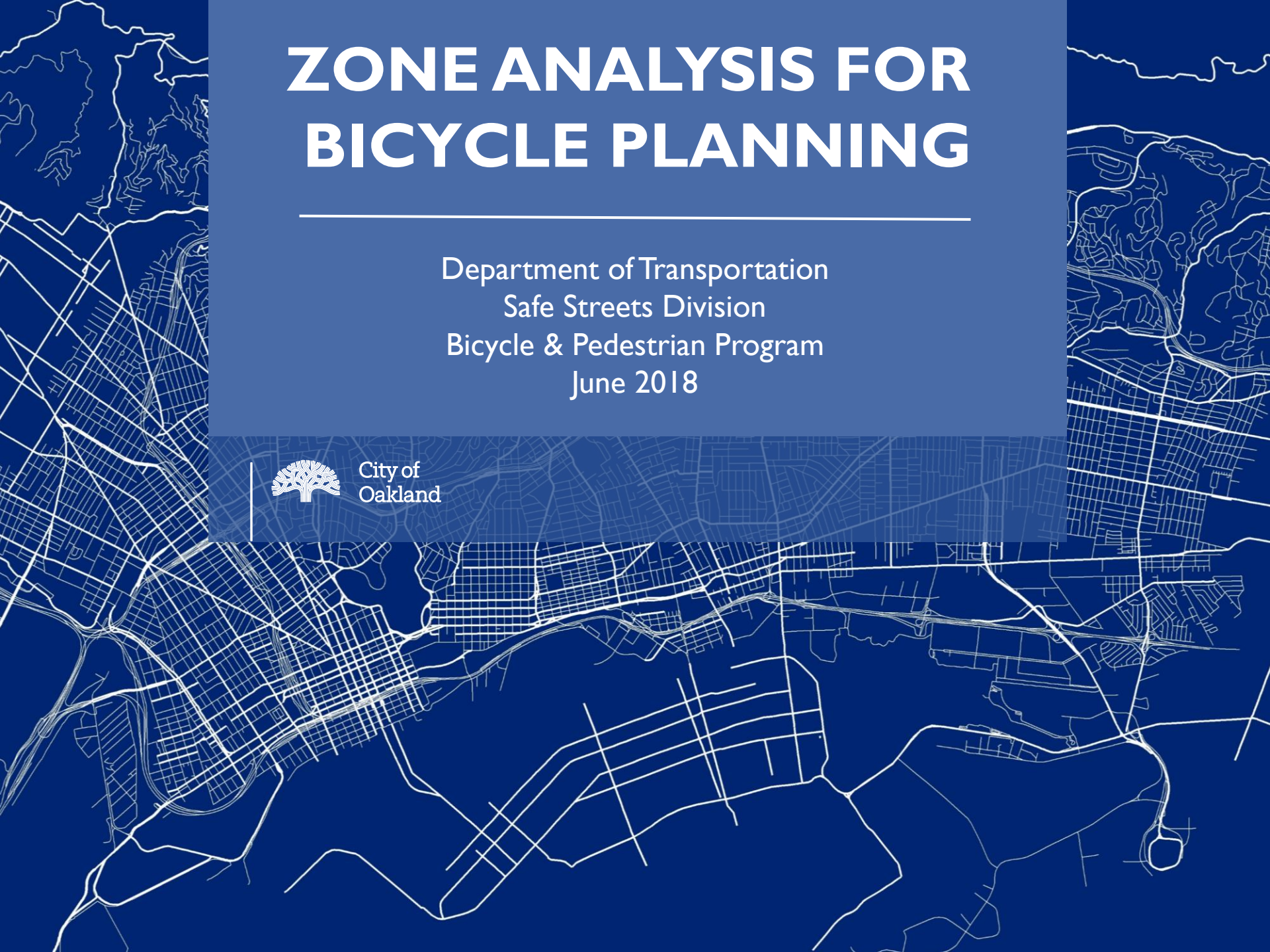
ZONE ANALYSIS FOR BICYCLE PLANNING

Department of Transportation
Safe Streets Division
Bicycle & Pedestrian Program
June 2018

City of Oakland



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INTRODUCTION

Oakland is a city of contrasts – by race and income, but also by geography: food culture amidst food deserts and tent cities within blocks of million-dollar bungalows. Oakland is flat and hilly. Downtown is central to just half of the city, and 88% of Oakland's BART stations are clustered in 34% of the city's land area.

What does this mean for bicycle planning?

- Citywide averages hide differences that are critical to understanding Oakland.
- Analyzing data by geographical zone can bring these differences into focus.
- Because of the differences between zones, different zones will have different solutions.

What datasets can we draw upon to improve Oakland's bicycle planning?

Socioeconomics

- Race & ethnicity
- Income
- Age
- Disability
- One parent households
- Rent burdened households
- Language barriers
- Motor vehicle access

Geography

- Topography
- Proximity to Downtown
- Proximity to BART

Infrastructure

- Pavement quality
- Bikeways
- Bicycle parking

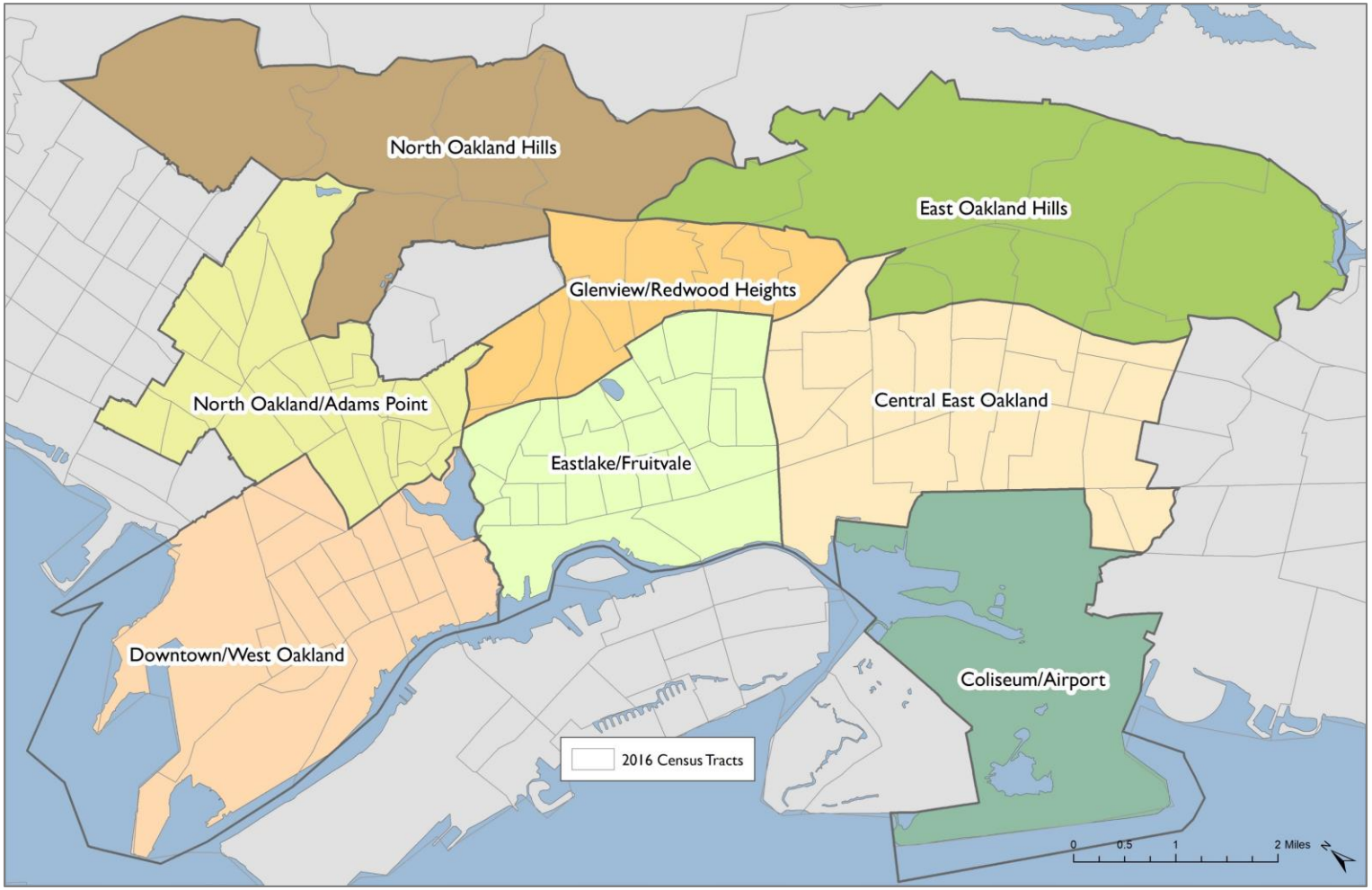
Bicycle Use

- Bicycling rates
- Crashes
- Traffic stress

DEFINING THE ZONES

Zones highlight the similarities within each zone and the contrasts between zones that may be hidden in citywide averages. The size of the zones seek to balance land area and population (given large variations in density).

The eight zones follow census tract boundaries and geographic edges created by topography, neighborhoods, and freeways. Variations within a single zone may be analyzed by comparing data for the census tracts in each zone.



BASIC FACTS

Zone	Area (Square Miles)	Population	Population Per Square Mile	Number of Workers	Number of Bicycle Commuters	Percent of Bicycle Commuters	Female Bicycle Commuters	Male Bicycle Commuters	Bicycle Commuters Per Square Mile
Central East Oakland	7.8	98,937	12,684	38,031	308	0.8%	23%	77%	39
Coliseum / Airport	6.2	3,752	605	1,486	28	1.9%	29%	71%	5
Downtown / West Oakland	7.4	45,032	6,085	21,869	1,067	4.9%	38%	62%	144
East Oakland Hills	10.3	30,733	2,984	15,126	70	0.5%	41%	59%	7
Eastlake / Fruitvale	5.8	98,739	17,024	45,631	1,157	2.5%	28%	72%	199
Glenview / Redwood Heights	3.7	31,976	8,642	16,876	270	1.6%	20%	80%	73
North Oakland Hills	8.8	23,658	2,704	12,677	62	0.5%	82%	18%	7
North Oakland / Adams Point	5.6	79,213	14,145	47,779	3,161	6.6%	43%	57%	564
Citywide	**55.6**	**412,040**	**7,417**	**199,475**	**6,123**	**3.1%**	**38%**	**62%**	**110**

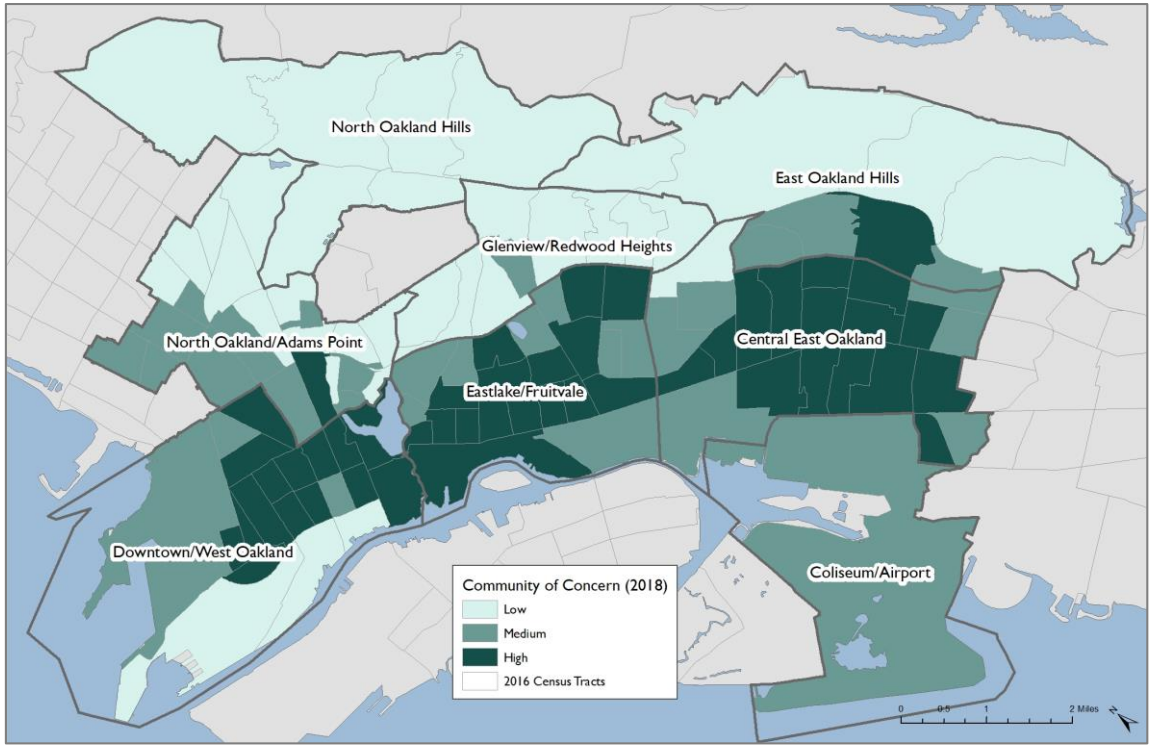
Across the city bicycling rates vary sharply, with the highest levels of commuting in North Oakland / Adams Point and Eastlake / Fruitvale, and lowest levels of bicycle commuting in the zones furthest from downtown.

The cells in dark blue are the "high" value for each column and the cells in white are the "low" value. The density of bike commuters varies dramatically, from a high of 564 per square mile to a low of 5 per square mile.

Zone Analysis For Bicycle Planning

SOCIOECONOMICS

COMMUNITIES OF CONCERN



Communities of Concern is a metric created by the Metropolitan Transportation Commission (MTC) to identify **areas of socioeconomic disadvantage** using eight indicators from the US Census Bureau.

In the MTC's analysis, large extents of Oakland are identified as Communities of Concern. The City of Oakland reworked the metric from a binary output to a continuous output. This allows Oakland to understand the extent of socioeconomic disadvantage within MTC's Communities of Concern.

Zone	Minority	Low-Income	Limited English Speakers	People in Zero Vehicle Households	Seniors Over 75	People with a Disability	People in Single-Parent Families	Cost-Burdened Renters	Total Disadvantaged Population Score
Central East Oakland	93%	55%	16%	12%	3%	12%	25%	16%	0.91
Coliseum / Airport	96%	50%	17%	6%	4%	13%	16%	12%	0.83
Downtown / West Oakland	77%	51%	15%	44%	7%	19%	17%	26%	1.00
East Oakland Hills	73%	22%	3%	8%	7%	12%	16%	8%	0.58
Eastlake / Fruitvale	85%	49%	22%	16%	5%	13%	17%	18%	0.88
Glenview / Redwood Heights	48%	16%	5%	8%	6%	9%	11%	6%	0.43
North Oakland Hills	31%	6%	1%	2%	7%	8%	8%	1%	0.25
North Oakland / Adams Point	50%	27%	4%	20%	5%	11%	9%	17%	0.56
Citywide	**73%**	**39%**	**12%**	**17%**	**5%**	**12%**	**16%**	**15%**	**0.74**

ADDITIONAL SOCIOECONOMICS

Zone	Median Household Income	Under 18	Asian	Black / African American	Hispanic / Latino	Non-Hispanic White	Other Race
Central East Oakland	$42,562	29%	5%	34%	50%	7%	7%
Coliseum / Airport	$44,125	29%	4%	35%	53%	4%	7%
Downtown / West Oakland	$38,532	15%	25%	32%	14%	23%	7%
East Oakland Hills	$89,483	18%	11%	41%	14%	27%	10%
Eastlake / Fruitvale	$44,562	21%	28%	18%	34%	15%	8%
Glenview / Redwood Heights	$102,936	21%	16%	14%	11%	52%	9%
North Oakland Hills	$157,550	19%	14%	5%	6%	69%	6%
North Oakland / Adams Point	$75,655	12%	11%	20%	12%	50%	9%
Citywide	**$57,778**	**20%**	**16%**	**25%**	**27%**	**27%**	**8%**

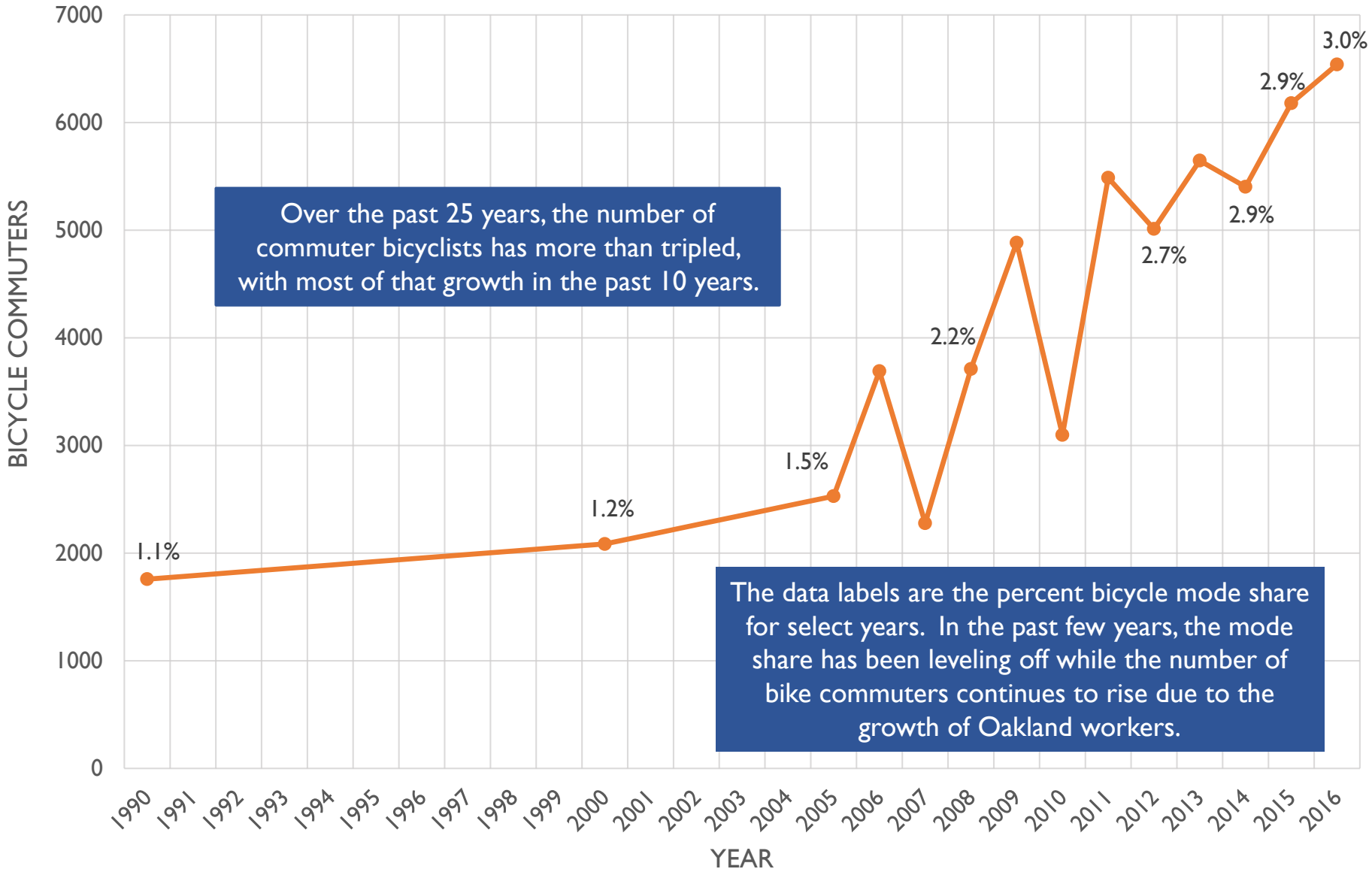
These socioeconomic data help communicate **who is living in each zone.** Understanding these differences is shaping how available resources are turned into meaningful services: **serve each zone differently**, based on the needs of the people in each zone.

The above data are related to (but not explicit) in the analysis of Communities of Concern. They help in understanding that socioeconomic indicators **vary widely** across the city. **Median household income highlights the economic stratification across the city with a difference of over $100,000 between the wealthiest zone and the four poorest zones.**

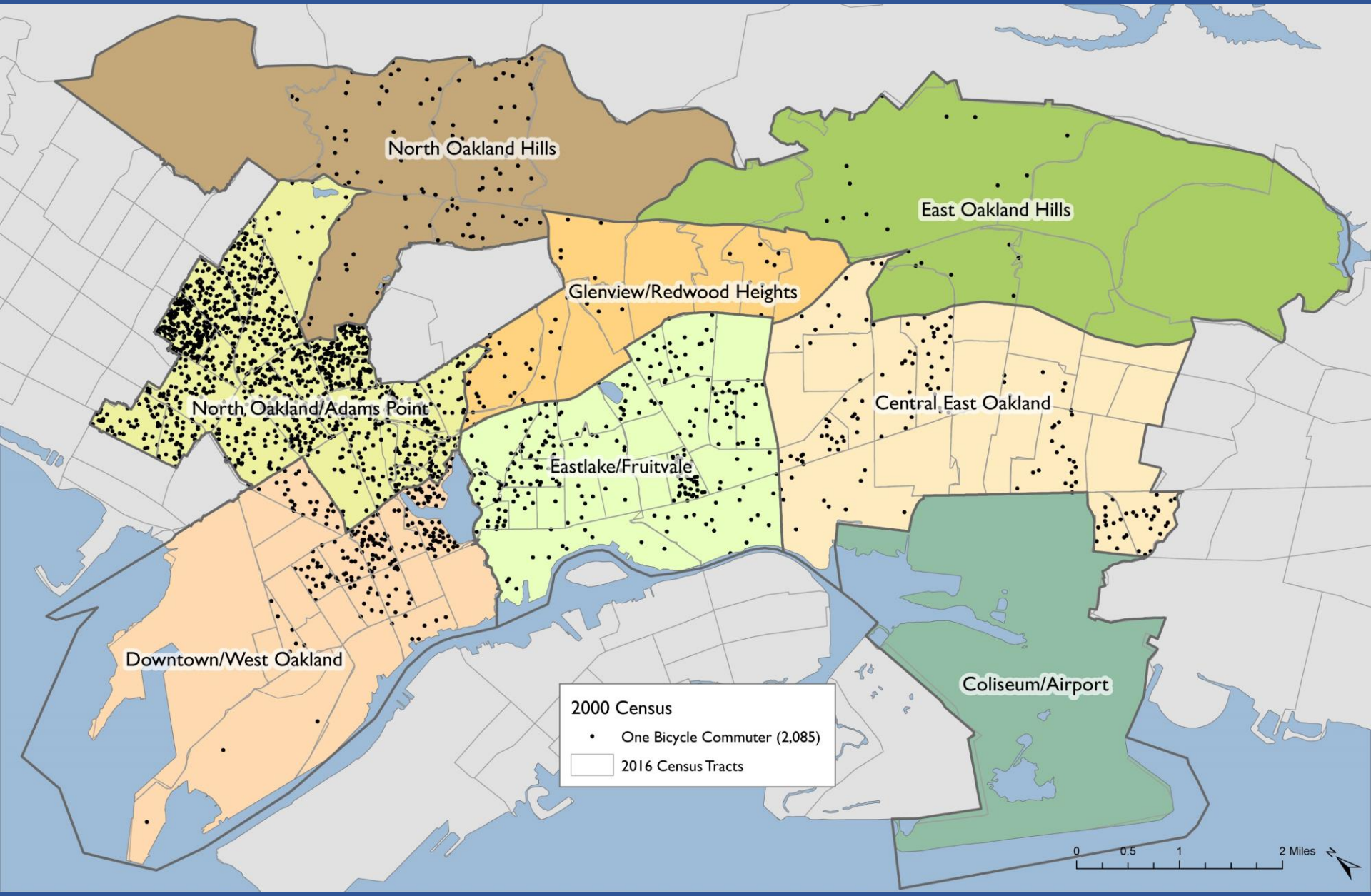
Zone Analysis For Bicycle Planning

BICYCLING RATES

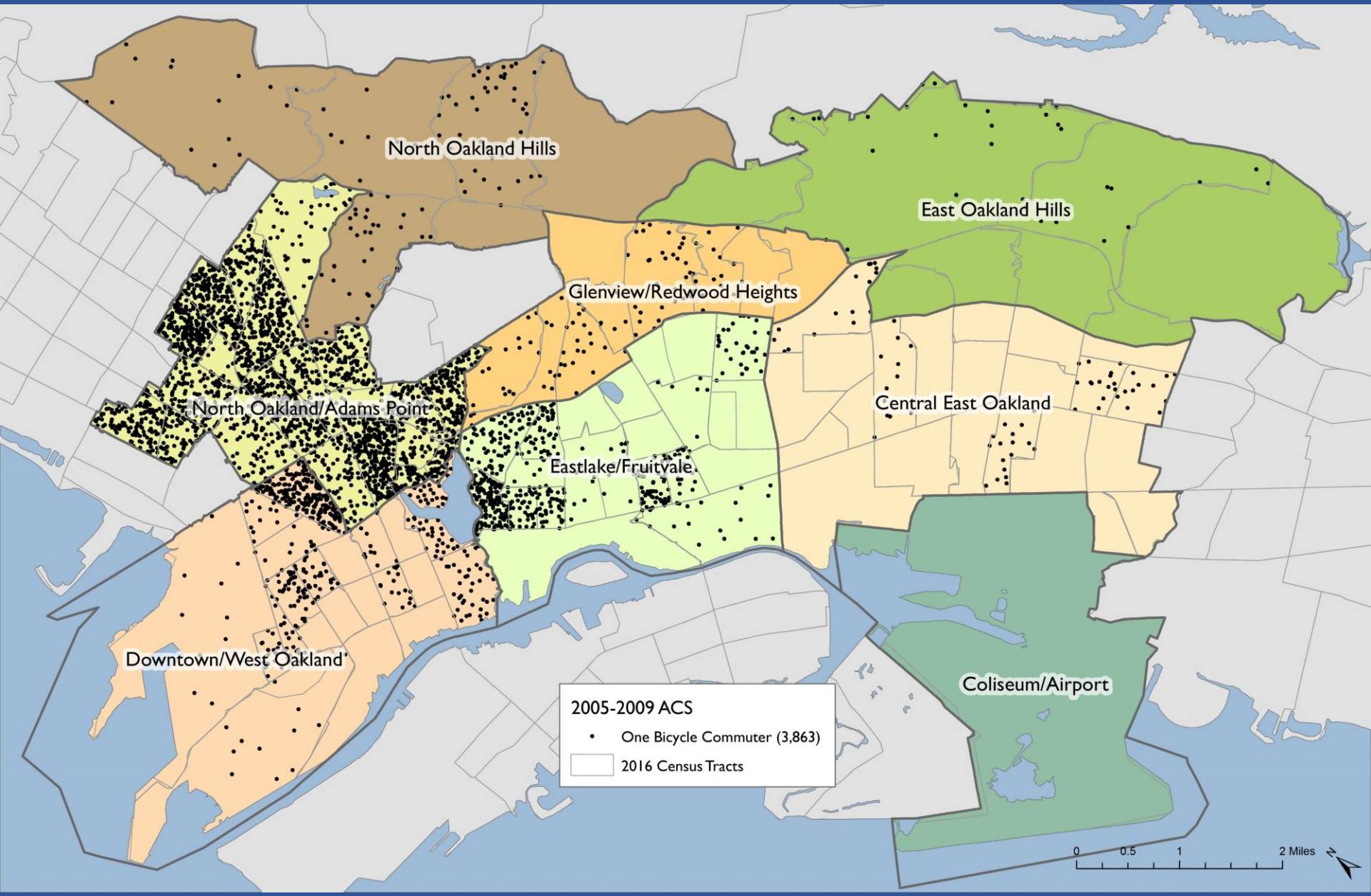
COMMUTER BICYCLING



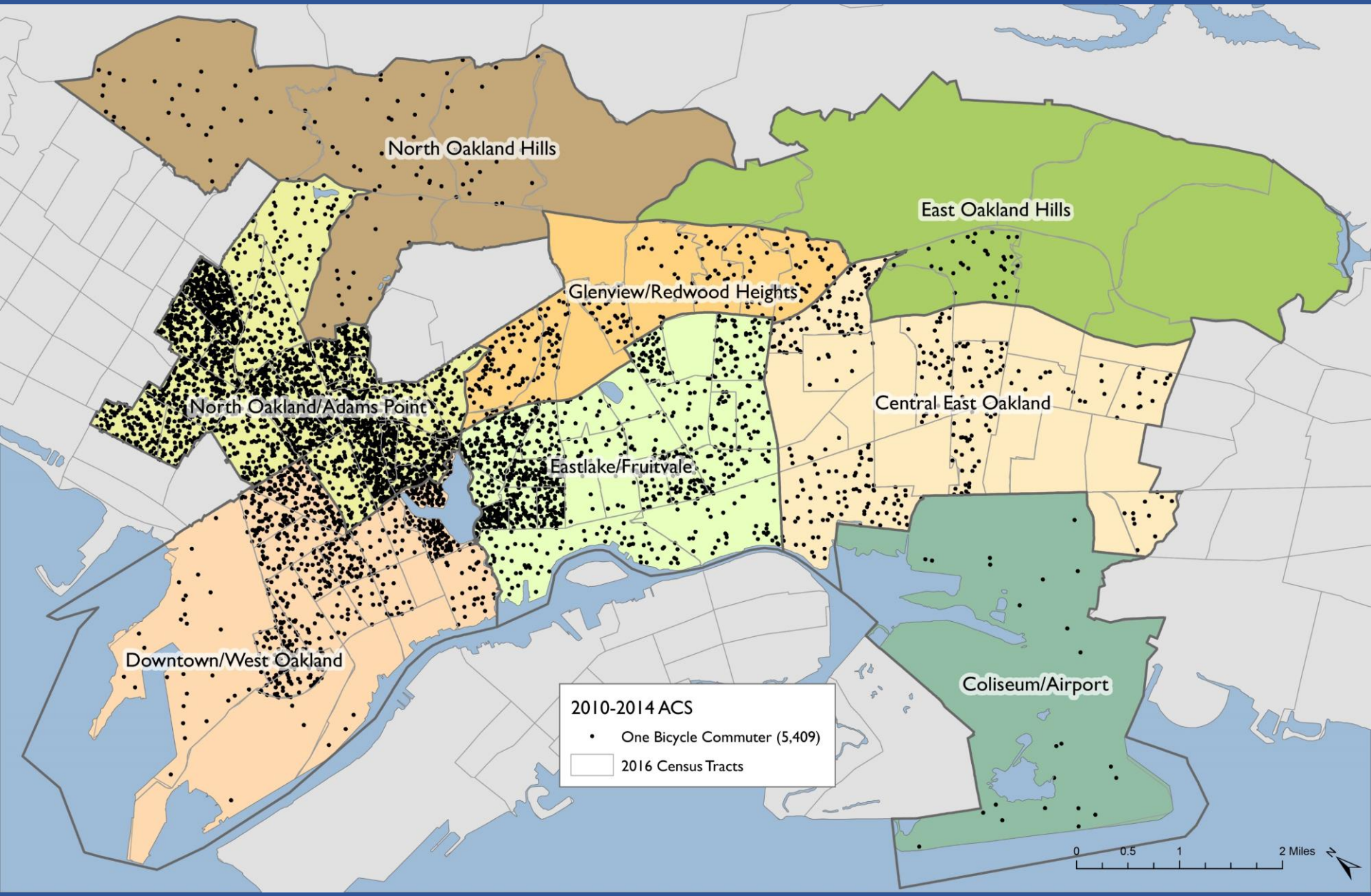
BICYCLE COMMUTERS (2000)



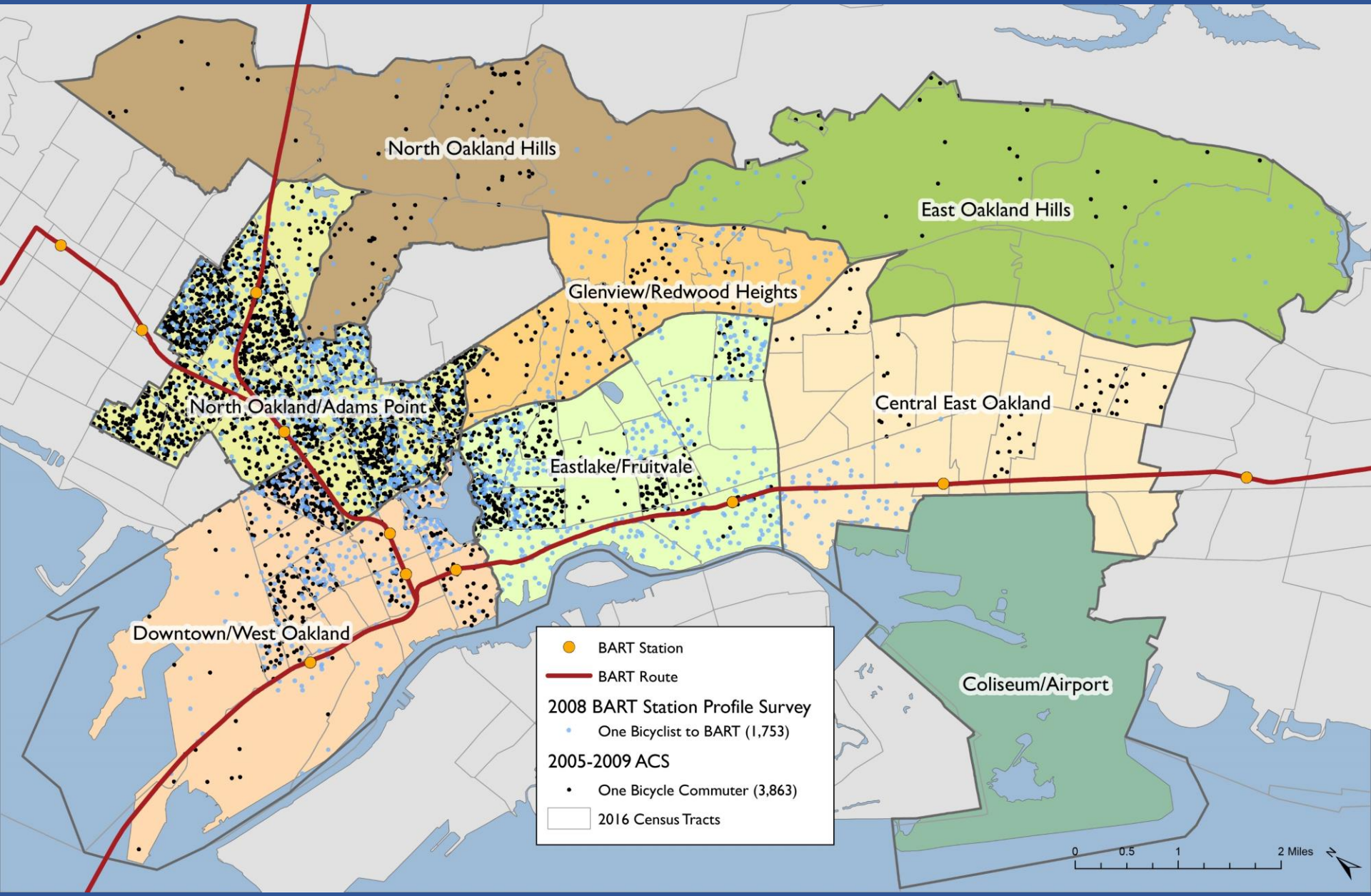
BICYCLE COMMUTERS (2005-2009)



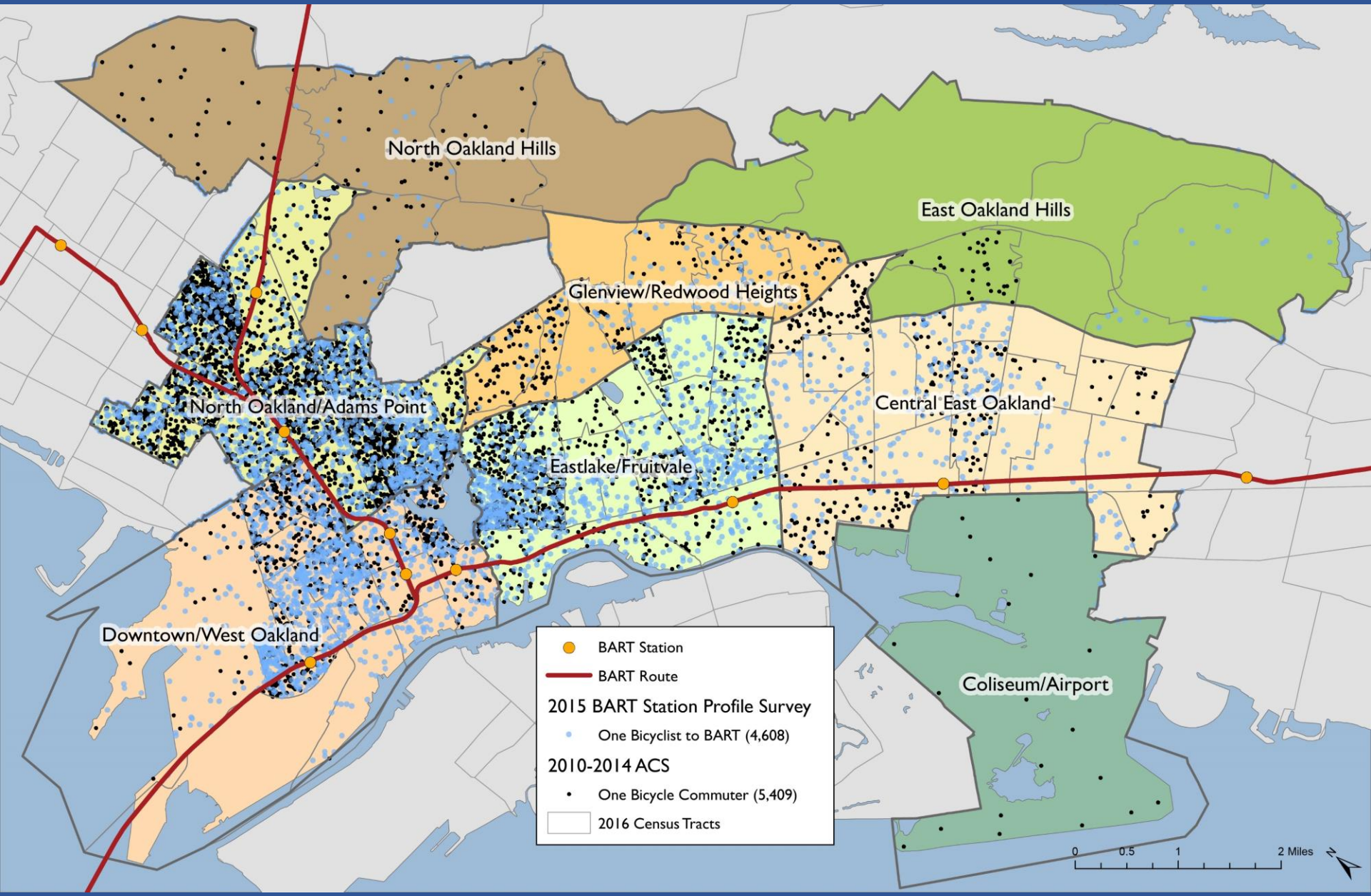
BICYCLE COMMUTERS (2010-2014)



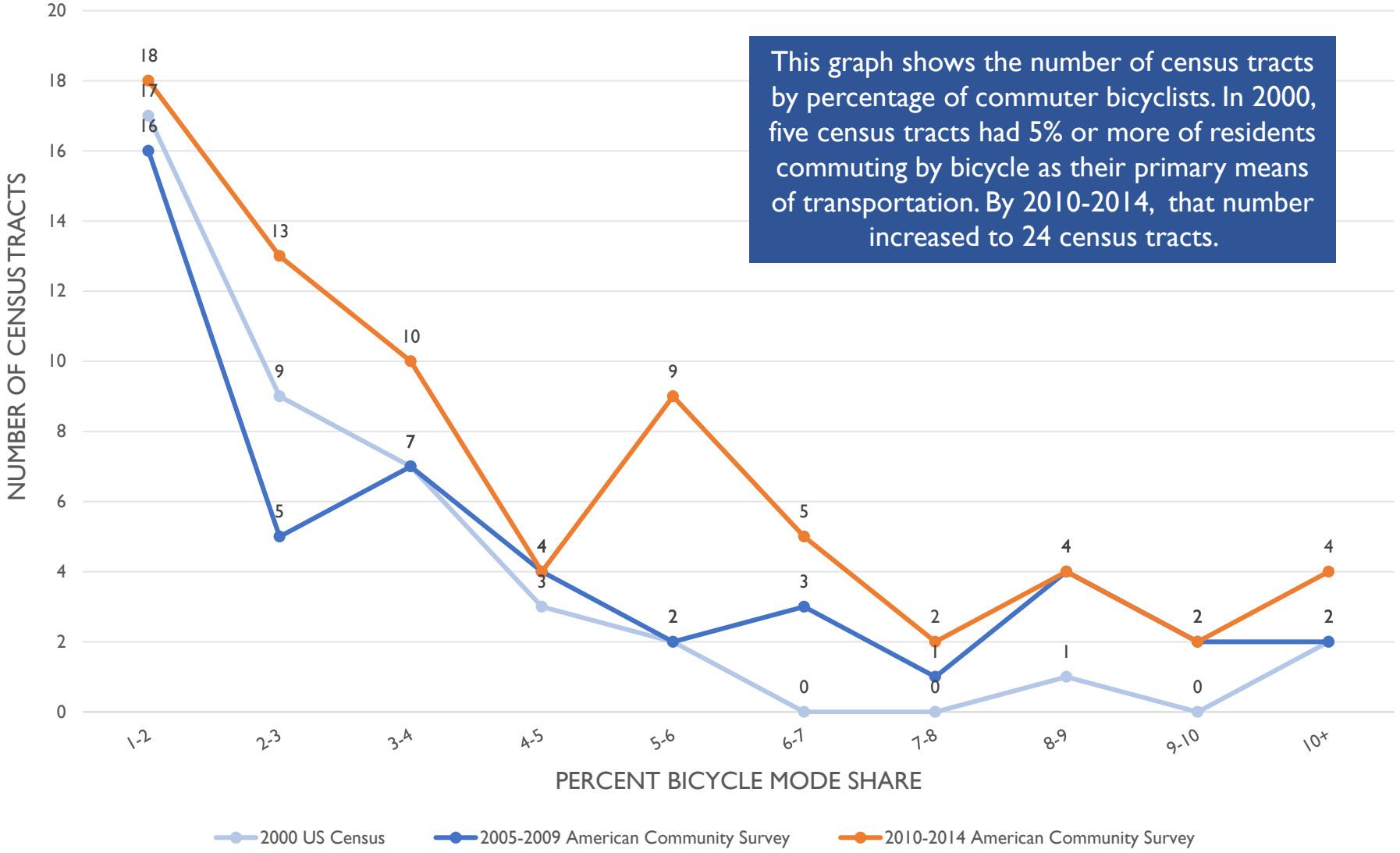
BICYCLISTS TO BART (2008)



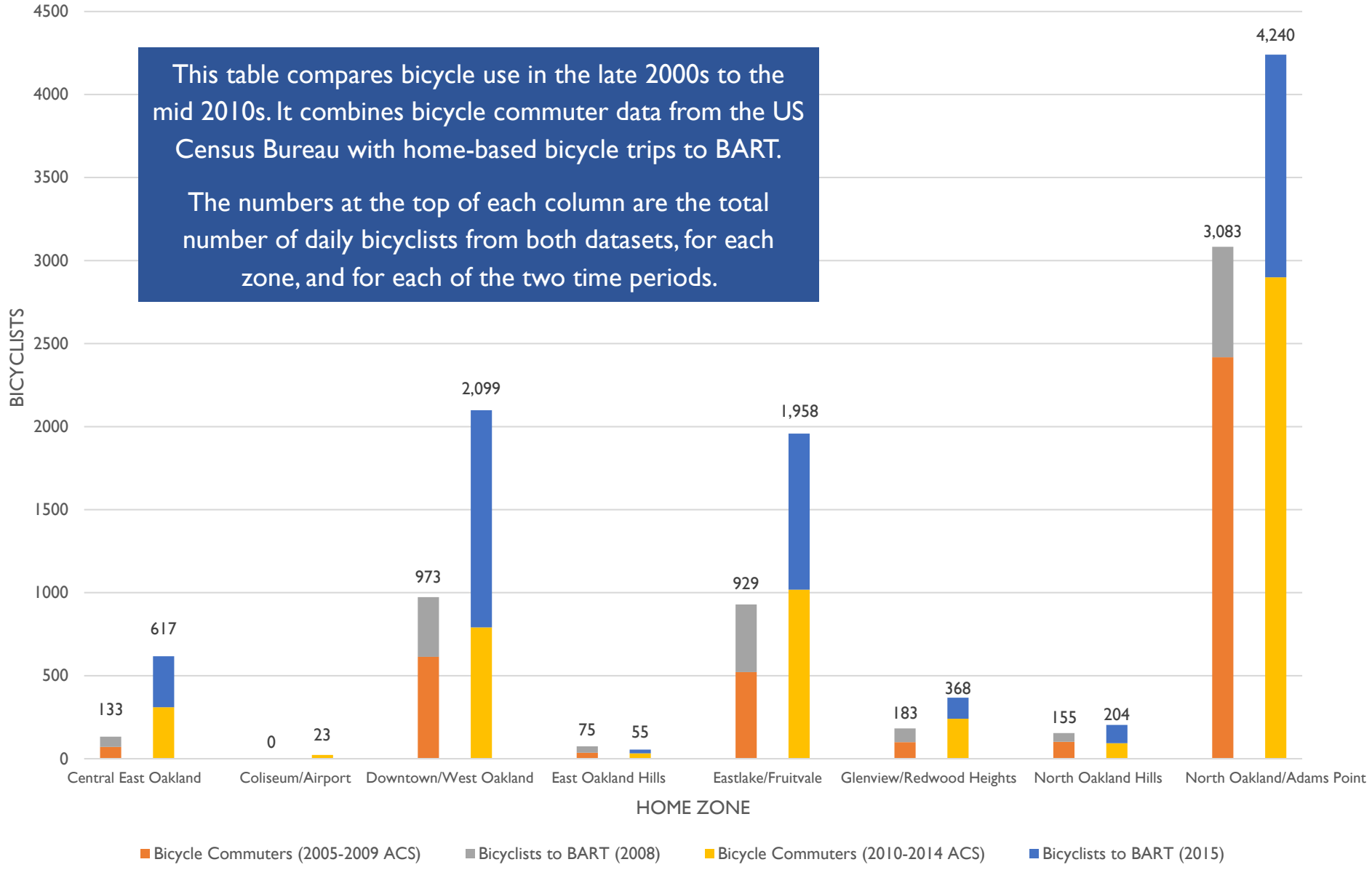
BICYCLISTS TO BART (2015)



BICYCLE MODE SHARE BY CENSUS TRACT

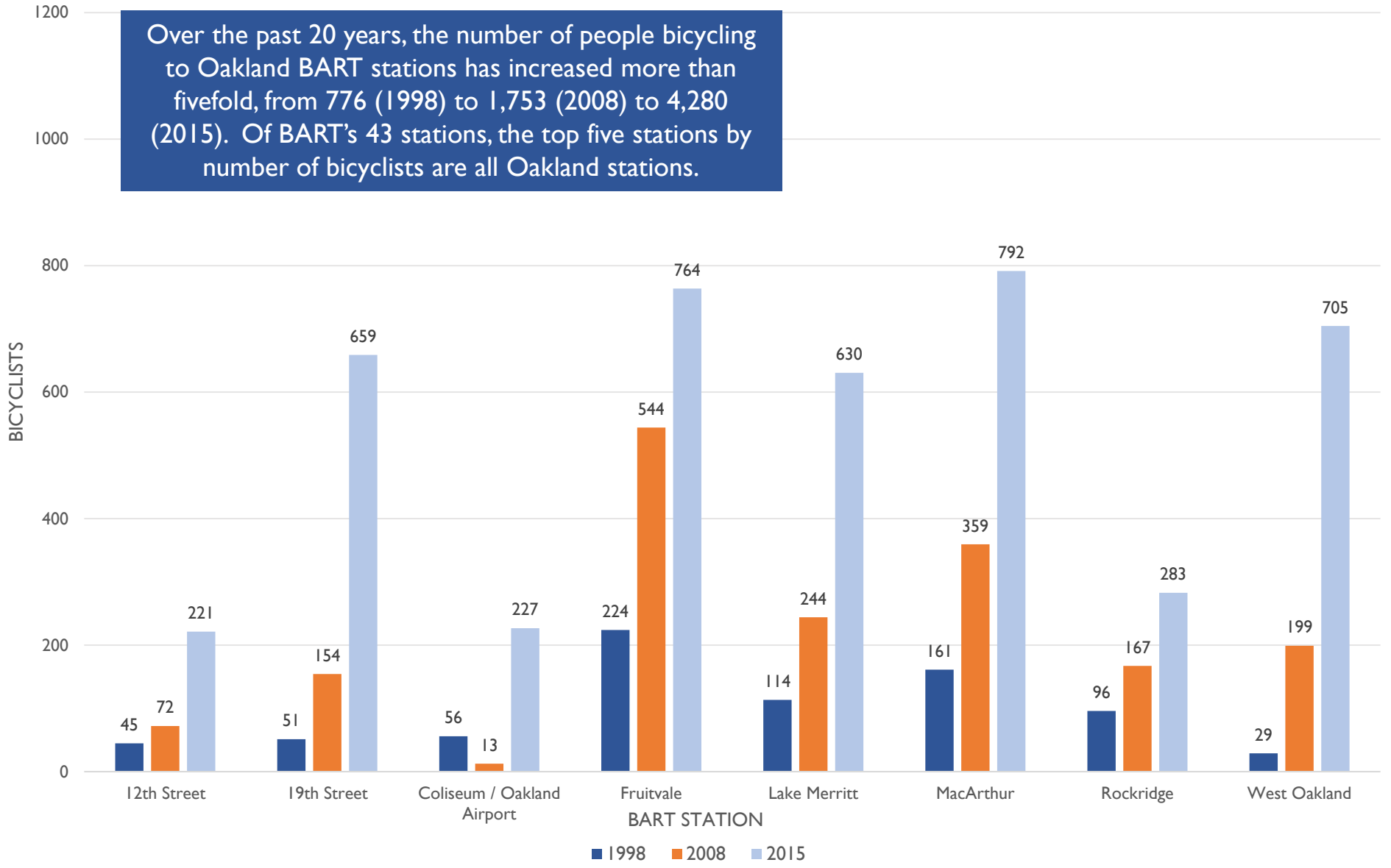


BICYCLING TO WORK AND TO BART



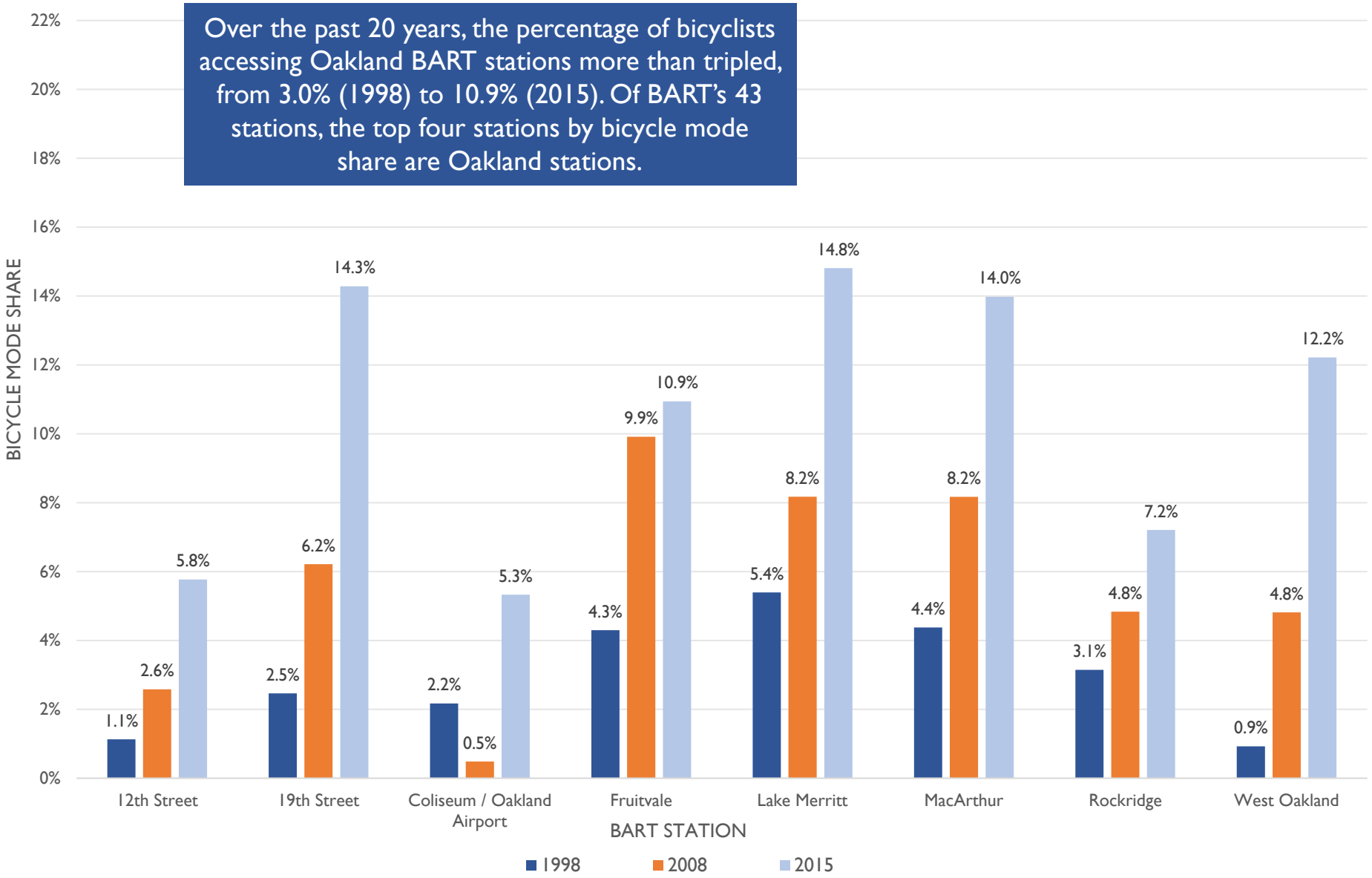
BICYCLISTS TO BART BY STATION

Over the past 20 years, the number of people bicycling to Oakland BART stations has increased more than fivefold, from 776 (1998) to 1,753 (2008) to 4,280 (2015). Of BART's 43 stations, the top five stations by number of bicyclists are all Oakland stations.



BICYCLISTS TO BART MODE SHARE BY STATION

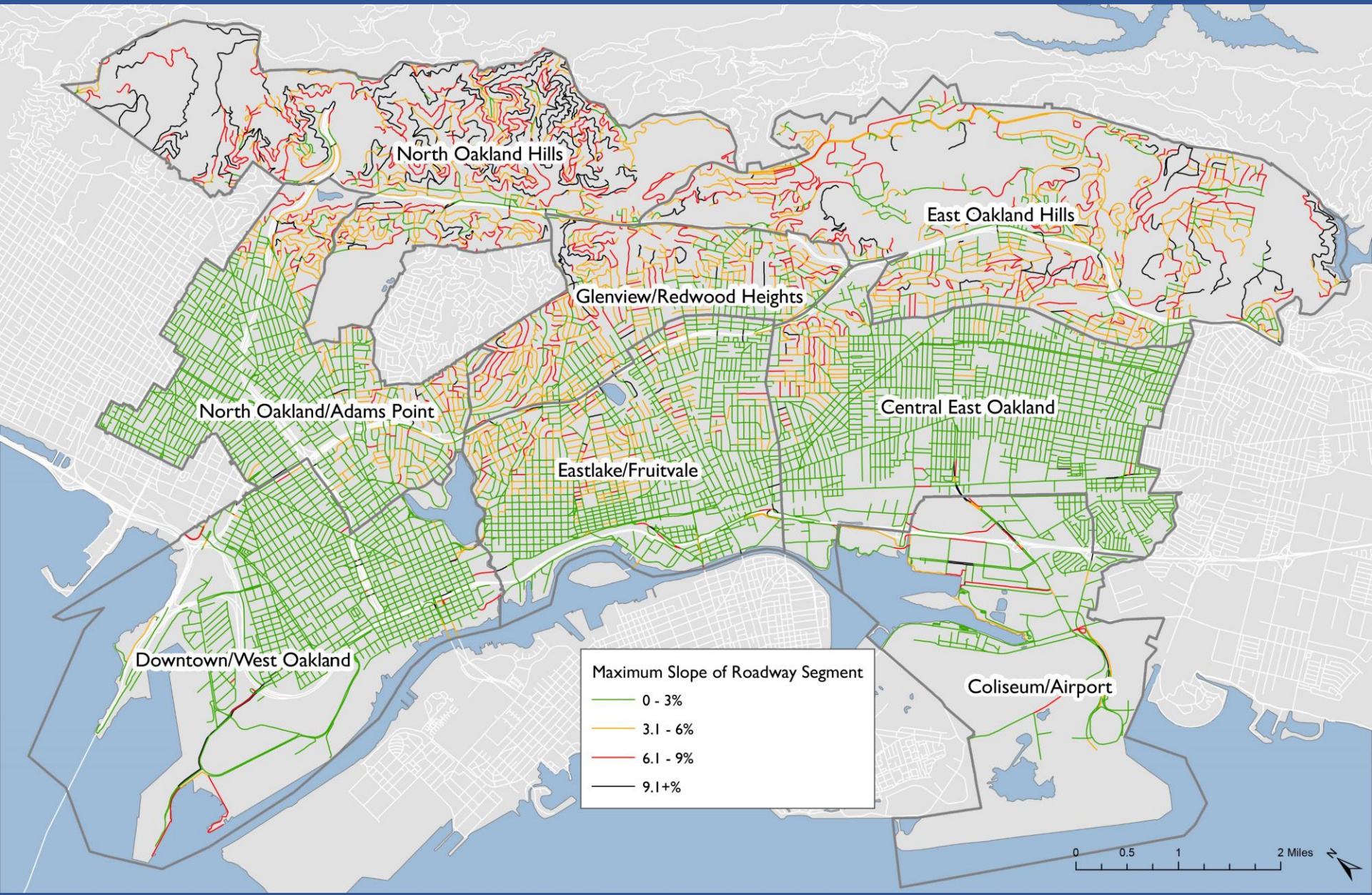
Over the past 20 years, the percentage of bicyclists accessing Oakland BART stations more than tripled, from 3.0% (1998) to 10.9% (2015). Of BART's 43 stations, the top four stations by bicycle mode share are Oakland stations.



Zone Analysis For Bicycle Planning

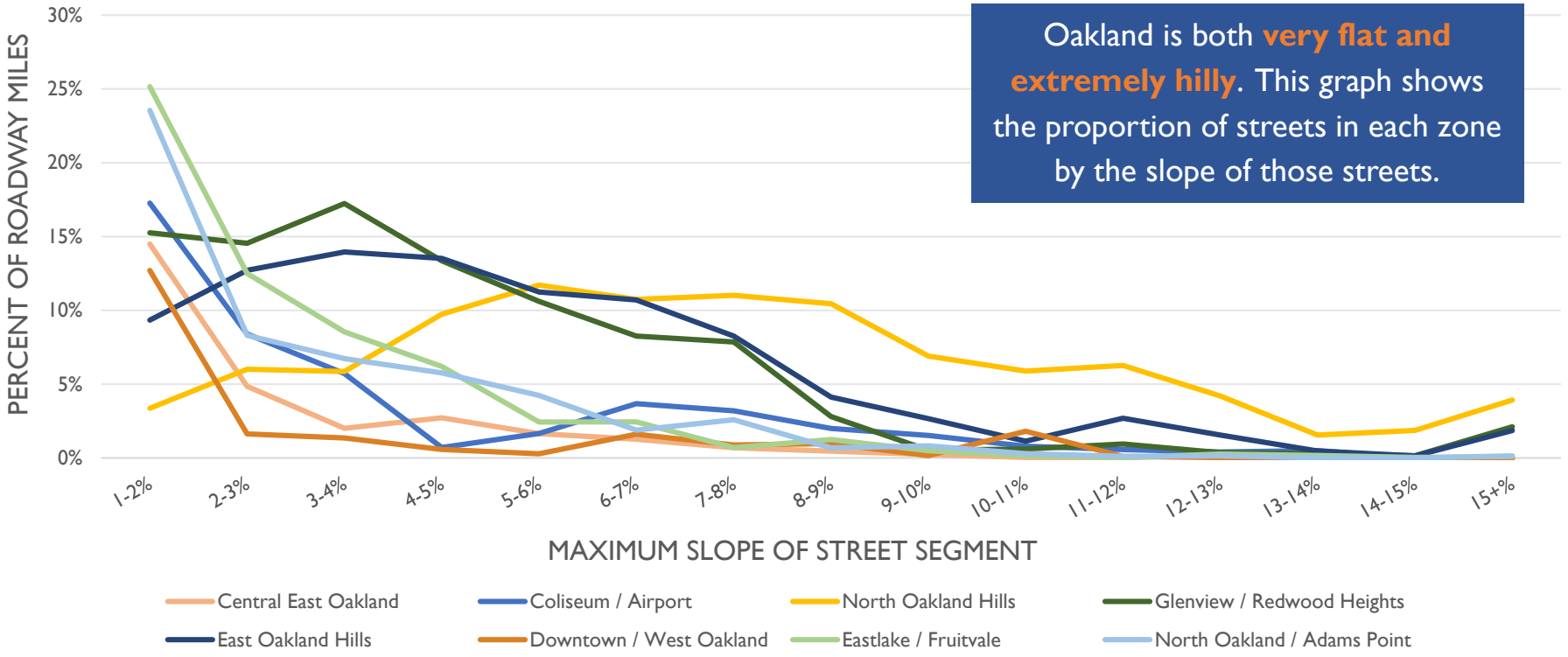
BIKEABILITY

STREET SLOPE



Note: Some individual street segments in the flatlands have anomalous slopes. This may be caused by embankments, bridges, and other aerial structures like elevated BART tracks.

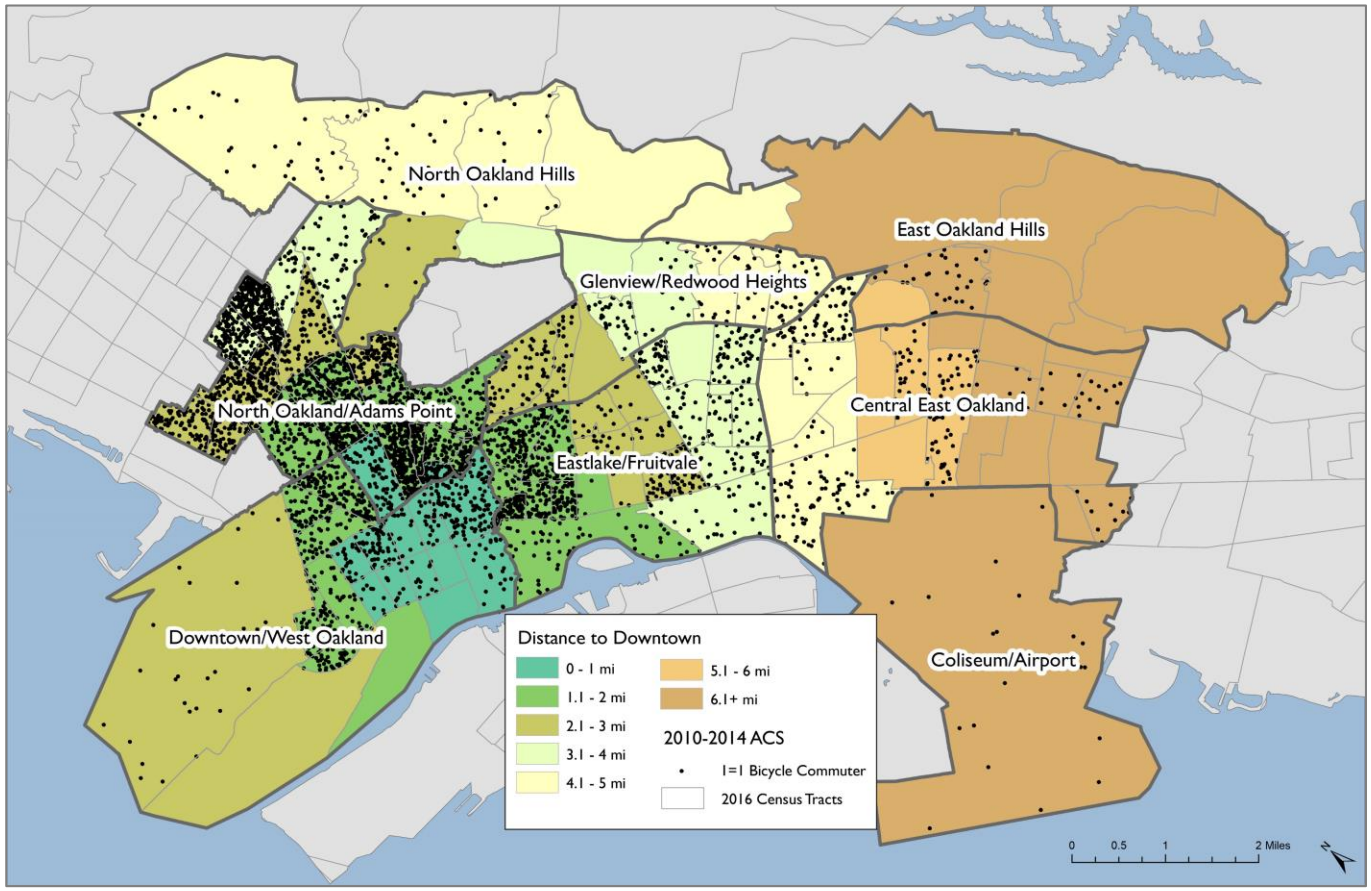
STREET SLOPE



Oakland is both **very flat and extremely hilly**. This graph shows the proportion of streets in each zone by the slope of those streets.

Maximum Slope of Street Segment	Central East Oakland	Coliseum / Airport	Downtown / West Oakland	East Oakland Hills	Eastlake / Fruitvale	Glenview / Redwood Heights	North Oakland Hills	North Oakland / Adams Point	**Citywide**
	Percent of Zone Roadway Miles								
0-3%	91%	80%	92%	28%	78%	35%	9%	77%	**62%**
3-6%	6%	8%	2%	39%	17%	41%	27%	17%	**19%**
6-9%	2%	9%	3%	23%	4%	19%	32%	5%	**12%**
9+%	1%	4%	2%	11%	1%	5%	31%	2%	**7%**
Slope Weighted by Segment Length	1.3%	2.1%	1.2%	5.1%	2.1%	4.7%	7.6%	2.1%	**3.2%**

DISTANCE TO DOWNTOWN

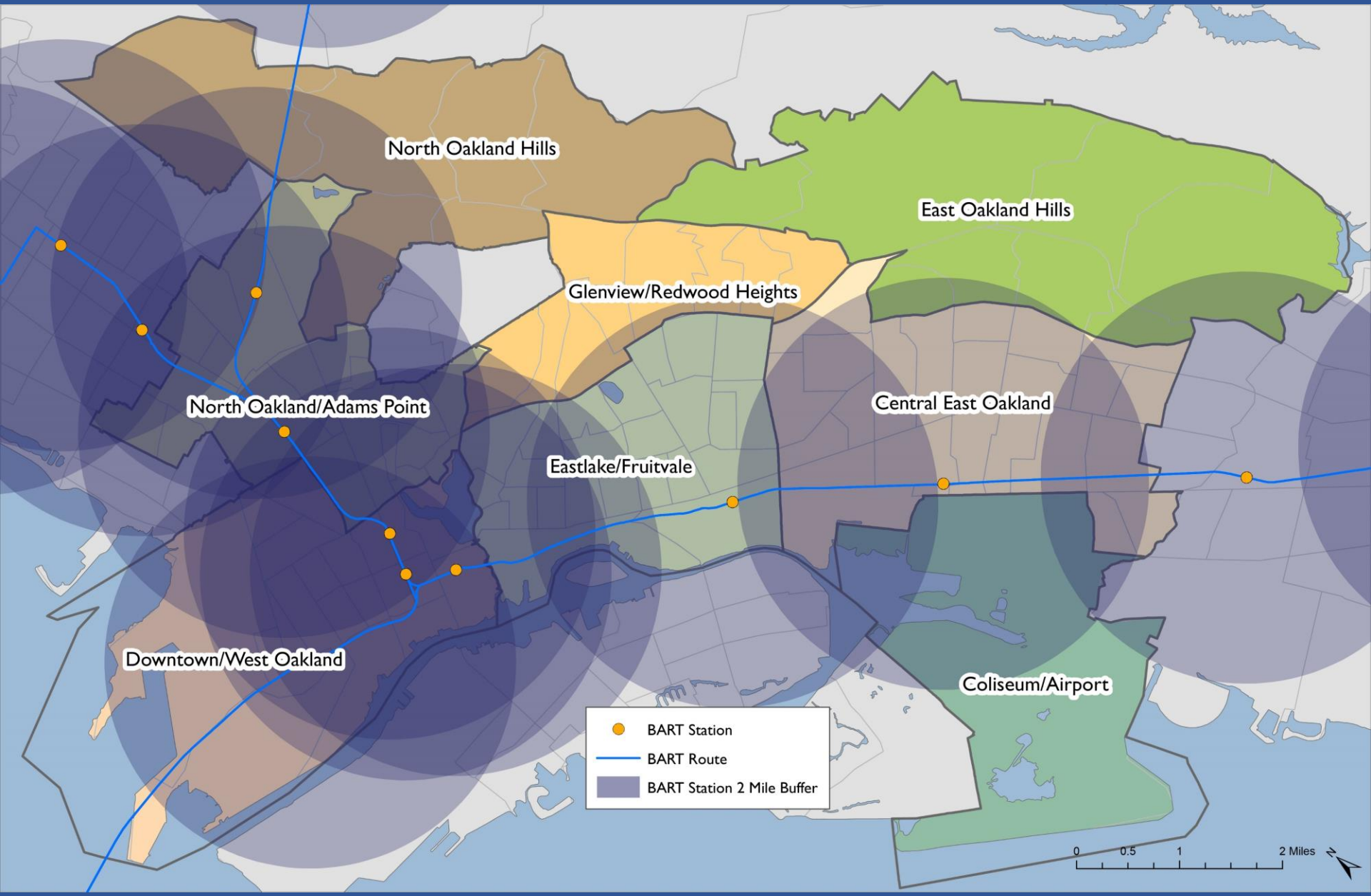


This map shows the distance to Downtown (at Broadway / 14th Street) to the center of each census tract as a measure of the access each zone has to the city's center.

When overlaid with the map of bicycle commuters, there is a **strong relationship between bicycle commuting and distance to Downtown.** Tracts within a one-mile radius have fewer cyclists, likely due to the practicality of walking to work.

Zone	Central East Oakland	Coliseum / Airport	Downtown / West Oakland	East Oakland Hills	Eastlake / Fruitvale	Glenview / Redwood Heights	North Oakland Hills	North Oakland / Adams Point
Miles to Downtown	5.6	6.2	1.3	7.0	2.5	3.5	4.1	2.1

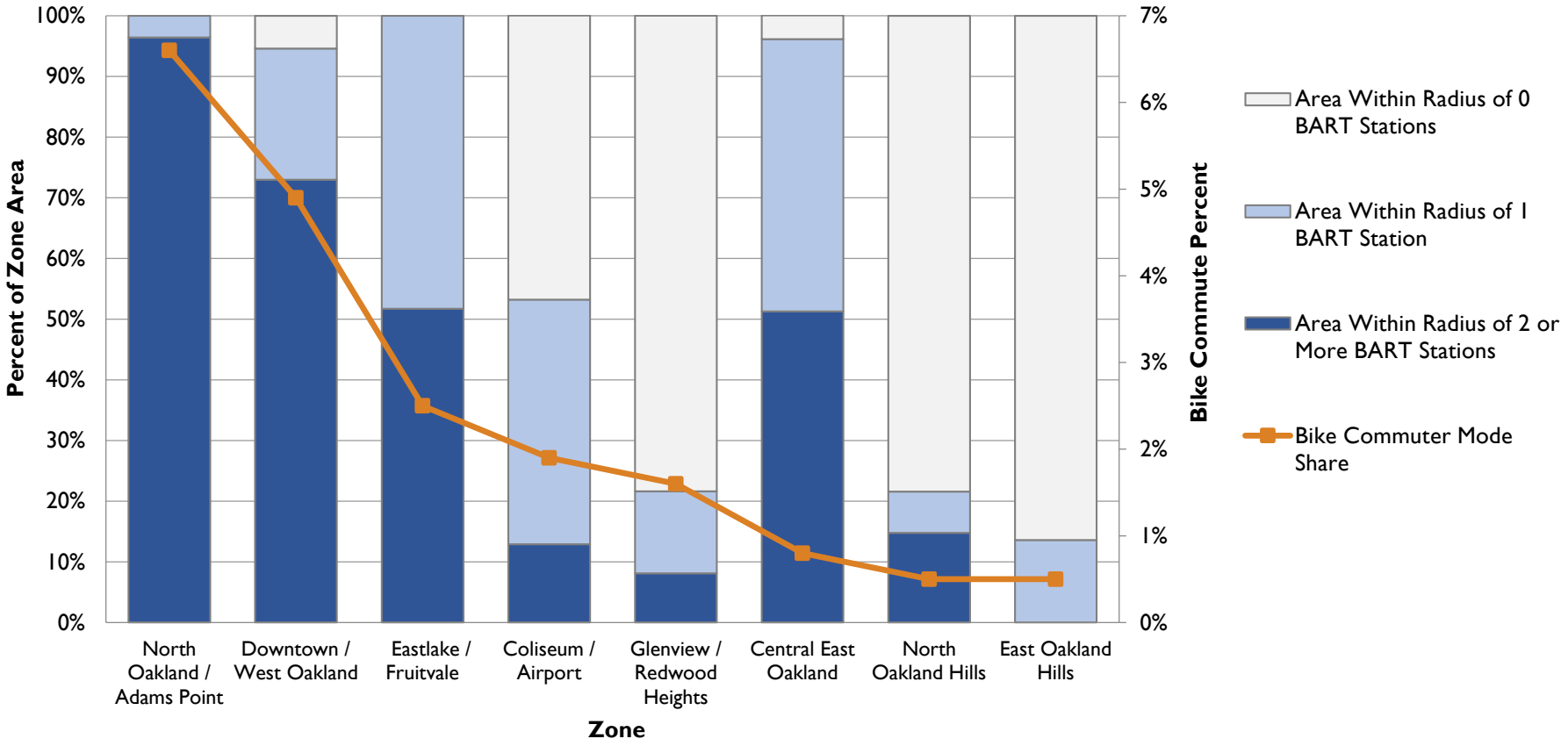
PROXIMITY TO BART



PROXIMITY TO BART

BART's original design planned for automobile access to BART stations for professionals working in the downtowns of San Francisco and Oakland. Through transit-oriented development, BART stations are now hubs for investment. **BART plus bikes is a strategy for making BART valuable to those who do not work near a BART station.**

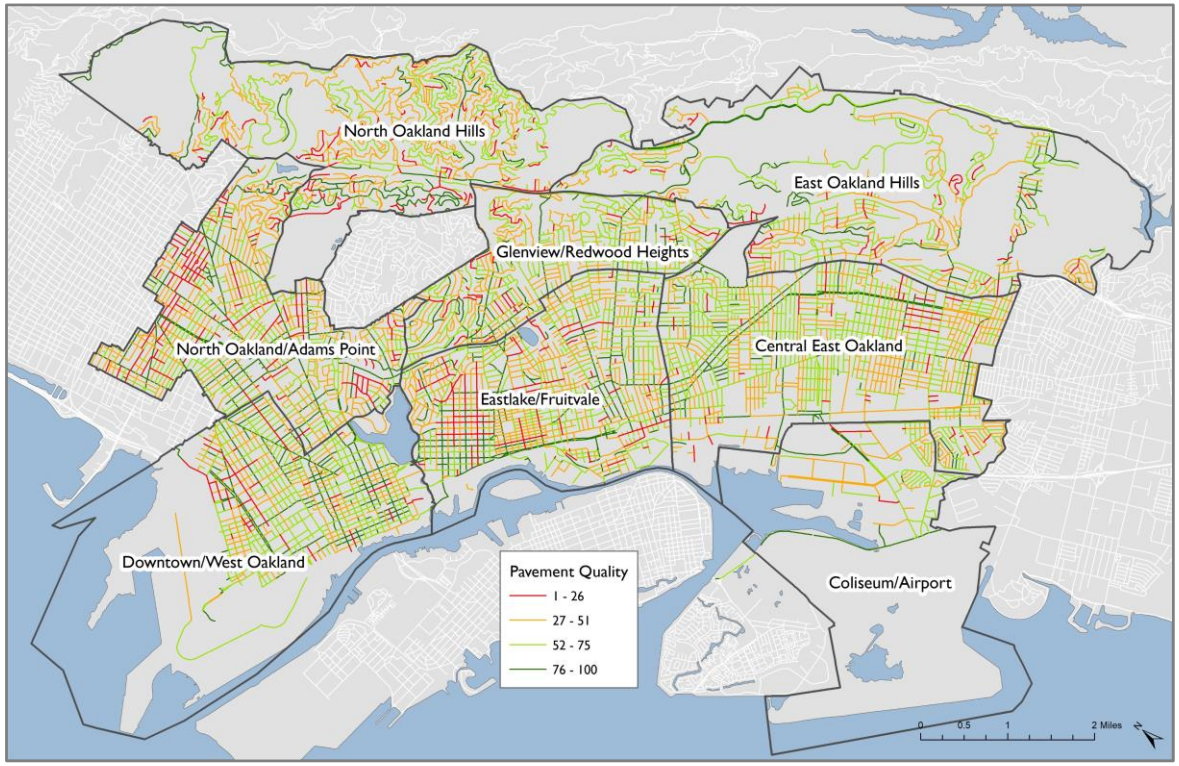
For most zones, there is a **strong correlation between BART proximity and bicycle commuter mode share,** except Central East Oakland which has high BART proximity but a low bicycle commuter mode share.



PAVEMENT QUALITY

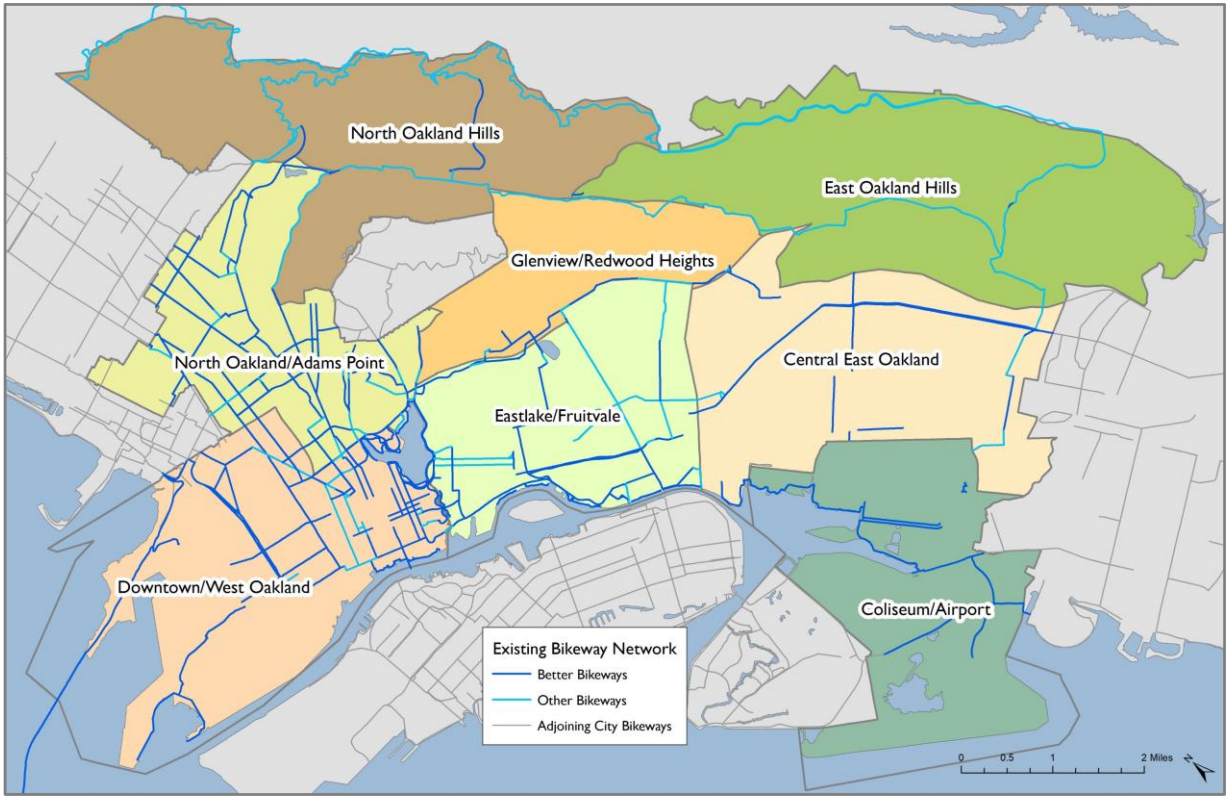
The Pavement Condition Index (PCI) is a means for measuring and analyzing the quality of pavement on Oakland's streets. It ranks street segments on a scale of 0 to 100 where higher values indicate better pavement quality.

The mean PCI for all streets is comparable across the zones (between 52 and 59). **Bikeways tend to have better pavement than other streets.** This is the result of 10 years of work to coordinate paving projects with bikeway construction.



Zone	Central East Oakland	Coliseum / Airport	Downtown / West Oakland	East Oakland Hills	Eastlake / Fruitvale	Glenview / Redwood Heights	North Oakland Hills	North Oakland /Adams Point	**Citywide**
Mean PCI	56	58	59	58	55	55	52	53	**56**
Mean PCI for Existing Bikeways	73	88	67	69	78	62	63	71	**70**
Mean PCI for Proposed Bikeways	66	62	63	70	72	60	65	69	**67**

EXISTING BIKEWAY NETWORK

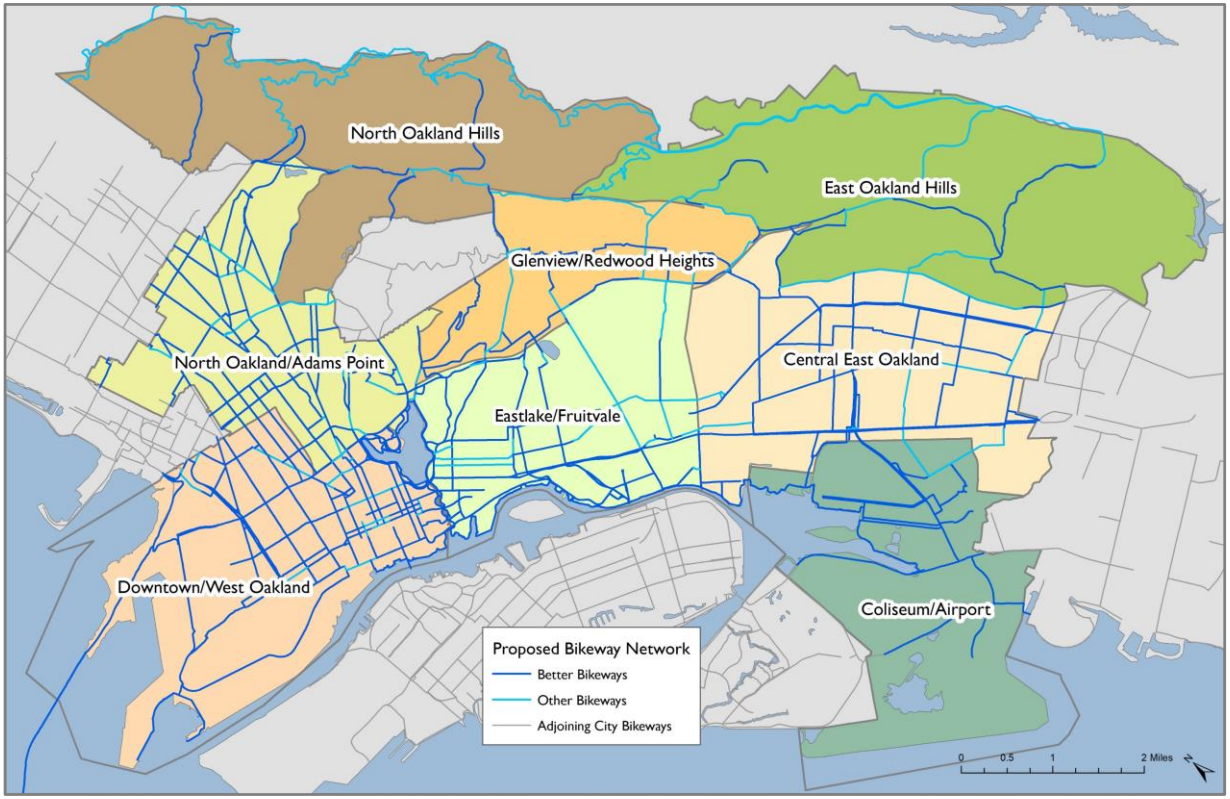


Oakland's existing bikeway network is the most developed in the zones that are closest to downtown and have the best BART access. These zones also have the most bicycle commuters and the busiest BART stations for bicyclists.

Since the early 2010s, Oakland has had a bikeway network with basic connectivity. Work is now focused on improving the quality of bikeways, and extending the network into new areas with unrealized potential for bicycle use.

	Better Bikeways			Other Bikeways				
Zone	Bike Paths (mi)	Bike Lanes (mi)	Bike Boulevards (mi)	Arterial Bike Routes (mi)	Bike Routes (mi)	Total Existing Bikeways (mi)	Total Roadways (mi)	Bikeways out of all Roadway Miles
Central East Oakland	1	10	1	1	1	13	184	7%
Coliseum / Airport	7	1	0	0	0	9	54	16%
Downtown / West Oakland	14	23	1	2	2	41	169	25%
East Oakland Hills	0	0	0	0	16	16	146	11%
Eastlake / Fruitvale	2	13	3	6	1	24	160	15%
Glenview / Redwood Heights	0	3	1	1	3	7	88	8%
North Oakland Hills	1	1	0	0	18	21	139	15%
North Oakland / Adams Point	1	18	5	3	0	28	157	18%
Citywide	**27**	**69**	**10**	**13**	**40**	**160**	**1,096**	**15%**

PROPOSED BIKEWAY NETWORK

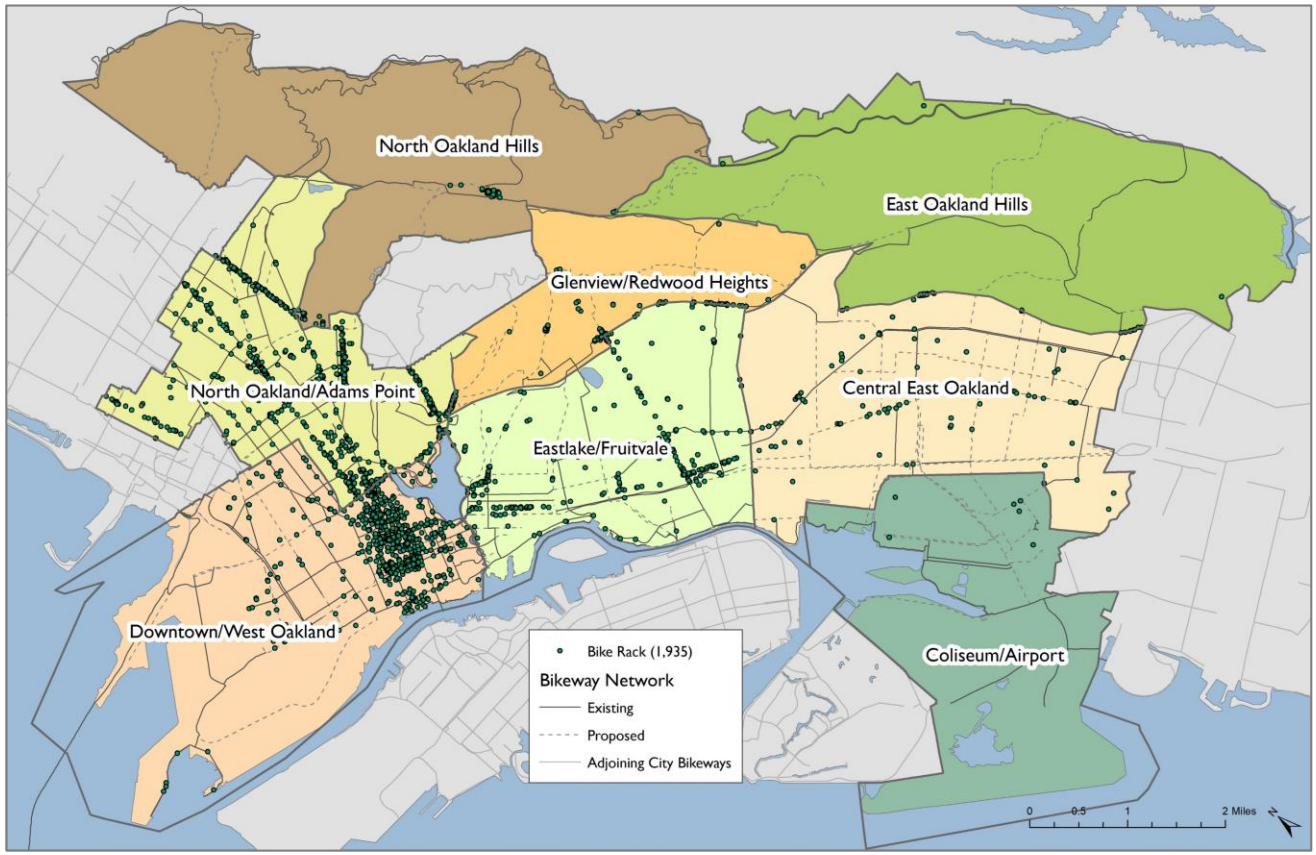


Oakland's proposed bikeway network includes 251 centerline miles of streets and paths. "Better Bikeways" include dedicated space for bicyclists (bike paths, bike lanes) and streets with low motor vehicle volumes and speeds (bike boulevards). "Other Bikeways" have bicyclists sharing lanes with motorists on busier streets, including "bike routes" for recreational cycling in the Oakland Hills. The shared lanes in the Oakland Flatlands (arterial bike routes) are narrow busy streets that will require tradeoffs to create "Better Bikeways" with dedicated space for bicyclists.

	Better Bikeways			Other Bikeways				
Zone	Bike Paths (mi)	Bike Lanes (mi)	Bike Boulevards (mi)	Arterial Bike Routes (mi)	Bike Routes (mi)	Total Proposed Bikeways (mi)	Total Roadways (mi)	Bikeways out of all Roadway Miles
Central East Oakland	5	21	8	5	0	39	184	21%
Coliseum / Airport	8	8	1	1	0	18	54	34%
Downtown / West Oakland	17	33	1	3	0	55	169	33%
East Oakland Hills	1	6	1	6	13	26	146	18%
Eastlake / Fruitvale	6	20	5	6	0	37	160	23%
Glenview / Redwood Heights	1	3	7	7	0	17	88	20%
North Oakland Hills	1	5	1	1	15	23	139	17%
North Oakland / Adams Point	1	23	7	5	0	35	157	23%
Citywide	**40**	**118**	**31**	**34**	**28**	**251**	**1,096**	**23%**

BICYCLE PARKING

Oakland's CityRacks Bicycle Parking Program has installed bicycle racks by public request since 1994. The location of bike racks is thus a useful indicator of where historically there has been bicycling activity and demand for bicycle parking. The racks also indicate the locations of commercial activity. (The CityRacks Program has not installed bike parking in residential areas for residential use.) Bike racks are concentrated in Downtown and in neighborhood commercial districts.

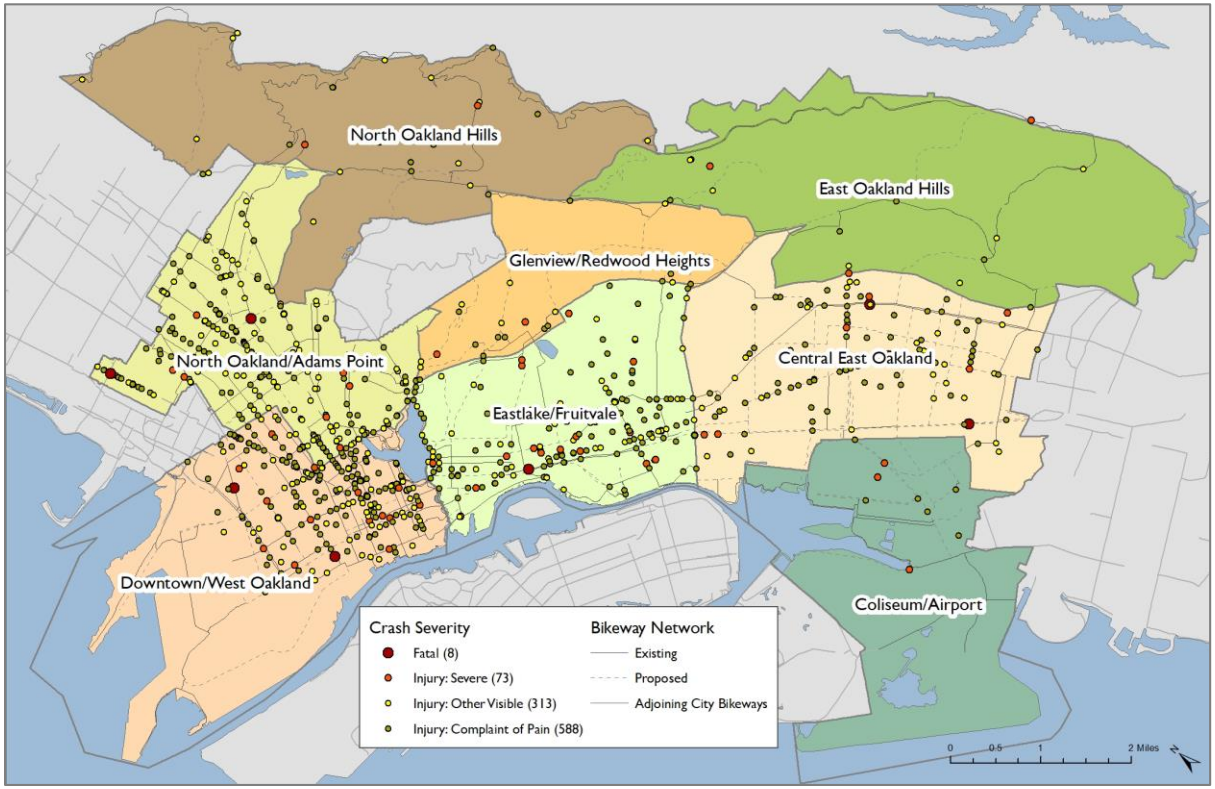


Zone	Central East Oakland	Coliseum / Airport	Downtown / West Oakland	East Oakland Hills	Eastlake / Fruitvale	Glenview / Redwood Heights	North Oakland Hills	North Oakland / Adams Point	**Citywide**
Bike Parking Spaces	585	62	4,095	30	1,152	312	314	3,350	**9,900**
Bike Parking Spaces per Square Mile	75	10	553	3	199	84	36	598	**178**
Bike Parking Spaces per Bicycle Commuter	1.9	2.7	5.2	0.9	1.1	1.3	3.3	1.2	**1.8**

Zone Analysis For Bicycle Planning

SAFETY

BICYCLIST-INVOLVED CRASHES BY SEVERITY

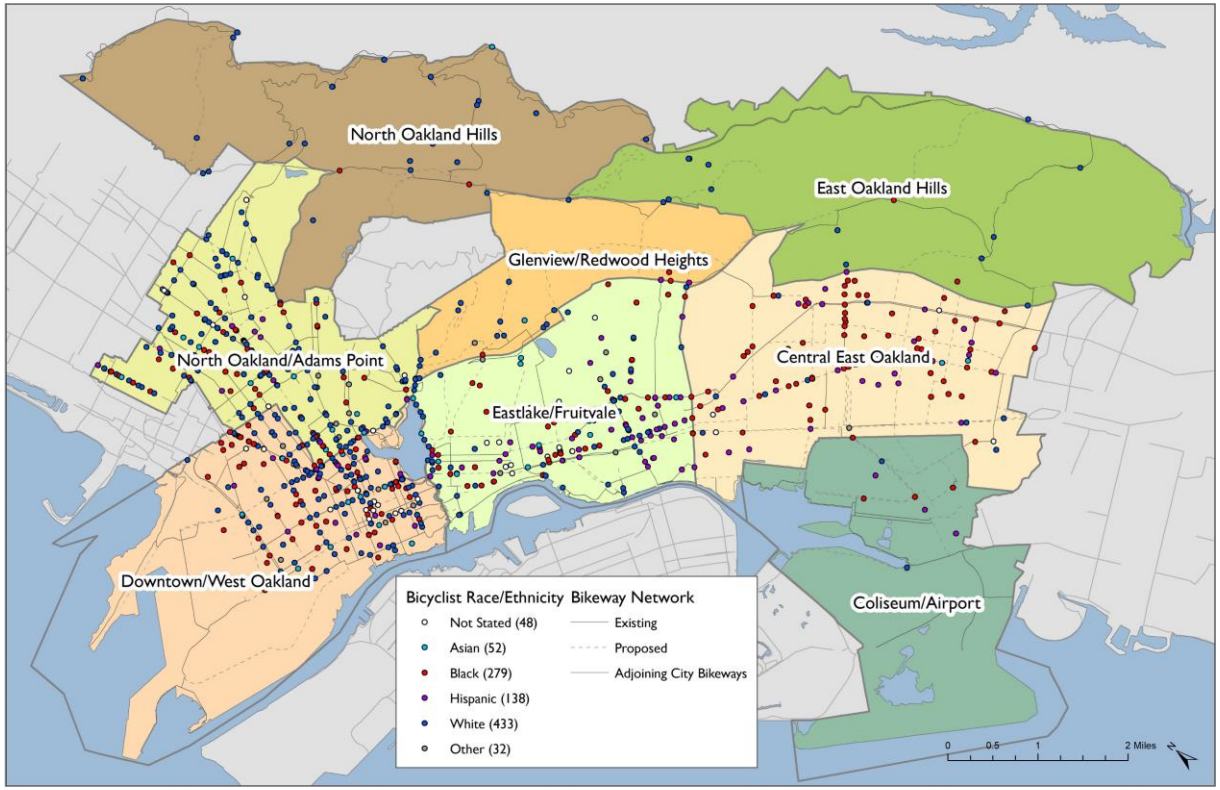


This map and table show five years of bicyclist-involved crashes that resulted in a bicyclist injury or fatality. Note the lines of dots along **specific streets like International Blvd, San Pablo Ave, and Grand Ave.**

The areas with the greatest number of bicyclist crashes generally match the areas with the greatest number of bicyclists. Normalizing the crashes by the number of bicycle commuters or by land area provides limited insight. For example, the East Oakland Hills has few crashes and even fewer bicycle commuters, resulting in the highest crash rate.

Zone	Fatalities	Severe Injuries	Other Injuries	Total Crashes	Crashes per 100 Bicycle Commuters per Year	Crashes per Square Mile per Year
Central East Oakland	3	8	112	123	7.9	3.2
Coliseum / Airport	0	3	6	9	7.8	0.3
Downtown / West Oakland	2	21	279	302	7.6	8.2
East Oakland Hills	0	3	12	15	9.1	0.3
Eastlake / Fruitvale	1	19	188	208	4.1	7.2
Glenview / Redwood Heights	0	2	23	25	2.1	1.4
North Oakland Hills	0	3	27	30	6.4	0.7
North Oakland / Adams Point	2	14	254	270	1.9	9.6
No Location Available	1	7	62	70	N/A	N/A
Citywide	**9**	**80**	**963**	**1052**	**3.9**	**3.8**

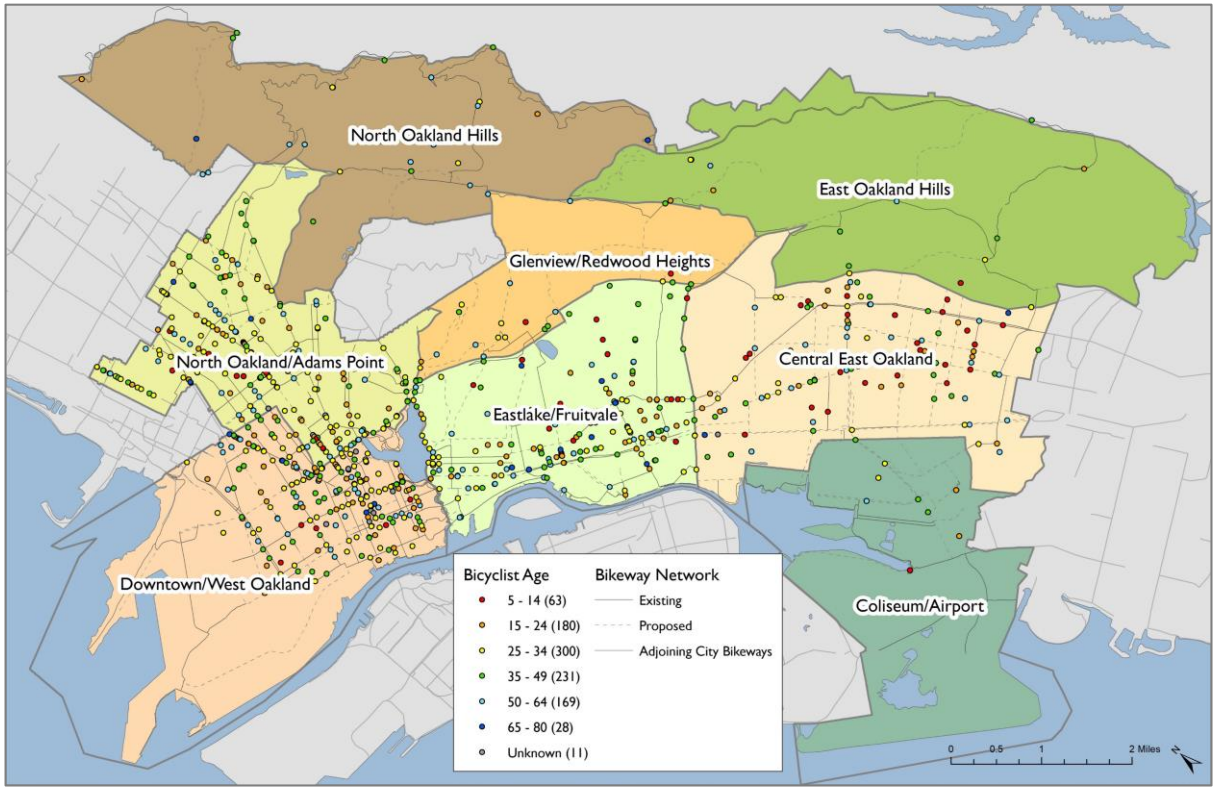
BICYCLIST-INVOLVED CRASHES BY RACE & ETHNICITY



This map and table show five years of bicyclist-involved crashes that resulted in a bicyclist injury or fatality. The crashes are categorized by the race / ethnicity of the bicyclists. The number of crashes by race / ethnicity is compared to survey results that identified the race / ethnicity of people who had biked in the previous month. People who identified as Black or White are over-represented in crashes. People who identified as Asian or Hispanic are under-represented in crashes. The zones with the most crashes for a given race / ethnicity generally match the zones with those populations and the most bicyclists.

Zone	Asian	Black	Hispanic	White	Other	Blank - Not Stated	Total
Central East Oakland	2	74	31	10	2	4	123
Coliseum / Airport	0	4	3	2	0	0	9
Downtown / West Oakland	21	85	27	141	9	19	302
East Oakland Hills	0	2	1	12	0	0	15
Eastlake / Fruitvale	14	54	55	63	8	14	208
Glenview / Redwood Heights	1	3	3	16	2	0	25
North Oakland Hills	1	2	0	27	0	0	30
North Oakland / Adams Point	13	55	18	162	11	11	270
No Location Available	7	16	5	36	3	3	70
Citywide Totals	**59**	**295**	**143**	**469**	**35**	**51**	**1052**
Percent of All Crashes	**6%**	**28%**	**14%**	**45%**	**3%**	**5%**	**100%**
Biked for Any Reason in the Past Month	18%	19%	31%	32%			

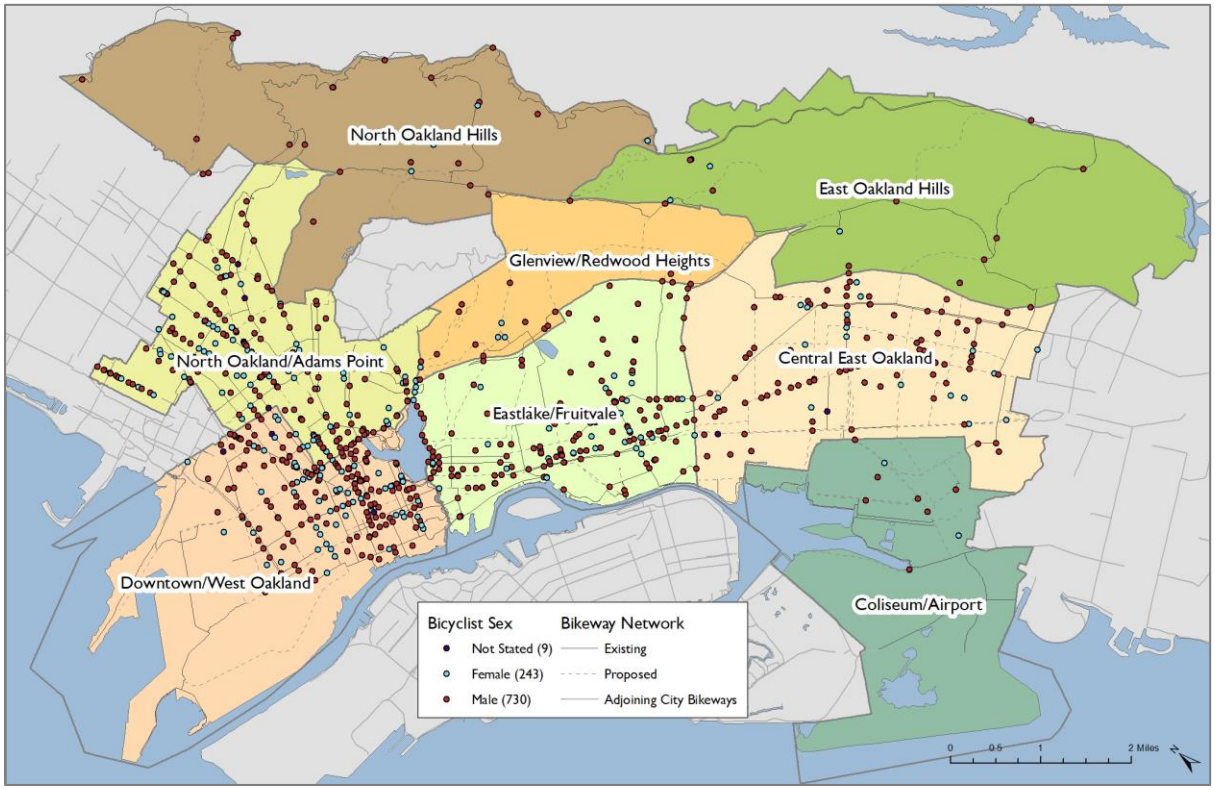
BICYCLIST-INVOLVED CRASHES BY AGE



This map and table show five years of bicyclist-involved crashes that resulted in a bicyclist injury or fatality. Bicyclists aged 15 through 49 are overrepresented in crashes compared to their share of the population. Downtown / West Oakland had the largest number of crashes for all categories from 15 to 64 years of age. Central East Oakland had the largest number of crashes involving children and youth (ages 5-14) while Eastlake / Fruitvale had the largest number of crashes involving seniors (ages 65-84).

Zone	5 - 14	15 - 24	25 - 34	35 - 49	50 - 64	65 - 84	Not Stated	Total
Central East Oakland	26	19	17	31	26	3	1	123
Coliseum / Airport	1	2	2	3	1	0	0	9
Downtown / West Oakland	7	54	113	70	44	5	9	302
East Oakland Hills	1	3	4	4	3	0	0	15
Eastlake / Fruitvale	16	45	50	47	38	12	0	208
Glenview / Redwood Heights	3	2	6	8	6	0	0	25
North Oakland Hills	0	2	5	9	12	2	0	30
North Oakland / Adams Point	9	53	103	59	39	6	1	270
No Location Available	1	5	18	17	23	6	0	70
Citywide Totals	**64**	**185**	**318**	**248**	**192**	**34**	**11**	**1052**
Percent of All Crashes	**6%**	**18%**	**30%**	**24%**	**18%**	**3%**	**1%**	**100%**
Percent of the Oakland Population	11%	10%	18%	22%	18%	10%		

BICYCLIST-INVOLVED CRASHES BY SEX



This map and table show five years of bicyclist-involved crashes that resulted in a bicyclist injury or fatality.

While women were 38% of Oakland's bicycle commuters, they were only 25% of the bicyclists involved in crashes.

These proportions are similar across Oakland. Men are more likely to commute by bicycle, and male bicyclists are even more likely to be involved in crashes.

Zone	Female	Male	Not Stated	Total	Female-to-Male-Involved Crashes	Female-to-Male Bicycle Commuter
Central East Oakland	19	102	2	123	1 to 5	1 to 4
Coliseum / Airport	2	7	0	9	1 to 3	1 to 2
Downtown / West Oakland	86	213	3	302	1 to 2	1 to 2
East Oakland Hills	3	12	0	15	1 to 4	1 to 2
Eastlake / Fruitvale	41	167	0	208	1 to 4	1 to 2
Glenview/Redwood Heights	6	19	0	25	1 to 3	1 to 3
North Oakland Hills	6	24	0	30	1 to 4	3 to 1
North Oakland / Adams Point	80	186	4	270	1 to 2	1 to 2
No Location Available	24	46	0	70	1 to 2	N/A
Citywide	**267**	**776**	**9**	**1052**	**1 to 3**	**1 to 2**

Zone Analysis For Bicycle Planning

NEXT STEPS

NEXT STEPS

Work is underway to add analysis in these areas:

- Bicyclist Level of Traffic Stress (LTS)
- Bicyclist suitability, by combining street slope and LTS

Future work may explore these areas:

- Public health data
- AC Transit data
- Hospital crash data
- Proximity to jobs
- Sales tax revenues
- Student populations and school-related issues

Zone Analysis For Bicycle Planning

SOURCES & ENDNOTES

SOURCES

Page	Page Number	Topic	Source	Table/Other Info	Universe
Cover	1	Streets	City of Oakland's Departent of Information Technology, GIS Unit		
INTRODUCTION	3	BART fact	City of Oakland's Departent of Information Technology, GIS Unit		
DEFINING THE ZONES	4	Census Tract Boundaries	2016 Bureau of Census	US Department of Commerce. Cartographic Boundary Shapefiles - Census Tracts for California	
		Water Features	City of Oakland's Departent of Information Technology, GIS Unit		
BASIC FACTS	5	Area	City of Oakland's Departent of Information Technology, GIS Unit		
		Population	ACS 2012-2016 5 Year Estimates	B01003 TOTAL POPULATION	Total Population
		Workers and Bicycle Commuters	ACS 2012-2016 5 Year Estimates	B08006 SEX OF WORKERS BY MEANS OF TRANSPORTATION TO WORK	Workers 16 years and over
COMMUNITIES OF CONCERN	7	All COC Topics	MTC Communities of Concern 2018 derived from 2012-2016 ACS 5 Year Estimates		
		Population	ACS 2012-2016 5 Year Estimates	B01003 TOTAL POPULATION	Total Population
		Minority	ACS 2012-2016 5 Year Estimates	B03002 HISPANIC OR LATINO ORIGIN BY RACE	Total Population
		Low-Income	ACS 2012-2016 5 Year Estimates	C17002 RATIO OF INCOME TO POVERTY LEVEL IN THE PAST 12 MONTHS	Population For Whom Povery Status is Determined
		Limited English Speakers	ACS 2012-2016 5 Year Estimates	B1605 NATIVITY BY LANGUAGE SPOKEN AT HOME BY ABILITY TO SPEAK ENGLISH FOR THE POPULATION 5 YEARS AND OVER	Population 5 Years and Older
		Zero Vehicle Households	ACS 2012-2016 5 Year Estimates	B08201 HOUSEHOLD SIZE BY VEHICLES AVAILABLE	Households
		Seniors Over 75	ACS 2012-2016 5 Year Estimates	B01001 SEX BY AGE	Total Population
		People with a Disability	ACS 2012-2016 5 Year Estimates	C18108 AGE BY NUMBER OF DISABILITIES	Civilian Noninstitutionalized Population
		Single Parent Families	ACS 2012-2016 5 Year Estimates	B11004 FAMILY TYPE BY PRESENCE AND AGE OF RELATED CHILDREN UNDER 18 YEARS	Families
		Cost Burdened Renters	ACS 2012-2016 5 Year Estimates	B25070 GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME IN THE PAST 12 MONTHS	Renter-occupied housing units
		Average size of household and rented household	ACS 2012-2016 5 Year Estimates	B25010 AVERAGE HOUSEHOLD SIZE OF OCCUPIED HOUSING UNITS BY TENURE	Occupied housing units (Oakland city, California)
		Average size of 1 parent family	ACS 2012-2016 5 Year Estimates	S1101 HOUSEHOLDS AND FAMILIES	
ADDITIONAL SOCIOECONOMICS	8	Median Household Income	ACS 2012-2016 5 Year Estimates	B19013 MEDIAN HOUSEHOLD INCOME IN THE PAST 12 MONTHS (IN 2016 INFLATION-ADJUSTED DOLLARS)	Households for Alameda County Tracts
		Population, Age, Race, and Ethnicity	ACS 2012-2016 5 Year Estimates	DP05 ACS DEMOGRAPHIC AND HOUSING ESTIMATES	

SOURCES

Page	Page Number	Topic	Source	Table/Other Info	Universe
COMMUTER BICYCLING	10	Bicycle Commuters	2000 Census Summary File 3	MEANS OF TRANSPORTATION TO WORK FOR WORKERS 16 YEARS AND OVER	Workers 16 years and over
			2010 Census Summary File 3	MEANS OF TRANSPORTATION TO WORK FOR WORKERS 16 YEARS AND OVER	Workers 16 years and over
			ACS 1 Year Estimates 2005-2016	B08006 SEX OF WORKERS BY MEANS OF TRANSPORTATION TO WORK	Workers 16 years and over
BICYCLE COMMUTER AND BICYCLIST TO BART, BICYCLE MODE SHARE BY CENSUS TRACT, BICYCLING TO WORK AND TO BART, BICYCLISTS TO BART BY STATION	11-19	Bicycle Commuters	2000 Census Summary File 3	MEANS OF TRANSPORTATION TO WORK FOR WORKERS 16 YEARS AND OVER	Workers 16 years and over
		Bicycle Commuters	ACS 2005-2009 5 Year Estimates	B08006 SEX OF WORKERS BY MEANS OF TRANSPORTATION TO WORK	Workers 16 years and over
		Bicycle Commuters	ACS 2010-2014 5 Year Estimates	B08006 SEX OF WORKERS BY MEANS OF TRANSPORTATION TO WORK	Workers 16 years and over
		Bicycle to BART Commuters	1998 BART Station Profile Survey (weekdays)		Base: Home origins only, systemwide estimate
		Bicycle to BART Commuters	2008 BART Station Profile Survey (weekdays)		Base: Home origins only, systemwide estimate
		Bicycle to BART Commuters	2015 BART Station Profile Survey (weekdays)		Base: Home origins only, systemwide estimate
		BART Station/BART routes	City of Oakland's Departent of Information Technology, GIS Unit		
		BART Locations	City of Oakland's Departent of Information Technology, GIS Unit		
		Census Tract Boundaries	2016 Bureau of Census	US Department of Commerce. Cartographic Boundary Shapefiles - Census Tracts for California	
		Water Features	City of Oakland's Departent of Information Technology, GIS Unit		
STREET SLOPE	21-22	Street Slope	City of Oakland's Departent of Information Technology, GIS Unit	Analyzed by Eric Tucker	
		Streets Layer	City of Oakland's Departent of Information Technology, GIS Unit		
DISTANCE TO DOWNTOWN	23	Bicycle Commuters	ACS 2010-2014 5 Year Estimates	B08006 SEX OF WORKERS BY MEANS OF TRANSPORTATION TO WORK	Workers 16 years and over
		Census Tract Boundaries	2016 Bureau of Census	US Department of Commerce. Cartographic Boundary Shapefiles - Census Tracts for California	
PROXIMITY TO BART	24-25	BART Locations	City of Oakland's Departent of Information Technology, GIS Unit		
		Census Tract Boundaries	2016 Bureau of Census	US Department of Commerce. Cartographic Boundary Shapefiles - Census Tracts for California	
		Bicycle Commuter Mode Share	ACS 2012-2016 5 Year Estimates	B08006 SEX OF WORKERS BY MEANS OF TRANSPORTATION TO WORK	Workers 16 years and over

SOURCES

Page	Page Number	Topic	Source	Table/Other Info	Universe
PAVEMENT QUALITY	26	Pavement Condition Index	City of Oakland's Departent of Information Technology, GIS Unit	Analyzed by David Lok	
		Bikeways	City of Oakland's Departent of Information Technology, GIS Unit	Updated as of January 2018	
		Streets	City of Oakland's Departent of Information Technology, GIS Unit		
		Adjoining City Streets	City of Oakland's Departent of Information Technology, GIS Unit		
EXISTING AND PROPOSED BIKEWAY NETWORKS	27-28	Bikeways	City of Oakland's Departent of Information Technology, GIS Unit	Updated as of January 2018	
		Adjoining City Bikeways	City of Oakland's Departent of Information Technology, GIS Unit		
		Streets	City of Oakland's Departent of Information Technology, GIS Unit		
BICYCLE PARKING	29	Bicycle Parking	City of Oakland's Departent of Information Technology, GIS Unit	Updated as of January 2018	
		Bikeways	City of Oakland's Departent of Information Technology, GIS Unit	Updated as of January 2018	
		Adjoining City Bikeways	City of Oakland's Departent of Information Technology, GIS Unit		
		Bicycle Commuters	ACS 2012-2016 5 Year Estimates	B08006 SEX OF WORKERS BY MEANS OF TRANSPORTATION TO WORK	Workers 16 years and over
BICYCLIST-INVOLVED CRASHES	32-36	Crashes	Transportation Injury Mapping System (TIMS), Safe Transportation Research and Education Center, University of California, Berkeley. 2018	January 1, 2012- December 31, 2016 SWITRS	Party Type: 4 - Bicyclist
		Cyclist Race/Ethnicity	2018 Bike Plan Update Survey	December, 2017	Oakland Sample Population
		Oakland Population Age	ACS 2012-2016 5 Year Estimates	DP05 ACS DEMOGRAPHIC AND HOUSING ESTIMATES	Total Oakland Population
		Bicycle Commuter Sex	ACS 2012-2016 5 Year Estimates	B08006 SEX OF WORKERS BY MEANS OF TRANSPORTATION TO WORK	Workers 16 years and over
BASIC FACTS (ACS 2010-2014)	42	Population	ACS 2010-2014 5 Year Estimates	B01003 TOTAL POPULATION	Total Population
		Workers and Bicycle Commuters	ACS 2010-2014 5 Year Estimates	B08006 SEX OF WORKERS BY MEANS OF TRANSPORTATION TO WORK	Workers 16 years and over
ADDITIONAL SOCIOECONOMICS (ACS 2010-2014)	43	Median Household Income	ACS 2010-2014 5 Year Estimates	B19013 MEDIAN HOUSEHOLD INCOME IN THE PAST 12 MONTHS (IN 2014 INFLATION-ADJUSTED DOLLARS)	Households for Alameda County Tracts
		Population, Age, Race, and Ethnicity	ACS 2010-2014 5 Year Estimates	DP05 ACS DEMOGRAPHIC AND HOUSING ESTIMATES	
PAVEMENT QUALITY	26	Pavement Condition Index	City of Oakland's Departent of Information Technology, GIS Unit	Analyzed by David Lok	

END NOTES

Overall

- This report was initiated by Eric Tucker and completed by Noel Pond-Danchik in the Bicycle & Pedestrian Program of the City of Oakland's Department of Transportation.
- Many of the numbers in the charts have been rounded to the nearest tenth or whole number for ease of reading.
- Many of the numbers in this document are based on American Community Survey Estimates based on samples of the population and have some margin of error.

INTRODUCTION

- The fact about BART was determined by the percentage of BART stations in the zones with the most BART access (Downtown / West Oakland, North Oakland / Adams Point, and Eastlake / Fruitvale) out of all BART stations in Oakland (seven out of eight) and the land area of those three zones with the most BART access (34%).

DEFINING THE ZONES

- The zones used in this analysis are those used in the City's 2017 Pedestrian Plan except that the Pedestrian Plan analyzed Downtown and West Oakland as separate zones.
- While the American Community Survey (ACS) Bicycle Commuter data is the best available data for bicycling rates, it should be noted that bicycle commuter data far from represents who is actually biking in an area because it omits bicyclists with destinations other than work (errands, recreation) as well as unemployed bicyclists, undocumented or unreported bicyclists, children, etc. Also, it omits most commute trips that include bicycling to BART because the BART trip is selected as the primary commute mode.

BASIC FACTS

- Zone areas do not include East Bay Regional Parks which are property of the Park District.
- The "Percent Bicycle Commuters" category refers to the percentage of people who commute to work by bicycle out of the total number of workers.
- The "Female Bicycle Commuters" category refers to the percentage of all bicycle commuters who are female. The "Male Bicycle Commuters" category refers to the percentage of all bicycle commuters who are male.

COMMUNITIES OF CONCERN

- The Total Disadvantaged Population Score was calculated by counting the sum of people who fall into each category and dividing by the total population then normalizing the scores on a 0-1 scale. One difference between Oakland's and the MTC's methods of calculating Communities of Concern is that Oakland chose to count people every time a factor applied. Therefore, for example, a person who fell into three categories would have been counted thrice.
- For more info on how the numbers were computed, see the "Methodology" tab in: [illegible]
- The number of people in the "Single Parent Family" category was estimated by multiplying the number of single parent families by the average size of a single parent family in Oakland (3.55).
- The number of people in the "Cost-Burdened Renter" category was estimated by multiplying the number of cost-burdened households by the average size of a rented household in Oakland (2.44).
- The "Low," "Medium," and "High" levels of concern categories were chosen based off the Total Disadvantaged Population Score using the classification "Natural Breaks" in ArcMap.
- The "Minority" column refers to the percentage of people who are a racial or ethnic minority out of the total population.
- "Low Income" refers to the percentage of the population who had incomes under 200% of the Federal Poverty Level out of the population for whom poverty status is determined.
- "Limited English Speakers" refers to the percentage of people who speak English "not at all" or "not well" out of the total population.
- "People in Zero Vehicle Households" refers to the percentage of people living in a zero-vehicle household out of the total population.
- "Seniors Over 75" refers to the percentage of people who are over 75 out of the total population.
- "People with a Disability" refers to the percentage of people with a disability out of the total civilian noninstitutionalized population.
- "People in Single-Parent Families" refers to the percentage of people living in a single parent family out of the total population.
- "Cost-Burdened Renters" refers to the percentage of people living in a rent burdened household in the past twelve months out of the total population. Rent burdened is determined as a household's gross rent equaling 50 percent or more of their household income.

ADDITIONAL SOCIOECONOMICS

- Median household income is shown in 2016 inflation-adjusted dollars.
- The sum of the racial categories equals more than 100% because Hispanic is an ethnic, not racial, category.

COMMUTER BICYCLING

- The 1990 and 2000 data points came from responses to the US Census and are not estimated. The 2005 through 2016 points are taken from the ACS 1-Year Estimates.

BICYCLE COMMUTERS AND BICYCLISTS TO BART

- Each dot represents the home location of one commuter or one bicyclist to BART. The home locations of bicyclists to BART and number of bicyclists who arrived at each station are taken from the results of two BART Customer Satisfaction Surveys. Whatever respondents entered as their home location was translated to census tracts. As such, the results may not capture the entire picture, especially for the Coliseum/Airport zone which is only one census tract.
- The dots do not represent exact home locations but are randomly scattered within the home census tract of each commuter.
- The BART Survey captured home-based trips to BART, so bicyclists were counted more than once if they biked from their home to a BART station more than once in one day.

END NOTES

BICYCLE MODE SHARE BY CENSUS TRACT
- 0-1% Bicycle Mode Share is omitted in the graph, creating a smaller scale for the Y-axis to emphasize the number of census tracts where bicycle mode share is greater than one percent.

BICYCLING TO WORK AND TO BART AND BICYCLISTS TO BART BY STATION
- The home locations of bike to BART commuters and number of bicyclists who arrived at each station by bicycle are taken from the results of two BART Customer Satisfaction Surveys. Whatever respondents entered as their home location and is then translated to census tracts. As such, the results may not capture the entire picture, especially for the Coliseum/Airport zone which is only one census tract. This also explains discrepancies between the Bicycling to Work and to BART graph and the Bicyclists to BART by Station graphs.
- The survey captured home-based trips to BART, so bicyclists were counted more than once if they biked from their home to a BART station more than once in one day.

BICYCLISTS TO BART MODE SHARE BY STATION
- The bicycle mode share refers to the percentage of people who accessed BART by bicycle out of the total number of people who access BART.

STREET SLOPE
- Some individual street segments in the flatlands have anomalous slopes. This may be caused by embankments, bridges, and other aerial structures like elevated BART tracks that are captured in the topographic data.

STREET SLOPE (Table and Graph)
- The 0-1% Maximum Slope of Street Segment Percent was omitted from the graph creating a smaller scale for the Y-axis because so much of the city's roadway falls into the 0-1% maximum slope category. This was done to emphasize the zones where the maximum slope is greater than one percent.
- Oakland's street network is broken up into small street segments. Each street segment has an associated maximum slope. The numbers in the graph and table were derived by finding the average of the maximum slopes of all the street segments in a zone, weighted by the length of the segment.
- In the table and graph, each roadway segment that crosses a zone boundary was associated with the zone containing the majority of its length.
- The maximum, rather than the average, slope of street segments was used because the maximum slope is what is most noticeable to a bicyclist and because average slope hides ups and downs within a segment.
- The numbers in the "Slope Weighted by Segment Length" row of the table are the maximum slopes of all the segments in a zone averaged by the segments' lengths.

DISTANCE TO DOWNTOWN
- Distances to Downtown were measured from the intersection of 14th St and Broadway.
- The distance measured from Downtown is the distance to the zone centroid.

PROXIMITY TO BART
- The Bike Commuter Mode Share represents ACS 2012-2016 5-Year Estimates

PAVEMENT QUALITY
- The mean PCIs are calculated by weighting each segment by its length.
- The mean PCI by Existing and Proposed bikeways only includes on-street bikeways; there is no PCI data for off-street bikeways (i.e., bicycle paths).
- For the mean PCI for Existing Bikeways and mean PCI for Proposed Bikeways, roadway segments that crossed a zone boundary were associated with the zone containing the majority of its length.

EXISTING BIKEWAY NETWORK and PROPOSED BIKEWAY NETWORK
- **The Bikeway Network types are explained as such:**
    - **Bike Paths (Class 1)** are paved rights-of-way completely separated from streets. These paths are typically shared with pedestrians and often called mixed-use paths.
    - **Bike Lanes (Class 2)** are on-street facilities designated for bicyclists using stripes and stencils. Bike lanes may include buffer striping to provide greater separation between bicyclists and parked or moving vehicles.
    - **Bike Routes (Class 3)** are streets designated for bicycle travel and shared with motor vehicles. While the only required treatment is signage, streets are designated as bike routes because they are suitable for sharing with motor vehicles and provide better connectivity than other streets.
    - **Arterial Bike Routes (Class 3A)** are installed on arterial streets where bike lanes are not feasible, and parallel streets do not provide adequate connectivity. These streets may be designed to promote shared use with lower posted speed limits (preferably 25 mph), shared lane bicycle markings ("sharrows"), and signage.
    - **Bike Boulevards (Class 3B)** are bike routes on residential streets that prioritize through trips for bicyclists. Traffic calming is included as needed to discourage drivers from using the boulevard as a through route. Oakland's Bike Boulevards are marked with shared lane bicycle markings (aka "sharrows") and signage.
    - **Protected Bike Lanes (Class 4)**, also known as cycle tracks, provide space that is exclusively for bicyclists and separated from motor vehicle travel lanes, parking lanes, and sidewalks. Parked cars, curbs, bollards, or planter boxes provide physical separation between bicyclists and moving cars. Where on-street parking is allowed, it is placed between the bikeway and the travel lanes (rather than between the bikeway and the sidewalk, as is typical for Class 2 bike lanes).
- Miles are counted as centerline miles, not lane miles.
- Bike lanes on one side of the street only and protected bike lanes are both counted in the "Bike Lanes" category in the chart.
- Due to rounding, not all sums of the bike network mileage by type exactly equal total existing bikeway mileage.

END NOTES

BICYCLE PARKING

- Bicycle parking data is updated as of January 2018.
- "Bike Parking Spaces" refers to the number of spaces available for bikes. For instance, one standalone bike rack would provide two parking spaces.

All Crash Data

- All crash data includes only reported, fatal or injury-related bicyclist-involved crashes (no property damage only crashes) from 2012 to 2016.
- The term "crashes" refers only to crashes in such category.
- The demographic data (race, age, and sex) always refer to the bicyclist no matter who was at fault for the collision.
- The crash data was taken from the Transportation Injury Mapping System (TIMS) website by querying between January 1, 2012 and December 31, 2016 for the city of Oakland and choosing Party Type under Party factors and selecting "4 – Bicyclist". The "Collisions" and "Parties" data was then downloaded, and the "Collision" data was mapped in ArcMap using x and y coordinates and joined to the "Parties" data. The data without x and y coordinates was analyzed separately.

BICYCLIST-INVOLVED CRASHES BY SEVERITY

- The number of crashes is not a good indicator of the relative safety of an area because it doesn't account for how many people are biking in that area. For that reason, crashes per 100 bicycle commuters per year is shown, but commuter data underreports who is actually biking in an area. (See "Defining the Zones.")
- The "Crashes per 100 Bicycle Commuters per Year" Category was determined by dividing the total number of reported fatal or injury related crashes in 2012-2016 by five to get a one-year average, then dividing by the estimated number of bicycle commuters from the 2012-2016 ACS data, and multiplying by 100 to represent 100 bicycle commuters.

BICYCLIST-INVOLVED CRASHES BY RACE & ETHNICITY

- The "Biked for Any Reason in the Past Month" category was determined from the results of the Oakland Bike Plan Update Web Survey of Residents of Oakland, California (2017) based on a representative sample size of 800 interviews. The percentages in the table were determined by dividing the number of people who marked that they had biked in the past month and fell into one of the categories: "Asian," "Black," "Hispanic," or "White" and divided it by the sum of all the people who marked that they had biked in the past month and fell any of the race/ethnicity categories previously listed. The intention is that this category be used as a source of comparison to see who is biking versus who is involved in injury related, reported crashes.

BICYCLIST-INVOLVED CRASHES BY AGE

- The youngest and oldest bicyclist involved in a fatal or injury related crash were 5 and 81 respectively.
- The age categories align with ACS age categories.
- The "Percent of the Oakland Population" row represents the percentage of the population of Oakland who are that age not necessarily the percentage of people who bike who are that age.
- The "Female-to-Male-Involved Crashes" and "Female-to-Male Bicycle Commuter" categories refer to simplified ratios of the number of female to male bicyclists involved in crashes and female to male commuters respectively. These numbers were rounded. The two columns were intended as a source of comparison between who is involved in injury related, reported crashes versus who is bicycle commuting.

BICYCLIST-INVOLVED CRASHES BY SEX

- The bike commuter ratios use 2012-2016 ACS data but it should be noted that bicycle commuter data underreports who is actually biking in an area. See "Defining the Zones."
- The crash ratios were determined by dividing the total number of crashes across the five-year period by five to get the average number of crashes per year and dividing that by the number of commuters in that zone. The numbers were then rounded into ratios for ease of reading.
- The "Female Bicycle Commuters" category refers to the percentage of all bicycle commuters who are female. The "Male Bicycle Commuters" category refers to the percentage of all bicycle commuters who are male.

OLDER DATA FOR COMPARISON

- The data on the Basic Facts and Additional Socioeconomics slides mimics the format of the earlier slides with the same names using earlier data (ACS 2010-2014). These were included as a means of comparison between the two timeframes.

Zone Analysis For Bicycle Planning

OLDER DATA FOR COMPARISON

BASIC FACTS (ACS 2010 – 2014)

Zone	Area (Square Miles)	Population	Population per Square Mile	Number of Workers	Number of Bike Commuters	Percent Female Bike Commuters	Percent Male Bike Commuters	Bike Commute Percent	Bike Commuters per Square Mile
Central East Oakland	7.8	96,018	12,310	34,624	310	18%	82%	0.9%	40
Coliseum / Airport	6.2	4,037	651	1,437	23	35%	65%	1.6%	4
Downtown / West Oakland	7.4	46,655	6,305	20,179	791	38%	62%	3.9%	107
East Oakland Hills	10.3	30,586	2,970	14,047	33	34%	66%	0.2%	3
Eastlake / Fruitvale	5.8	96,418	16,624	42,158	1,018	33%	67%	2.4%	176
Glenview / Redwood Heights	3.7	32,168	8,694	16,363	241	23%	77%	1.5%	65
North Oakland Hills	8.8	23,587	2,680	12,332	94	78%	22%	0.8%	11
North Oakland / Adams Point	5.6	76,770	13,709	44,833	2,899	39%	61%	6.5%	518
Citywide	**55.6**	**406,239**	**7,306**	**185,973**	**5,409**	**36%**	**64%**	**2.9%**	**97**

ADDITIONAL SOCIOECONOMICS (ACS 2010 – 2014)

Zone	Median Household Income	Under 18	Asian	Black / African American	Hispanic / Latino	Non-Hispanic White	Other Race
Central East Oakland	$39,993	30%	6%	36%	48%	7%	4%
Coliseum / Airport	$47,805	33%	5%	37%	49%	4%	6%
Downtown / West Oakland	$36,281	16%	24%	34%	14%	22%	5%
East Oakland Hills	$84,877	20%	10%	41%	14%	28%	7%
Eastlake / Fruitvale	$41,450	22%	30%	19%	34%	13%	5%
Glenview / Redwood Heights	$96,906	20%	17%	14%	11%	50%	7%
North Oakland Hills	$146,484	19%	14%	5%	6%	68%	7%
North Oakland / Adams Point	$77,634	12%	13%	21%	11%	49%	6%
Citywide	**$54,618**	**21%**	**16%**	**26%**	**26%**	**27%**	**6%**