George Mason University

Spatial Prioritization of SRTS Program Adoption within the Fairfax County Public School System

A spatial approach for advocates to prioritze outreach efforts to encourage uptake of the Safe Routes to School (SRTS) Program.

Paul Andrew Kavitz

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This paper supports outreach efforts encouraging development of Safe Routes to School plans for Fairfax County, Virginia. A spatial cost-benefit analysis identifies schools with the fewest impediments to success. This project is of interest to Parent Teacher Organizations (PTOs), county officials, and active transportation advocacy groups who seek to prioritize efforts to encourage SRTS program adoption. Project data is sourced from the county GIS Department and includes pathways, school locations and boundaries, residential population densities, and geographical data. With this analysis, stakeholders will have a prioritization scheme with which to target school communities with outreach efforts.

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Abstract

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Keywords

Safe Routes to School, SRTS, Fairfax County, Virginia, Transportation, Bicycle, Planning, Active Commuting, Pedestrian, Walking, Bicycling, School Travel Plan, Elementary Schools, Terraset

Intended Audience

This paper is intended for advocates and stakeholders for active commuting program development in Fairfax County Schools. The methodology used to conduct this prioritization analysis may also be of interest to Safe Routes to School program managers elsewhere in the United States as a framework for stakeholder engagement.

Acknowledgements

The author wishes to extend his gratitude to Mike Demmon and Jeff Hermann of the Fairfax County Department of Transportation who helped identify and prepare the source data used for this analysis.

Introduction

Fairfax County is a suburb of Metropolitan Washington DC with a 2010 population of over 1 million people (U.S. Census Bureau 2010), making it the most populous county in Virginia with 13.5% of the state's population. The Fairfax County Public School system (FCPS) is the 11th largest in the country, with over 170,000 students enrolled (Fairfax County Public Schools 2010).

The Safe Routes to School Program (SRTS) is a federally-funded program designed to enable and encourage children to walk and bicycle to school, make bicycling and walking to school a safer and more appealing option for children. Projected benefits of the program include reduced traffic, fuel consumption, and air pollution, as well as improved child health and fitness. The Virginia Department of Transportation (VDOT) has managed grant distribution to schools in the state, with records dating back to program inception in 2007. Despite the availability of federal funds and the projected benefits to the Fairfax County student population, only two schools in the FCPS system have received grants through the SRTS program.

This paper identifies and evaluates spatial characteristics of FCPS communities who are the best candidates for SRTS program investments. This project is of interest to Parent Teacher Organizations (PTOs), county officials, and bicycle and pedestrian advocacy groups who seek to prioritize organizational efforts to encourage SRTS program adoption. Project data is from the Fairfax County GIS Department and includes pathways, school locations and boundaries, residential population densities, and geographical data. With this analysis, stakeholders will have a prioritization scheme with which to target school communities with outreach efforts to encourage program adoption. Regional considerations are also made to integrate and align SRTS program investments with wider infrastructure plans such as Phase 2 of the Fairfax County Bicycle Program.

Review of the Literature

Three primary literature sources supported this research. These are:

- The Federal Safe Routes to School Program which consolidates nationwide best practices for implementation of program goals. In particular, case studies from successful programs supported development of the cost benefit structure of the analysis and the advocacy of a facilitated bottom-up approach in school travel plan design
- The Virginia Department of Transportation (VDOT) Safe Routes to School Program, which coordinates grants within the state funded through the federal Safe Routes to School Program.
- The Fairfax County Bicycle Program, which was approved by the Fairfax County Board of Supervisors in 2006, has created some program documents that supported this research. These include the Fairfax County Bicycle Map and Phase 1 of the Fairfax County Bicycle Master Plan.

Data and Methodology

Several key pieces of information are necessary to determine which Fairfax County schools are likely to have the best cost/benefit case for adoption of the Safe Route to School program. This section identifies the sources of data used in the analysis, and the rationale for inclusion of these data sources within the analysis methodology.

Data Sources and Characteristics

The distribution of school-age children throughout Fairfax County is important to help determine the areas where plans and infrastructure investments may be used to support active commuting options. The smallest census area by which data is publicly distributed is the Block Group level. At the time of this paper's production, the 2010 U.S. Census data for age demographics was not available at the block group level, so this analysis used the 2000 U.S. Census block group data to determine population age and distribution. While these counts are over a decade old and the children represented in the census have grown beyond the elementary grades, this data is still useful to indicate the areas where children are still most likely to live. Subsequent phases of this analysis may wish to include the most recent data to improve the quality of the analysis.

The Fairfax County Department of Transportation (FC DOT) provided the county-level information used in this analysis. Datasets useful to this analysis included parcel land use data, school location and school attendance area data, roadways, bike lanes, pedestrian pathways (including trails and sidewalks), and crosswalks. Table 1 summarizes the sources and metadata for information used in this analysis. Since the entirety of this analysis focuses upon a region in Northern Virginia, the "NAD 1983 StatePlane Virginia FIPS 4501 Feet" coordinate system was used as a baseline, and the block group data from the U.S. Census was projected onto this coordinate system.

Table 1 - Project Data and Metadata

#	Dataset	Source	Year	Coordinate System	Attributes used
1	Schools	FC DOT	2010	NAD 1983 StatePlane Virginia North FIPS 4501 Feet	School locations
2	School Attendance Areas	FC DOT	2010	NAD 1983 StatePlane Virginia North FIPS 4501 Feet	School attendance areas
3	Population	U.S. Census	2000	GCS North American 1983	Block Group areas, age, and gender
4	Parcels	FC DOT	~2010	NAD 1983 StatePlane Virginia North FIPS 4501 Feet	Parcel areas, Zoning Codes
5	County Extent	FC DOT	2010	NAD 1983 StatePlane Virginia North FIPS 4501 Feet	Boundary
6	Road centerline	FC DOT	~2010	NAD 1983 StatePlane Virginia North FIPS 4501 Feet	Roads, speed limits
7	County walkways	FC DOT	2000	NAD 1983 StatePlane Virginia North FIPS 4501 Feet	Trails, sidewalks
8	Bicycle Roadway	FC DOT	~2006	NAD 1983 StatePlane Virginia North FIPS 4501 Feet	Bicycle Level of Service for roadways
9	Crosswalks	FC DOT	2000	NAD 1983 StatePlane Virginia North FIPS 4501 Feet	Crosswalks

Methodology

The data sources described in Table 1 served as input into an analytical methodology summarized in Diagram 1. These steps included parallel and serial operations on different data sources to produce a series of maps that then informed the paper's recommendations. This process was iterative, as shown by the arrow, where the transformed datasets produced interim maps, and then were further transformed to produce more refined maps for final analysis.

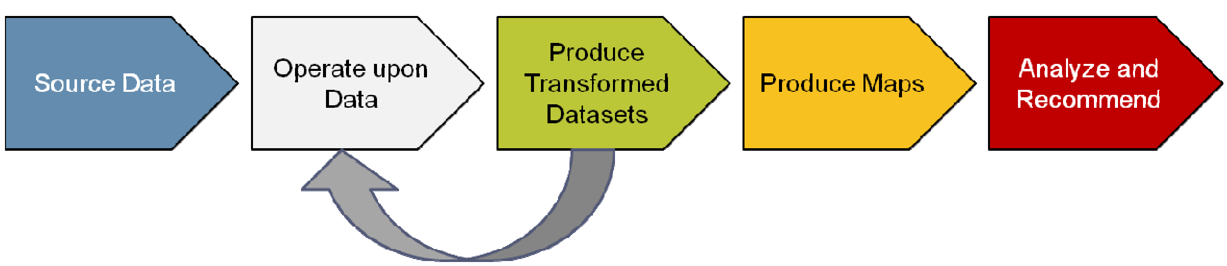

Diagram 1 - Methodology Overview

Diagram 2 depicts the detailed steps used to transform the source data into a form that could then be analyzed to make recommendations for elementary school outreach prioritization and plan development.

Table 2 reviews these steps and the rationale used for each. The color codes used for the detailed steps in Diagram 2 are consistent with those used in the high-level overview steps depicted in Diagram 1.

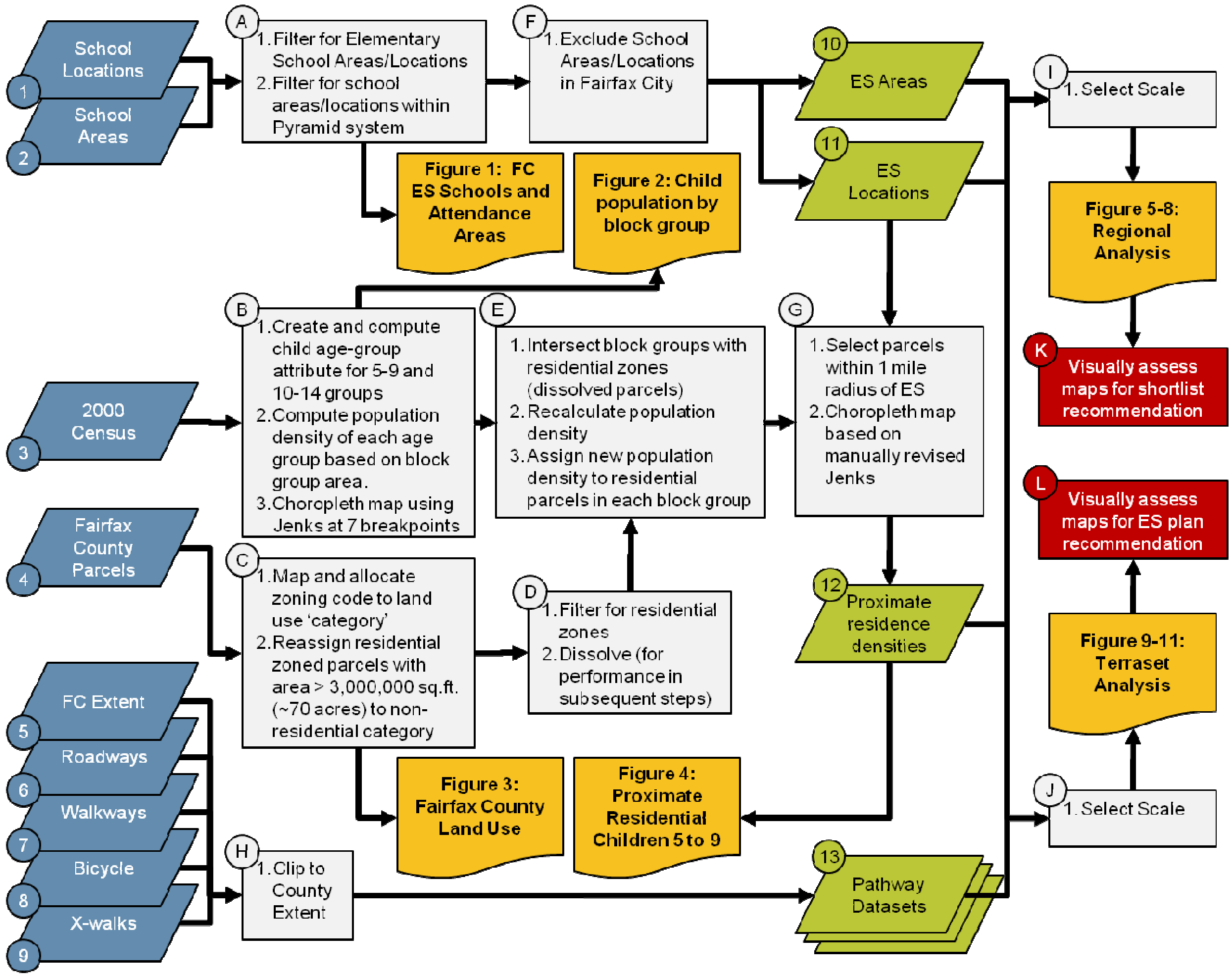

Diagram 2 – Methodology Detail

Table 2- Methodology Rationale

Step	Source Input	Rationale
A1	1, 2	Elementary schools selected to restrict total data analyzed for scope purposes. Since Middle Schools also qualify for SRTS funding through VDOT, a similar analysis could be conducted for this grade level.
A2	A1	A number of Fairfax County Public Schools did not feed into the pyramid scheme of grade promotion. To simplify interpretation of school and attendance area interpretation, non-pyramid school locations were filtered from the source dataset.
Fig. 1	A2	Map depicted in Figure 1 was created with a county-wide scale.
B1	3	A spreadsheet was used to calculate age groups 5-9 and 10-14 based on the raw census demographic for these block groups.
B2	B1	The aggregated census population statistics was joined with the 2000 census block group shape files to produce a geospatial distribution of population. The census block group level of granularity was chosen as it was the smallest (finest) areas publicly available, and this was necessary to inform the benefit (children population density) component of the cost-benefit analysis.
B3	B2	A Choropleth map was created using a Natural Breaks (Jenks) classification scheme with seven (7) breakpoints. Seven breakpoints were chosen to more clearly see the distribution of population towards the upper (more dense) regions and demarcate more strongly from less dense regions.
Fig. 2	B3	Map depicted in Figure 2 was created with a county-wide scale.
C1	4	Using a spreadsheet, Fairfax county zoning codes (Fairfax County Department of Planning and Zoning 2011) were mapped to a broad zoning category of 'Industrial', 'Commercial', 'Residential', 'Agricultural', and 'Special'. Multipurpose zoning codes were either mapped to the dominant category (where this could be inferred) or to a 'Special' category. After this mapping, exceptions still existed, but they represented a very small fraction of the total land area and were judged to be immaterial to the population density analysis and evaluation steps.
C2	C1	Some large parcels such as parks and golf courses were found to be designated under a 'Residential' zoning code. Since it was unlikely that school children resided on these parcels, a spreadsheet was used to recategorize all 'Residential' parcels with land size greater than 70 acres (3,000,000 sq ft.) to a non-residential zoning code category of 'Other'. Even if the occasional large residence was mistakenly reclassified using this scheme, it would be unlikely to have an effect on the population density calculations.
Fig. 3	C2	Map depicted in Figure 3 was created with a county-wide scale. Symbology based on Unique values across Zoning categories created in steps C1-C2.
D1	C2	A separate layer was created to include only parcels with a 'Residential' zoning category where children could be residing.
D2	D1	These parcels were dissolved into a single shape to improve performance of subsequent population density analysis.
E1	B2, D1	2000 census block group regions and calculated age-group demographics from steps B2 was merged with the residential zones calculated in step D2. In this way, populations could be assigned to the usually smaller residential zones instead of across the entire block group area.
E2	E1	Population density for the age 5-9 group was then recalculated across the new land area (usually smaller denominator) with the same total child count. This resulted in a wider range and different distribution of densities more accurately reflecting children population densities within the county.
E3	E2	Recalculated population densities were then assigned to 'Residential' category parcels contained in each block group. At the conclusion of this step, an attribute exists for each parcel indicating the density of the (2000) 5-9 age population of that parcel. While each parcel

		obviously does not necessarily have this population density (it is inherited from the larger block group region, this step was performed to allow subsequent steps to select and display population densities at a much smaller scale than the block group scale.
F1	A2	While the Fairfax County School System manages schools and school attendance areas covering the Fairfax City region, the absence of parcel information in steps E1-3 for Fairfax City precluded the inclusion of these schools within the SRTS analysis. This step excluded Providence and Daniels Run Elementary Schools, and their associated attendance areas, from these datasets. The Daniels Run Elementary School Attendance Area extends north past the city boundary of Fairfax City to the north (near Oakton), so when this school as excluded, it also excluded a medium density child population in Fairfax County. Upon cursory examination of this area, however, it was believed to be immaterial based on the threshold values used in the regional analysis section of this paper.
G1	E3, 11	Using the school location data excluding Fairfax City (transformed data set 11) and the residential children 5-9 population density from step E3, all parcels within a 1 mile radius of any Elementary School were selected into a separate layer. This selection did not take into account the attendance areas for schools. This means that parcels which were located within one mile of a school, but that were assigned to a different school attendance area (potentially to a school further than 1 mile away) are still present within this layer. Discrimination of these parcels was achieved manually through visual assessment of the maps in Figures 5-8 (see step K).
G2	G1	A Choropleth map was created using the same number of break points as that used in step B3 (for comparison consistency). Given the significant right skew of the density distribution due to some very small residential / block group parcel intersections, a manual reassignment of the basic Jenks distribution was undertaken to more clearly demarcate the population densities. The upper ranges were collapsed into a wider distribution and the lower ranges were adjusted to spread out population density a little more evenly.
Fig. 4	G2 (12)	Using the output from step G2 (transformed dataset 12), a Choropleth map was created using a county-wide scale.
H1	5, 6, 7, 8, 9	Several of the pathway dataset provided by the FC DOT included sidewalk and roadway data that extended beyond the boundary of Fairfax County. To improve clarity of the maps produced in the regional analysis and ensure the viewer did not mistakenly assume that analysis scope extended beyond the county extent, this pathway data was clipped to the Fairfax county extent.
I1	10, 11, 12, 13	For the regional analysis in Figures 5-8 a smaller scale was used to improve reader interpretation of the maps and analysis data. The county was divided roughly into quadrants, and a scale large enough to comparatively evaluate several schools but small enough to see some population density detail, was used. Some sections of the county were excluded from this more detailed review, as it could be seen from Figure 4 that there were no significant high-density population densities in these regions (e.g. northeast or southern Fairfax County).
Figs. 5-8	I1	Using the transformed data sets (10-13) and the scale selected in step I1, Figures 5-8 were created. From the pathway datasets, only major roadways (with speed limits >= 45 mph.) were included to improve orientation to the map by Fairfax County governmental stakeholders.
J1	10, 11, 12, 13	For the detailed school analysis, the scale was selected to maximize the detail within a single school attendance area. For Figures 9 and 10, the scale was specified by the VDOT SRTS program requirements. For Figure 11, the scale was selected to support feature identification important to the regional analysis objective of this map.
K	Fig. 5-8	Visual analysis is described in Stage 2: Regional Analysis
L	Fig. 9-11	Visual analysis is described in Stage 3: Preparing an SRTS School Travel Plan

Analysis

This analysis seeks to identify those school locations with the fewest impediments to the successful pursuit of a Safe Routes to School program. This analysis proceeds under the hypothesis that program adoption is more likely if the following conditions hold:

- Program initiated within schools that are close (within 1 mile) to a high concentration of children.
- A majority of the student population can take advantage of active commuting options
- The pedestrian infrastructure proximate to that school is sufficiently developed so that only incremental funding is necessary to enable active commuting by students.

These criteria were chosen based on a cost-benefit model seeking to provide the greatest benefit (in total numbers of children benefited) for the least cost (number of engineering interventions required to improve active commute safety. Any given residence will have at least one preferred pathway to school based on travel time and safety. We can assume that clusters of students residing in close proximity (high density areas on our maps), will likely have very similar or identical preferred pathways to school (same route). The SRTS program seeks to fund engineering interventions to improve the quality and safety of the route from residences to the school. Given this, each engineering intervention along a heavily trafficked route (from a densely populated residential cluster) will a higher utility (more use per intervention) than an intervention along a less travelled route. At a regional level, used to identify schools proximate to densely populated regions, the analysis does not discern or estimate relative financial costs of the intervention, only the high level utility of such interventions.

This section evaluates the spatial characteristics of Fairfax County's population and infrastructure to help advocates prioritize and target outreach and support efforts to encourage SRTS program initiation.

Elementary School Distribution

Schools with student bodies up to grade eight (8) are eligible for funds under the Virginia Department of Transportation SRTS program. Within the Fairfax County Public school system, this includes both Elementary Schools (Grades K-6) and Middle Schools (grades 6-8). While the methodology used in this paper is generally applicable to any school category, the analysis concentrates upon the Fairfax County Elementary Schools due to availability of data, more numerous candidates for evaluation, and the relatively small attendance area size compared to middle schools. Figure 1 shows the distribution of elementary schools and attendance areas across the Fairfax County public school system.

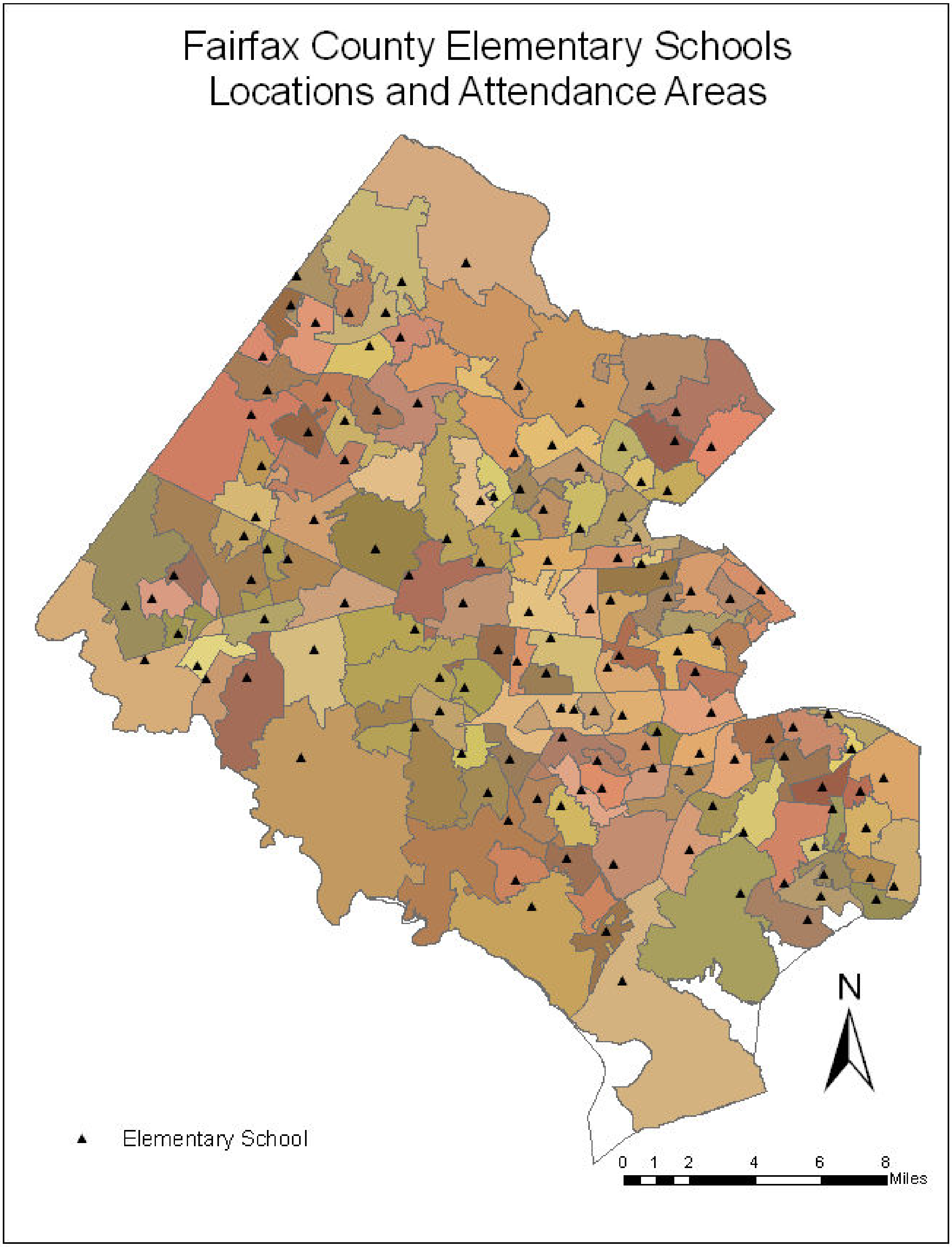

Figure 1 - Fairfax County Elementary Schools

Child Population Distribution

Children in Fairfax County are unevenly distributed across the region and are found to be concentrated in several distinct areas, as depicted in Figure 2 In the western part of the county, relative high child population density can be found in the communities of Herndon and Reston in the northwest, near the community of Centreville in the Southeast, and adjacent to the transportation corridor connecting these two regions. Population concentrations can also be found in the eastern, southeastern, and south-central parts of the county. Large parts of the north, north east, and southern part of the counties can be seen to have relatively low population densities.

The population density distribution derived from 2000 U.S. Census block group regions does not directly correlate with land use patterns. For this reason it is difficult to differentiate whether a low density block group area consists of small high density residential zones adjacent to large commercial and industrial zones, or to uniform low-density residential land use. Figure 3 uses parcel zoning information made available by the Fairfax County Department of Transportation to differentiate land usage in Fairfax County. From this figure it is clear that low-density populations in the west portion of the county are due to wide-spread industrial and commercial land usage (e.g. Dulles International Airport) with no children resident. This is similar for the lower southeastern corner of the county where low-density can be attributed to widespread open space zoning (e.g. Fort Belvoir designation). This contrasts with the band from communities in the north (e.g. Great Falls) to the south (e.g. Clifton) which is largely low-density residential regions. Children live in these areas, but they are dispersed.

Parcel information for the independent city of Fairfax City in the center of the county was not available. This is depicted by the missing area located in the center of Figure 3. Since parcel zoning information is central to the author’s evaluation methodology, subsequent steps in this analysis will exclude Daniel’s Run and Providence Elementary schools which primarily serve the Fairfax City region.

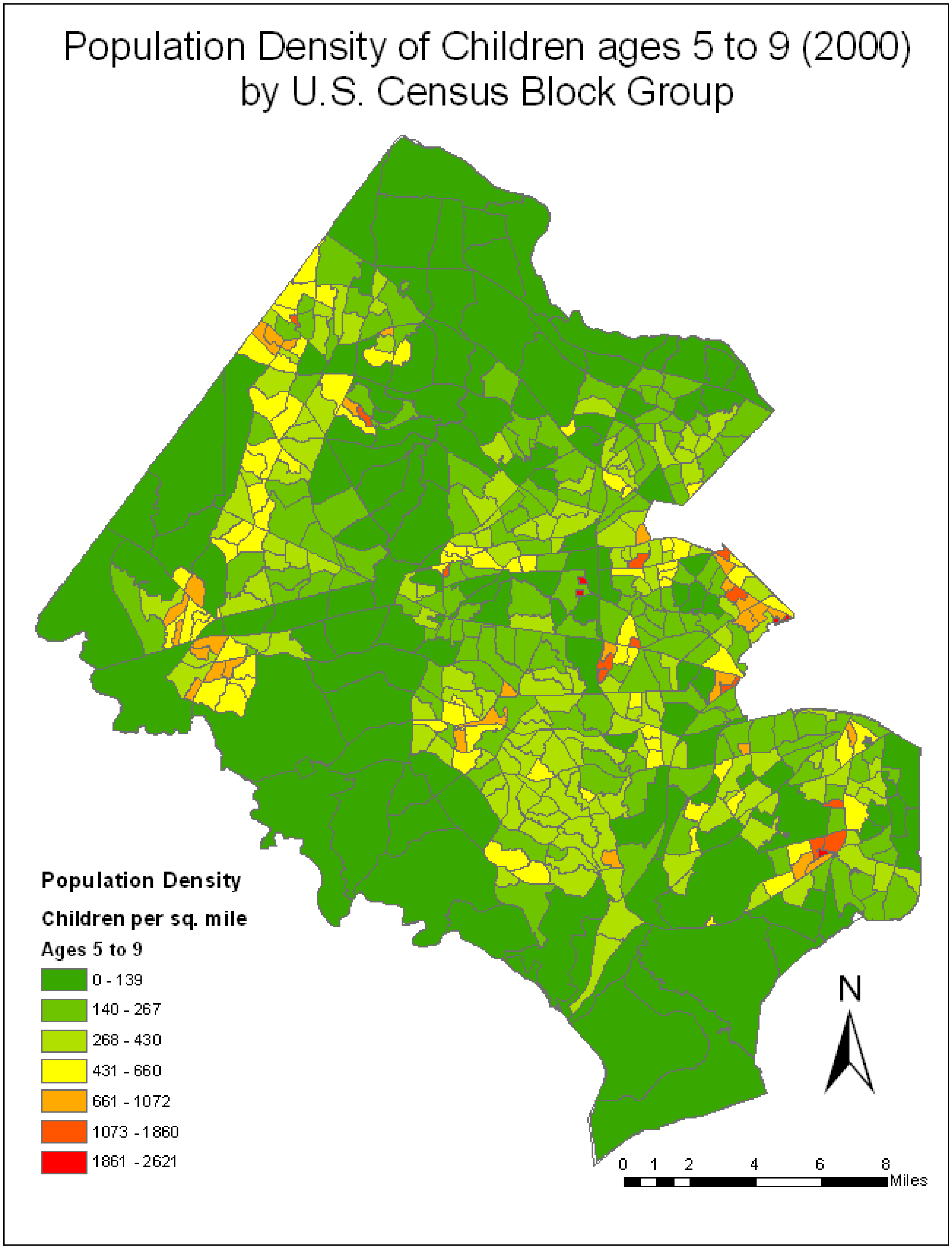

Figure 2 - Population Density of Children 5 to 9 (block group)

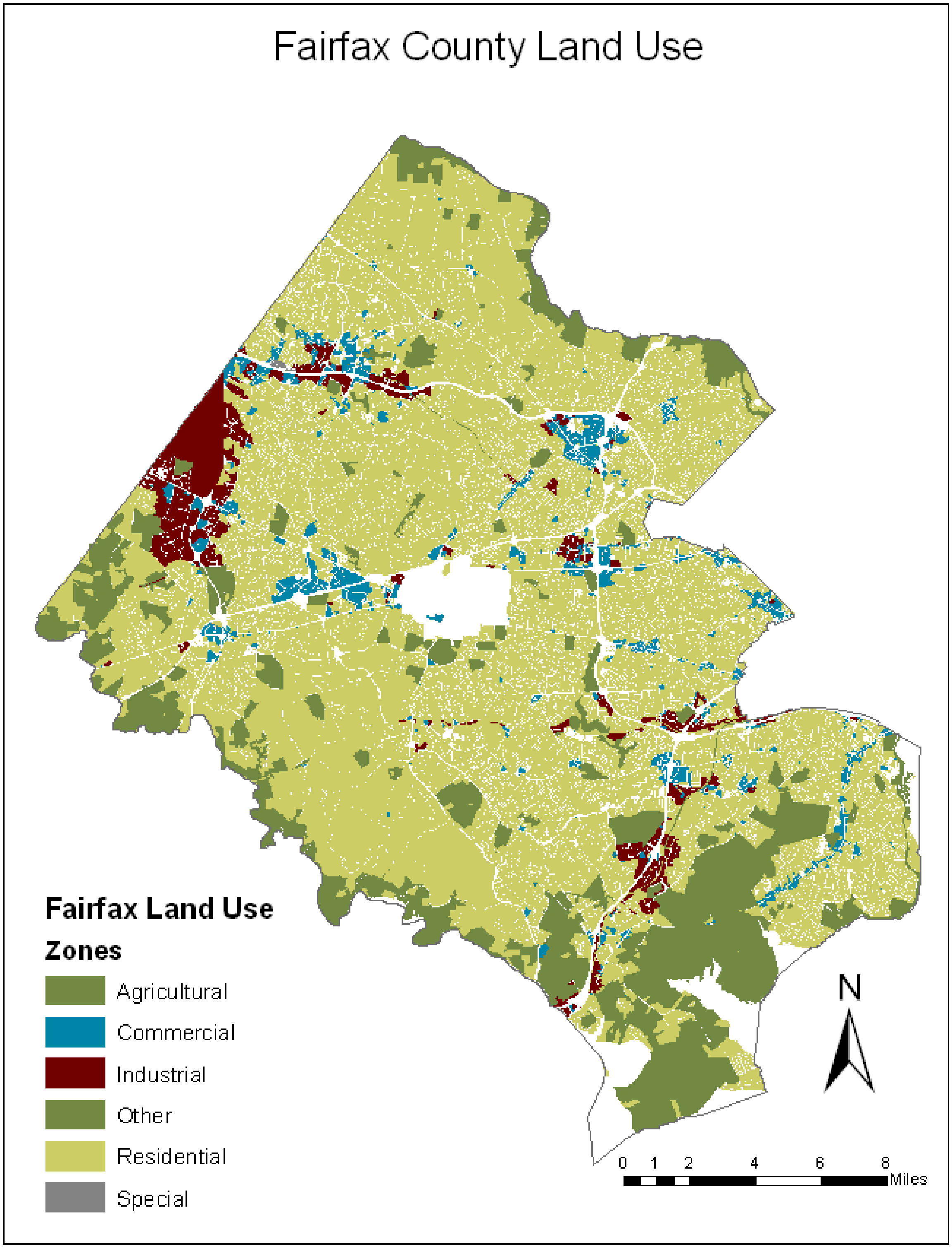

Figure 3 - Fairfax County Land Use

Stage 1: Proximate Residential Child Population Density Analysis

Using the basic assumption that children live on parcels designated as residential land use (as opposed to industrial, commercial, or agricultural land uses), we can recompute the population density by excluding from each census block groups those land uses which are not residential. Using this method the total count of children will remain the same in each census block group, but the area over which the number is divided (the denominator of the density ratio) will be smaller. This approach produces a more accurate and precise distribution of child population density, and reduces the penalty for school populations that live in or near multi-use land zones when prioritizing best SRTS program candidates.

Children population settlement patterns may well have changed in the intervening years between the latest publicly available demographic information in the 2000 census and today. Utilization of the more recent 2010 census or other information sources such as the FCPS student directory would improve the accuracy of this analysis, but these were unavailable to the author at the time of publication.

Promoters of the SRTS program for young school age children (ages 5-9) generally agree on a radius of 1 mile for cyclists, and 0.5 miles for walkers as a reasonable expectation for active commuting participants. A proximity restriction of 1 mile between residential land use parcels and Fairfax County Elementary Schools thus allows us to significantly reduce the populations under consideration for SRTS program outreach efforts. Figure 4 depicts the residential land use parcels within one mile (as a crow flies) of an elementary school, and shows the revised population density for children ages 5 to 9 in these areas.

This map provides the basis by which subsequent steps of this analysis can evaluate which schools have the closest and densest populations of children aged 5 to 9. Active commuting options are most beneficial for these school populations.

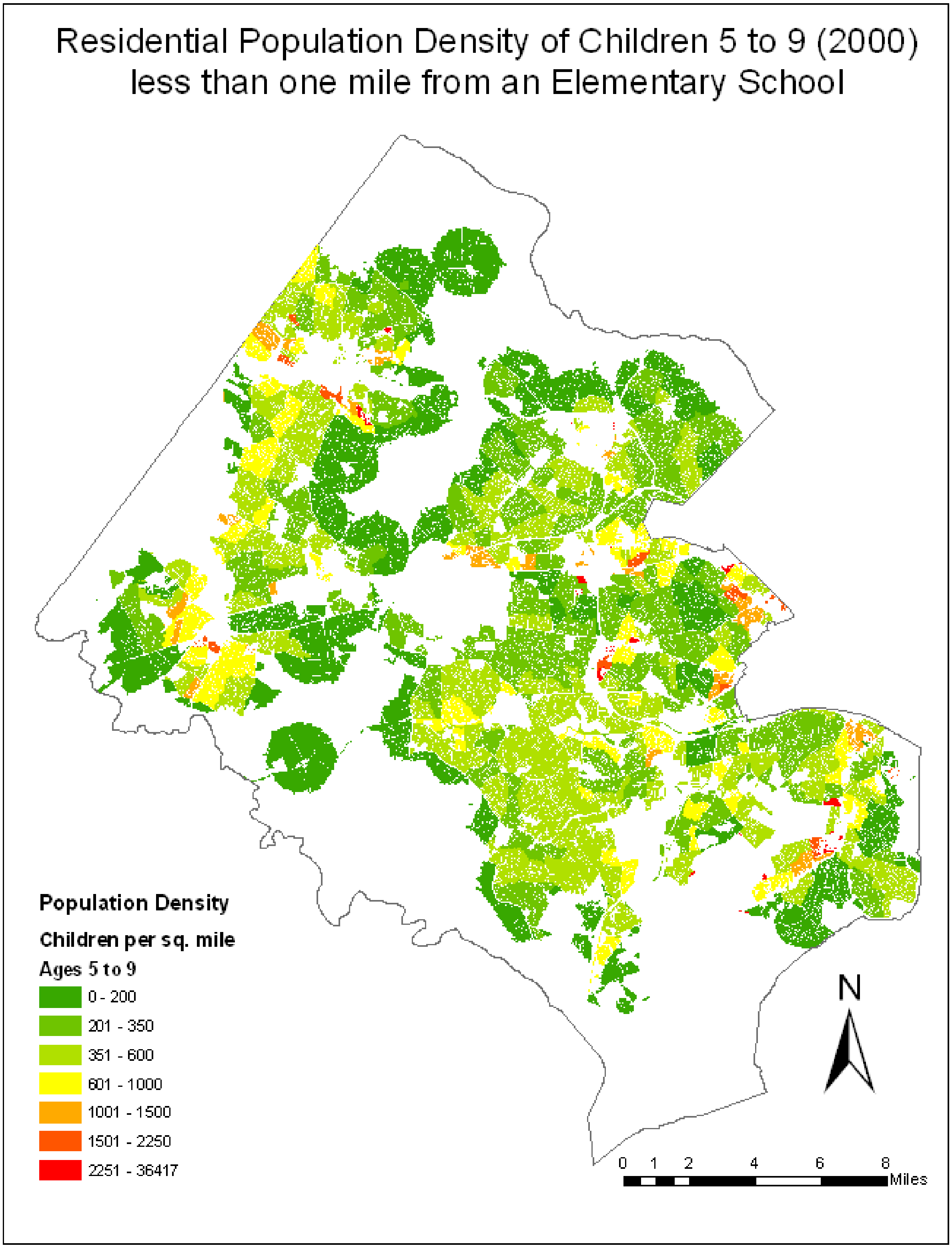

Figure 4 - Proximate Residential Population Children 5 to 9

Stage 2: Regional Analysis

In this stage of the analysis, a more detailed review is conducted for each school zone proximate to high population densities of children. For each region of Fairfax County containing relatively dense populations of children, the school location and attendance area is evaluated upon the following criteria:

- Relative centricity of school location within the attendance area. With more central school placement offering a greater relative area within close commuting distance.
- Relative proportion of the school attendance area within walking distance (0.5 miles) of the school. Active commuting options that are available to a relatively high proportion of residences within the attendance area may be presumed to more easily gain stakeholder (e.g. parent and faculty) advocacy.
- Presence of major transportation corridors (with speed limits >= 45 mph) which bisect the school attendance area and present a significant obstacle to active commuting options for a portion of the student body.
- Proximity of relatively dense populations of children. Upon review of the data, density of 1000 children per square mile was chosen as the discriminating threshold for selection.

It is important to note, that all schools and school children could potentially benefit from active commuting programs such as the Safe Routes to School Program. This stage of the analysis is not intended to differentiate which schools are most in need of, or would most value, such a program. It is intended to help identify and prioritize which schools would have the greatest total benefit (in numbers of students) that are a reasonable commuting distance from residential population centers.

Northwest Region

In the northwest region of Fairfax County, there are several schools that include relatively dense population centers (See Figure 5). Lake Anne, Forest Edge, Terraset, Dogwood, Hutchison, and McNair Elementary schools are close to dense residential populations within their school attendance area.

Of these, Hutchison, Dogwood, and Terraset schools attendance areas are the closest to relatively large and dense population zones. Dogwood is bisected by two major transportation corridors; while Hutchison and Terraset have the totality of their student body within active commuting distance.

Northwest Fairfax County
Elementary Schools and Residential Population Density

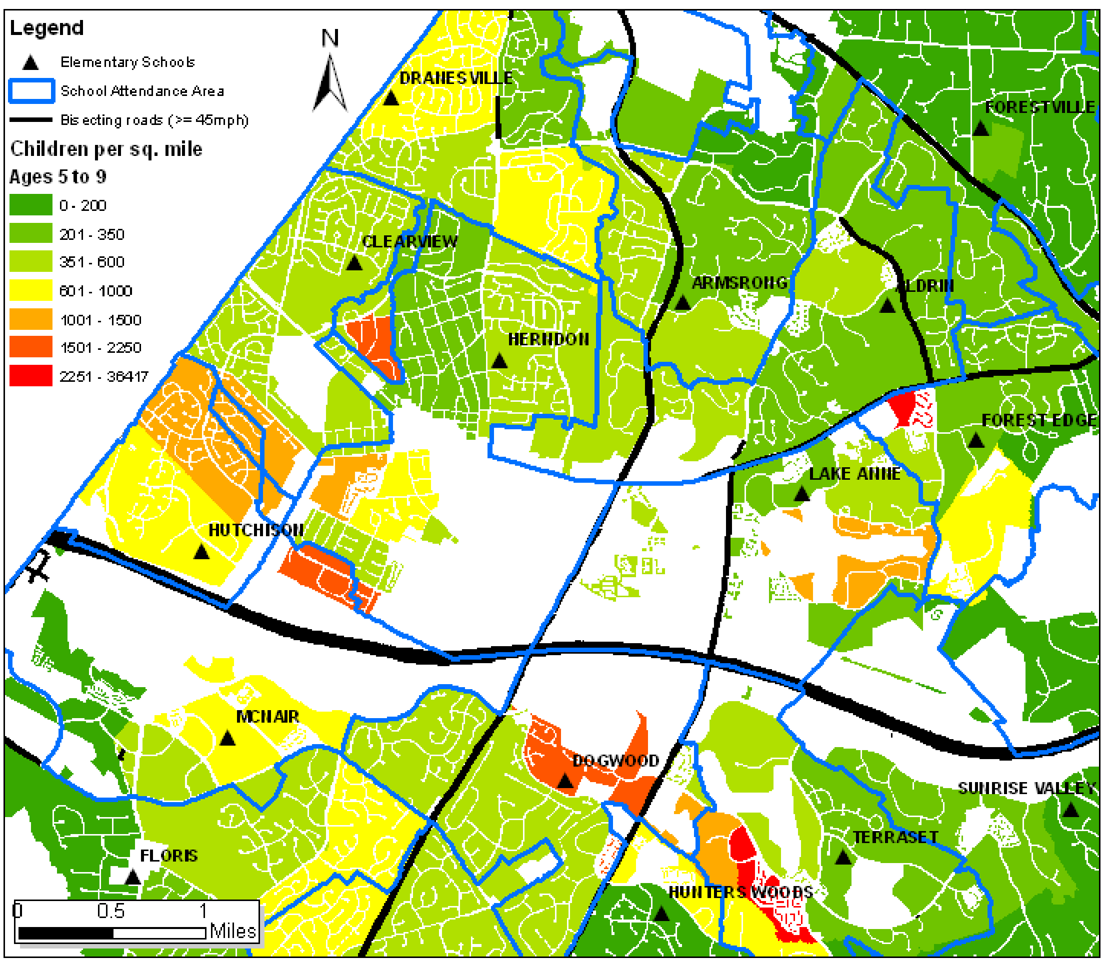

Figure 5 - Northwest Fairfax County Elementary School Areas and Population Density

East Region

Mosby Woods, Graham Road, Bailey's, Braddock, and Weyanoke Elementary School areas within the central eastern portion of Fairfax County are the most promising for SRTS program adoption. Of these, Bailey's ES has the advantages of central location within the attendance area, adjacent proximity to high density residential populations, and an entire student body as candidate beneficiaries of SRTS program adoption.

Eastern Fairfax County
Elementary Schools and Residential Population Density

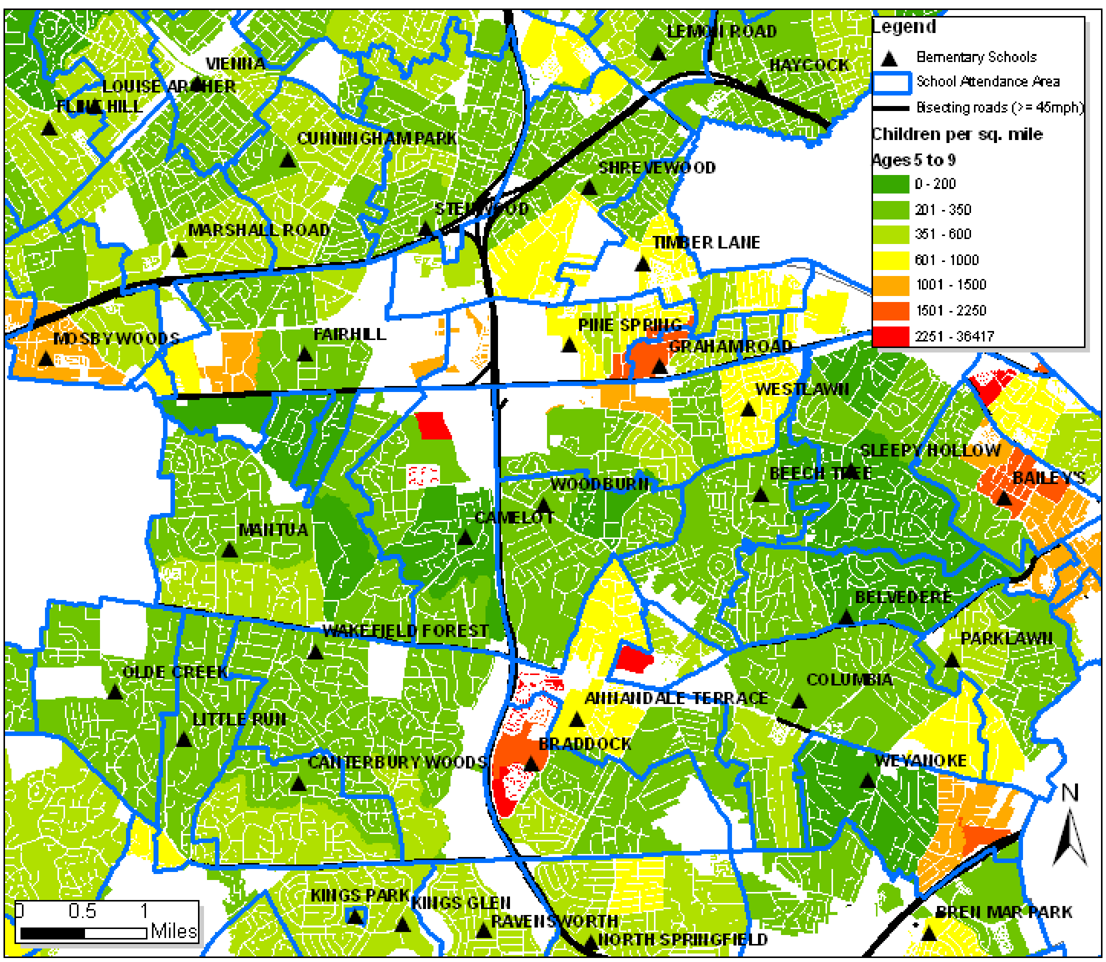

Figure 6 - Eastern Fairfax County Elementary School Areas and Population Density

Southeast Region

The Fairfax County Elementary Schools of Mount Eagle, Mount Vernon Woods, Hybla Valley, and Crestwood have the highest projected utility for SRTS program uptake. Crestwood and Mount Vernon Woods schools are the most centrally located within the attendance area with relatively dense populations immediately adjacent to the school.

Southeastern Fairfax County
Elementary Schools and Residential Population Density

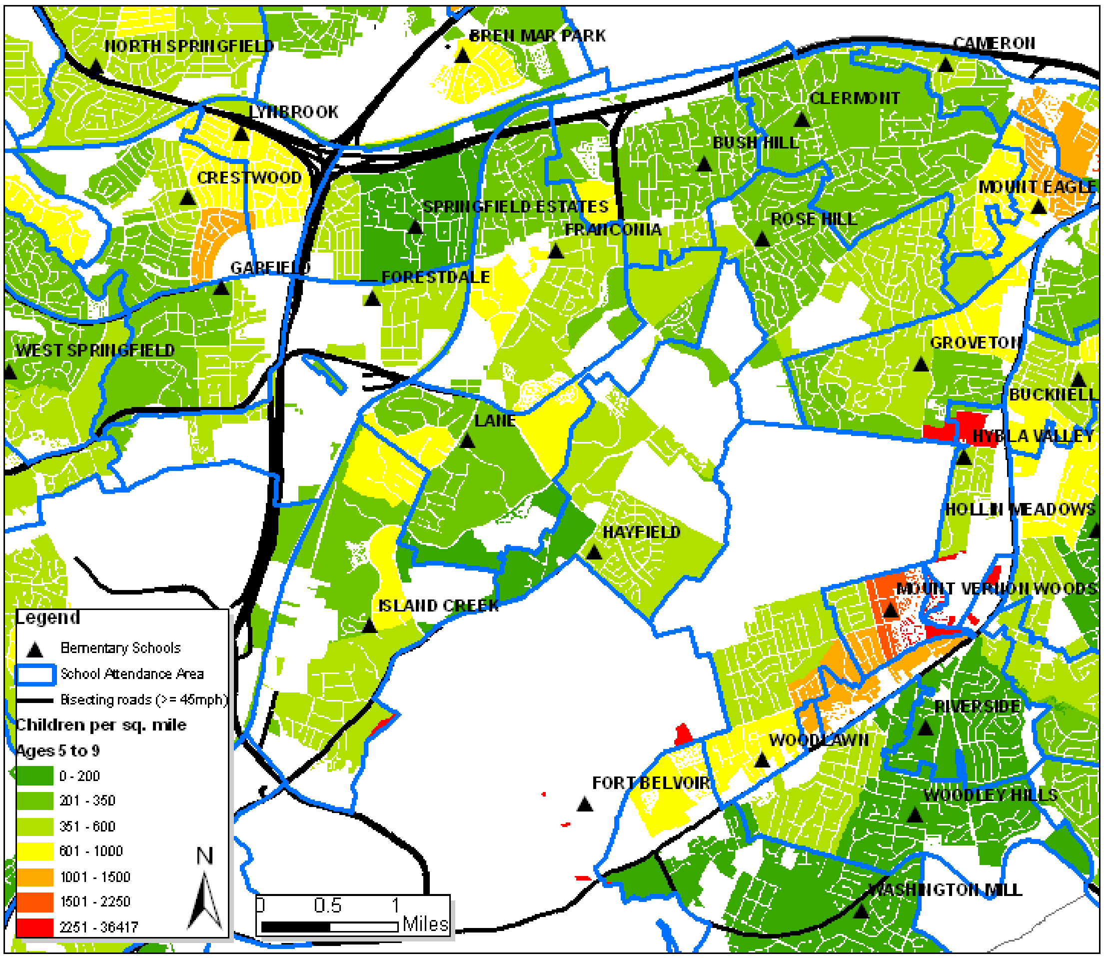

Figure 7 - Southeast Fairfax County Elementary School Areas and Population Density

Southwest Region

The southwestern corner of Fairfax County contains several school areas proximate to high density residential populations. These include London Towne, Centre Ridge, and Brookfield Elementary Schools. While all three make promising early-adopter candidates, London Towne is best positioned with a school location directly adjacent to a dense population area and a relatively small attendance area where the entire student body could benefit.

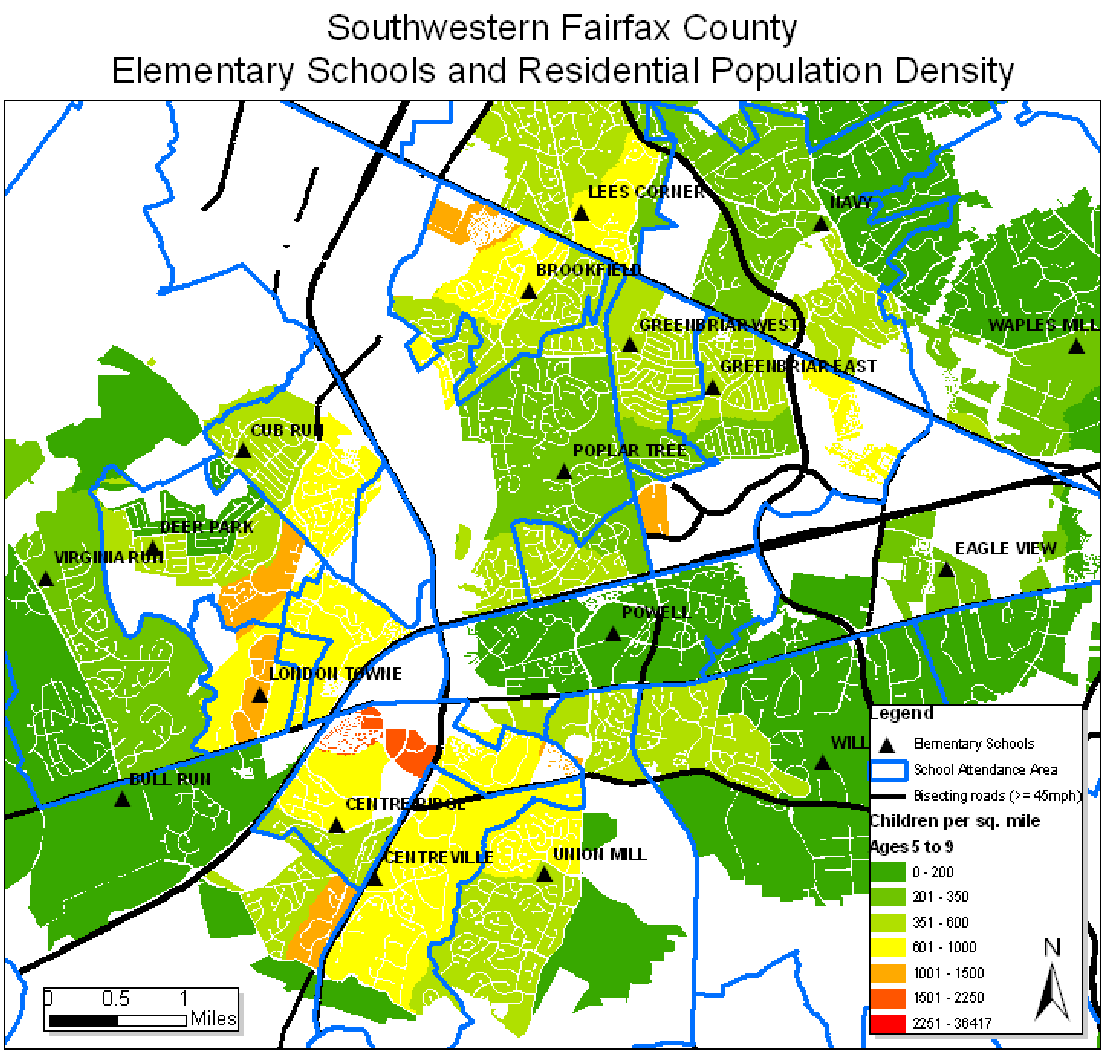

Figure 8 - Southwest Fairfax County Elementary School Areas and Population Density

Summary Results of Regional Prioritization

Across all 187 Fairfax County Elementary Schools evaluated as part of this analysis, a few stand out as the most promising candidates for initial uptake of a Safe Routes to School initiative. When prioritizing outreach and support efforts, advocacy groups may wish to consider targeting stakeholders within the following schools first:

- Terraset Elementary School
- London Towne Elementary School
- Bailey's Elementary School
- Mount Vernon Woods Elementary School
- Crestwood Elementary School

While every school could benefit from SRTS program funding and active commuting options, these schools are deemed to have the highest utility of investment given the spatial characteristics of high-density residential population proximate to the school, and the configuration of school location within the attendance area. The presence of significant transportation corridors which could limit pedestrian and bicycling by young students was also considered at this stage of the analysis.

Stage 3: Preparing an SRTS School Travel Plan

Stakeholders seeking state and Federal funding for Safe Routes to School planning and infrastructure investments must first develop a School Travel Plan per the guidelines outlined by the Virginia Department of Transportation. Appendix A includes guidance for the mapping components of a school plan.

This section begins a preliminary assessment of the spatial and infrastructure considerations that could be included in a School Travel Plan for Terraset Elementary School. Stakeholders can use this analysis as a starting point for a more detailed consideration of proposed infrastructure improvements as part of the School Travel Plan.

School Overview – Terraset Elementary School

The map depicted in Figure 9 meets the primary requirements of the Virginia Department of Transportation guidelines for Map 1 of the School Travel Plan (see Appendix A for guidelines). This includes a scale within a 2-mile radius of the school, a location of the school and the school attendance boundary, and the major roads in the area. School stakeholders seeking to use this map to develop a School Travel Plan would need to include the location of proposed engineering strategies.

Terraset Elementary School Overview

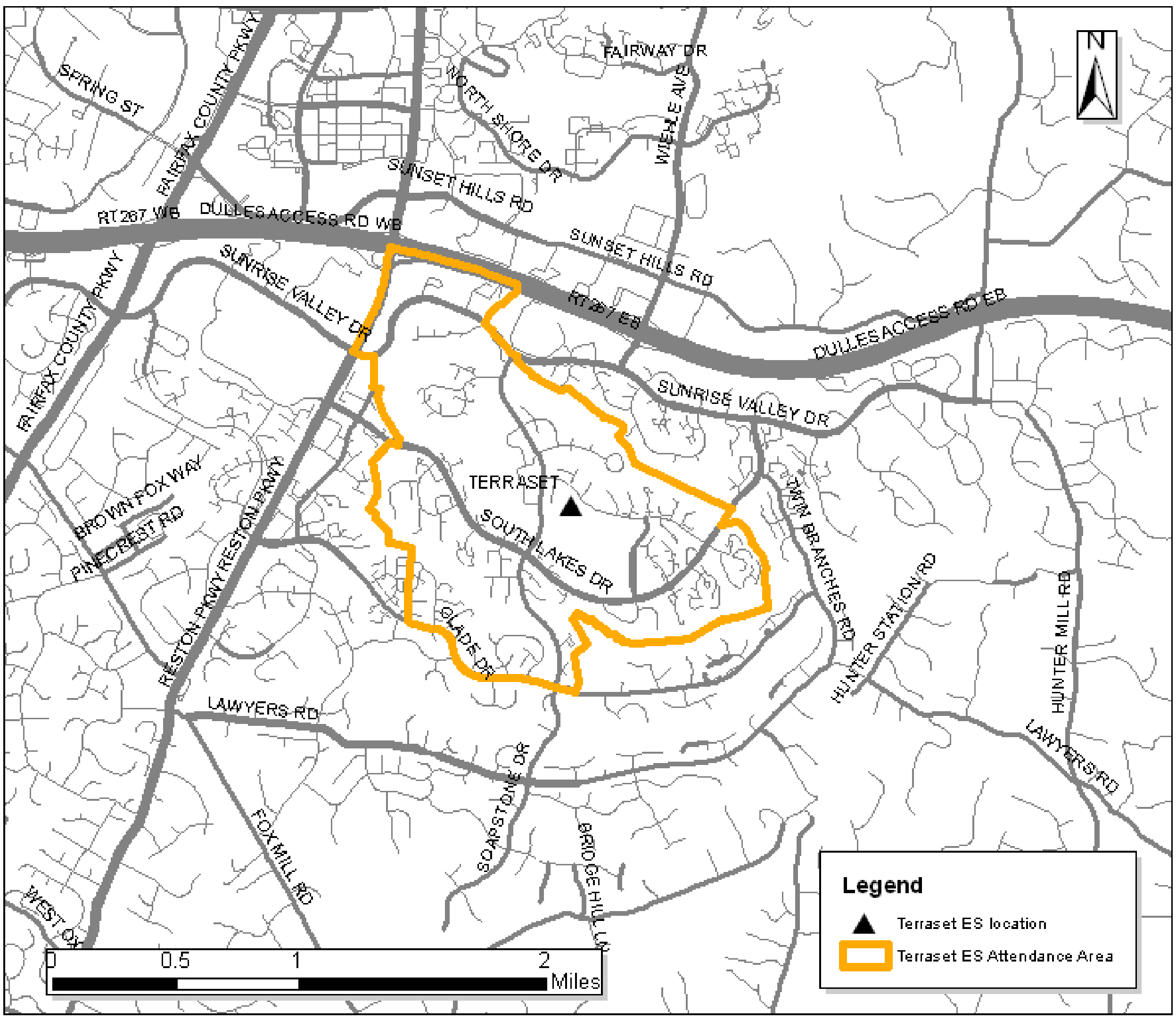

Figure 9 - Terraset ES Overview

Pedestrian and Bicycle Infrastructure – Terraset Elementary School

The map depicted in Figure 10 supports the development of Map 2 for a typical School Travel Plan (see Appendix A). Terraset Elementary contains numerous off-road pathways connecting the dense population centers in the southwest of the school attendance area with the school. These include crosswalks at the major crossroads of South Lakes Drive and Soapstone Drive. This suggests that infrastructure investments to further encourage active commuting adoption by the student body will be less significant at Terraset than at schools with relatively less existing pedestrian and bicycle infrastructure.

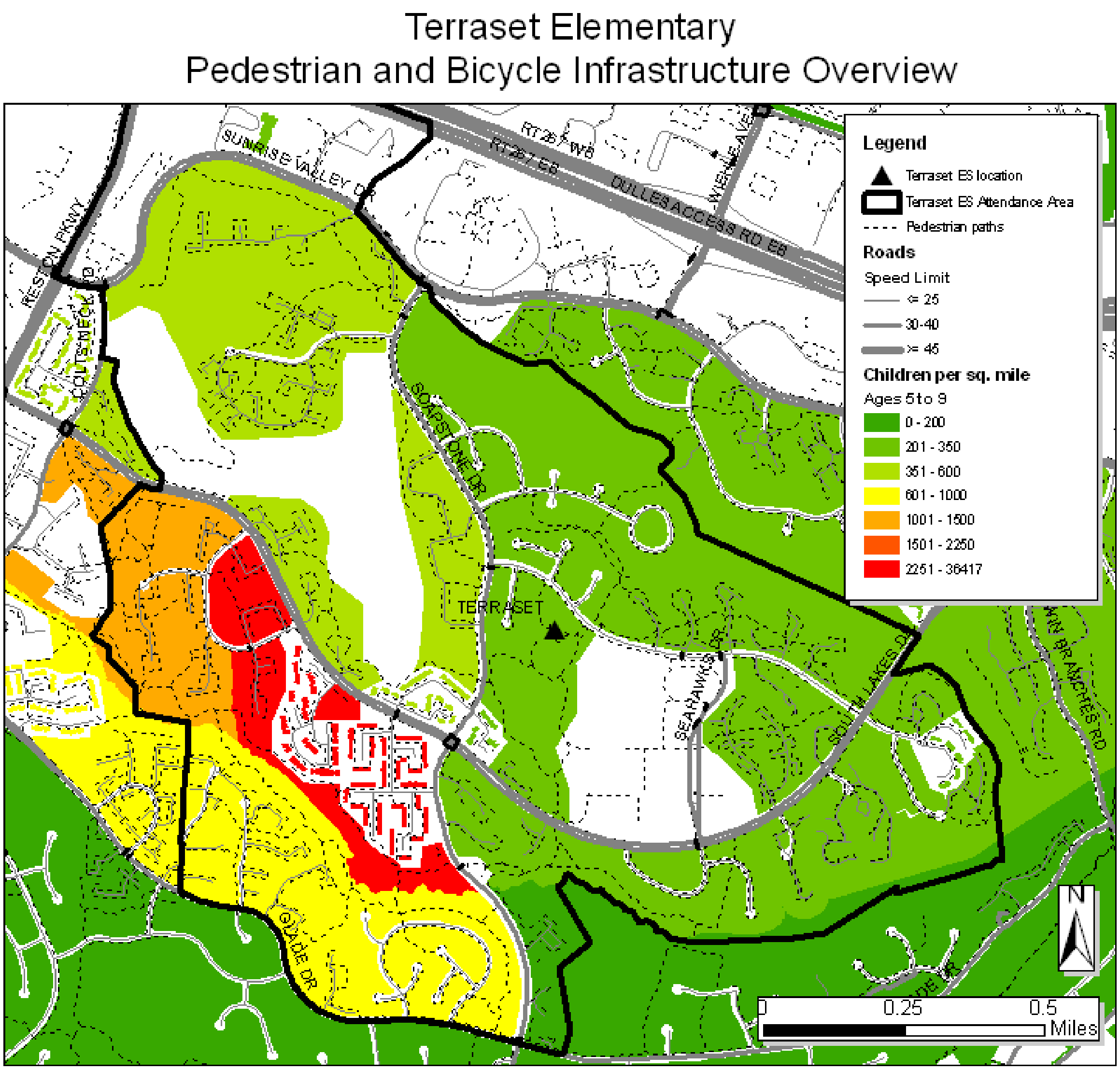

Figure 10 - Terraset Elementary Infrastructure

Terraset Elementary School – Preliminary Engineering Proposals

The absence of marked bicycle lanes on the primary west to east road in the school attendance area (South Lakes Drive) suggests a potential engineering proposal to be considered by SRTS stakeholders at the school. The concept of a 'complete street' may be appropriate for South Lakes Drive to include pedestrian paths, marked cycle ways, and bus transit lanes (National Complete Streets Coalition 2011). This could serve to remediate the absence of bike lanes, and provide roadside pedestrian sidewalks to provide more direct school access to those living in the high density residential areas.

Additional crosswalks crossing South Lakes Drive west of Soapstone Drive would better help connect neighborhoods in the southwest of the school attendance area with off-road pathways to the north of South Lakes Drive, providing shorter pedestrian travel times to school.

Regional Integration of Terraset SRTS investments

Improving active commuting options in the Terraset Elementary School Attendance Area can also serve to support regional benefits due to the proximity to other community assets. Terraset is adjacent to Hughes Middle School and South Lakes High School, and the student body graduates into these higher secondary schools. Students habituated to active commuting options can continue these as they advance through the grades within the FCPS pyramid scheme, and are able to reuse the infrastructure improvements. From a cost benefit perspective, Terraset SRTS investments have spillover advantages to other schools within the Fairfax County System, further increasing its prioritization for outreach efforts.

Terraset Elementary School is also within 1 mile of a new Washington Metro Silver Line terminal currently under construction and scheduled for completion in 2013. This is also very close to the W&OD trail, a large regional multiuse pathway for pedestrian and bicycle traffic. Investments in bicycle pathway enhancements through the SRTS program would optimally be aligned and integrated with these regional amenities (See Figure 11).

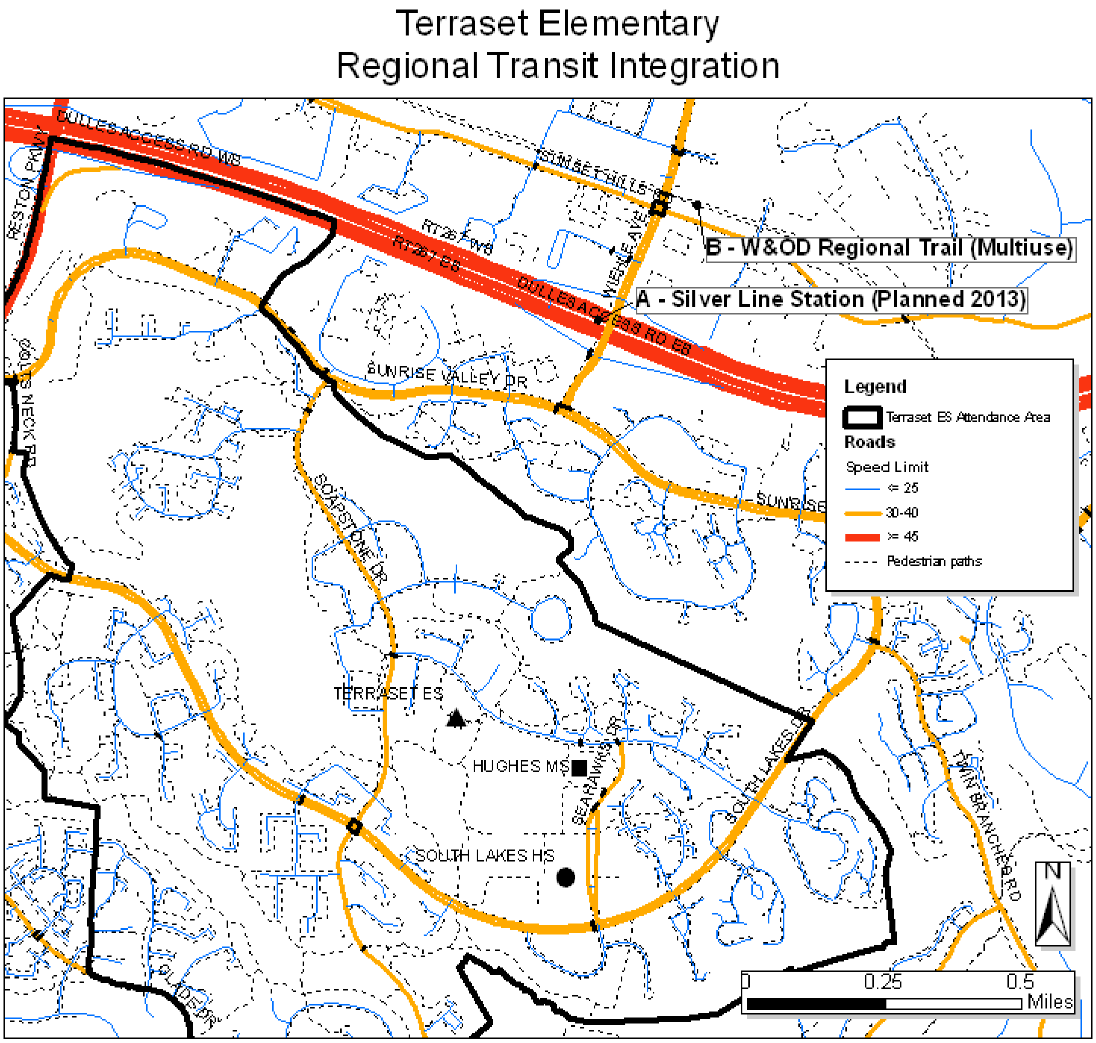

Figure 11 - Terraset Regional Transit Integration

Conclusions

Stakeholders within Fairfax County Government and advocacy groups organizing outreach efforts to encourage Safe Routes to School program adoption within the county public school system must choose where to begin among the 210 schools within the system. The analysis presented in this paper recommends a shortlist of elementary schools with the best high-level cost-benefit case for program adoption, and provides geospatial analytic approach to identifying and supporting plan development for all schools within Fairfax County.

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Appendix A – Preparing a School Travel Plan

The Virginia Department of Transportation (VDOT) provides a School Travel Plan (STP) template to assist schools with producing the documentation necessary to participate in the Safe Routes to School program (Virginia Department of Transportation 2011). Section 8 of the STP template requires various maps of the school and infrastructure to be prepared to qualify for funding. The School Travel Plan Reference Guide provides guidance for schools for preparing these maps. This appendix contains the recommendations found Section 8 of this guide.

School Travel Plan Reference Guide - SECTION 8: MAPPING

Summary: It is important to be able to visually represent existing walking and bicycling routes, as well as the kinds of infrastructure changes you would like to implement. You should obtain a map or an aerial photograph of the area for inclusion in the plan.

What to include:

Map A: School Overview Map, show and label: 1) location of target school(s); 2) a two-mile radius around school; 3) attendance zone boundary for each school or a note that boundary is city-wide, for example; 4) any major streets/roads; and 5) location of proposed engineering strategies.

Map B: Pedestrian and Bicycle Infrastructure within a half mile radius, show and label: 1) existing sidewalks, multi-use paths and bike lanes within 1/2 mile of each school; 2) identified barriers; 3) neighborhoods or student clusters ; 4) location of any traffic signals and crossing guard locations; and 5) location of proposed engineering strategies. (For School Travel Plans with multiple schools, it may be necessary to create several maps to show the pedestrian/bicycle infrastructure around the schools.)

Map C,D,E etc: Infrastructure Improvement Map (only if infrastructure changes are planned). In these maps, you denote the location of schools and planned improvements. Show and label the following: 1) proposed strategies and surrounding street names, for example within three or four block radius; 2) stop, yield signs and traffic signals; 3) school flashing beacons; 4) speed limit on roads/street; 5) vehicle counts on road (i.e. AADT, and peak hour); and 6) school entrances, when nearby. If your Plan seeks to outline infrastructure improvements at several locations, create a separate map for each site.

Tips on completing this section: Mapping is very important to locating the hazards and barriers and proposed improvements you are planning. If GIS support is not available, consider using Google Maps, or a similar tool, to show aerial views. Sketch-maps to scale should show all of the information listed above. You may need the assistance of a professional traffic engineer or planner.