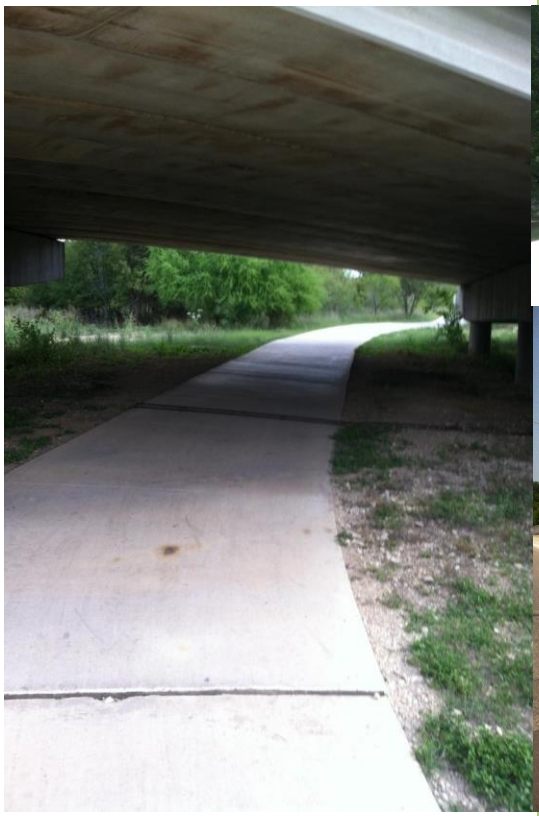
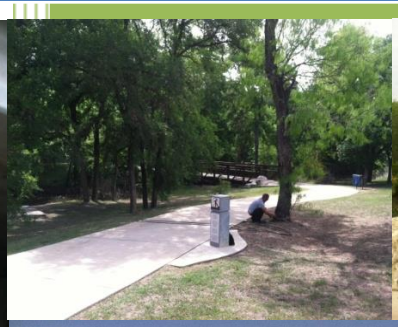
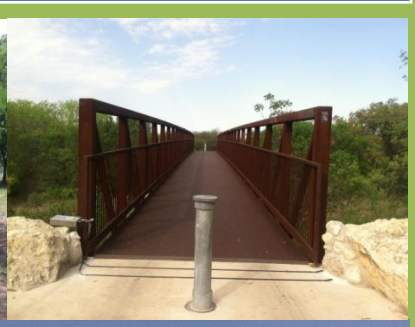
CITY OF SAN ANTONIO
OFFICE OF SUSTAINABILITY

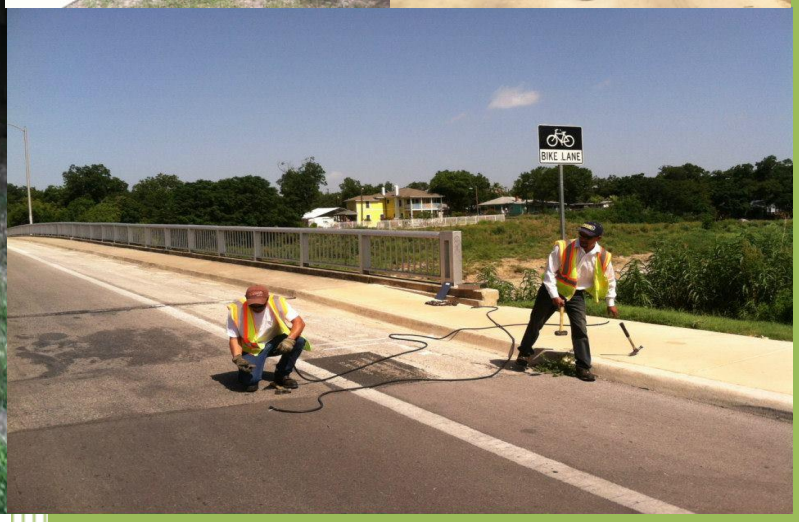
2013-2014

Bicycle Counting Report









SAN ANTONIO BIKES
Office of Sustainability

City of San Antonio Office of Sustainability

Sustainable Transportation

San Antonio Bikes

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Introduction

The City of San Antonio's Office of Sustainability initiated the Bicycle Counting program in 2013 based on recommendations within the City's 2011 Bike Master Plan. Administered by San Antonio Bikes in coordination with the Transportation and Capital Improvements (TCI) Department, the Bicycle Counting program is a critical tool that can help planners and engineers understand bicycle ridership throughout the city.

The 2013 Federal Highway Administration's (FHWA) Traffic Monitoring Guide[1] includes general guidance on traffic monitoring best practices for non-motorized traffic, including bicyclists and pedestrians. The methodology and technology used to collect data within San Antonio's Bicycle Counting program follows the recommendations within the FHWA's Traffic Monitoring Guide.

Methodology & Data Collection

Data collection of bicyclists is conducted with temporary, mobile pneumatic tube counters as well as permanent counters that utilize a combination of inductance loops and infrared sensors. The pneumatic tubes, which are portable and capable of counting bicyclists on roadways, are utilized to collect short duration counts of bicyclists. Two parallel tubes are secured laying perpendicular to the direction of roadway traffic at selected geographic locations. The tubes are placed to adequately cover the bicyclist's path and additionally cover as much of the street as practical to limit the possibility of bicyclists maneuvering around the tubes, thereby undercounting the number of bicyclists. The pneumatic tube counters are additionally programmed to be bicycle oriented in terms of speed and weight, yielding heavier and faster vehicle types to be disregarded from counts. The pneumatic tube counters are capable of determining the direction and volume of bicyclists within 15 minute time increments.

Permanent counters are installed throughout the city by removing a small portion of the facility's surface (each permanent counter thus far has been installed along a concrete trail surface) and placing inductive loop sensors within the concrete, as well as an infrared sensor on the side of the trail. The inductive loops discern bicycles from other vehicles, whereas the infrared sensor is solely able to count pedestrian traffic. The utilization of permanent counters allows the addition of continuous bicycle and pedestrian direction and volume data within 15 minute time intervals.

Pneumatic tube counting studies conducted in 2013 establish baseline "before" counts on construction projects slated for future bicycle facility improvements, including: Theo and Malone Avenues, Hausman Road, and South Alamo Street. A number of roadways that recently received bicycle infrastructure implementation were additionally counted in 2013, including: Roadrunner Way, Cincinnati Avenue, and South Flores Street.

Pneumatic tube counting studies conducted in 2014 were designed to capture variations in bicycle volumes along the Linear Creek Greenway Trail System, in particular Leon Creek and Salado Creek. Although 2014 studies were primarily designed to establish baseline volumes to better understand the levels of activity occurring on the greenway trails, future counting studies can be programmed to capture changes in volumes along the greenways over time as the trail system continues to expand throughout the City of San Antonio.

In November 2014, two permanent counters were installed along the greenway trails to enhance

[1] http://www.fhwa.dot.gov/policyinformation/tmguide/

data collection for both bicyclists and pedestrians on the greenway trails. These counters were installed in addition to four permanent counters installed along the Museum Reach and the Mission Reach, which are owned and maintained by the San Antonio River Authority.

Average Annual Daily Bicyclists (AADB)

Calculating the Average Annual Daily Bicyclists (AADB) is a normalization methodology which accounts for bicycle counting studies performed at different times during the year. Due to the high variability in bicycling volumes based on several factors including weather and seasonality, the AADB is a preferred volume adjustment to compare volumes of bicycle activity throughout the city. AADB accounts for seasonality, precipitation, and other potential variables. For this counting report, annual data was extrapolated from the San Antonio River Authority's Theo and Malone (located on the Mission Reach near Theo Avenue) permanent counter due to its availability of annual data since its February 2012 installation. Future reports will be capable of incorporating additional permanent counting data to improve AADB calculations.

AADB is calculated by applying adjustment factors for the year the bicycle counts were administered. First, the appropriate adjustment factors should be calculated depending on the length of the counting study (hourly, daily, and/or monthly factors) [2]:

$$AADB = C_{known} * H * D * M$$

C_{known} = known manual count for one hour
H = Hourly Factor
D = Daily Factor
M = Monthly Factor

[2]Nordback, Krista, et al. "Estimating annual average daily bicyclists: Error and accuracy." *Transportation Research Record: Journal of the Transportation Research Board* 2339 (2013): 90-97.

Next, an annual AADB should be calculated for the year the bicycle counting studies were performed. For example, the annual AADB is divided by the monthly AADB to determine the monthly factor (M):

$$M = \frac{AADB}{MADB} = \frac{\text{July}}{\frac{500}{1{,}000}} = 0.5$$

The average day in July is double the AADB.

where
MADB = Ave daily bike count in that month

In this scenario, the MADB was twice as high as the AADB, yielding a monthly factor of 0.5. This equates to a normalization halving bicycle counts performed in July.

Other adjustment factors can be found in a similar fashion, depending on the length of the counting study conducted. Each of the City of San Antonio's pneumatic tube bicycle counting studies was conducted for at least seven days, necessitating only a monthly factor be applied. Therefore, the AADB for this counting report was consistently calculated as follows:

$$\mathbf{AADB = ADB * M}$$

Where the AADB of a temporary counting location is calculated by multiplying the ADB (average daily bicyclists) of the counting period times the monthly factor correlating to when the counts were conducted. The following tables display the 2013 and 2014 monthly factors for the Mission Reach and Theo Avenue counter.

2013	Annual AADB	Monthly AADB	Monthly Factor (M)
January	260	195	1.333333
February	260	251	1.035857
March	260	357	0.728291
April	260	361	0.720222
May	260	350	0.742857
June	260	163	1.595092
July	260	177	1.468927
August	260	284	0.915493
September	260	270	0.962963
October	260	309	0.841424
November	260	247	1.052632
December	260	157	1.656051

2014	Annual AADB	Monthly AADB	Monthly Factor (M)
January	295	251	1.175299
February	295	289	1.020761
March	295	321	0.919003
April	295	353	0.835694
May	295	390	0.75641
June	295	392	0.752551
July	295	374	0.78877
August	295	211	1.398104
September	295	219	1.347032
October	295	343	0.860058
November	295	235	1.255319
December	295	172	1.715116

Results and Limitations

Prior to the initiation of the Bicycle Counting program in 2013, the City of San Antonio did not have available data on bicycle ridership. Without an existing library of data, portable pneumatic tube counts provide only a short duration snapshot of bicycle ridership. Additionally, while the presence of permanent counters is an invaluable tool for understanding annual and monthly variations in ridership, their placement covers a limited geography that does not necessarily reflect bicycle activity levels throughout the entire city. These limitations can be addressed and improved upon each year by continuing to conduct counting studies and collect a larger library of data. The results of the overall counting studies conducted in 2013 and 2014 are summarized within this report.

Analysis

Several trends were observed during the Bicycle Counting program and are highlighted in Figures 1-5. Figure 1 displays the estimated 2014 AADB for all counting locations available within the Bicycle Counting program. When comparing on-street facilities such as shared routes (shared with motorized traffic) and bike lanes with off-street facilities (such as multi-use trails), the majority of off-street facility estimated AADB exceeded the AADB estimated for on-street facilities. Exceptions to this trend were South Alamo Street at Refugio,

and South Flores Street at Hafer, which exceeded the estimated AADB on the Mission Reach near the San Juan Pump Station and on Salado Creek at Pletz County Park. The estimated AADB for both Theo and Malone at Nunes slightly exceeded the estimated AADB on Salado Creek at Pletz County Park. Leon Creek near Prue Road recorded the highest overall estimated AADB (491) in 2014.

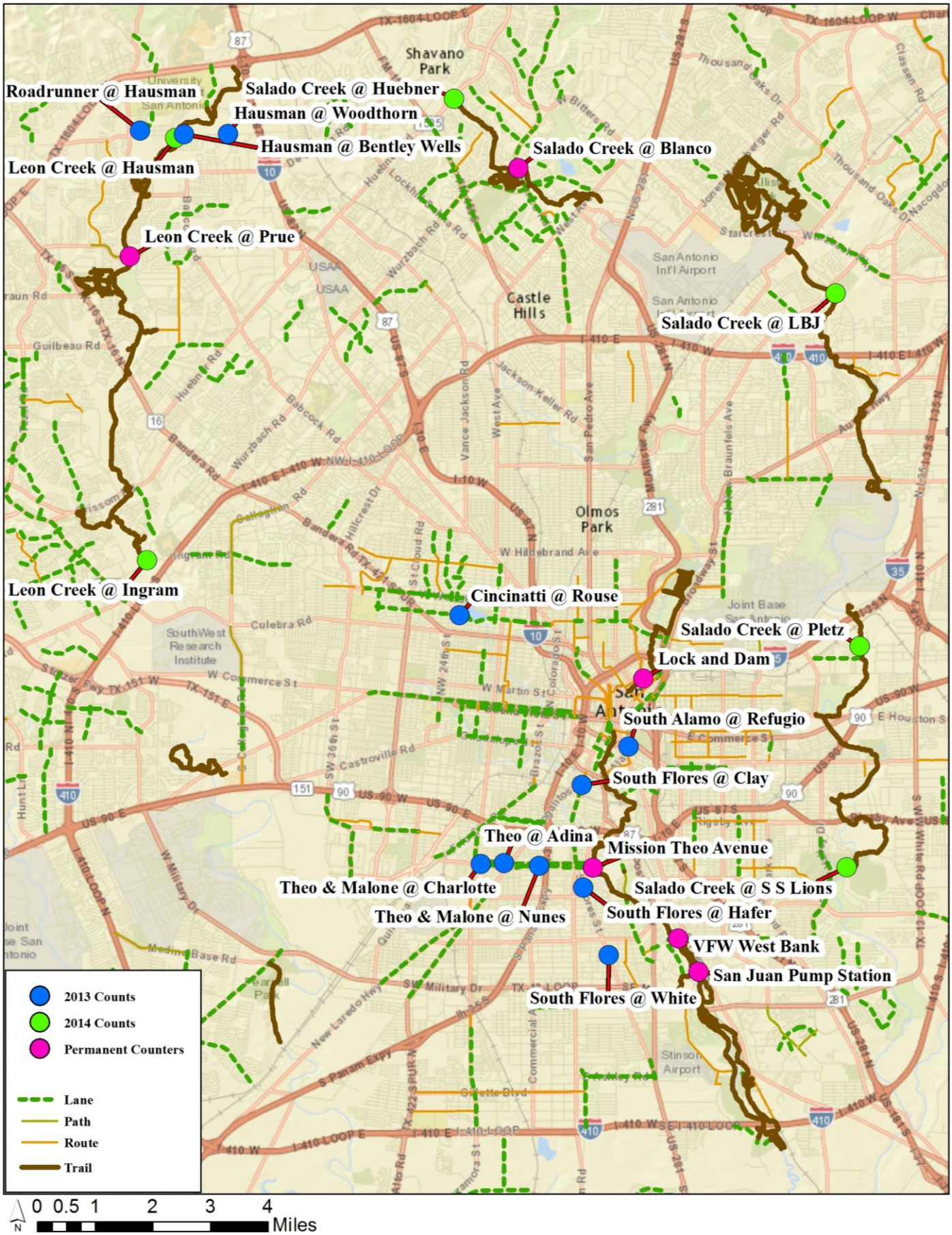
Figure 2 displays the percentage of bicyclists vs. pedestrians counted for each of the permanent counters located along the Museum Reach, Mission Reach, and Linear Greenway trails. The percentage of pedestrians exceeded that of bicyclists on the Museum Reach (Lock and Dam) and Salado Creek at Blanco Road locations. Conversely, the percentage of bicyclists exceeded that of pedestrians on each of the locations along the Mission Reach as well as Leon Creek.

Figure 3 displays specific days of the week and the relationship between weekend and weekday ridership. On-street bicycle facilities generally exhibited a larger share of ridership occurring throughout weekdays (Monday through Friday) compared to weekend ridership. Off-street facilities along the trails tended to display a larger share of ridership instead occurring during the weekend.

Figure 4 provides a raw count of annual bicyclists and pedestrians recorded since the 2012 installation of the first permanent counter on the Mission Reach near Theo Avenue. Based on the data available on this counter, annual bicycle ridership is steadily rising. Beginning in 2012 with the first bicycle counts, total annual bicycle ridership has grown from a little over 74,000 to nearly 110,000 in 2014 at this location.

It is also important to note throughout this analysis that the City of San Antonio's 2011 Bike Master Plan has established a goal of increasing the bicycle commute mode share to 0.5% in 2015, 1.0% in 2020, and 2.0% in 2025. Although several daily bicycle trips are not always intended specifically for work commutes, the American Community Survey (ACS) provides an additional important tool for tracking how travel patterns change across time and place within the San Antonio region. According to ACS 3-year estimates (Figure 5), the percentage of workers in San Antonio commuting by bike has increased from 0.1% in 2010 to 0.3% in 2013.

Map Area of Studies



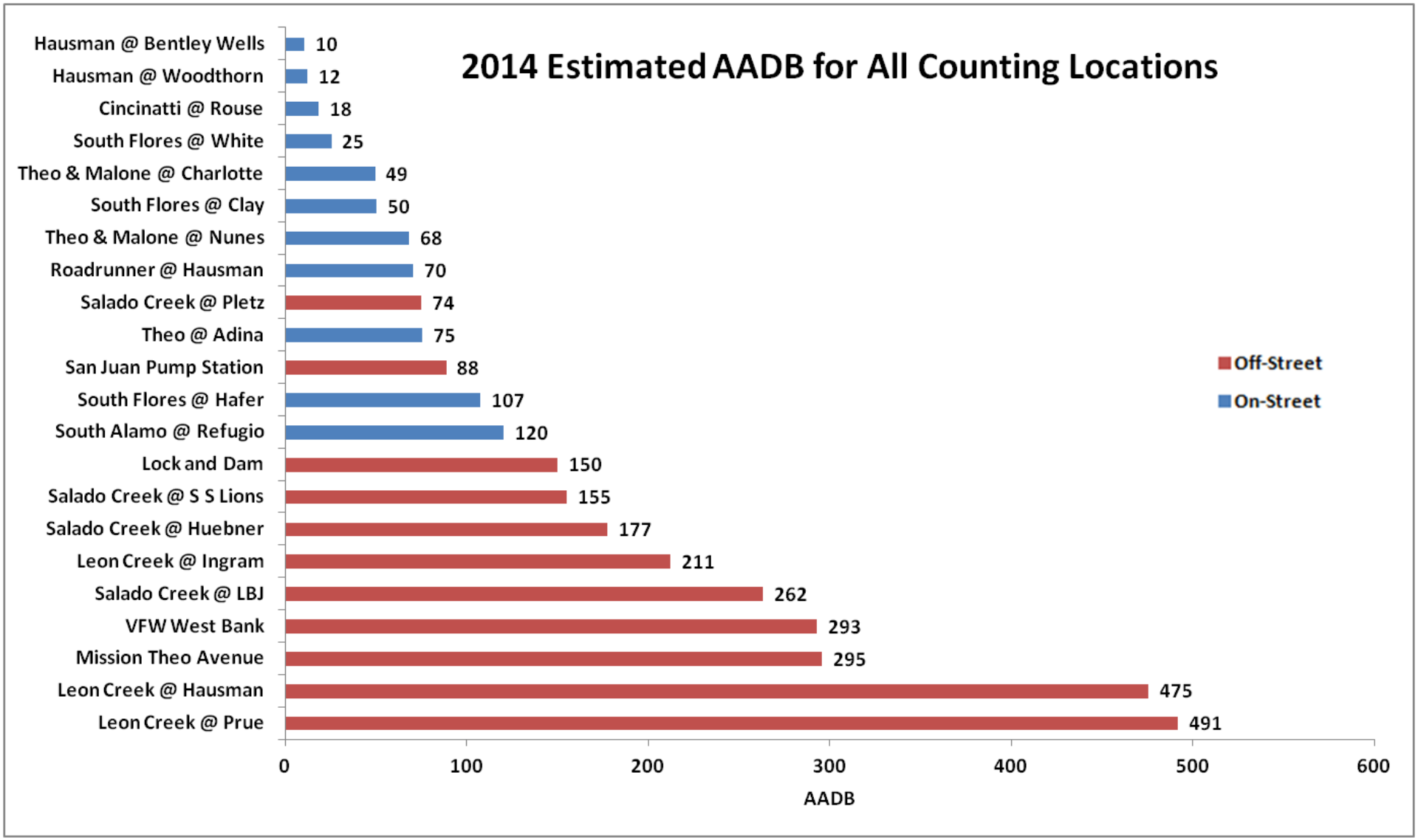


Figure 1: 2014 Estimated (AADB) Bicycle Volumes for All Counting Locations (Single-Direction Counts Doubled to Match Bidirectional Counts)

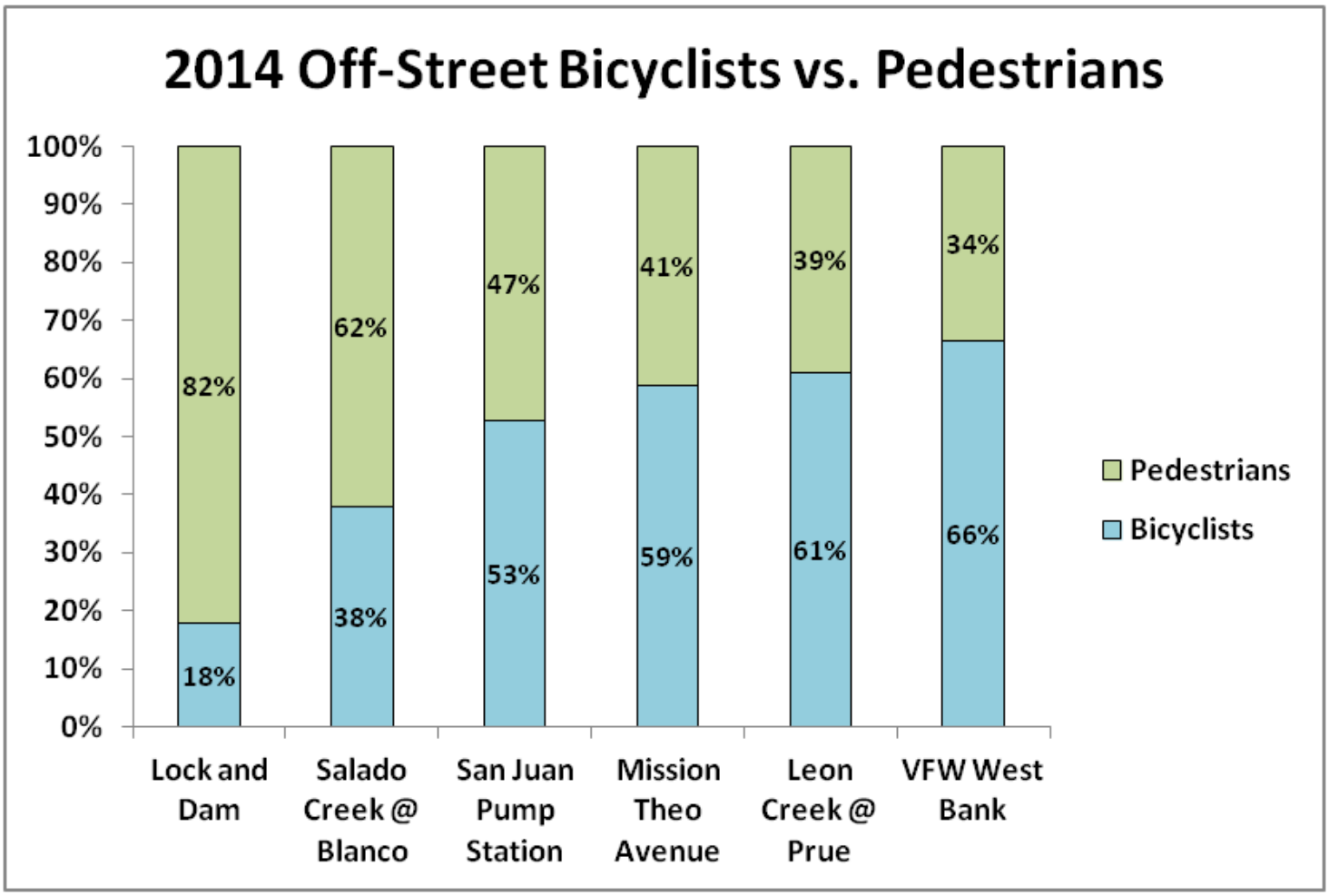


Figure 2: Comparison of Bicyclists and Pedestrians for Off-Street Facilities (Permanent Counting Locations AADB vs. AADP)

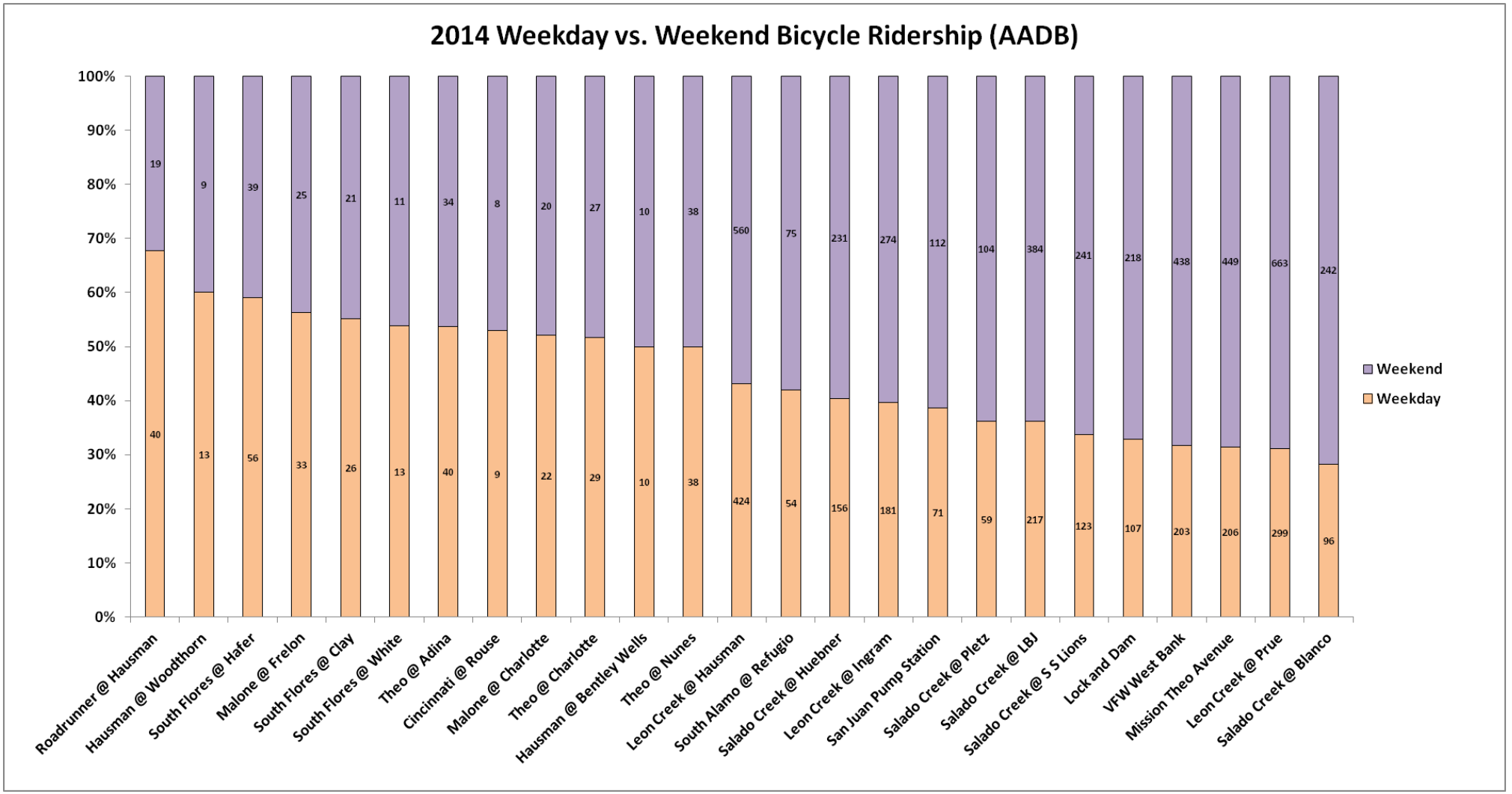


Figure 3: Comparison of Bicycle Ridership on Weekdays and Weekends for All Counting Locations

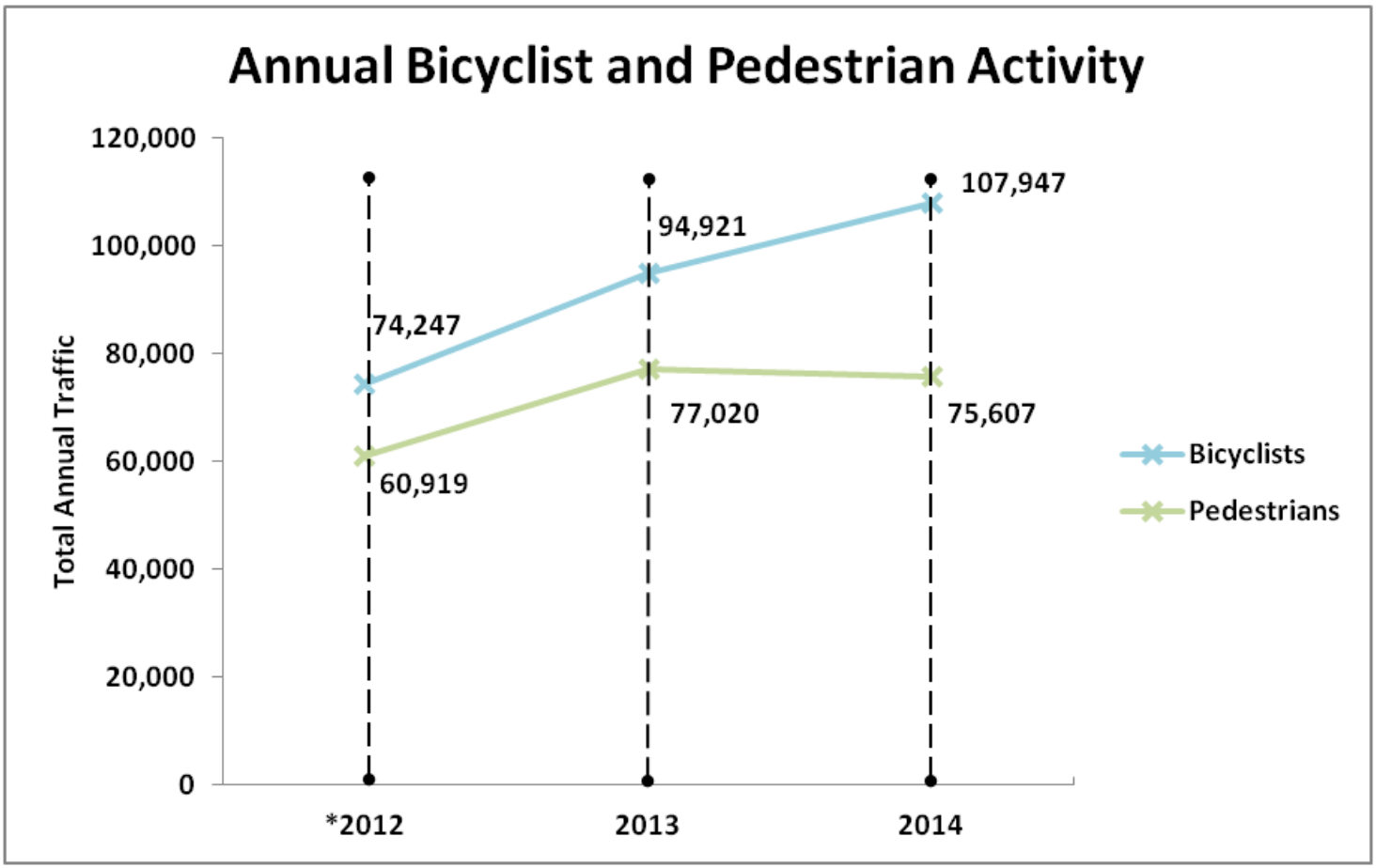


Figure 4: Annual Bicycle and Pedestrian Counts at the Mission Reach/Theo and Malone Counter (*2012 Counts Began on 2/2/2012)

Figures
Annual Census Commuting Maps
*Data Collected from ACS 3 Year Estimates

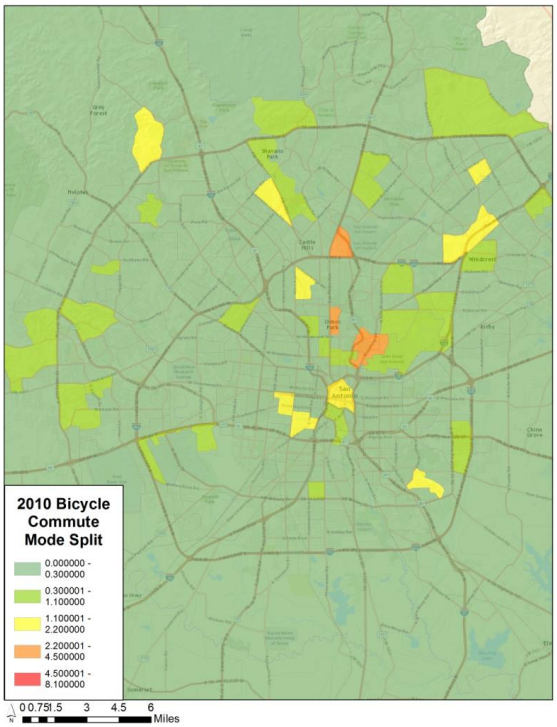


Figure 5A: 2010 Census Commuting Map

2010 % of Commute Trips by Bike: **0.1%**

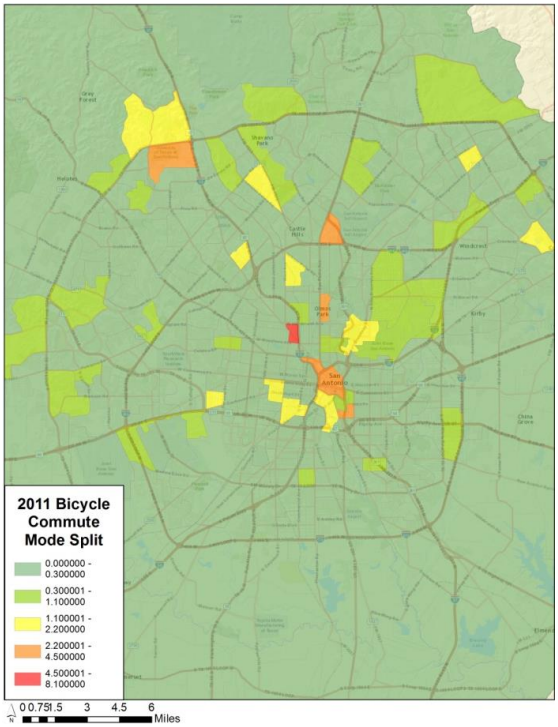


Figure 5B: 2011 Census Commuting Map

2011 % of Commute Trips by Bike: **0.2%**

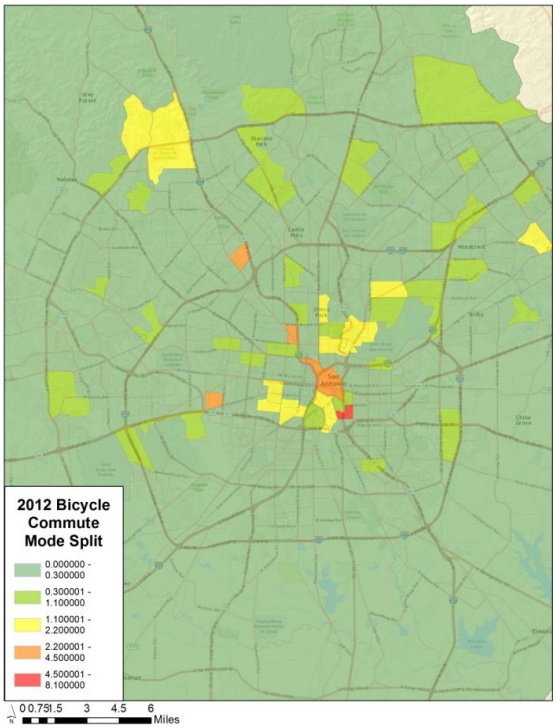


Figure 5C: 2012 Census Commuting Map

2012 % of Commute Trips by Bike: **0.2%**

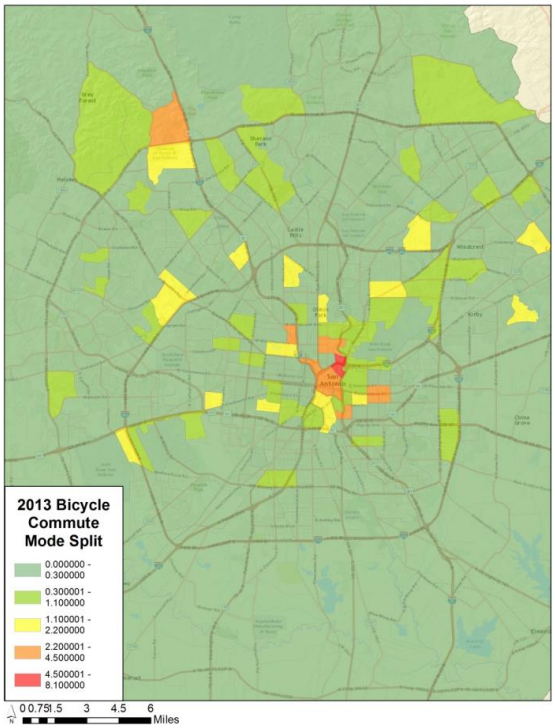


Figure 5D: 2013 Census Commuting Map

2013 % of Commute Trips by Bike: **0.3%**