

NORTHWEST ENVIRONMENT WATCH

SPRAWL AND SMART GROWTH IN METROPOLITAN PORTLAND:

Comparing Portland, Oregon, with Vancouver, Washington, during the 1990s

By Northwest Environment Watch
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I. EXECUTIVE SUMMARY

Greater Portland sits astride the border between two states, each with its own approach to growth management. During the 1990s, the Oregon side of the metropolitan area safeguarded rural lands and “grew smart,” by encouraging compact, efficient communities. But neighboring Vancouver, Washington, and its Clark County environs, sprawled outward in car-dependent tracts. As this analysis of US Census data and satellite imagery details, few places in North America illustrate more clearly the consequences of different planning regimes.

During the 1990s:

- The population of greater Portland—which includes Multnomah, Washington, and Clackamas Counties, Oregon, and Clark County, Washington—grew faster than the population of many Third World megacities, adding 376,000 new residents during the decade for a total of just under 1.8 million. This growth overran roughly 8 acres of farmland and open space each day. It also clogged the region’s roads with worsening traffic congestion. But the paths of the Oregon and Washington parts of the metropolis diverged.
- In the Oregon counties, total population increased by 270,000, and the number of people living in compact neighborhoods (defined as 12 or more people per acre) increased by 141,000. These compact neighborhoods foster public transit and encourage shorter car trips by keeping destinations closer together. Compact neighborhoods also consume less open space per resident.
- In Washington’s Clark County, population grew by 106,000, and the number of residents in low-density, sprawling areas increased by 78,000. Per capita, Clark County converted about 40 percent more land from rural to suburban population densities than did the Oregon counties. And by the end of the period, Clark County’s residential areas had partially or fully paved over 23 percent more land per resident than the Oregon counties.
- If the Oregon counties had grown in the pattern of Clark County, suburban development would have overtaken an extra 14 square miles of farmland and open space—an area roughly twice that of Forest Park.
- The major difference between Clark County’s sprawl and Oregon’s smart growth was Portland’s growth management policies, which protect open space and foster compact communities.

II. METHODS AND ANALYSIS

To examine the consequences of differing growth-management regimes, Northwest Environment Watch (NEW) examined population and land-use trends in greater Portland between 1990 and 2000. Researchers at NEW and CommEn Space, with whom NEW contracted for GIS and remote-sensing research, analyzed data from the 1990 and 2000 US Censuses and from satellite images from NASA's Landsat. In this analysis, we define "greater Portland" as Multnomah, Washington, and Clackamas Counties in Oregon, and Clark County, in Washington. All 24 cities that make up Portland Metro—the regional planning body under Oregon law—are included in this region, as are the urban and suburban areas surrounding the Washington State cities of Vancouver, and Camas.

NEW and CommEn Space analyzed data for each census block—typically corresponding to a single city or suburban block—in the four-county region, except for small portions of Clackamas County located in US national forests. We calculated local population densities for each location by determining the population density of the smallest circle containing at least 500 residents—a proxy for a neighborhood.

NEW and CommEn Space also analyzed Landsat satellite images from 1989 and 1999 to determine the extent to which impervious surface covered the Portland-area landscape. We relied on a texture analysis of the Earth's surface from Landsat images to measure impervious surface at two thresholds: partially impervious, where roughly 15 percent or more of the landscape is covered by roads, buildings, and other hard, built surfaces; and fully impervious, where at least 80 percent of the landscape is covered by such surfaces. We spot-checked our conclusions against aerial photographs available at www.mapquest.com and confirmed that our analysis of Landsat images was reliable.

These two data sets—population and built surfaces—provided a variety of ways of measuring growth in greater Portland.

III. RAPID POPULATION GROWTH

During the 1990s, greater Portland's four counties added people at a very rapid rate: about 4 new residents every hour, or more than 100 new residents a day. Overall, the Portland region added 376,000 new residents during the decade, as the region's population swelled from 1.4 to nearly 1.8 million.

This growth translates to an annual growth rate of 2.4 percent during the 1990s—about double the US rate and faster than that of many of Third World megacities. Portland grew faster than Cairo, Egypt; Jakarta, Indonesia; and Rio de Janeiro, Brazil.¹

Table 1. Portland's annual population growth rate rivaled rates of many Third world megacities

	Annual population growth rate
New Delhi, India	3.0%
Karachi, Pakistan	2.6%
Portland, Oregon	2.4%
Jakarta, Indonesia	2.3%
Cairo, Egypt	2.3%
Tehran, Iran	2.3%
Rio de Janeiro, Brazil	1.9%
Bombay, India	1.9%
Beijing, China	1.8%

Sources: Portland population, US Census; international cities, see endnote 1.

The three counties in Oregon—Clackamas, Multnomah, and Washington—accounted for about 70 percent of the Portland area’s population growth over the decade. Clark County, Washington accounted for the remainder.

Table 2. The four counties that make up greater Portland grew by 27 percent during the 1990s

	People added 1990 to 2000	1990s growth rate
Clackamas, Ore.	59,440	21%
Multnomah, Ore.	76,394	13%
Washington, Ore.	133,888	43%
Clark, Wash.	106,484	45%
Total, greater Portland	376,206	27%

IV. COMPACT COMMUNITIES

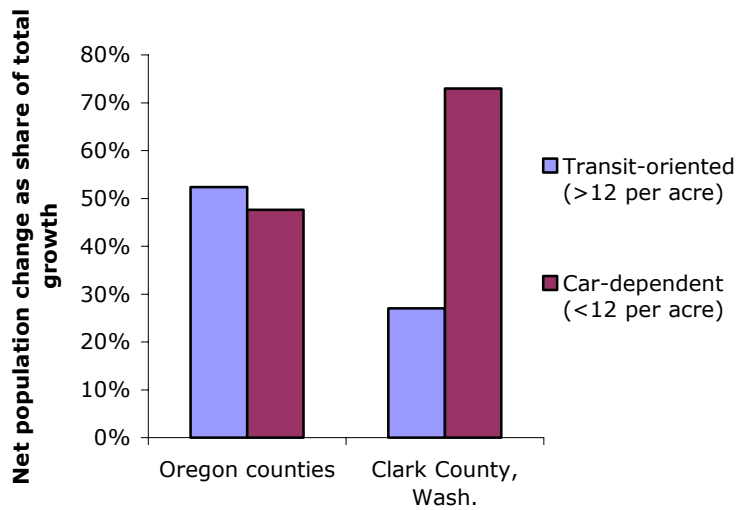
Studies of cities around the world suggest that, compared with less-dense areas, urban zones with population concentrations above 12 people per acre have dramatically higher transit ridership (which in turn makes public transit more cost-effective), lower private vehicle ownership, shorter car trips, and lower gasoline consumption. We refer to these neighborhoods as “compact,” “smart growth,” or “transit-oriented.” In contrast, in neighborhoods with fewer than 12 people per acre a car is needed for virtually every trip. Residents of such neighborhoods must drive to work, stores, and basic services, and those without access to cars are often stranded. We refer to these neighborhoods as “sprawling” or “car-dependent.”²

Compact neighborhoods also reduce the amount of land affected by impervious surfaces such as roads, rooftops, and parking lots. Impervious surface increases flooding, erosion, and sedimentation in nearby streams. It slows the recharge of underground aquifers, lowers water tables, and raises stream temperatures. These changes diminish water supply, harm water quality, and undermine aquatic ecosystems.³

Compact neighborhoods use land more intensively but pave over less of the landscape. Person for person, greater Portland's sprawling neighborhoods contained nearly three times as much land fully or partially covered by impervious surfaces as did compact neighborhoods.⁴

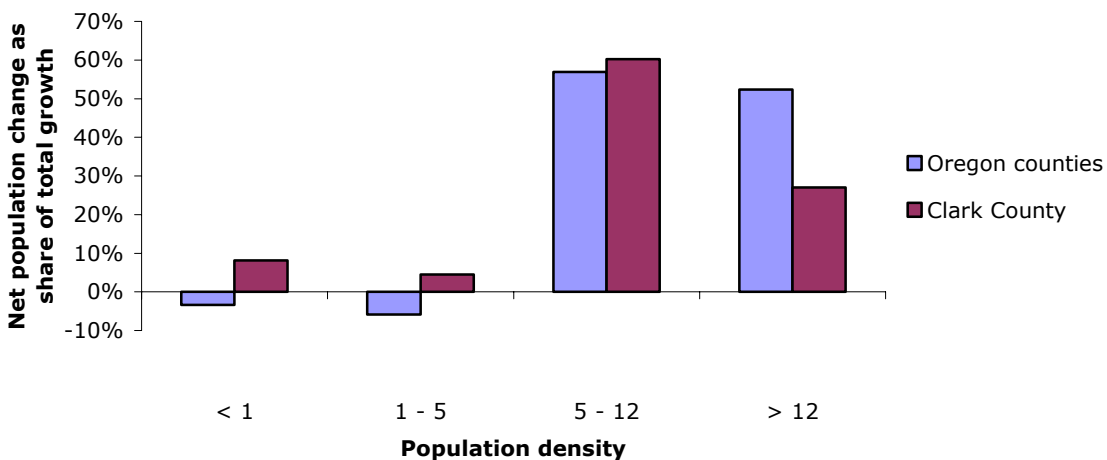
In the three Oregon counties that make up Portland Metro, total population grew by 270,000 in the 1990s, and the number of people living in compact neighborhoods increased by 141,000 (see Figure 1). About half of this growth in transit-oriented neighborhoods occurred as new residents moved in. The remainder was due to threshold effects: the addition of new residents pushed some neighborhoods above the transit-oriented density threshold. By the end of the decade, 28 percent of residents in the three-county region lived in compact neighborhoods, up from 23 percent in 1990.

Figure 1. In the 1990s, Clark County experienced rapid growth in car-dependent sprawl.



Even within the Oregon counties' car-dependent neighborhoods, population concentrations inched upward toward the threshold of 12 people per acre. The number of these counties' residents living at the low end of the density range (1 to 5 people per acre)—densities that are particularly sprawling and car-dependent—declined not only in relative but in absolute terms over the decade. So did the number of people living in exurban sprawl, where population density is below 1 per acre (see Figure 2).

Figure 2. More of the Oregon counties' growth took place in mid- to high-density neighborhoods.



Clark County showed a much different growth pattern. In the 1990s, the number of Clark County residents increased by 106,000, and the number of residents of low-density, sprawling areas increased by 77,000 (see Figure 1). Few Clark County areas rose above the 12-people-per-acre threshold as this growth took place. By 2000, about 13 percent of all Clark County residents lived in compact neighborhoods, compared with 27 percent in the rest of greater Portland. In further contrast to greater Portland's Oregon counties, in Clark

County, low-density developments boomed, adding nearly 5,000 new residents at the low end of the density range (from 1 to 5 people per acre) and 8,700 new residents at exurban densities of less than 1 per acre (see Figure 2). This sprawling growth took a toll on the landscape. Person for person, by 1999, Clark County’s residential development fully or partially covered 23 percent more land with impervious surfaces than the Oregon counties’ residential neighborhoods.

As seen in the maps that accompany this report, the differences in growth patterns are striking. The Portland metropolitan area south of the Columbia River contains substantial areas at transit-oriented densities (see Figure 3, map). Very few new residents were added in Oregon’s rural land (see Figure 4, map). In contrast, a much smaller share of Clark County’s population lives at transit-oriented densities, and the county experienced considerable growth in rural areas and sprawling suburbs (see Figure 5, map).

V. LOSS OF RURAL LAND AND OPEN SPACE

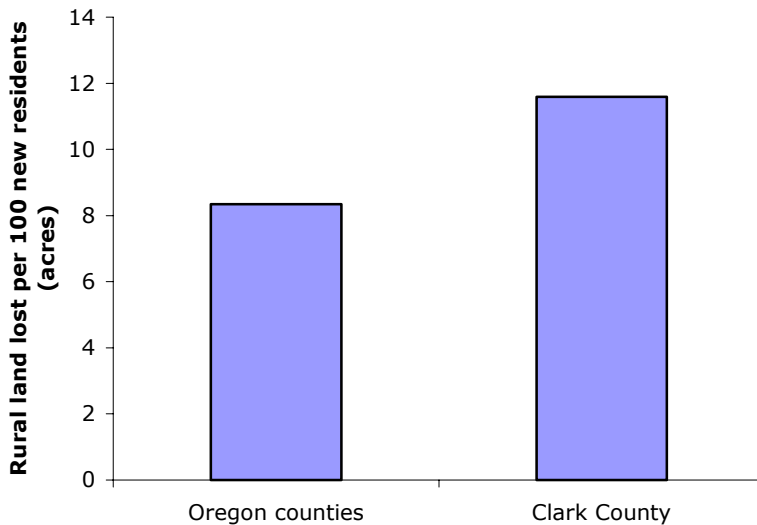
Greater Portland’s rapid population growth came at a cost. Over the decade, roughly 35,000 acres of Portland-area farmland, open space, and other rural environs were converted to urban or suburban residential development (see Table 3).⁵

Table 3. Greater Portland lost nearly 35,000 acres of rural land to suburban development.

	Rural land lost (acres)
Three Oregon counties	22,519
Clark County, Wash.	12,342
Total	34,861

But on average, the Oregon counties lost less farmland and open space to development—roughly 40 percent less per capita—than did Clark County. For every 100 new residents in Clark County over the 1990s, 11.6 acres of land changed from rural population densities to suburban or higher population densities (at least one person per acre). In the three Oregon counties, however, only 8.3 acres of rural land were converted to densities above one person per acre for every 100 new residents (see Figure 6).

Figure 6. Clark County lost 40 percent more rural land per new resident than the three Oregon counties.



If the three Oregon counties had experienced the same rate of suburban sprawl as Clark County, an additional 8,700 acres of Oregon rural land—roughly 14 square miles—would have been developed over the decade. Conversely, if Clark County’s growth had mimicked that of the three Oregon counties, approximately 3,500 additional acres of land within the county, or 5 square miles, would have remained as open space.

IV. CONCLUSION

Greater Portland’s residents lived through sweeping changes in their cities, towns, and farmlands during the 1990s. Many Portlanders have found the city’s rapid changes unsettling, and some have even blamed Portland’s growth management laws, including the urban growth boundary, for the changes.

But our analysis suggests that in the three Oregon counties, growth management softened the impact of rapid population increase in the metropolis. Portland Metro’s urban growth boundary restrained suburban sprawl, slowed the loss of rural land and open space, and provided better transportation alternatives by channeling development into compact neighborhoods that use land and urban infrastructure more efficiently. And an examination of vehicle travel in urban areas suggests that compactness does not correlate with traffic delays: indeed, more compact development may help slow the growth of congestion (see Appendix).

In contrast, Vancouver, Washington, and the surrounding towns and unincorporated areas of Clark County, grew more like greater Seattle, Washington: in scattered, low-density development that did not form cohesive communities, with larger resulting losses of farmland and open space.⁶

The principal reason for the slower pace of sprawl in Portland was that growth management laws in Oregon jurisdictions encourage compact neighborhoods, and greater Portland has been effective in implementing these policies. Unlike the Oregon counties, Clark County did not have strong or comprehensive growth management policies during the 1990s. Its growth management policies did not begin until well into the decade and remained more localized, fragmented, and weaker throughout the period.

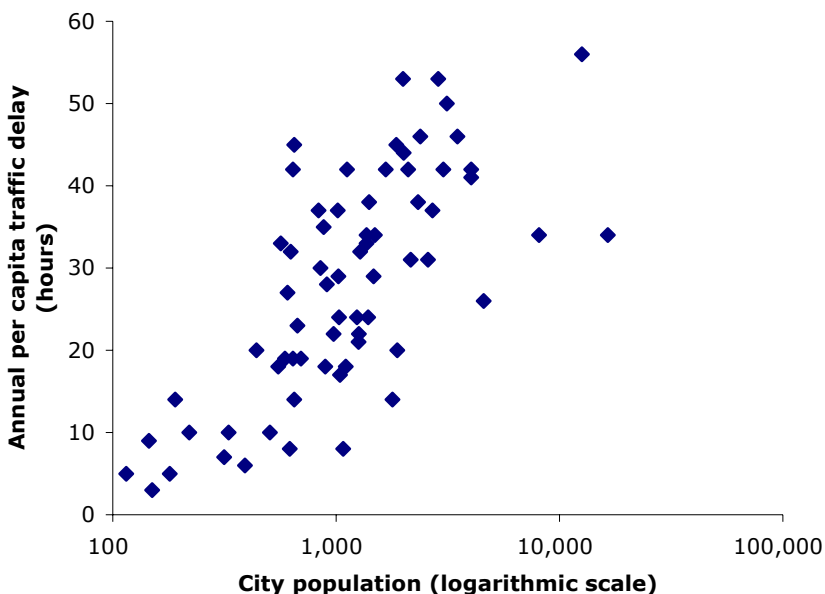
APPENDIX: POPULATION, DENSITY, AND TRAFFIC DELAYS

For some, traffic congestion and growth are virtually synonymous: burgeoning traffic is the clearest and most visible sign of an increasing population. Over time, traffic congestion has taken a larger and larger a bite out of Portland area residents' time. In 1999 the average Portland area resident spent a total of 34 hours stuck in traffic—nearly a full work week—up from 10 hours in 1987.⁷

Critics of growth management have claimed that compact development has been the driving force behind the region's traffic increases. But a comparison of data from 68 US cities suggests that traffic delays are closely tied to total metropolitan population but only weakly correlated with average metropolitan population density. Residents of cities with larger populations tend to spend more time in traffic regardless of the average residential density of the city.

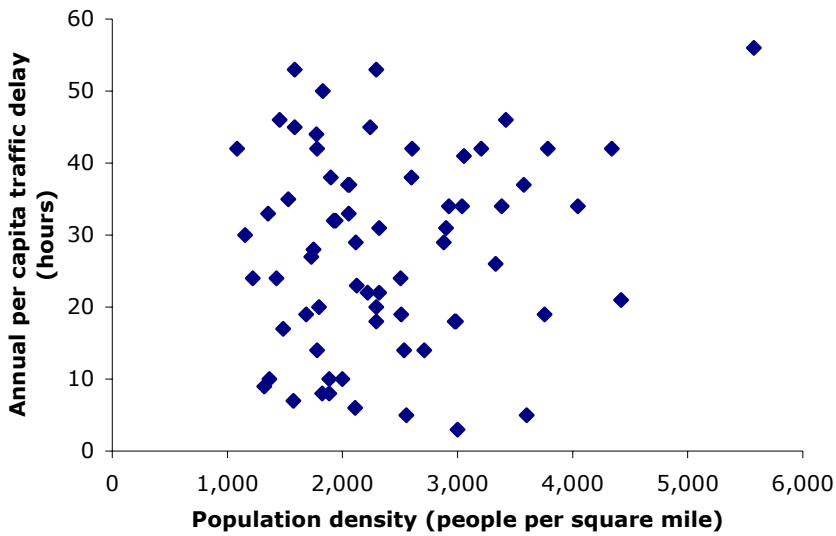
Statistically, total metropolitan population explains about 50 percent of the variation in annual per capita traffic delays (see Figure A1). Other factors, including geography and the amount and configuration of roads and intersections, explain the remaining half.

Figure A1. Population size explains about 50 percent of the variation in total traffic delay among 68 US cities.



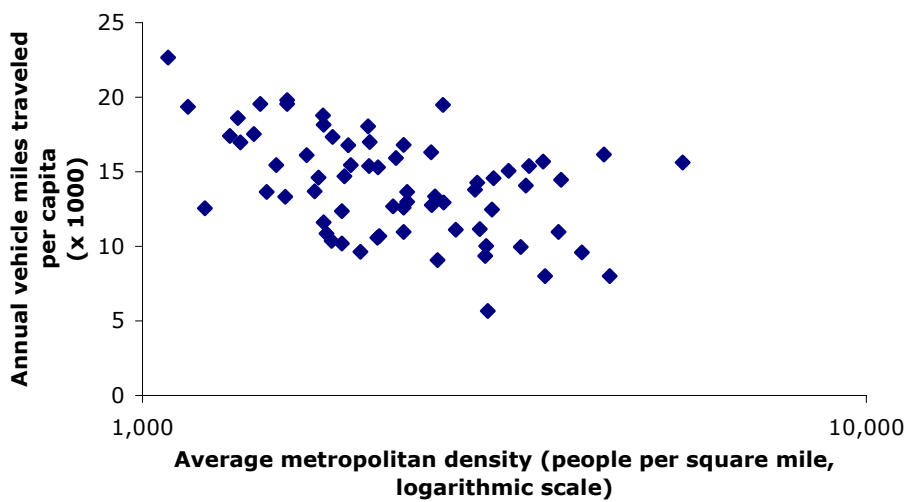
Surprisingly, traffic delays correlate weakly with average metropolitan population density (see Figure A2). In fact, more compact urban designs may slightly *decrease* per capita traffic delays, once the effects of total population are taken into consideration. Local geography and other features of metropolitan transportation infrastructure appear to have a much greater effect on travel delays than does density.

Figure A2. Virtually no correlation exists between average metropolitan density and per capita traffic delay.



One reason that density does not correlate with traffic delays is that compact communities tend to require less driving. Increased average metropolitan density correlates with reduced vehicle miles traveled per capita, though this correlation is not as strong as the relation between total metropolitan population and driving delays (see Figure A3).

Figure A3. Higher metropolitan densities reduce per capita vehicle travel.



ABOUT NORTHWEST ENVIRONMENT WATCH

Northwest Environment Watch (NEW) is a Seattle-based, nonprofit research and communication center that monitors progress toward an environmentally sound economy and way of life in the Pacific Northwest, a region that includes British Columbia, Washington, Oregon, Idaho, and adjoining parts of Alaska, Montana, and California. NEW has published 13 books since 1993; this analysis was an expansion of research completed for NEW's most recent publication, *This Place on Earth 2002: Measuring What Matters*, the first product of the group's multi-year project to develop an index of true progress for the Northwest.

Authors of the report include the four members of NEW's research team: Alan Durning, executive director; Clark Williams-Derry, research director; Eric de Place, research associate; and Dan Bertolet, research intern. Tim Schaub, CommEn Space, conducted GIS research and analysis. For more information about NEW and NEW publication, please see www.northwestwatch.org.

SOURCES

1. World city population growth rates derived from *The World Gazetteer*, "Cities and Metropolitan Areas," by country, www.world-gazetteer.com/home.htm, April 30, 2002.
2. Density thresholds from Peter W. G. Newman and Jeffrey R. Kenworthy, *Cities and Automobile Dependence* (Brookfield, VT: Gower Technical Press, 1989). These thresholds apply to urban cores and may not hold in smaller towns or isolated dense neighborhoods.
3. Impacts from 1000 Friends of Washington, "Land Use and Water Quality," www.friends.org/waterq.htm, viewed Nov. 15, 2001; and US Environmental Protection Agency, Office of Water, "Urbanization and Streams: Studies of Hydrologic Impacts," March 1998, at www.epa.gov/OWOW/NPS/urbanize/report.html.
4. The precise acreage of impervious surface in 1990 and 2000 was impossible to determine using available Landsat satellite data. Some residential areas also contained impervious surface related to industrial and commercial development, so not all impervious surface in low-density residential areas can be attributed to residential development.
5. For this report, "rural areas" are defined as those that have local population densities of less than one person per acre. "Urban and suburban" areas have local population densities of greater than one person per acre. To the extent possible, areas identified through satellite image analysis as commercial or industrial were excluded from estimates of rural land. See "Methods and Analysis."
6. See Northwest Environment Watch, *This Place on Earth 2002: Measuring What Matters* (Seattle: NEW, 2002).
7. All traffic congestion and delay data from Texas Transportation Institute, Texas A & M University, 2001 Urban Mobility Study, at <http://mobility.tamu.edu/ums/>.