Executive Summary

- Portland, Oregon was a city like any other US city in the 1980s and early 1990s in terms of transportation behavior
- It is only when Portland began investing in bicycle infrastructure that residents began to use bicycles for transportation at rates higher than the national average
- Portland’s bicycle transportation system has achieved a maturity both in terms of use and knowledge about that use that lends itself to an assessment of the role bicycle transportation can play in the transportation systems of American cities
- Portland has created conditions such that in large swaths of town bicycle use rivals transit use
- From 1990 to 2008 Portland added more daily bicycle commuters (14,912) than daily transit commuters (13,191)
- Bicycle use in Portland continues to grow geometrically while other modes either grow modestly or decline; since 1990 bicycle use has grown 400%, transit use has grown 18% and driving has declined 4%, all relative to population
- For the period 2005-2009 average city-wide bicycle commute mode split was 4.8%; in 40% of town it was 9.6%, in 30% of town it was 11.3% and in parts of town representing 20% of city residents it was 13.1%
- Since 2005-2009 bicycle use has grown another 20%
- Bicycling provides the best return on investment for transportation dollar spent in terms of providing personal mobility; in the period 1995-2010 the Portland Metropolitan region cumulatively spent $4.2 billion on roadway and freight improvements, $2.1 billion on transit improvements and $153 million on active transportation (which includes at least 50% pedestrian improvements)
- The estimated replacement cost of Portland’s entire 300+ mile bikeway network—acknowledged as the best in North America—is approximately $60 million ($2008), which is roughly the cost of one mile of four-lane urban freeway
- Complete build out of all recommended bicycle facilities in Portland—as identified in the Portland Bicycle Plan for 2030—would cost approximately $580 million and is expected to result in an minimum overall bicycle mode split of 25%
- Portland’s bicycle transportation has allowed key portal roadways into the city’s downtown to operate the same for automobiles today as they did 20 years ago, despite a 12% increased demand for mobility
- Portlanders’ use of bicycles has resulted in improved health for Portland’s population and more money remaining in the local economy
- Portland’s City Traffic Engineer states that “Bicycling infrastructure is relatively easy to implement and low cost compared to other modes. It is by far the most cost-effective way to provide for personal mobility in an urban transportation system”
- Cities across the US that are beginning to invest in bicycle infrastructure are seeing the same types of changes and benefits from which Portland has been benefiting for years
Build it and they will come
Portland Oregon’s experience with modest investments in bicycle transportation
By: Roger Geller, Bicycle Coordinator
City of Portland, Oregon

The City of Portland provides a good example of what can be achieved with modest investments in bicycle infrastructure and programs. For a small fraction of the investments made in other modes of travel, Portland has created conditions such that bicycle use rivals transit use in large swaths of town. Bicycle use continues to grow geometrically while other modes either grow modestly or decline. This report gives more credence to the pithy statements of past years that “bicycle transportation offers the best bang for the transportation buck” and that “bicycle transportation is a cheap date.” Portland’s bicycle transportation system has achieved a maturity both in terms of use and information that lends itself to a well-documented assessment of the role bicycle transportation can play in the transportation systems of major American cities. Embedded in this assessment is good data about what such systems cost—especially relative to other means of transportation—and an indication of the benefits that are realized by increasing bicycle transportation.

Perhaps more importantly, the types of changes experienced by Portland are now being seen—and documented—in cities of all sizes across North America that are beginning to make similar investments in bicycle infrastructure and programs.

Build it and they will come.
Portland was like any other US city in the 1980s and 1990s. It had very little in the way of bicycle facilities and very little bicycle use. That began to change in the mid-1990s as the city began to make modest investments in bicycle lanes, bicycle boulevards and off-street paths (Figures 1, 2, 3 and 4; all figures are displayed at the end of the document). With that investment came growing bicycle use.

Portland has measured bicycle use in various ways, most notably through the city’s annual bicycle counts.¹ More recently Portland has available data from the US Department of Commerce that accounts for commute behavior at the relatively fine level of census tracts. Formerly, this data was available only with the decennial census. However, the Census Bureau, through the American Community Survey (ACS) now reports commute data at the census tract level as a five-year average.² Figures 5, 6 and 7 display the changes in bicycle commute behavior that have occurred.

How many have come?
As Figures 5, 6 and 7 suggest, bicycle transportation grows as facilities are provided. The average city-wide bicycle mode split for the period 2005-2009 was 4.8%.³ It is instructive to dig

¹ See http://www.portlandonline.com/transportation/index.cfm?c=44671
² The most recent ACS data available presents an average for the years 2005-2009. The network shown represents that for the year 2007, the mid-point of that period.
³ That is based on this average data. City-wide ACS data for 2009 found a bicycle mode split of 5.8%, representing an increase of 20% beyond the data used in this report.
deeper into the data and look at how different parts of the city have responded to bicycle transportation.

According to the ACS data, a subset of census tracts representing approximately 40% of city commuters had a bicycle mode split of 4.5% or greater. In these areas the overall bicycle commute mode split was 9.6% for the period 2005-2009. The areas with the highest bicycle mode split—those census tracts with eight percent (8%) or greater bicycle commuters—displayed an overall bicycle commute mode split of 13.1%. This number holds for an area in which approximately 20% of the city’s commuters reside. Figures 8, 9 and 10 graphically display this data, which is also shown below in Table 1.

Table 1. Mode split by area of city (Average 2005-2009) (ACS)

<table>
<thead>
<tr>
<th>City of Portland</th>
<th>Census Data 2005-2009</th>
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<tbody>
<tr>
<td></td>
<td>City-Wide</td>
</tr>
<tr>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>Drive Alone</td>
<td>184,553</td>
</tr>
<tr>
<td>Carpool</td>
<td>28,259</td>
</tr>
<tr>
<td>Transit</td>
<td>35,916</td>
</tr>
<tr>
<td>Bus</td>
<td>30,804</td>
</tr>
<tr>
<td>Rail and other non-bus</td>
<td>5,112</td>
</tr>
<tr>
<td>Bicycle</td>
<td>14,247</td>
</tr>
<tr>
<td>Walk</td>
<td>14,653</td>
</tr>
<tr>
<td>Other</td>
<td>1,672</td>
</tr>
<tr>
<td>Worked at Home</td>
<td>17,932</td>
</tr>
<tr>
<td>Total</td>
<td>298,403</td>
</tr>
</tbody>
</table>

Excluded from table, but included in total: Taxi, Motorcycle

Notable about these sections of town is how bicycle commuting compares to transit commuting. In those parts of town where bicycle use is highest, it is rivaling transit use. Indeed, in the period from 1990-2008 the change in daily bicycle commuters citywide outpaced the change in daily transit commuters. This is displayed in Figure 11.

What has been the change?
Portland’s experience has been that bicycle use is the only transportation mode growing significantly relative to population. Relative to Portland’s population, bicycle commuting has grown more than 400% since 1990, while drive alone commuting has declined almost four percent (4%). Transit commuting increased approximately 18% relative to population during this time and walking decreased 2.5%. Though driving alone showed the largest increase in terms of numbers between 1990-2008 (see Figure 11), in terms of proportion of population driving that
represented a drop from 67.3% in 1990 to 64.6% in 2008.\[^4\] This change is shown in Figure 12, which presents a trend line graph of changes in commute mode split relative to 1996.\[^5\]

**How much has it cost?**
Investments in Portland’s bicycle transportation infrastructure have been modest. A 2009 estimate placed the replacement value of Portland’s entire bicycle infrastructure at close to the average cost of one mile of four-lane urban freeway: approximately $60 million.\[^6\]

More telling comparative expenditure data comes from the region’s metropolitan government—Metro—which serves as the region’s metropolitan planning organization and thus as the conduit for federal transportation dollars to local jurisdictions. In 2010, Metro identified that in the 15-year period from 1995-2010 the region cumulatively spent $4.2 billion on roadway and freight improvements, $2.1 billion on transit improvements and $153 million on active transportation improvements (which include both bicycle and pedestrian improvements, See Figure 13).

To get a sense of the cost effectiveness of investments in bicycle transportation, consider Figures 11 and 13 in tandem. It is also worth noting that the total estimated capitol investment needed to build out the entire bikeway network envisioned in the “Portland Bicycle Plan for 2030”\[^7\] is just under $600 million. That level of investment is expected to result in a minimum 25% overall bicycle mode split.

**It’s not about the bicycle.**
Building bicycle infrastructure is not intended to simplistically get people using bicycles. It’s about tapping into the benefits that are realized by modern cities that make bicycling a pillar of their transportation systems. These benefits include: preserving mobility and roadway capacity, strengthening local economies, improving public health, offering an affordable means of providing for personal mobility and reducing environmental threats.

**Mobility and Roadway Capacity.** Portland’s population has grown since 1990 as has economic activity in the city. These two things combined contribute to an increased demand for mobility. This has been seen on Portland’s downtown bridges, all of which are key portals into Portland’s central city. Four of these bridges have been bicycle-friendly since the early 1990s and have allowed that increased demand for mobility to be met almost wholly by the bicycle. Between 1990 and 2008 the number of vehicles on these four bridges\[^8\] increased by 12%, which is consistent with both increased population and economic activity. However, the entire increase was borne by the bicycle (which are defined as “vehicles” in Oregon). The number of motor

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\[^4\] These numbers are for those who left their homes to go to work; they do not include people who worked at home.

\[^5\] No interim American Community Survey data is available for Portland between 1990 and 1996, which is why the graph shows a comparison to 1996. In the period between 1996 to 2008 bicycle commuting increased 250%, transit commuting increased 10%, walking increased 26% and driving alone decreased 5%. This is the data displayed in Figure 12.


\[^7\] See http://www.portlandonline.com/transportation/index.cfm?c=44597

\[^8\] The Broadway, Steel, Burnside and Hawthorne bridges.
vehicles crossing those bridges has stayed essentially constant since 1990. Thus, those bridges work as well for automobiles today as they did in 1990 despite the increased demand for mobility (see Figure 14).

Economic benefit. For the Portland metropolitan region, as for many regions of the US, less driving means more money circulating through the local economy. Brookings Institute Senior Fellow (non-resident) Joe Cortright quantified the economic benefit of driving less in a report titled “Portland’s Green Dividend.” He estimates that annually $800 million that would have otherwise left the Portland region instead remains to circulate in the regional economy simply because Portlanders drive an average four miles per day less than the national average. People using bicycles as a form of transportation tend to drive much less than four miles per day less than the national average and thus—all else being equal—contribute disproportionately more to that local economic benefit than do people not bicycling.

Portland’s anecdotal experience with bicycle parking seems to support this notion. Since 2008, Portland’s previously modest investment in bicycle corrals skyrocketed to the point that there are now 64 locations with bicycle corrals on Portland streets with another 68 in the works. Bicycle corrals are locations where on-street automobile parking in commercial districts is removed in favor of on-street bicycle parking. All corrals are installed at the request of adjacent business owners and business associations. More than 100 auto parking spaces have been removed in storefront commercial districts in Portland in favor of more than 1,000 bicycle parking spaces at these 64 locations. Figures 15 displays the rise in requests for bicycle corrals in Portland.

Health benefits. The public health benefits of increased physical activity are well known. Such benefits are copiously documented in public health literature. It is for no small reason that the federal Centers for Disease Control and Prevention long ago identified that “automobile trips that can be safely replaced by walking or bicycling offer the first target for increased physical activity in communities” (Dr. Jeffrey Koplan and Dr. William Dietz, 1999 with CDC).

In addition to the direct benefits of increased physical activity, there are also benefits associated with reduced motor vehicle emissions. A 2010 report by the Health Effects Institute on traffic-related air pollution found a suggestion of a causal relationship between proximity (defined as within 300 to 500 m) to busy roads and cardiovascular mortality and a definite causative relationship between such proximity and asthma and respiratory symptoms, especially in children. They conclude that 30% to 45% of the population in large North American cities is so affected.

Cost of providing mobility. Like many North American cities, Portland expects a significant influx of new residents in the next 20 years. Metro, the regional government, projects approximately 1,000,000 more people in the seven-county Portland-Beaverton-Vancouver

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10 See http://www.portlandonline.com/transportation/index.cfm?a=250076&c=34813
11 The Health Effects Institute is a nonprofit corporation chartered in 1980 as an independent research organization to provide high-quality, impartial and relevant science on the health effects of air pollution. It receives half of its core funding from the US EPA and half from the worldwide motor vehicle industry. See http://www.healtheffects.org/
12 See http://pubs.healtheffects.org/view.php?id=334
PMSA by 2035. It is because of our experience with bicycle transportation—as displayed in Figures 5-14—that have led Portland’s City Traffic Engineer to state that “[B]icycling infrastructure is relatively easy to implement and low cost compared to other modes. It is by far the most cost-effective way to provide for personal mobility in an urban transportation system.”

It is also why Portland’s Bicycle Plan for 2030 recommends a city-wide policy that calls for the city to “create conditions that make bicycling more attractive than driving for trips of three miles or less.”

Environmental Benefit. In addition to reducing deposition of health-threatening chemicals and particulates into the air and waterways of Portland, bicycle transportation figures prominently in Portland’s plans to reduce greenhouse gas emissions. The joint City of Portland-Multnomah County Climate Action Plan 2009 recognizes that transportation contributes 38% of the county’s greenhouse gases. The plan calls for 25% of all trips in the county to be accomplished by bicycle by 2030.

Conclusion. There is nothing in the water or the air that makes Portland, Oregon different from any other American city. Prior to Portland’s investments in bicycle transportation it was mostly indistinguishable from any other American city. Everybody drove. A few people used transit. A miniscule minority rode bicycles. It wasn’t until Portland began investing in earnest in bicycle facilities in the mid-1990s that bicycle transportation began to grow.

It was the investment in infrastructure that then allowed additional (and even more modest) investments to be made in encouragement and education programs and enforcement that have allowed Portland to further leverage its investments in infrastructure.

Portland’s experience is being replicated in cities across North America. As these cities build bikeway networks bicycle transportation is increasing. The better and more connected these networks are, the more use they attract.

It is that simple: build it and they will come.

15 This minority is referred to in Portland as the “strong and fearless,” representing one of four bicycle transportation “types.” For a full discussion of the “four types of cyclists,” which is one driving factor in Portland’s bicycle transportation planning, see: http://www.portlandonline.com/transportation/index.cfm?c=44671&a=237507
“Build it and they will come”
Portland’s experience with modest investment in bicycle transportation

Figure 1. Portland bikeway network 1990

Figure 2. Portland bikeway network 2000
“Build it and they will come”
Portland’s experience with modest investment in bicycle transportation

Figure 3. Portland's bikeway network 2007

Figure 4. Portland's bikeway network existing & funded
“Build it and they will come”
Portland’s experience with modest investment in bicycle transportation

Figure 5. Bicycle commute mode split 1990

Figure 6. Bicycle commute mode split 2000
“Build it and they will come”
Portland’s experience with modest investment in bicycle transportation

Figure 7. Bicycle commute mode split 2005-2009 (ACS)

Figure 8. Census tracts with minimum 4.5% bicycle mode split (2005-2009 ACS)
“Build it and they will come”

Portland’s experience with modest investment in bicycle transportation

Figure 9. Census tracts with minimum 6.5% bicycle mode split (2005-2009 ACS)

Figure 10. Census tracts with minimum 8.0% bicycle mode split (2005-2009 ACS)
"Build it and they will come"
Portland’s experience with modest investment in bicycle transportation

Figure 11. Change in daily commute trips by mode 1990-2008

Figure 12. Change in mode split relative to 1996 (Trend Line)
“Build it and they will come”
Portland’s experience with modest investment in bicycle transportation

Figure 13. Cumulative regional capitol expenditures in transportation 1995-2010

Figure 14. Increased demand for mobility largely met by bicycles on four principal Portland bridges
Portland’s Bicycle Corrals
Installations by year

Source: City of Portland Bureau of Transportation

Figure 15. Bicycle corral installation status March, 2011
Appendix A: [July 2012 update]

Available data from the US Census Bureau’s American Community Survey provides updated information for Portland about the amount and location of commuting activity by means of transportation.

Table A-1. Mode split by area of city; 2006-2010 and 2005-2009

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<tr>
<th></th>
<th>Census Data 2006-2010</th>
<th>Census Data 2005-2009</th>
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<td>City-Wide</td>
<td>Census Tracts with</td>
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<tr>
<td>Drive Alone</td>
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<td>Carpool</td>
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<td>Transit</td>
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<td>13,901</td>
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<td>Bus</td>
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<tr>
<td></td>
<td>5,558</td>
<td>2,801</td>
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<tr>
<td>Bicycle</td>
<td>15,926</td>
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<tr>
<td>Walk</td>
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<td>Other</td>
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<tr>
<td>Worked at Home</td>
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<tr>
<td></td>
<td>305,229</td>
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Percentage of Portland Commuters:  

<table>
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<th>Census Data 2005-2009</th>
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<td>City of Portland</td>
<td>City of Portland</td>
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<tr>
<td></td>
<td>Census Tracts with</td>
<td>Census Tracts with</td>
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<tr>
<td></td>
<td>higher than 4.5%</td>
<td>higher than 6.5%</td>
</tr>
<tr>
<td></td>
<td>bicycle mode split</td>
<td>bicycle mode split</td>
</tr>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
</tr>
<tr>
<td>Drive Alone</td>
<td>184,553</td>
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<td>Carpool</td>
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<td>Transit</td>
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<td>15,416</td>
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<tr>
<td></td>
<td>5,112</td>
<td>2,336</td>
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<tr>
<td>Bicycle</td>
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<td>11,754</td>
</tr>
<tr>
<td>Walk</td>
<td>14,653</td>
<td>7,357</td>
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<tr>
<td>Other</td>
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<td>786</td>
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<tr>
<td>Worked at Home</td>
<td>17,932</td>
<td>8,491</td>
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<td>298,403</td>
<td>121,902</td>
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<tr>
<td></td>
<td></td>
<td>60,073</td>
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</tbody>
</table>

Excluded from table, but included in total: Taxi, Motorcycle
This data, which represents a summary of five year’s worth of averaged census data, is represented on the following maps as “2008”—the mid-point year. The map shows the bicycle facilities that existed in Portland in 2008.

The data shows a continuing climb in bicycle commuting, with the addition of 1,629 new bicycle commuters (more than 11% growth from the previous year). The data shows a slight decline in both drive alone and transit commute percentages and an increase in walking.

Both the tables and map show that a higher proportion of Portlanders lived in parts of town with higher bicycle commute rates in the 2006-2010 period compared to the 2005-2009 period. In the former, approximately 46% of Portlanders lived in areas where the average bicycle split was 9.6%, while 23% of Portlanders lived in areas where the average bicycle split was 13.2%. This data is shown in the four maps on the following two pages.
“Build it and they will come”
Portland’s experience with modest investment in bicycle transportation
Appendix A

Figure A-1. Bicycle commute mode split 2006-2010 (ACS)

Figure A-2. Census tracts with minimum 4.5% bicycle mode split (2006-2010 ACS)
“Build it and they will come”
Portland’s experience with modest investment in bicycle transportation
Appendix A

Figure A-3. Census tracts with minimum 6.5% bicycle mode split (2006-2010 ACS)

Figure A-4. Census tracts with minimum 8% bicycle mode split (2006-2010 ACS)