

What Does the Oregon Household Activity Survey Tell Us About the Path Ahead for Active Transportation in the City of Portland?

a White Paper by Roger Geller
March 2013

Introduction

In assessing the existing structure of Portland's transportation system and planning for the future some large questions arise: has the city been successful in advancing non-automotive means of transportation? Will the city and region be able to achieve policy and mode split goals as elucidated in the Portland Plan, the Climate Action Plan, the Portland Bicycle Plan for 2030 and the Regional Transportation Plan? What are the appropriate strategies to advance toward those goals? What are the costs of not achieving them? This paper uses Oregon Household Activity Survey (OHAS) data recently provided by Metro to suggest some directions to consider in seeking answers.

In October 2012 Metro made available initial data from the OHAS, which was conducted in Portland in 2011. The most recent survey of comparable depth and quality was conducted in 1994. A comparison of the data from these two time periods demonstrates that Portland has been successful in advancing non-automotive transportation. This analysis is encouraging of the ability of the city to achieve its goals related to bicycling and active transportation. The data tells us that active transportation and transit have contributed significantly to the continuing livability and attractiveness of Portland and the region. Specifically:

- In 1994 19 percent of trips by Portlanders were either walking (12 percent) transit (5.5 percent) or bicycling (1.6 percent).
- In 2011 28 percent of trips by Portlanders were either walking (15 percent) transit (7 percent) or bicycling (6 percent).
- There were approximately 162 million more annual trips taken by Portland residents in 2011 than in 1994, an increase of 24 percent
- 47 million of those additional trips were walking trips (29 percent), 36 million were bicycling trips (22 percent) and 20 million were transit trips (12 percent). Together, walking, bicycling and transit accounted for 64 percent of trips added since 1994
- Walking added the most new non-automotive trips, bicycling increased the most per capita
- Total annual motor vehicle miles traveled by Portland residents seems to have dropped from 2.35 billion in 1994 to 2.26 billion in 2011

This analysis also indicates that the costs to the city and the region of not reaching targets for active transportation and transit are high:

- If active transportation and transit had not advanced since 1994, then Portlanders would have made 211,000 more weekday automotive trips in 2011 than they actually did. This is 1.5 times higher than the daily traffic volume on I-5 at the Marquam Bridge (2010 volumes)
- If active transportation and transit do not continue to advance, then by 2035 there will be more than 1,000,000 more daily automotive trips than there would otherwise be; this would be the equivalent of the daily traffic on approximately 23 additional Powell Boulevards.

Finally, this paper points to suggestions for advancing bicycle transportation, in part by recognizing that:

- The potential for bicycle transportation in Portland remains largely untapped, and
- The potential for the greatest gains in reduction in vehicle miles traveled (VMT) is in the household- and trip-rich east side (between the Willamette River and I-205).

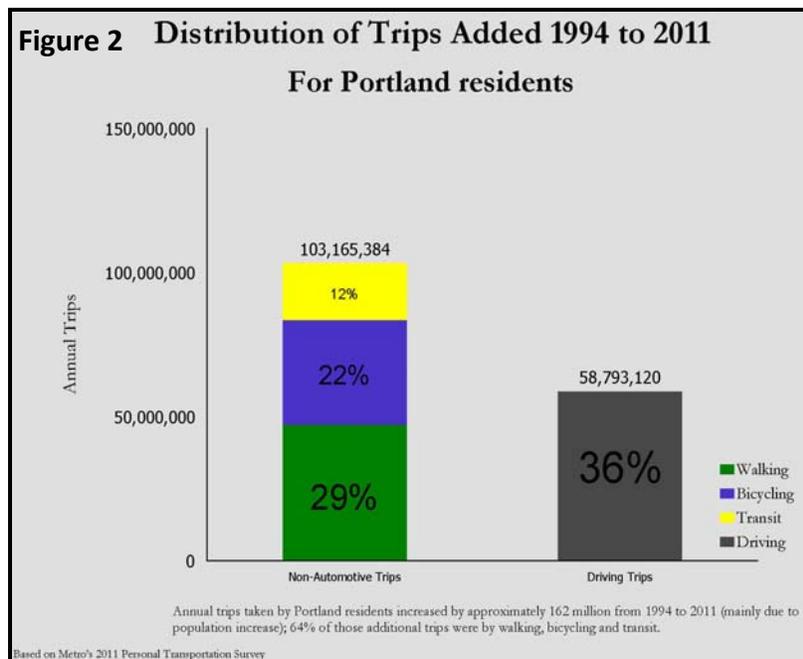
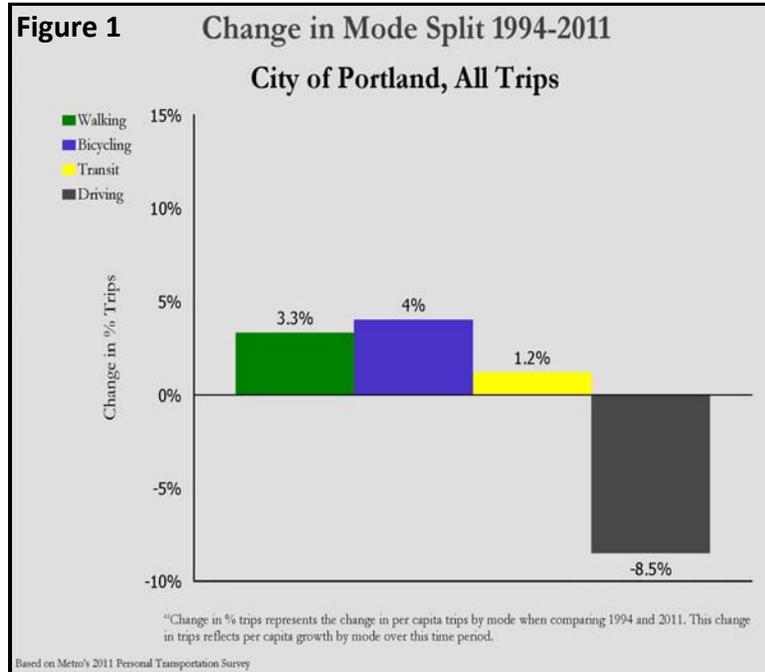
Active transportation as largest contributor to reduction in per capita driving trips.

The addition of more than 53,000 Portland households since 1994 is the reason why Portland residents took 162 million more annual trips in 2011 than they did in 1994. Of these new trips walking (29 percent) and bicycling (22 percent) together outnumbered driving (36 percent).

Per capita driving trips declined 3.5 percent for the region and 8.5 percent for the City of Portland¹. Bicycle transportation contributed 4 percent of the change for the city (transit and walking contributed 1.2 percent and 3.3 percent, respectively, see Figure 1). Based on Metro’s reported numbers, bicycle transportation contributed 47 percent of the per capita drop in driving in the City of Portland, with walking and transit contributing 39 percent and 15 percent, respectively.

This mode shift meant more than 72 million fewer driving trips by Portland residents per year, or more than 200,000 fewer driving trips on the typical weekday.

Bicycle use grew unevenly across the city (see map of sectors in Appendix Figure A-1). The highest growth was in the area defined by Metro as “Portland Central City (not including the Central Business District [CBD])”, which saw bicycle use more than quadruple (364 percent growth) and account for a change in per capita trips of more than 10 percent. The smallest growth and change in trips was in the Portland CBD (39 percent growth, 0.7 percent change in per capita trips). Because of the paucity of trips originating from the relatively few households in these areas (representing 4% and 1 percent of all city trips, respectively) neither change effectively moved the needle for overall bicycle mode splits in the city.



¹ This drop, when combined with reported shorter trip distances traveled, seems to have produced a drop in overall automobile vehicle miles traveled for by Portland residents in 2011 compared to 1994.

The area defined as “Portland: Outside the Central City, east of river to I-205” had the greatest growth in the number of bicycle trips. That area experienced a 6.1 percent change in per capita bicycle trips reflecting more than 300 percent growth since 1994. Because this is a household- and trip-rich area (approximately 55

Table Array 1: Data from 2011 Metro OHAS compared to Data from 1994 Personal Transportation Survey

All Trip Mode Split Data 2011

based on Metro's 2011 Travel Activity Survey

	Portland CBD				Portland Central City (not including CBD)			
	1994	2011	Change	Growth	1994	2011	Change	Growth
Walk	39.5%	47.0%	7.5%	19%	35.6%	22.7%	-12.9%	-36%
Bike	1.8%	2.5%	0.7%	39%	2.8%	13.0%	10.2%	364%
Transit	15.9%	16.2%	0.3%	2%	10.0%	22.0%	12.0%	120%
Drive	42.8%	34.3%	-8.5%	-20%	51.6%	42.3%	-9.3%	-18%

	Portland: Outside CC, east of river to I-205				Portland, outside CC, west of river			
	1994	2011	Change	Growth	1994	2011	Change	Growth
Walk	11.7%	16.2%	4.5%	38%	14.6%	10.5%	-4.1%	-28%
Bike	2.0%	8.1%	6.1%	305%	1.3%	2.0%	0.7%	54%
Transit	6.0%	6.0%	0.0%	0%	3.1%	6.1%	3.0%	97%
Drive	80.3%	69.7%	-10.6%	-13%	81.0%	81.4%	0.4%	0%

	East Portland				Entire Region			
	1994	2011	Change	Growth	1994	2011	Change	Growth
Walk	6.8%	10.3%	3.5%	51%	8.7%	9.2%	0.5%	6%
Bike	0.5%	1.8%	1.3%	260%	1.1%	2.8%	1.7%	155%
Transit	5.1%	6.9%	1.8%	35%	2.9%	4.2%	1.3%	45%
Drive	87.6%	81.0%	-6.6%	-8%	87.3%	83.8%	-3.5%	-4%

	Entire City of Portland <small>(based on assumptions about #hholds and daily trips)</small>				Contribution to growth in non- auto trips
	1994	2011	Change	% Change	
Walk	11.9%	15.2%	3.3%	28%	38.8%
Bike	1.6%	5.5%	4.0%	254%	46.6%
Transit	5.6%	6.9%	1.2%	22%	14.6%
Drive	80.9%	72.4%	-8.5%	-11%	

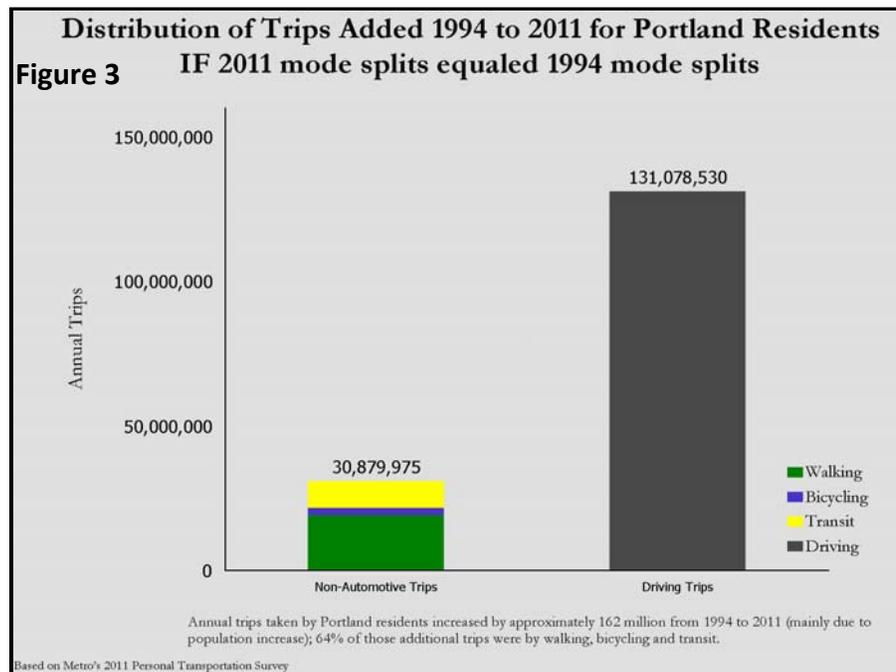
percent of all households in the city) it is likely that the growth in bicycle use in this area drove both the region's and city's bicycle contribution to motor vehicle trip reduction. This area accounted for 80 percent of all bicycle trips in Portland for 2011².

Scenarios for Future Growth

This analysis shows that future Portland residents—largely because of projected household growth—could reasonably be expected to generate almost 500,000 and 1.2 million more transportation trips per day by 2020 and 2035, respectively, than they generated in 2011 (see Appendix A). In planning for future growth the questions then become:

- Can the city achieve its desired targets for non-automotive and automotive transportation?
- What are the appropriate strategies to advance toward those targets?

Transit, walking and bicycle trips for Portlanders respectively increased 22%, 28% and 254% between 1994 and 2011. The benefit of that increase is demonstrated by comparing Figures 2 and 3; if active transportation and transit use had remained at 1994 levels, then the difference for car trips between actual levels and those shown in Figure 3 would have been 1.5 times the traffic volumes handled on I-5 at the Marquam Bridge (see Figure 10, too).



For the city to achieve targeted levels of bicycle

mode split, the east side of Portland between the river and I-205 will have to play a prominent role. This is because of its density, population and land use that results in short trips³. For example, 75% growth in bicycle mode share in the east side to I-205 (growing from current 8.1% to 14%⁴) by 2020 would result in a city-wide mode split increase of 9%. Doubling trips elsewhere in the city would raise the city-wide bicycle mode split to 10%, representing an overall 80% growth in bicycle mode split (See Table Arrays 3 and 4).

Table Array 2 displays growth by non-automotive modes 1994-2011 and assumptions for continued growth to higher non-automotive transportation in 2020 and 2035. Table Array 4 shows the results of these assumptions. The assumptions and results are discussed more thoroughly in Appendix A.

² This area also accounted for 62% of all walking trips, 54% of all transit trips and 56% of all driving trips.

³ At an average of 3.2 miles per trip it is second only to the CBD and almost two miles less than the region-wide average.

⁴ The 2006-2010 ACS shows that much of this area already has between 10-13% bicycle commute mode split.

Table Array 2: Scenario Assumptions

**Input Assumptions for
Non-Automotive Mode Growth**

Growth Scenarios: Bike Growth			
	1994-2011	2011-2020	2011-2035
CBD	38.9%	100.0%	300.0%
Central (not CBD)	364.3%	75.0%	100.0%
East to I-205	305.0%	75.0%	320.0%
West	53.8%	100.0%	400.0%
East PDX	260.0%	100.0%	800.0%
City Wide	254%	79%	346%

Growth Scenarios: Transit Growth			
	1994-2011	2011-2020	2011-2035
CBD	1.9%	3.0%	3.0%
Central (not CBD)	120.0%	50.0%	50.0%
East to I-205	0.0%	20.0%	40.0%
West	96.8%	50.0%	100.0%
East PDX	35.3%	50.0%	110.0%
City Wide	22%	37%	74%

Growth Scenarios: Pedestrian Growth			
	1994-2011	2011-2020	2011-2035
CBD	19.0%	10.0%	19.0%
Central (not CBD)	-36.2%	10.0%	20.0%
East to I-205	38.5%	10.0%	38.0%
West	-28.1%	10.0%	10.0%
East PDX	51.5%	10.0%	20.0%
City Wide	28%	11%	32%

These results show that if walking and bicycling grew at somewhat faster paces between 2011 and 2035 than they did in the period 1994-2011, then those modes could together account for approximately 45 percent of all trips taken by Portland residents in 2035. Growth in transit use would have to be more dramatic—growing at approximately 3.4 times the pace of growth it experienced 1994-2011—to achieve an overall 12 percent transit mode split in 2035 among Portland residents (see Table 3)⁵.

Table 3

Mode	Growth 1994-2011	Growth 2011-2035	Achieved mode split in 2035	2011-2035 growth relative to 1994-2011 growth
Walking	28%	32%	20%	1.1 times greater
Bicycling	254%	346%	25%	1.4 times greater
Transit	22%	74%	12%	3.4 times greater

⁵ See Appendix A for further discussion about the pace of growth. Though relatively small in percentage terms, the pace of growth for bicycling suggested here is quite steep.

Table Array 4: Scenario Analysis Results

All Trip Mode Split Data 1994-2011 and Projections

based on Metro's 1994 and 2011 Travel Activity Surveys and Assumption about Growth

		Portland CBD			
		94,700			
		1994	2011	2020	2035
Walk		39.5%	47.0%	52%	56%
Bike		1.8%	2.5%	5%	10%
Transit		15.9%	16.2%	17%	17%
Drive		42.8%	34.3%	27%	17%

		Central City (not CBD)			
		37,200			
		1994	2011	2020	2035
Walk		35.6%	22.7%	25%	27%
Bike		2.8%	13.0%	23%	26%
Transit		10.0%	22.0%	33%	33%
Drive		51.6%	42.3%	19%	14%

		Inner East Side			
		1,379,600			
		1994	2011	2020	2035
Walk		11.7%	16.2%	18%	22%
Bike		2.0%	8.1%	14%	34%
Transit		6.0%	6.0%	7%	8%
Drive		80.3%	69.7%	61%	35%

		West Portland			
		374,700			
		1994	2011	2020	2035
Walk		14.6%	10.5%	12%	12%
Bike		1.3%	2.0%	4%	10%
Transit		3.1%	6.1%	9%	12%
Drive		81.0%	81.4%	75%	66%

		East Portland			
		599,600			
		1994	2011	2020	2035
Walk		6.8%	10.3%	11%	12%
Bike		0.5%	1.8%	4%	16%
Transit		5.1%	6.9%	10%	14%
Drive		87.6%	81.0%	75%	57%

Mode Splits City of Portland: 1994, 2011 and Projected Showing Growth

	Entire City of Portland				1994-2011		2011 to 2020		2011-2035	
	1994	2011	2020	2035	Change	Growth	Change	Growth	Change	Growth
Walk	11.9%	15.2%	17%	20%	3.3%	27.7%	2%	11%	5%	32%
Bike	1.6%	5.5%	10%	25%	4.0%	254.2%	4%	79%	19%	346%
Transit	5.6%	6.9%	9%	12%	1.2%	22.1%	3%	37%	5%	74%
Drive	80.9%	72.4%	64%	43%	-8.5%	-10.5%	-9%	-12%	-29%	-40%
MVMT billion miles	2.35	2.26	2.39	2.06						

This scenario construction and analysis point out some interesting observations and considerations. First, is that even dramatic growth in bicycle transportation in West Portland and East Portland households will still produce bicycle use levels that are well below citywide targets for non-automotive trips⁶. It is the trip- and household-rich inner east neighborhoods (between the Willamette River and I-205) that will have to carry a disproportionate share of the non-automotive trips if Portland is to approach a 25% mode split for bicycle transportation. To achieve that, the pace of growth in bicycle transportation for those neighborhoods between now and 2035 will have to slightly exceed the pace of growth seen in those neighborhoods between 1994 and 2011. Growth in East Portland will have to skyrocket to achieve a 16% bicycle mode split, while growth in West Portland will have to similarly accelerate to achieve a 10% mode split.

Second, is that even dramatic increases in the pace of growth in transit use will result in only approximately 12% of trips by Portland residents being made by transit.

Third, is the overall drop in motor vehicle miles traveled (MVMT) by 2035 relative to 2011 despite an increase in the number of households. The assumptions modeled here produce by 2035 a continued drop in motor vehicle miles traveled by Portland residents relative to 1994.

Fourth, is that the above scenarios modeled here do not show an obvious means to achieving the goal of a 70% non-automotive mode split for city residents, as called for in The Portland Plan.

The Potential for Bicycling in Portland Remains Largely Untapped

That the potential for bicycling remains largely untapped, and that the greatest gains are to be had in the inner East is based on modeling of home-based work (HBW) trips for transportation analysis zones (TAZ) in inner SE Portland and East Portland as shown in Figure 4⁷. This analysis is more fully described in Appendix B.

This analysis shows a clear difference in the trip profiles for HBW trips in these areas as well as for the potential for future trips with current land use patterns. Figures 5 and 6 show the number of trips at each trip length as well as the proportion of trips that can be taken on the existing and funded low-, medium- and high-stress bikeway networks. Figure 5 shows what the bicycle commute capture might look like to produce the known 18.3% bicycle commute mode split in inner SE Portland. Figure 6 shows what the bicycle commute capture might look like in the East Portland study area with ridership assumptions identical to those used to in Inner SE Portland to produce the known 18.3% bicycle commute mode split. Because of a different trip distance profile and bikeway network quality the bicycle commute mode split achieved in East Portland is 7% rather than 18%.

Figures 7 and 8 address the question of “what if the entire bikeway network consisted of low-stress facilities?” Then, using the same ridership assumptions as before, the mode split in Inner SE rises to 32% and in East Portland to 14%. The lower value in East Portland is again, largely attributable to generally longer trip distances. This simple analysis shows a higher proportion of shorter trips in the inner neighborhoods and thus a higher potential for bicycle trips than for East Portland.

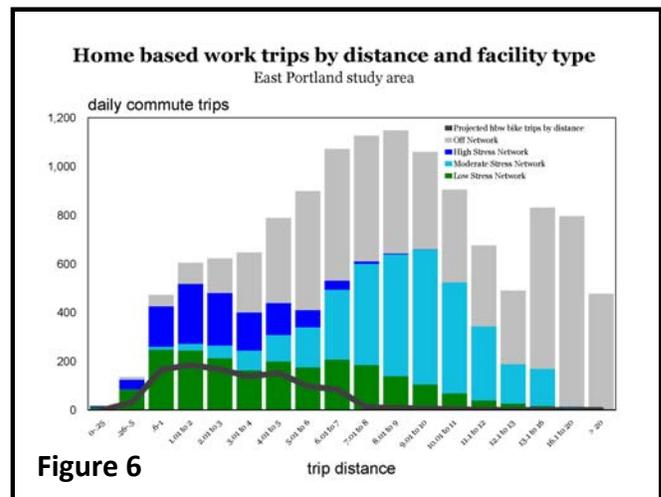
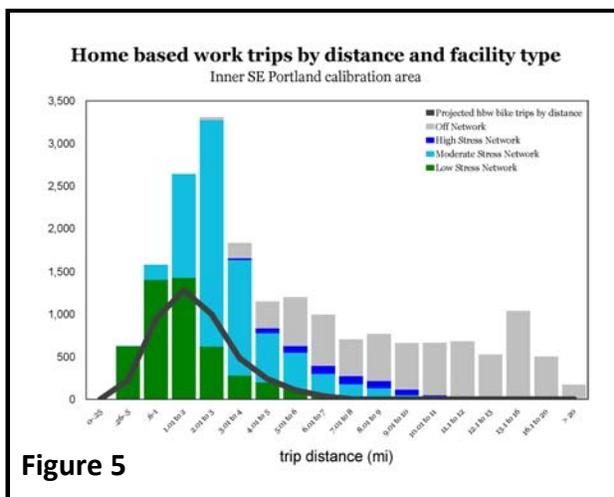
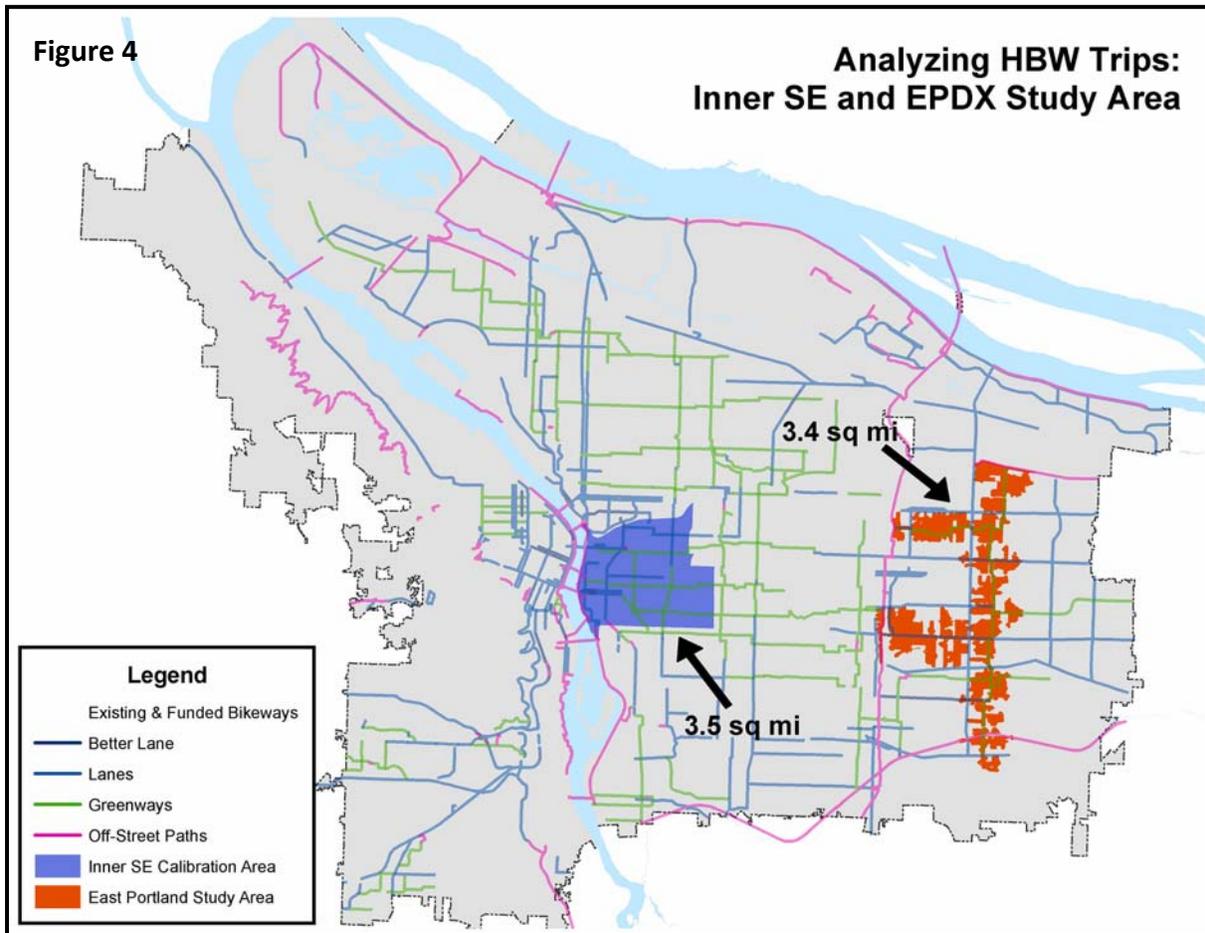
One element of this analysis not readily apparent from these graphs is the smaller population base in the East Portland area compared to the Inner SE area that can easily access the bikeway network. This is apparent when all data bicycle commute data are displayed on one graph with the same scale, as in Figure 9.

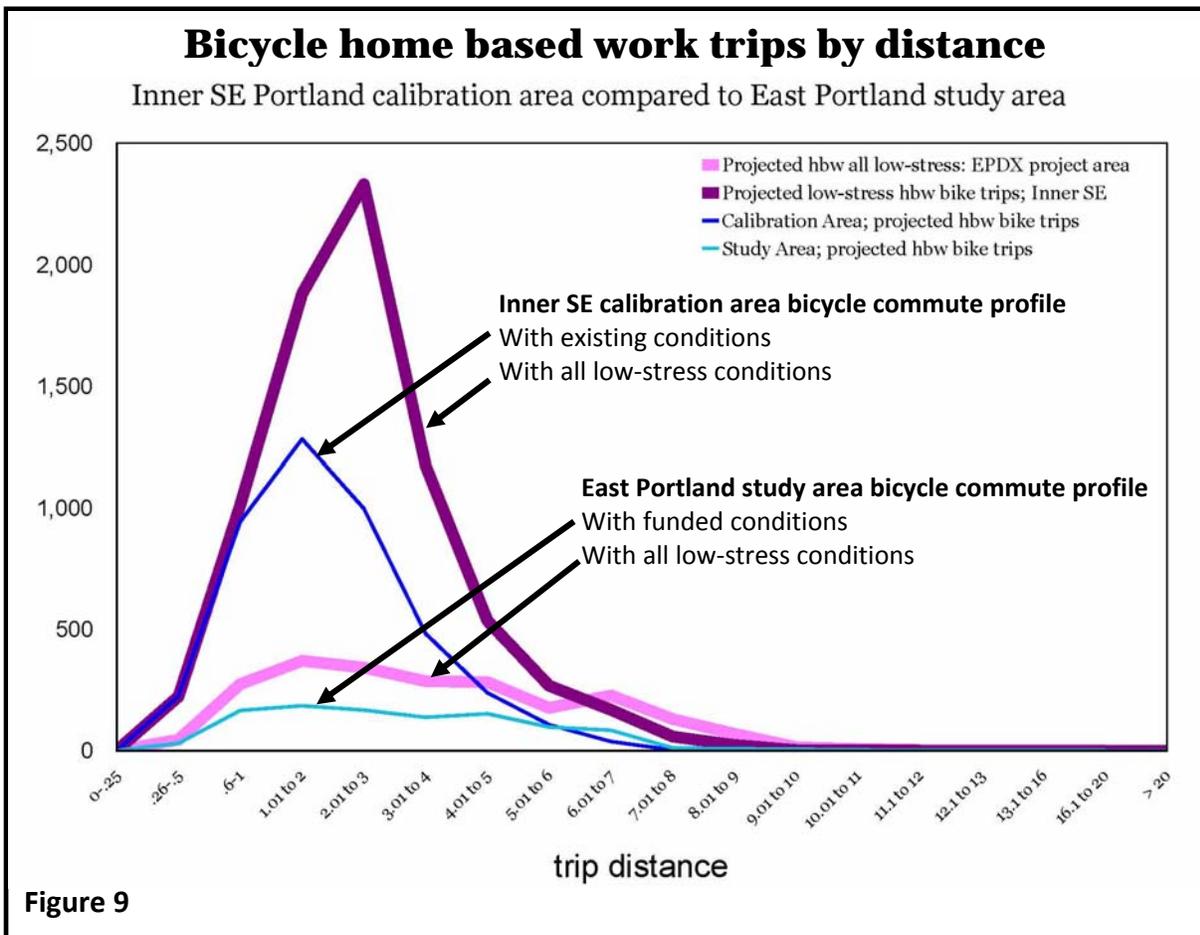
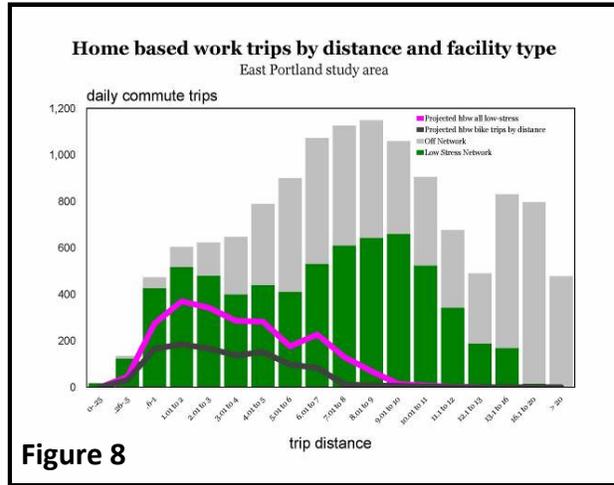
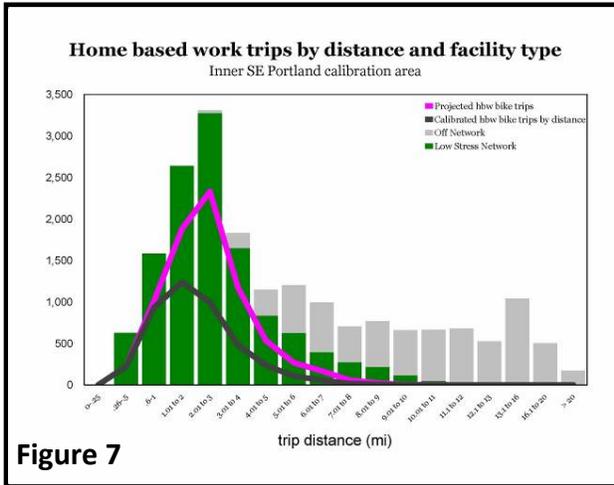
What does this analysis tell us? It tells us that:

⁶ The City of Portland and Multnomah County Climate Action Plan 2009 calls for commute mode shares of 25% for bicycling, 25% for transit and 7.5% for walking by 2030. The Portland Plan calls for the same commute mode splits by 2035. The Portland Bicycle Plan for 2030 calls for 25% of all trips to be made by bicycle by 2030.

⁷ See Appendix B for a more complete description of this analysis.

- While the potential for bicycling growth in both areas is significant, it will be easier for a higher proportion of trips to be made by bicycle in the closer-in neighborhoods than in the outer neighborhoods, principally because of trip distance, which relates to land use
- Because of higher population density and better access to the city's bikeway network, each percentage point increase in the inner neighborhoods represents more trips than it does in the outer neighborhoods, and
- A foundational element to maximizing bicycle use is to create a network of low-stress bikeways; when that occurs then potential HBW bicycle trips in both areas essentially double.

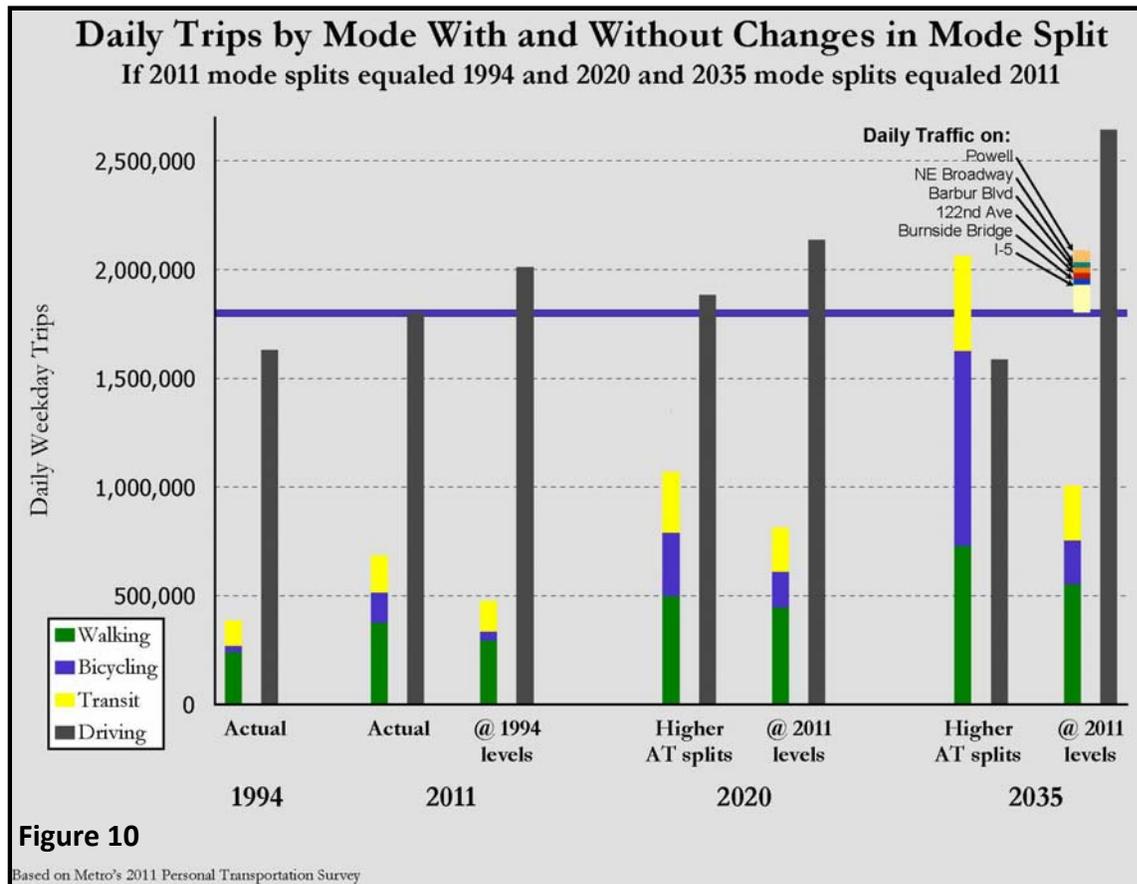




The implications of not achieving non-automotive mode splits

Because of expected population growth, the number of trips taken by Portland residents in 2035 is going to be significantly greater than in 2011. This model shows a growth from 2.5 million daily weekday trips in 2011 to 2.9 million in 2020 and to 3.6 million by 2035. Figure 10 shows the actual distribution of trips for 1994 and 2011 and the projected distributions of trips in 2020 and 2035 at the higher non-automotive mode splits projected in this paper. The graph also projects daily traffic in 2020 and 2035 under conditions in which active transportation and transit mode splits remain as they were in 2011 (identified as “@2011 levels” in the graph).

Figure 10 shows that only through significant growth in non-automotive means of transportation can city residents keep their motor vehicle miles traveled near (in 2020) or below (in 2035) levels that existed in 2011. If there is no additional change in mode split by 2035, then city streets will need to accommodate more than 1,000,000 daily weekday automobile trips in 2035 beyond what this model projects can be achieved. This is equivalent to the traffic on approximately 23 Powell Boulevards. This has significant implications for congestion, health, safety, movement of goods and greenhouse gas emissions.



Conclusion

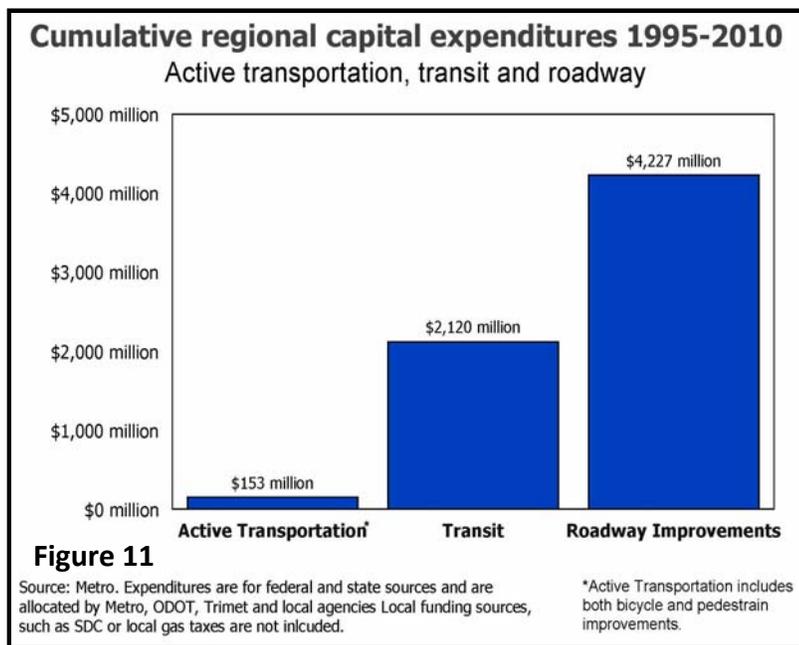
This modeling exercise demonstrates the rapid advances that occurred for both bicycling and walking, the great potential for increased growth in bicycle transportation and the costs of not achieving significantly higher non-automotive mode splits in the future.

There are three primary mobility modes planned for and funded in the City of Portland: automobiles, transit and bicycling. Of the three, increases in driving are actively discouraged by local, regional, county and state policies. Our transportation goals, as elucidated in the Climate Action Plan and Portland Plan call for an automotive mode split of 30%. The scenarios presented in this paper provide a discussion point and demonstrate one way to achieve a 43% automotive mode split by 2035. Achieving that assumes respective future growth in bicycling and walking that is 1.4 and 1.1 times greater, respectively, and in transit that is 3.4 times greater than the growth experienced by each of the modes 1994-2011.

In regard to bicycle transportation, the experience of cities around the world demonstrates that a 25% mode split is achievable with high quality bikeways that provide a comfortable and safe experience. Compared to the world's best bicycle transportation cities, Portland's bicycle network is largely substandard and incomplete. Most of that 250% growth in bicycling in Portland since 1994 occurred in the face of bicycle facilities now recognized as inadequate for most people, that fail to match best practices in bikeway design

and that do not directly serve the destinations found on most of Portland’s commercially zoned streets⁸. This is why, at 5.5% of trips city-wide, the potential for increases in bicycle transportation is largely untapped.

Will the city achieve 25% of all trips by bicycle by 2035? This paper demonstrates that there is a pathway to that goal and that there are still tremendous gains to be made in bicycle transportation. The juxtaposition of the potential for bicycle transportation together with the cumulative regional capital expenditures made in the period 1995-2010 (Figure 11) paint a clear picture about the affordability of bicycle transportation and the large return on investment it offers. In the world of non-automotive travel, bicycling is the low-hanging fruit. In order to achieve our goals for climate change, health, equity, and movement of goods we need to dramatically increase our heretofore limited investments in bicycling and active transportation.



Additional analysis/questions

How can transit achieve a 20% or 30% mode split? What would the size of the fleet need to be? What would the headways on bus routes have to be? What capital outlays would be required and what would the annual operating costs be to support such a system?

Beyond capital investments, where should the city target encouragement activities to promote active transportation and transit?

Developing a trip length profile for all trips originating in Portland would more fully flesh out the potential for active transportation.

Continuing to refine and run the Metro transportation model will also shed light on the potential for active transportation to reduce previously projected automobile trips.

⁸ The Portland Bicycle Plan for 2030 identified that most commercially-zoned roadways in Portland are not currently served by bicycle facilities. See Section 3.1.4 of the 2030 Plan (p 43) which identifies that in 2008 “only 33 percent of designated main streets in Portland’s Transportation System Plan and only 20 percent of the streets in Metro’s 2040 Growth Concept centers had a developed bicycle facility....”