreach. When the original County Dialog on Transportation (CDOT) was conducted, paper maps were provided which didn't allow for peripheral viewing of projects outside the immediate area of a select project.



Traditional mapping products are labor intensive and provide only a limited view of each area.





Interactive mapping applications allow for dynamic viewing and querying of the information. The TPP map (left) displays projects under consideration for funding as part of the FY 2018-2023 TPP. Current projects under consideration are shown in red. The Capital Projects map (above) identifies projects included in the TSR.

Interactive mapping applications:

http://arcg.is/2k6clqb

http://arcg.is/2idQOLs

Embark Richmond Highway
Comprehensive Plan Update
AFFORDABLE/WORKFORCE HOUSING

The Comprehensive Plan defines affordable housing as housing affordable to households earning up to 120% of the Area Median Income (AMI). In 2016, the AMI was $108,600 for a family of four.

The Board of Supervisors established the Affordable Dwelling Unit Program and Workforce Dwelling Unit Policy to produce much needed affordable housing in Fairfax County.

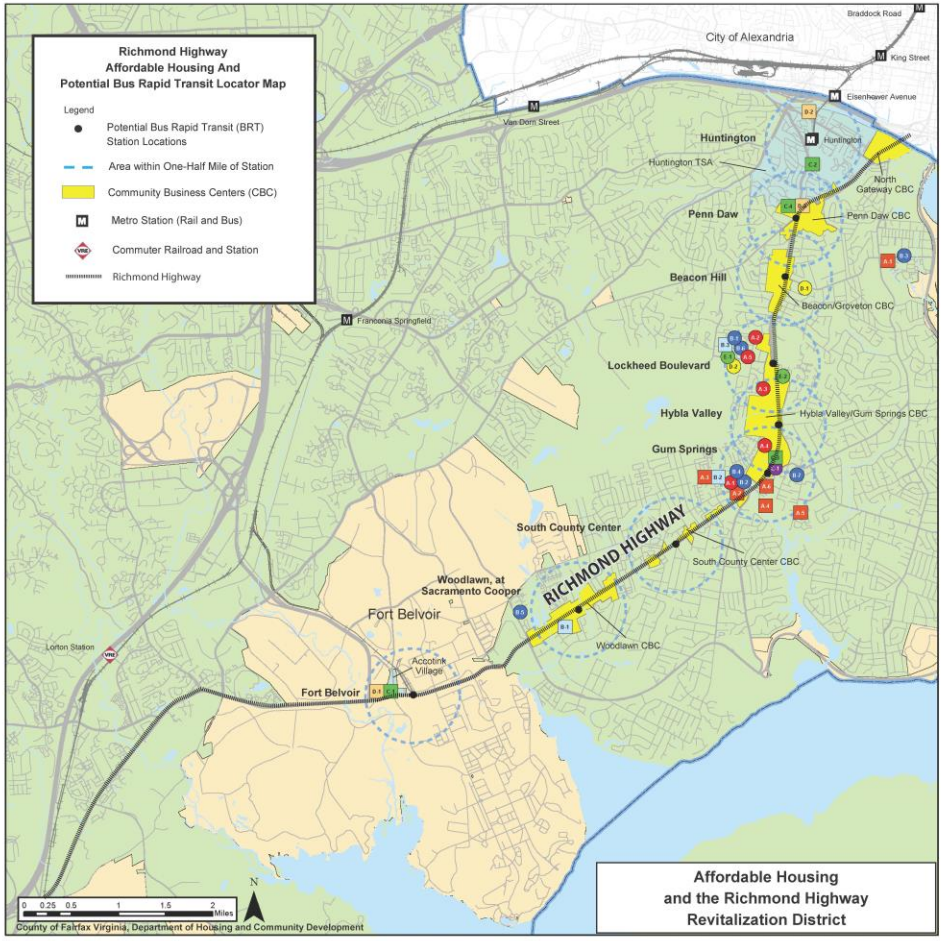
The Policy Plan recommends increasing the supply of affordable housing units each year by an amount equal to at least 12% of the total housing production for the previous year.

AFFORDABLE DWELLING UNIT (ADU) PROGRAM

- **Requires developers to set aside 5–6.25% of new residential units as ADUs** in multifamily developments.
- In single-family detached and townhouse developments that include 50 or more units, the developer is required to set aside up to 12.5% of all new residential units.
- The ADU program serves households earning up to 70% of AMI.

WORKFORCE DWELLING UNIT (WDU) POLICY

- The Board of Supervisors adopted the countywide WDU Policy in 2007.
- The WDU policy is an incentive-based system that encourages the **voluntary development of new housing affordable to a range of incomes** in areas planned for mixed-use or high-density residential development.
- Under the Policy, the developer is expected to provide at least 12% of new residential units as affordable housing.
- The countywide WDU Policy serves three income tiers: up to 80%, 100%, and 120% of AMI.



ID	Development Name	Units	District
	FCRHA Owned - Fairfax County Rental Program (FCRP)		
A-1	Colchester Towne	24	Lee
A-2	Holly Acres	2	Lee
A-3	Mt Vernon Gardens	36	Lee
A-4	Murraygate Village*	200	Lee
A-5	Tavenner Lane*	12	Lee
	Total Fairfax County Rental Program Units	**274**	
	FCRHA Owned - Public Housing (PH)		
B-1	The Atrium	37	Lee
B-2	Audubon	45	Lee
B-3	Belle View	40	Mount Vernon
B-4	Colchester Towne	8	Lee
B-5	Old Mill Gardens	47	Mount Vernon
B-6	Tavenner Lane*	12	Lee
B-7	West Ford I, II & III	105	Mount Vernon
	Total Public Housing Units	**294**	
	FCRHA Owned - Senior Housing		
C-1	Gum Springs Glen*	60	Mount Vernon
	Total Senior Housing Units	**60**	
	FCRHA Owned - Supportive Housing		
D-1	Beacon Hill Group Home	8	Mount Vernon
D-2	Mondloch House Shelter	8	Lee
	Total Supportive Housing Beds	**16**	
	FCRHA Owned Specialized Housing		
E-1	Mondloch Place	20	Lee
E-2	Woodley Hills Estates	115	Mount Vernon
	Total Specialized Housing Units	**135**	
	Privately Owned Federally Assited Rental Units		
A-1	Belle View/Hartwood	18	Mount Vernon
A-2	Buckman Road (aka Stony Brook Apartments)	145	Lee
A-3	Creekside Village* (aka Janna Lee Condominiums)	55	Lee
A-4	Hunting Creek (aka Brosar Village)*	35	Mount Vernon
A-5	Mt. Vernon House (Elderly)	130	Mount Vernon
A-6	Spring Gardens	208	Mount Vernon
	Total Federally Assisted Units/Beds	**591**	
	Privately Owned Non Federally Assisted Rental Units		
B-1	Belvoir Plaza	45	Mount Vernon
B-2	Creekside Village* (formerly Janna Lee Condominiums)	196	Lee
B-3	Lafayette Apartments* (formerly Groveton Gardens)	340	Lee
	Total Non-Federally Assisted Rental Units	**581**	
	Total Privatey Owned Affordable Dwelling Units (ADUs)		
C-1	Belvoir Square	14	Mt Vernon
C-2	Courts at Huntington Station	3	Mt Vernon
C-3	Gum Springs Glen	60	Mt Vernon
C-4	Shelby, The	15	Lee
	Total Privatey Owned Affordable Dwelling Units	**92**	
	Privately Owned Workforce Dwelling Units (WDUs)		
D-1	Belvoir Square	20	Mt Vernon
D-2	Parker, The	54	Mt Vernon
D-3	Shelby, The	13	Lee
	Total Privately Owned Work Force Housing Units	**87**	

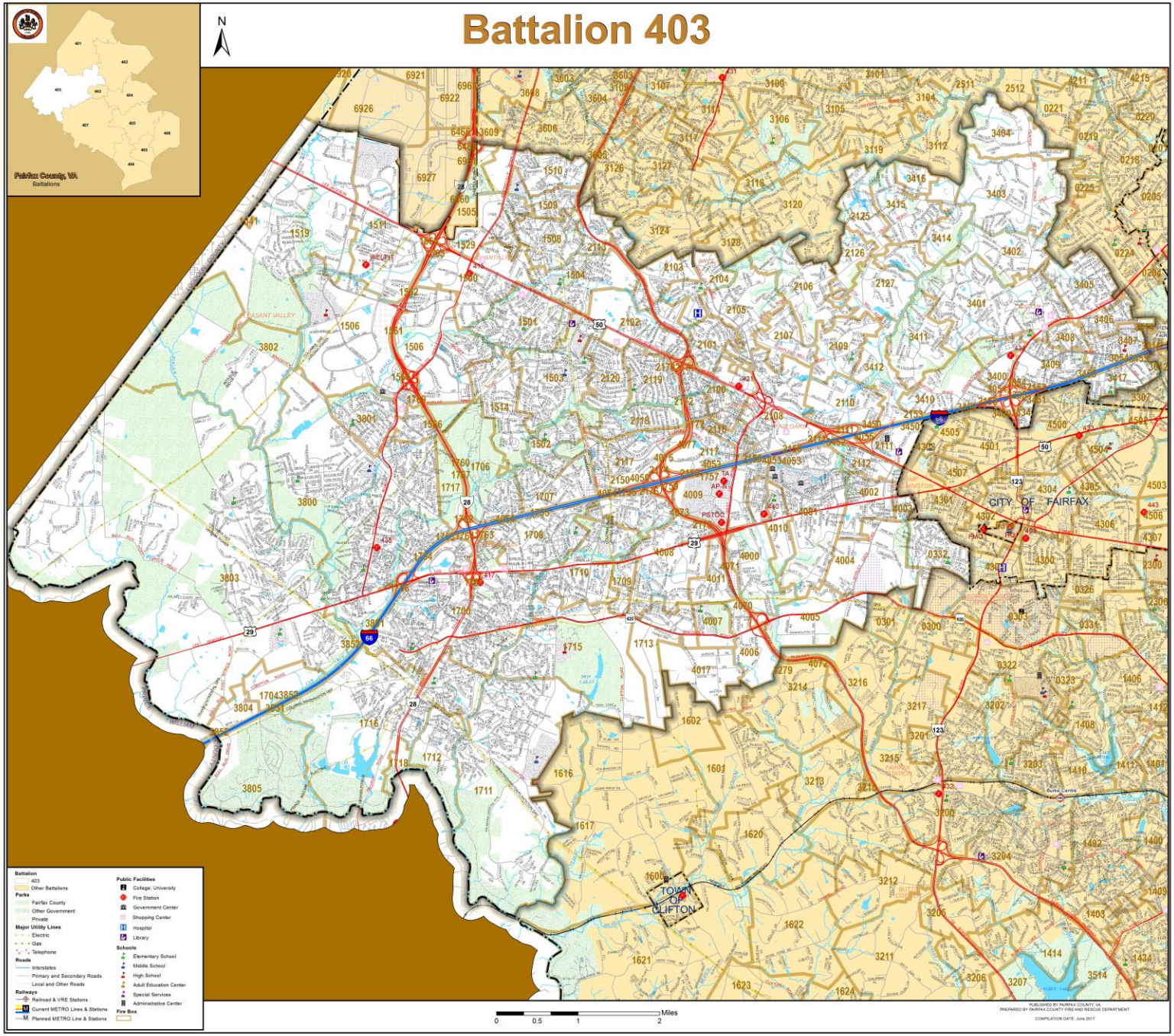
*Includes units financed with Low Income Housing Tax Credits

FCRHA refers to the Fairfax County Redevelopment and Housing Authority

Property locations a depicted on this map are for general geographic location only. For the property address and contact information please consult the Fairfax County Department of Housing and Community Development Low and Moderate Income Housing Guide.

To request this information in an alternate format, call the Planning Division, **703-324-1380** TTY 711 (Virginia Relay)

Battalion 403

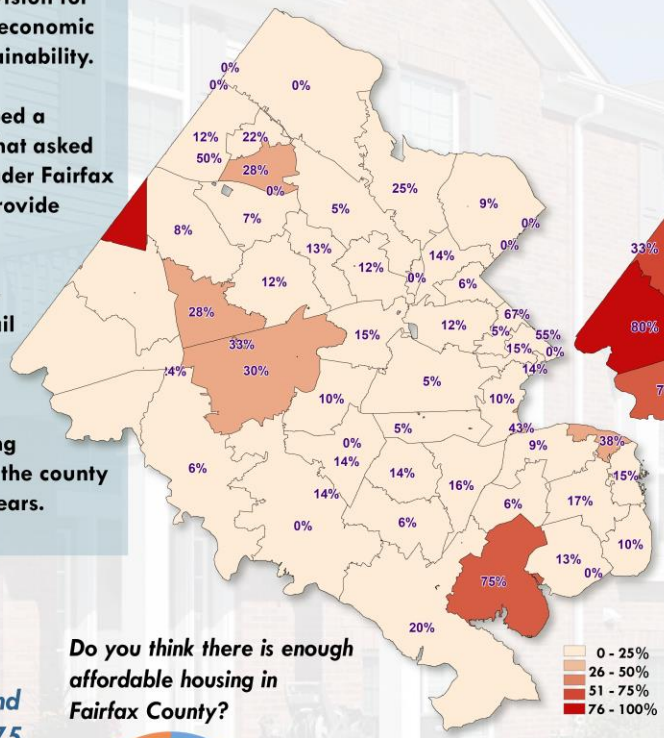


Fairfax County Communitywide Housing Strategic Plan

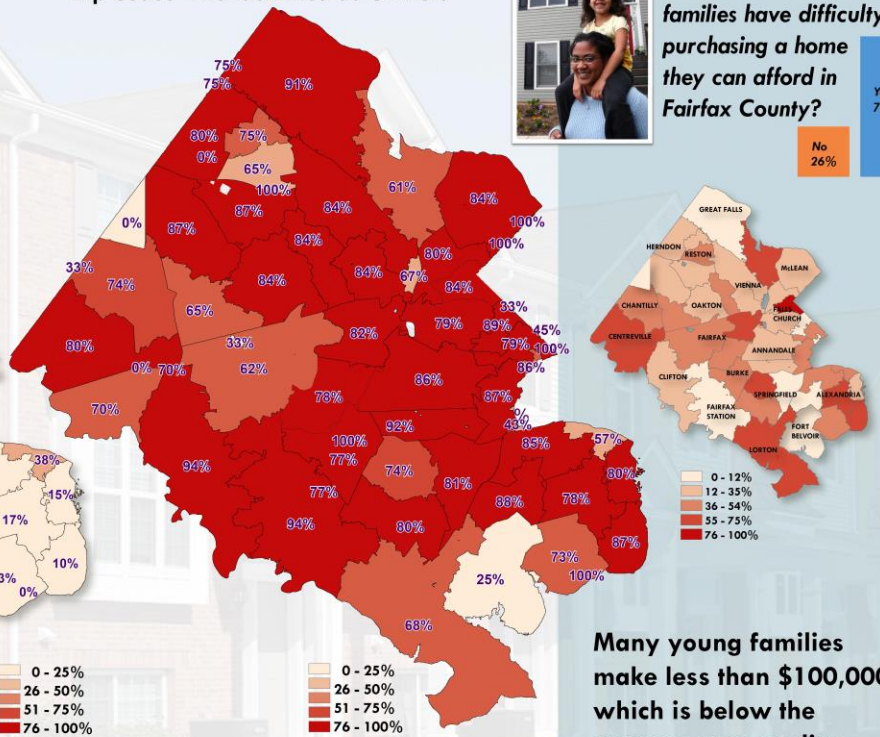
Fairfax County's Communitywide Housing Strategic Plan is an effort to create a shared community vision for how housing supports local economic growth and community sustainability.

Fairfax County staff developed a community survey in 2017 that asked citizens if, and how, the broader Fairfax County community should provide affordable housing to specific populations, including but not limited to – public sector employees, retail industry workers, and older adults. The results from the survey will help develop strategies to meet the growing affordable housing needs in the county over the next 5, 10 and 15 years.

Percentage of Survey Respondents by Zip Codes Who Identified as Renters



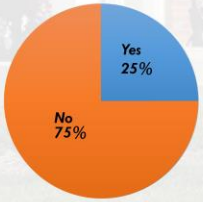
Percentage of Survey Respondents by Zip Codes Who Identified as Owners



Do you think it is a problem that young families have difficulty purchasing a home they can afford in Fairfax County?

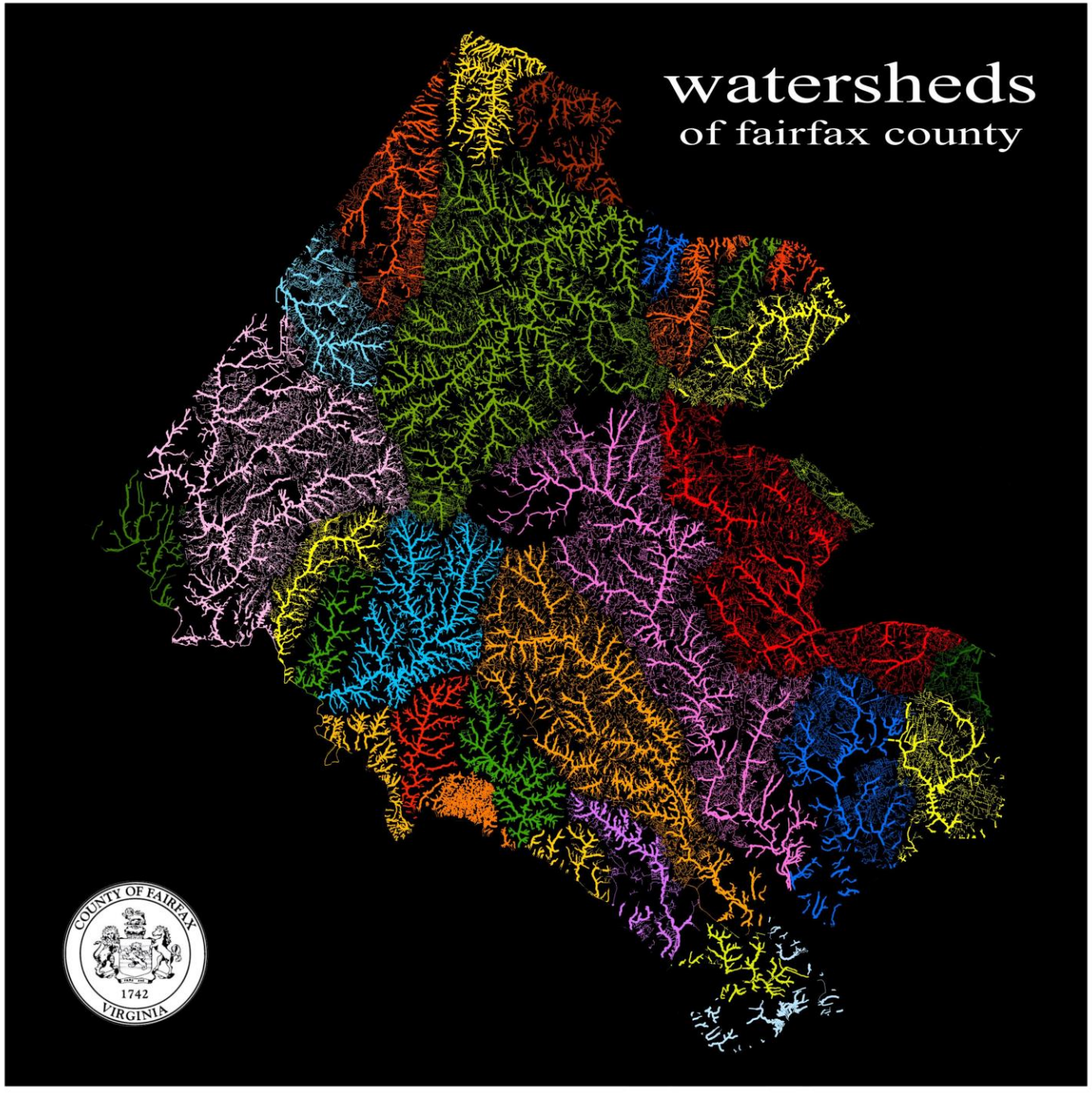
Over 4,500 people responded to the community survey, including both renters and homeowners, and over 75 percent of the respondents feel that there is not enough affordable housing in Fairfax County.

Do you think there is enough affordable housing in Fairfax County?



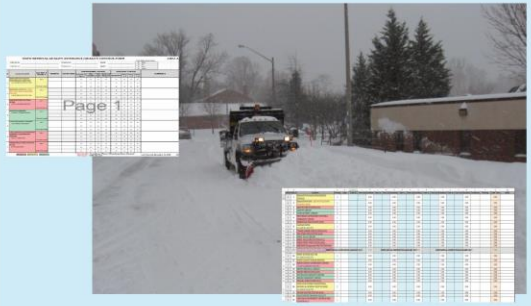
Over 77 percent of the respondents identified themselves as homeowners, 14 percent identified themselves as renters, and approximately 9 percent either live in a home with a friend or family member or chose not to answer the question.

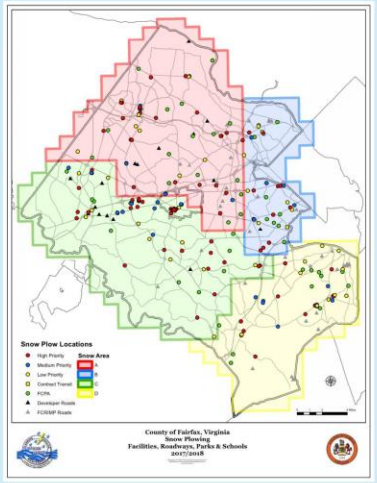
Many young families make less than $100,000, which is below the average area median income in Fairfax County ($110,300). Inadequate income is the biggest barrier when purchasing a first home.


watersheds
of fairfax county
COUNTY OF FAIRFAX
1742
VIRGINIA

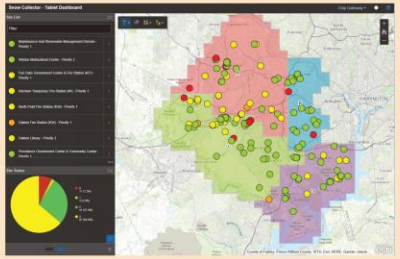
Snow Operation GIS Integration

The Fairfax County Maintenance & Stormwater Management Division (MSMD) coordinates and mobilizes a multi-agency response group for inclement winter weather events to remove snow and treat surfaces at more than 150 county facilities and 7 miles of roads. Over the years the organization has sought to continue to improve operations and reporting consistency while working to gain better operational awareness. Historically MSMD relied mainly on hardcopy laminated map books, spreadsheets and radio communications to direct, track and communicate work efforts. While these systems have fulfilled operational needs, there were inconsistencies reporting facility status back to the Department Operations Center (DOC) which required an efficient way to report the overall state of operations.



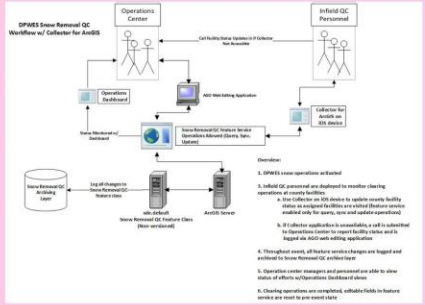


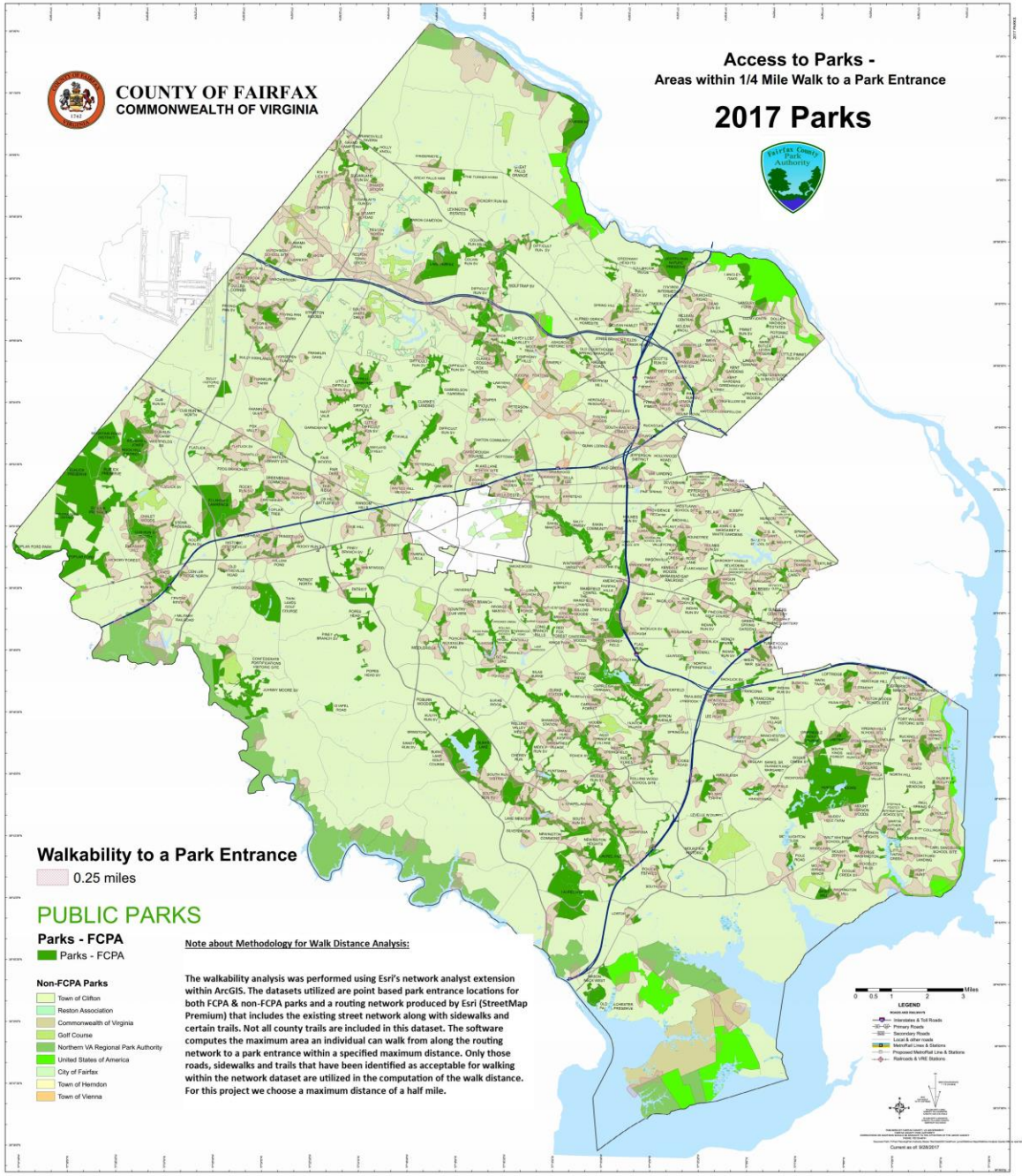
It was determined that MSMD would try and leverage Esri's mobile data collection software, Collector and ArcGIS Online (AGO) to achieve the desired efficiency improvements. The existing business process for facility status reporting was first reviewed to determine the essential information which needed to be collected at each facility to support the required reporting needs. Since new spatial data did not need to be created, the critical reporting fields were added to facility point locations and then moved into the county's enterprise geodatabase. This new feature class was then published as a direct edit feature service with archiving enabled to capture all activity during a snow event. An Operations Dashboard was configured to help visualize the progress for decision makers in the DOC while basic reporting tools were scripted to support overall and facility specific status to staff during shift changes.



Fifty AGO seats were purchased to support full deployment and provide the required personnel access to the software and published applications. Multiple training sessions were conducted to ensure proper mobile device configuration and bring all parties up to speed on how to use and access the Collector software during snow events.

By integrating mobile and web GIS into MSMD snow operations, the DOC experienced reduced radio traffic and consistent status feedback from the field. QC staff were able to efficiently update facility status, attach photos of observed damage or pertinent issues while DOC managers gained a real time view of snow removal operations across the county. Future efforts will pursue possible data and reporting improvements while beginning to explore historical event data.




COUNTY OF FAIRFAX
COMMONWEALTH OF VIRGINIA
Access to Parks -
Areas within 1/4 Mile Walk to a Park Entrance
2017 Parks
Fairfax County Park Authority
Walkability to a Park Entrance
0.25 miles
PUBLIC PARKS
Parks - FCPA
Parks - FCPA
Non-FCPA Parks
Town of Clifton
Reston Association
Commonwealth of Virginia
Golf Course
Northern VA Regional Park Authority
United States of America
City of Fairfax
Town of Herndon
Town of Vienna
Note about Methodology for Walk Distance Analysis:
The walkability analysis was performed using Esri's network analyst extension within ArcGIS. The datasets utilized are point based park entrance locations for both FCPA & non-FCPA parks and a routing network produced by Esri (StreetMap Premium) that includes the existing street network along with sidewalks and certain trails. Not all county trails are included in this dataset. The software computes the maximum area an individual can walk from along the routing network to a park entrance within a specified maximum distance. Only those roads, sidewalks and trails that have been identified as acceptable for walking within the network dataset are utilized in the computation of the walk distance. For this project we choose a maximum distance of a half mile.
Miles
0 0.5 1 2 3
LEGEND
Interstates & Toll Roads
Primary Roads
Secondary Roads
Local & other roads
Metrorail Lines & Stations
Proposed Metrorail Line & Stations
Railroads & VRE Stations
Current as of: 9/28/2017

Hejun Kang, Fairfax County Department of Transportation

Fairfax Connector Latent Demand Analysis

COUNTY OF FAIRFAX
COMMONWEALTH OF VIRGINIA

2017

Introduction

The purpose of the latent demand analysis is to estimate the potential for generating additional transit ridership in a region. It examines the characteristics that help predict the potential for transit ridership in both served and underserved areas. In served areas, the marketing effort should focus on areas where transit use is already high, but where additional service may generate further ridership gains. For areas that are underserved, we should focus on areas where more ridership can be generated by providing service.

Step 1: Transit Propensity– Demographic Analysis

Transit propensity is used to identify geographic areas where contain populations who typically use Fairfax Connector services. To calculate propensity for Fairfax County, the following procedures are required:

- Compare the demographic profile of a transit user to the general public
- Calculate propensity index, for instance, a person with no vehicle is 8 times as likely to use transit as someone who has a vehicle
- Multiply the calculated propensity indices by the population densities of each block group to calculate the propensity score.

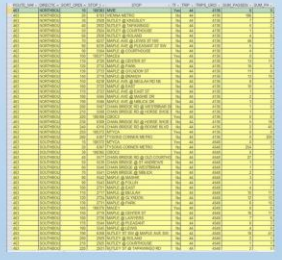
The 2010 Census and the 2015 five-year American Community Survey, and the Fairfax Connector 2014 on-board passenger survey are used for this analysis.

	2015 Census	Fairfax Connector Rider	Propensity Index
Age			
Under 18	24%	3%	*0.14*
18-44	38%	56%	*1.50*
45-64	28%	35%	*1.25*
65 and older	10%	5%	*0.50*
Income			
<=50,000	18%	54%	*3.06*
>50,000	82%	46%	*0.55*
Race			
Caucasian/White	53%	40%	*0.76*
Minority	47%	60%	*1.27*
Auto ownership			
No Vehicle	4%	38%	*8.41*
1 vehicle	29%	30%	*1.06*
2 or more vehicles	67%	32%	*0.48*

Step 2: Ridership Analysis

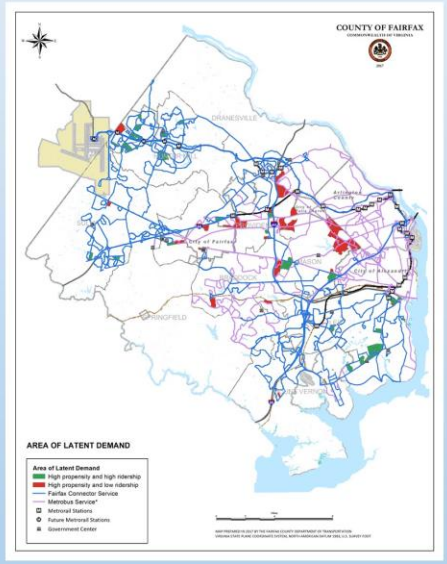
Fairfax Connector has recently implemented the Intelligent Transportation System (ITS) technology, which allows for the recording of daily auto passenger count (APC) at each bus stop.

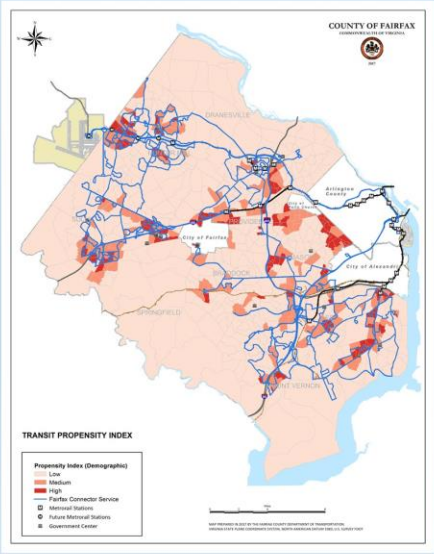
Sample APC data

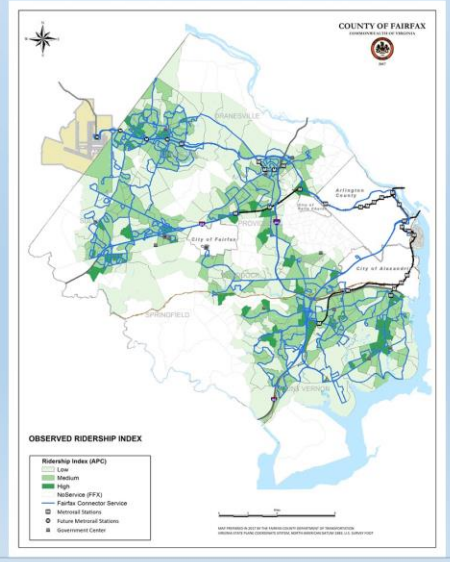


Step 3: Overlay (Results)

Two distinct markets are identified in the analysis: 1) areas (highlighted in red) where characteristics indicate a latent demand for transit use, with a strong propensity for transit use but where ridership is low; and 2) areas (highlighted in green) where characteristics indicate a strong propensity for transit use and ridership is high.





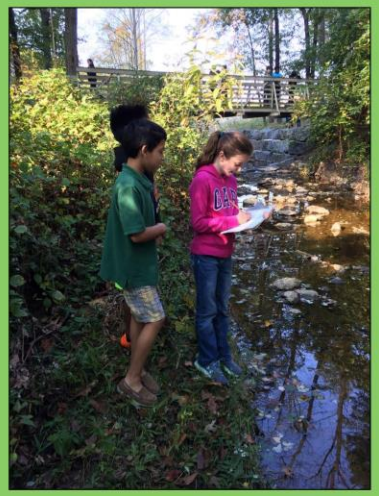


Conclusion

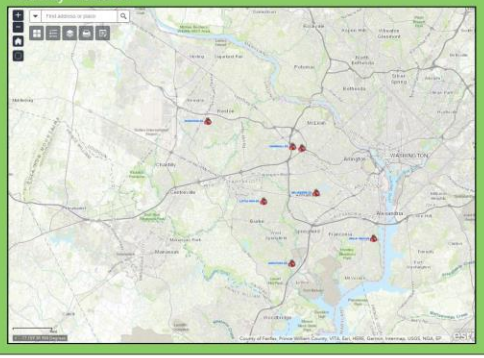
Block groups that have a high propensity for transit use based on demographic characteristics but exhibit low ridership are areas that may be underserved by transit, and where Fairfax Connector could likely generate more ridership by providing more, or different service. Some of these areas could have already been served by Metro bus, CUE bus etc. Further refined analysis with transit data from these agencies need to be conducted. Block groups that have a high propensity for transit use and exhibit high ridership are areas where further ridership gains possibly could be generated by providing additional or premium-type service, such as bus rapid transit (BRT) or limited stop services.

Citizen Scientist Floatable Monitoring Program

The Citizen Scientist Floatable Monitoring Program (Program) is designed as a hands-on, year-long collaboration between Fairfax County Public Schools (FCPS) and Fairfax County Department of Public Works and Environmental Services (DPWES). In the Program, scientists from DPWES and students from several schools across Fairfax County work together to monitor the amount of floatables (stream litter) that is reaching our local waterways. Throughout the school year, students identify and quantify the number and type of floatables in a 100-foot by 20-foot section of the stream valley. The goal of the program is to encourage students to use what they learned from their data to create an action plan to reduce the amount of floatables reaching their stream. The Program is a win-win-win collaboration as it provides DPWES with information about floatable loading in specific streams, gives students an opportunity to collect real data and see how that data can be used for a scientific evaluation, and fosters the connection between students and their environment. Response to this lab has been overwhelmingly positive from both teachers and students.



The sites for the floatable monitoring program span multiple watersheds and create a monitoring network across Fairfax County. As monitoring continues at each school, the total number of items found per event will be entered into the ArcGIS Online Web Application by Stormwater Planning Staff. The changes are the updated in the map below on the Fairfax County website.



Interactive mapping application:
http://arcg.is/2iXtXkD

Fairfax County Health Department
What Is In Your Well Water?

Background

Fairfax County has over 13,500 wells that serve an estimated 100,000 residents. There are three principle aquifers: North Atlantic Coastal Plain Aquifer which is composed of unconsolidated sediments, Piedmont Crystalline-Rock Aquifer composed of igneous and metamorphic rock, and Early Mesozoic Basin aquifer composed of interbedded siltstone, sandstone, shale and some igneous intrusions with metamorphic contact zones. The chemical parameters of the water can be very different between these aquifers.

One of Fairfax County Health Department's primary goals is to protect this ground water supply. Fairfax County Health Department accomplishes this mission through a strict well permitting process involving site plan and field reviews to ensure that the wells are not placed near sources of possible contamination and inspecting wells as they are constructed to ensure all standards are met. Additionally, abandonment inspections are conducted to verify proper procedures to prevent an avenue for possible surface contaminates to enter the aquifer. On top of these regulatory services the Health Department also conducts routine well water testing service at request of the owner to test for pH, Nitrates, Total Alkalinity (CaCO3), Total Hardness, Calcium Hardness, Iron, Total Dissolved Solids (TDS), Arsenic, and Lead (special request). This testing is not required but provided to help well owners understand what is in their water.

Objectives

The Fairfax County Health Department has sampled over 8,000 well water samples for various chemical parameters such as pH, Nitrates, Total Alkalinity (CaCO3), Total Hardness, Calcium Hardness, Copper, Iron, TDS, and Arsenic over the past 40 years. This study focuses on those water samples collected between the years 2000 to the present on systems that do not have water treatment devices. Over 500 well samples will be analyzed through the use of geostatistical analysis tools (inverse distance weighting) using ESRI ARC GIS. The objective is to create an accurate prediction layer of the various chemical parameters using these 500 samples to help predict the values in the many wells that have not been sampled.

Goals

The goal of this is the help answer one of the most asked questions, "Is this normal for my water?". By looking at geographic trends, we can potentially identify chemical trends. With accurate prediction models generated, these values can be applied to wells that have not been sampled. We can look for emerging problems such as potentially corrosive water, elevated Arsenic or Nitrates levels, and once identified, notify owners.

Methods

Over 500 well water samples were geocoded with their chemical attributes, such as Total Alkalinity (CaCO3), Total Hardness, Calcium Hardness, Copper, Iron, TDS, and Arsenic. The next step was to use the inverse distance weighted interpolation method in ArcGIS to make a geostatistical layer which then could be adjusted to get the best regression function. The goal is to have a regression function above 0.60. Creating a geostatistical layer vs. a raster layer permits instantaneous adjustments to the layer without having to rerun the tool. After making adjustments to the power function, search distance, and smoothing, the geostatistical layer was converted to a raster layer. Then a value could be then be extracted to the 13,000 non-sampled wells using the Spatial Analysis tools in ArcGIS.

Results

- **Calcium hardness**

Calcium hardness is the measure of the concentration of calcium ions. This is a byproduct of the rock weathering process and concentrations can vary greatly depending on geologic formations. High hardness levels can cause excessive water hardness, which can make soaps less efficient in cleaning. Low water calcium hardness can potentially lead to excessive corrosion on metal pipes. Geostatistical layer was created for this value using the IDW interpolation method with a regression function of 0.78605* x + 16.209. Adjustments were made to the power function, search type, smoothing factor and major/minor semiaxis to maintain a regression function above 0.60 and while still covering most of the non-sampled wells. This means that overall, the predicted values fall within 78% of the measured values. Figure 5 shows the Calcium hardness prediction layer which covers about 88% of the 22000 wells that have not been sampled.

- **Total Hardness**

Total Hardness describes the ability of water to precipitate an insoluble residue when soap is used. Total hardness unlike calcium hardness, measures all polyvalent cations such as Ca+2, Mg+2 or any other cation with a charge of +2. Ca+2, and Mg+2 tend to be the primary ground water constituents of hard water. Hard water, excessive concentrations polyvalent cations, reduces the effectiveness of soaps to clean, leaves a sticky film on skin, clothes, and hair, and deposits scale in water heaters, boilers. Geostatistical layer was created for this value using the IDW interpolation method with a regression function of 0.744599*x + 31.438. Adjustments were made to the power function, search type, smoothing factor and major/minor semiaxis to maintain a regression function above 0.60 and while still covering most of the non-sampled wells. This means that overall, the predicted values fall within 74% of the measured values. Figure 5 shows the Total Hardness prediction layer which covers about 88% of the 22000 wells that have not been sampled.

- **pH**

pH is a measure of the hydrogen-ion concentration. The pH scale ranges from 0 to 14. A pH of 7 indicates neutral water; greater than 7, the water is basic; less than 7, it is acidic. A one unit change in pH represents a 10-fold difference in hydrogen-ion concentration. For example, water with a pH of 5 has 10 times more hydrogen-ions than water with a pH of 6. Water that is basic can form scale; acidic water can corrode. According to U.S. Environmental Protection Agency criteria, water for domestic use should have a pH between 5.5 and 9. pH indicates whether water can be corrosive, determines the solubility and mobility of many dissolved metals, such as heavy metals like lead and arsenic being more likely to be dissolved in solution and mobile in ground water that is more alkaline. Geostatistical layer was created for this value using the IDW interpolation method with a regression function of 0.6118*x + 2.851. Adjustments were made to the power function, search type, smoothing factor and major/minor semiaxis to maintain a regression function above 0.60 and while still covering most of the non-sampled wells. This means that overall, the predicted values fall within 61% of the measured values. Figure 4 shows the pH prediction layer which covers about 88% of the 22000 wells that have not been sampled.

- **Total Alkalinity**

Alkalinity is the capacity of water to neutralize acid. Alkalinity is primarily a measure of dissolved bicarbonate and carbonate measured as CaCO3. Geostatistical layer was created for this value using the IDW interpolation method with a regression function of 0.7828*x + 17.733. Adjustments were made to the power function, search type, smoothing factor and major/minor semiaxis to maintain a regression function above 0.60 and while still covering most of the non-sampled wells. This means that overall, the predicted values fall within 78% of the measured values. Figure 3 shows the Total Alkalinity prediction layer which covers about 88% of the 22000 wells that have not been sampled.

- **Total Dissolved Solids**

Total Dissolved Solids (TDS) is a measure of the combined content of all dissolved constituents contained in drinking water, but does not define what exactly those constituents are. As water moves over the surface and infiltrates through the soil and rock, it dissolves naturally occurring minerals and, in some cases, radioactive material. Geostatistical layer was created for this value using the IDW interpolation method with a regression function of 0.83127*x + 30.745. Adjustments were made to the power function, search type, smoothing factor and major/minor semiaxis to maintain a regression function above 0.60 and while still covering most of the non-sampled wells. This means that overall, the predicted values fall within 83% of the measured values. Figure 2 shows the TDS prediction layer which covers about 88% of the 22000 wells that have not been sampled.

- **Arsenic**

IDW analysis was attempted, but running any of the geostatistical analysis tool requires many samples within a specified area. Arsenic testing in well water has not been conducted as extensively as the other perimeters in this analysis and there are only about 95 samples that have been collected throughout various locations in the county. Of those 95 samples collected, 17.5% have come back with detectable levels of arsenic, and 7.36% have come back with levels that exceed Environmental Protection Agency (EPA) maximum contaminent levels (MCL). Arsenic in the aquifer appears to be mostly limited to the Early Mesozoic Basin Aquifer, and the Piney Branch formation (shown on Figure 1), which is located in the Piedmont Crystalline-Rock Aquifer.

- **Iron**

IDW analysis was attempted for this perimeter, but error values were at almost 99%. It was determined that geostatistical analysis tools could not be used because of the wide range in iron values in the samples. This is not shown on any of the figures.

Conclusions

Table 1 below shows the raster values from the TDS, Total Alkalinity, Total Hardness, Calcium Hardness, and pH. The prediction methods used were able to cover about 88% of all the wells in the county and these raster values for the various tested constitutes were extracted to the wells shown on Figure 6. Minerals that occur that relatively low levels in the aquifer such as iron and arsenic were not successfully mapped using this method likely to the complex interactions of the pH and iron that can determine if heavy metals such as arsenic are mobile or immobile. But the pH prediction layer could be used to help predict the likelihood of heavy metal being present in the aquifer.

Table 1 shows a sample of the attribute table from the active well report. Raster values from the various prediction layers were extracted to the individual wells that have not been sampled.

References:

http://kgs.uky.edu/kgsweb/datasearching/water/analyteDescr.asp
http://www.wellwater.bse.vt.edu/clinics.php
https://water.usgs.gov/owq/hardness-alkalinity.html

Figure 1

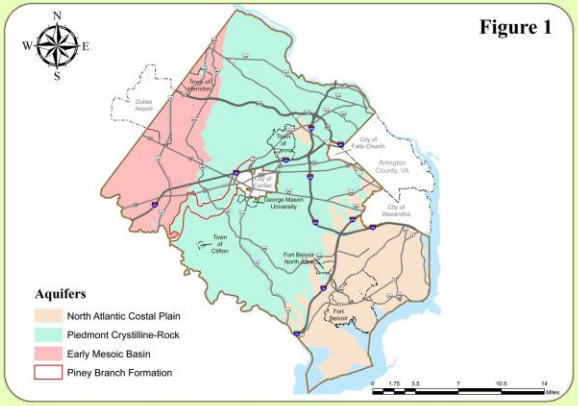


Figure 2

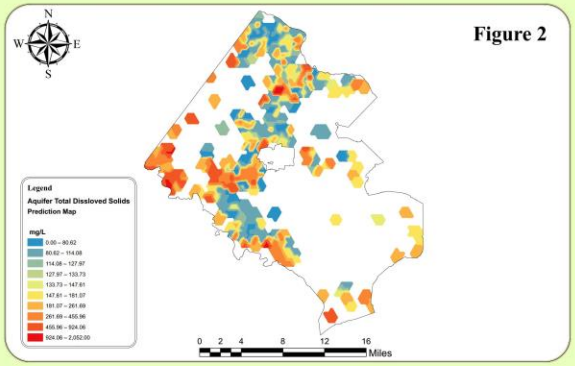


Figure 3

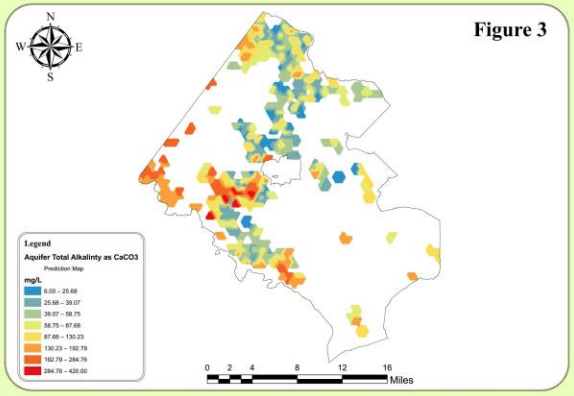


Figure 4

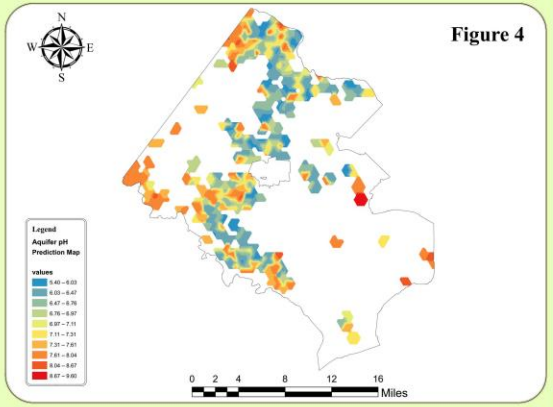


Figure 5

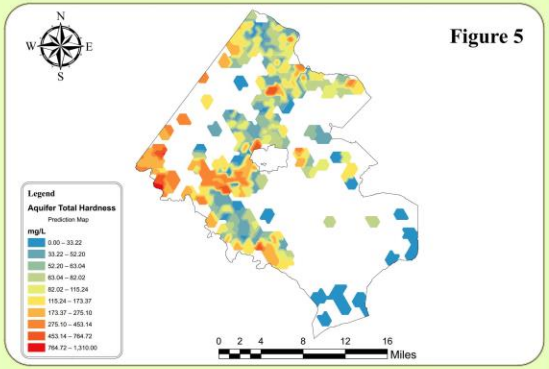
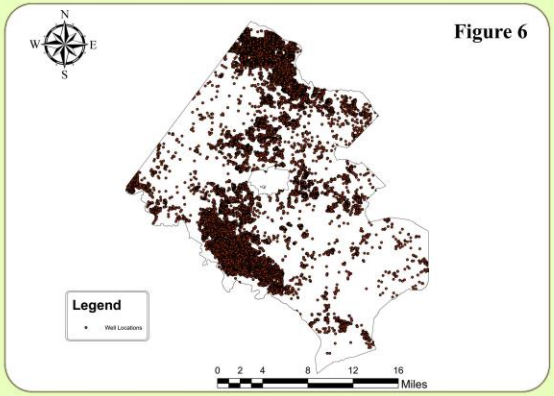
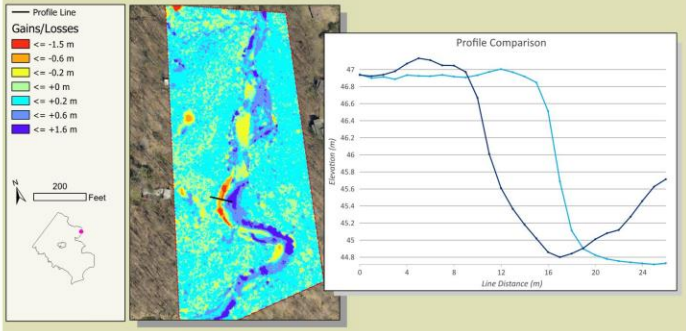


Figure 6



Differential LiDAR Analysis of Stream Erosion and Restoration Areas

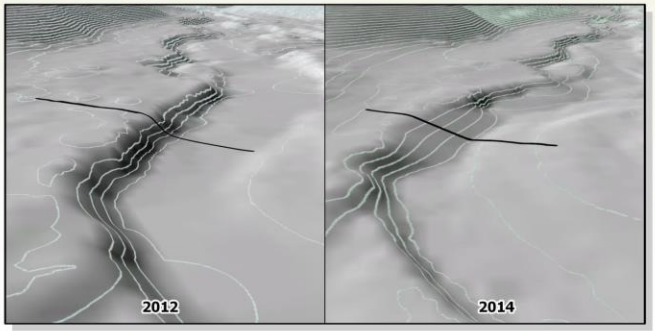
Pimmit Run Erosion Evaluation



The Department of Public Works and Environmental Services Stormwater Planning staff identified a section of Pimmit Run that was showing a significant amount of erosion between 2012 and 2014, a timeframe for which the county has overlapping LiDAR data. Two bare earth raster surfaces, one for 2012 and another for 2014, were interpolated from the LiDAR data and a raster subtraction was performed to show estimates of erosion and deposition occurring in the segment of Pimmit Run shown above and to the left. The profile line, contours and hillshades were generated to show where several hundred cubic meters of material have been eroded while other areas experienced deposition where slower moving water releases suspended material.

The ability to identify these areas of erosion is beneficial to Stormwater staff when they are choosing potential stream restoration projects. The density and accuracy of LiDAR points enables the detection of fine, sub-canopy elevation changes that are unlikely to be visible in the county's previously compiled photogrammetric elevation data. The results of this analysis served as justification for future LiDAR acquisitions to enhance stormwater work.

LiDAR Derived DEM with Contours

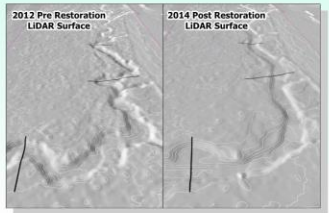


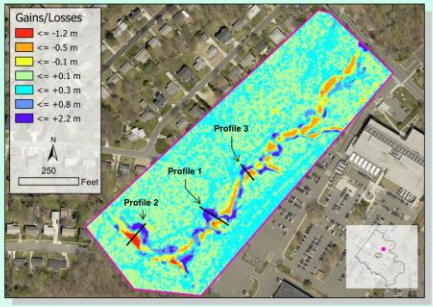
Wolftrap Creek Stream Restoration

Wolftrap Creek is a major tributary within the Difficult Run watershed. The land around Wolftrap Creek began to change from forest and agricultural use to residential in the 1960s and 1970s. Development increased to a point where the Wolftrap Creek watershed is approximately 40 percent impervious. Stormwater that would have once soaked into the ground now drains directly to Wolftrap Creek through the stormwater drainage system. The additional volume and velocity of stormwater runoff has increased the erosion of the stream channel and reduced the water quality.

The 2,541-foot-long Wolftrap Creek stream restoration project design was developed and approved through coordination with Fairfax County, the Town of Vienna and the community.The project was funded through the Fairfax County Stormwater Management Program. The goals of the project were to:

- Restore the ecological function of the stream corridor;
- Improve water quality through the reduction of Nitrogen, Phosphorous and Total Suspended Solids;
- Provide a safe and sustainable stream valley for the community;
- Protect property and public utility infrastructure; and
- Create in-stream and riparian habitat for wildlife.

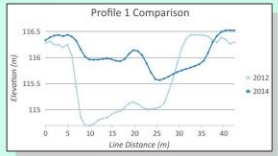


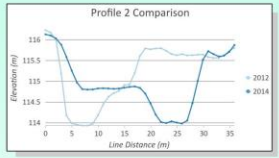


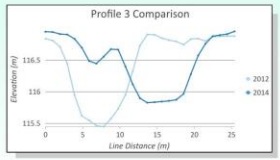
The images to the left show the stream prior to restoration in 2012, and after the restoration in 2014. The project restored the form and function of the stream using a variety of restoration techniques. These include:

- Raised the streambed to connect the stream to its floodplain (visible in surfaces shown at left and profiles at right);
- Constructed in-stream structures to divert water away from banks to reduce in-stream erosion;
- Installed a reinforced bed to reduce streambed erosion; and
- Planted native vegetation to stabilize the stream and provide food and habitat for wildlife.

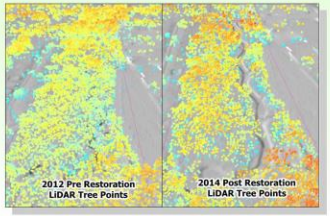
This project, like the Pimmit Run erosion evaluation, fell right in the timeframe and area of our overlapping LiDAR. The comparison of the two LiDAR surfaces (above) was used to identify the location of significant elevation change. The profile comparisons to the right represent the three cross sections drawn across the stream in those areas. We can see from these comparisons that the accuracy of the LiDAR was able to identify the elevations changes to the stream caused by the restoration. Profiles 2 and 3 also show the shift in location of the stream channel after restoration filled the previously eroded areas of the banks.







Evaluation of Tree Canopy Loss During Restoration



Tree loss during stream restoration projects is a major concern for citizens of Fairfax County. We used the 2011-2015 land cover change raster as well as LiDAR to analyze the tree canopy loss in the project area. The results of the land cover analysis show 14% tree canopy loss in the study area, with the majority of the change being from tree canopy to grass/shrub. The LiDAR point cloud was used to visualize canopy loss along the stream banks and reduction in crown closure over the stream. The replanting of native species along the stream restoration area benefits the quality of life in our community by ensuring the vitality of the urban forest and preserving the natural environment. The plantings are visible in the 2017 Pictometry image and ground photos below.

Fairfax County Department of Public Works and Environmental Services
Stormwater Planning Division
Utilizing Story Maps to Inform the Public of Proposed Projects

Background

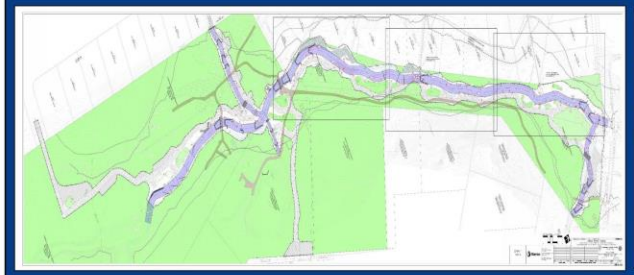
Fairfax County Stormwater Planning Division has many ongoing projects in the county which can directly affect the surrounding private properties. The Dead Run Stream Restoration Project at McLean Central Park is an excellent example. The majority of the project is on land owned by the Fairfax County Park Authority, but the remaining sections of the project were on private properties. The project scope includes the removal of 150 at risk trees along the stream bank which of course can be alarming to the residents affected by the project. To ease concerns Stormwater Planning worked with the Mclean Citizen Association, Mclean Tree Foundation and concerned residents to perform stream walks using printed maps and concept plans for reference in the field. This effort identified and documented problem areas with photos which were to be later presented to the public. This process can be tedious and ineffective in communicating complex project details to the public in an efficient manner. Therefore, a better way to combine these processes in a digital format made easily available to the public was needed.

Solution

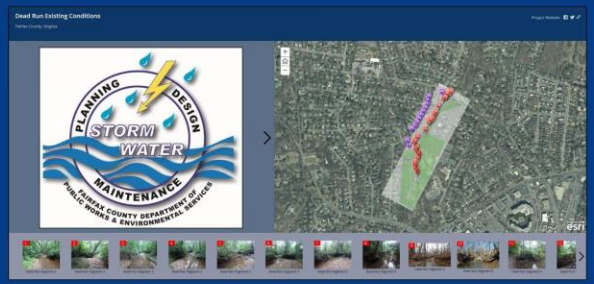
A Story Map was the perfect venue for displaying this type of data to the public in a user friendly visual format that clearly identifies the scope and extent of the project. Developing a Story Map for the project required gathering data that included photos, plans and the narrative descriptions of the photos that make up the story. ArcMap was then used to georeference the concept plans and create a tile package that was published to ArcGIS Online. The geotagged photos and their descriptions were then added to the Story Map. Artistic renderings were created showing several sections of the proposed work and used in a second Story Map to display the before and after of the projects.

The proposed project Story Map was presented at public citizen meetings and then made available on county's Stormwater Projects web page. We plan to continue using Story Maps for future projects to showcase the entire project lifecycle from project scoping to construction completion. They have proved to be a valuable resource for increasing transparency and providing detailed project information to the public. Furthermore, the Story Map not only gives the public a better overall perspective of the project scope in relation to their property, but also creates a virtual stream walk for citizens without even getting their feet wet.

From Paper Plans, Maps and Photos



To a Sleek, User Friendly, and Informative Story Map



Stormwater Planning Division

Interactive mapping applications:

http://arcg.is/2BsGbcO

http://arcg.is/2Bfw8H6

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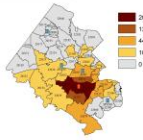
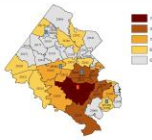
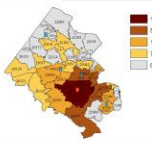
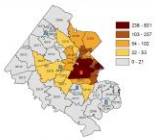
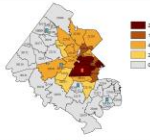
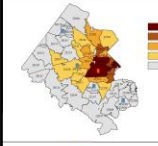
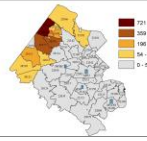
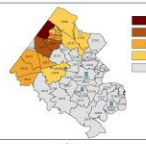
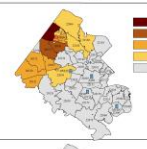
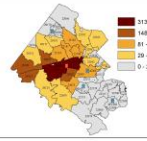
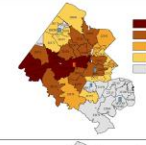
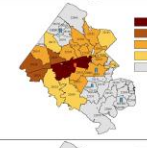
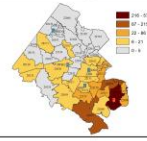
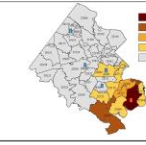
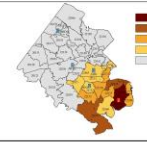
SDO			
ADO			
HRDO			
JWHC			
MVDO			
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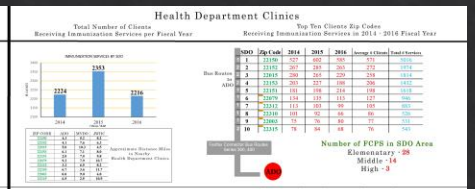
Services	44,311	47,009	42,187



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2	22041	548	657	674	626
3	22042	534	631	529	565
4	22312	237	267	276	260
5	22044	218	281	253	251
6	22043	209	218	201	209
7	22031	81	118	95	98
8	22180	93	105	87	95
9	22046	84	104	83	90
10	22102	102	71	67	80

HRDO	Zip Code	2014	2015	2016	Avg
1	20170	1332	1591	1432	1452
2	20191	720	688	603	670
3	20171	500	550	495	515
4	20190	358	348	276	327
5	20151	241	271	252	255
6	20120	195	172	181	183
7	20121	132	170	164	155
8	22033	153	148	143	148
9	20194	109	83	87	93
10	22066	76	92	65	78

JWHC	Zip Code	2014	2015	2016	Avg
1	22030	651	624	636	637
2	22031	422	424	445	430
3	22033	312	276	256	281
4	20121	223	218	223	221
5	20120	222	199	186	202
6	22032	186	149	134	156
7	22180	139	94	123	119
8	22181	147	102	102	117
9	22003	124	86	60	90
10	22124	94	77	85	85

MVDO	Zip Code	2014	2015	2016	Avg
1	22309	579	666	579	608
2	22306	551	671	595	606
3	22079	215	224	187	209
4	22303	166	175	166	169
5	22310	151	122	109	127
6	22315	86	96	85	89
7	22307	42	51	27	40
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9	22308	38	38	31	36
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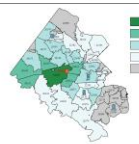
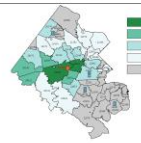
	2014	2015	2016
HRDO			
JWHC			
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Services	70,033	57,596	58,037

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5	22044	383	371	343	366
6	22043	293	319	272	295
7	22150	305	154	136	198
8	22031	215	191	169	192
9	22046	128	150	129	136
10	22151	170	127	109	135

HRDO	Zip Code	2014	2015	2016	Avg
1	20170	1723	1770	1567	1687
2	20191	899	709	700	769
3	20171	702	603	602	636
4	20190	424	359	364	382
5	20151	304	311	304	306
6	20120	240	242	189	224
7	20121	232	224	187	214
8	22033	196	206	166	189
9	20194	131	82	71	95
10	22066	71	80	45	65

JWHC	Zip Code	2014	2015	2016	Avg
1	22030	915	697	691	768
2	22031	571	490	478	513
3	22033	390	313	276	326
4	20121	309	243	233	262
5	20120	303	220	232	252
6	22032	282	227	220	243
7	22003	205	130	111	149
8	20151	187	129	112	143
9	20170	209	123	91	141
10	22180	165	100	148	138

MVDO	Zip Code	2014	2015	2016	Avg
1	22306	1281	1251	1086	1206
2	22309	1295	1140	1122	1186
3	22079	422	335	280	346
4	22303	255	279	211	248
5	22310	232	205	181	206
6	22315	190	137	120	149
7	22307	105	71	64	80
8	22150	82	69	46	66
9	22312	64	60	49	58
10	22308	64	47	38	50

Creating Data Driven Mapping Applications to Facilitate Economic Success in Fairfax County

Department of Information Technology—GIS **Department of Planning and Zoning**
Department of Tax Administration **Office of the County Executive** **Fairfax County Park Authority**

People Places Employment Governance

Background

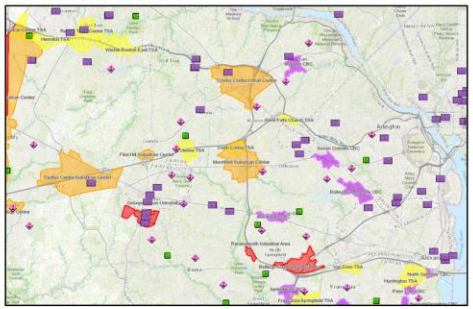
In 2015, Fairfax County Board of Supervisors adopted the Strategic Plan to Facilitate the Economic Success of Fairfax County. This wide-ranging strategic plan was designed to conceive economic success from a broad perspective that encompasses not only aspects of business, innovation, and entrepreneurial activity, but also incorporates the creation of place as an economic driver, as well as natural and physical infrastructure, equity, education, and transportation.

GIS Integration

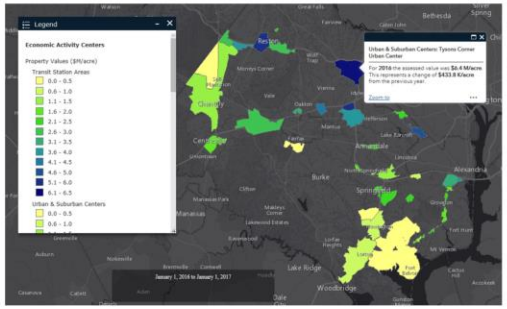
Several interactive mapping applications have been developed to assist county staff and the public in understanding the geographic data being used to address the economic success indicators. In addition to standard interactive map functionality of turning layers on and off and clicking features on a map to see more information about them, configurable tools have been deployed in these apps to add more complex analysis capabilities that, in the past, were confined to desktop mapping applications. For example, advanced searching and filtering tools allow for focused browsing of the apps to find and view information for adjustable subsets of the data. Other tools give the user the functionality to select a feature in one layer and use it to quickly select and summarize the coincident features of another layer in the map. Lastly, the addition of time-enabled layers and tools adds the ability to view and analyze data temporally as well as spatially. These advanced tools assist the users of these apps to more effectively interact with the maps and better understand the underlying data.

In addition to the interactive mapping applications, static maps were developed to provide a high level overview of economic success indicators in an effort to inform and educate stakeholders.

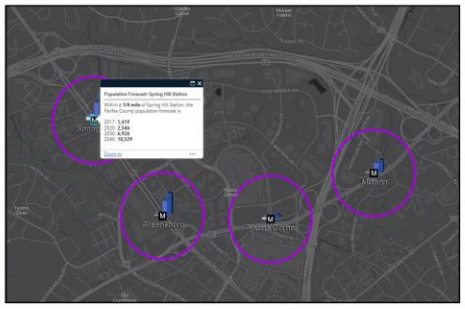
Interactive Mapping Applications



Art Venues—Search for and view detailed information about arts venues in and near Fairfax County Economic Activity Centers in the Performing and Visual Arts Venues viewer. The venues may also be filtered by type.

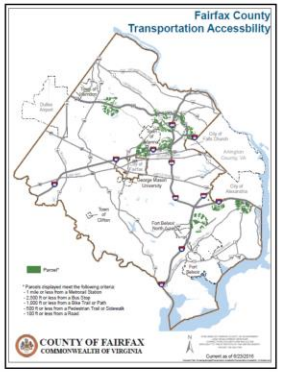


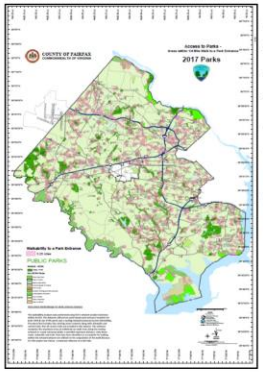
Assessed Value of Activity Centers—When the time-enabled layers of the Economic Activity Centers application are active, the map automatically changes to display property values and the change in property values for each year from 2005 to 2016.



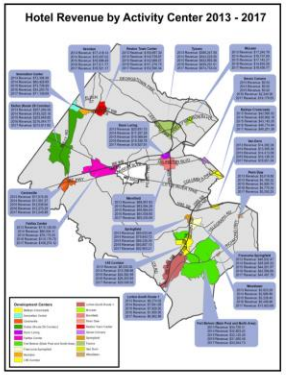
Density in Transit Station Areas—In addition to viewing detailed maps of the areas surrounding Metro and VRE stations in Fairfax County, users of the Rail Station Area Population viewer may click on a station to view the current and forecast population estimates within ¼ and ½ mile buffers of each sta-

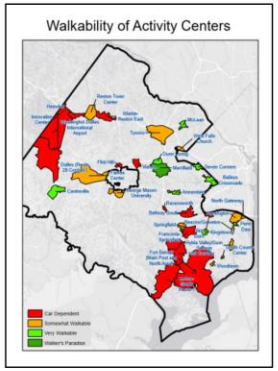
Static Data Maps





Static data driven maps were developed to provide a high level overview of various economic success indicators related to (from left to right) transportation accessibility, park access to county residents, hotel revenue generated by economic activity center, and walkability within the economic activity centers.





Interactive mapping applications:

http://arcg.is/2AB7yEe http://arcg.is/2k7CNQo http://arcg.is/2n6ArSN

Fairfax County Fire and Rescue Department: GIS Expansion Pilot

Background

The Fire and Rescue Department (FRD) is an all-hazards agency, meaning we respond to a wide variety incidents. Our personnel respond to medical emergencies (EMS), hazardous material spills, malfunctioning fire alarms, carbon monoxide incidents, building fires, and many other emergencies. Throughout every emergency, data is captured and recorded that let our analysts understand response patterns, predict where we need more resources, understand medical emergencies and community health, as well as answer questions from FRD leadership and the Board of Supervisors.

Problem: So Much Data!

The FRD has a SQL-based data warehouse where information from the Computer Aided Dispatch System (911), Fire Incident Reporting System, Electronic Patient Care Reporting System and Automatic Vehicle Location (AVL) System are all kept for analysis purposes.

- Incident Records >1.2 million and growing daily by 400-600
- Unit Records >1.5 million and growing daily by 500-800
- AVL Records > 37.2 million and growing daily by 30,000-40,000
- ePCR Records > 300,000 and growing daily by 200-400

Not only does the FRD have all these datasets, but each dataset has a spatial component!

Problem: More Datasets and Applications Needed

Additionally, the FRD collects information for incident preplanning, area familiarization, and community outreach. Some of the information is already in databases, but some of it isn't!

And again....

These datasets are spatial!

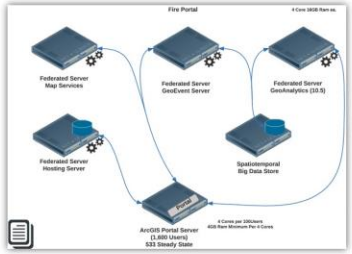
We asked the question....

How can we better leverage our large datasets for analysis as well as create applications to support operations while still keeping our information secure?

Solution: GIS Expansion Pilot

Portal for ArcGIS

In cooperation with DIT-GIS and Esri, staff from FRD worked on a pilot to expand our use of GIS, specifically implementing ArcGIS 10.5 including ArcGIS Server and the GeoAnalytics, Spatiotemporal Big Data Store and GeoEvent Servers.

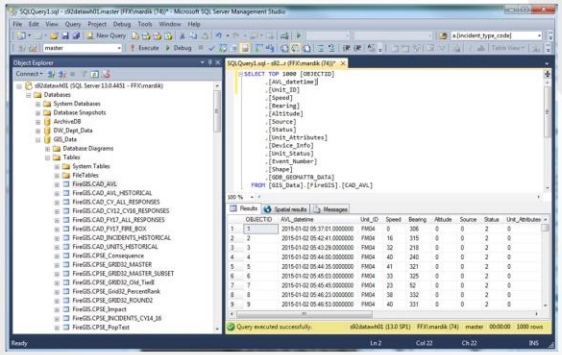


New FRD Portal with Active Directory Authentication!

Goals:

- Provide a data collection tool for capturing preplan information
- Provide a tool that can be used on the scene of an incident by the incident commander
- Provide end users the ability to query historical data
- Provide data analysts with enhanced data analytical tools to allow them to process queries more efficiently
- Provide an enhanced infrastructure that will allow more efficient data storage with faster retrieval times

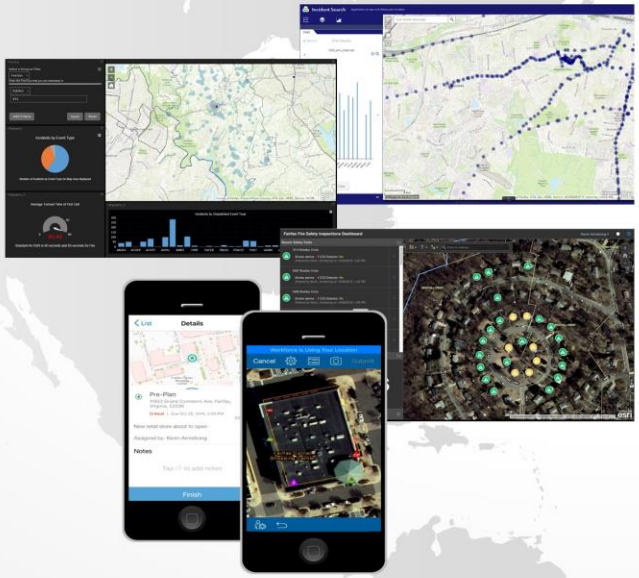
Integrated our SQL Data warehouse!



Outcome:

Based on the experiences with the GIS Expansion Pilot, FRD purchased ArcGIS Server and is expanding the use of GIS into more FRD business processes and analysis.

Infrastructure for Creating Maps and Apps!



Fairfax County Fire and Rescue Department in collaboration with Department of Information Technology, GIS Branch.