Sprawl and Smart Growth in Greater Vancouver

A Comparison of Vancouver, British Columbia, with Seattle, Washington

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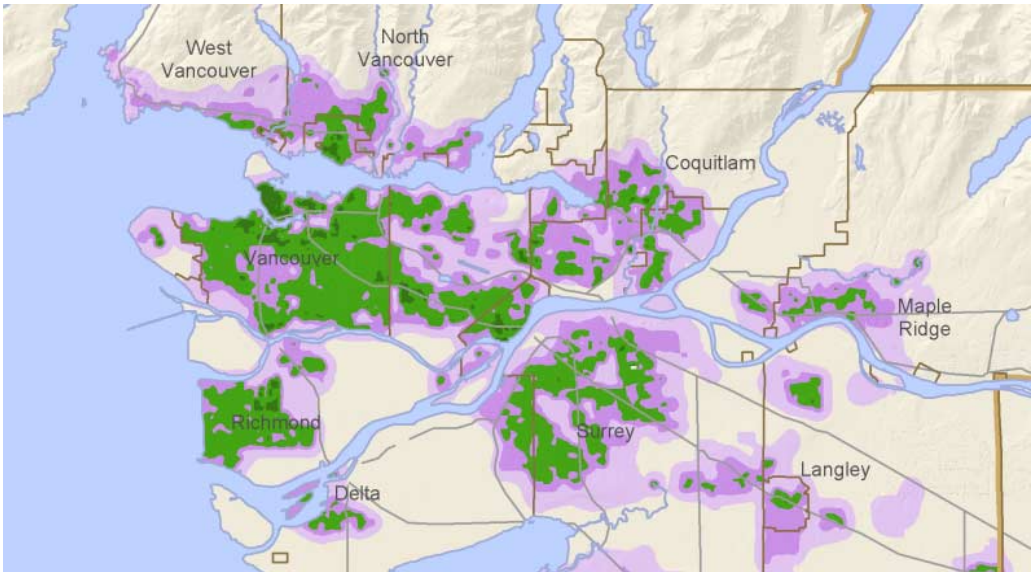
www.northwestwatch.org/press/vancouvergrowth.html



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EXECUTIVE SUMMARY

- Greater Vancouver's population increased by nearly 50 percent between 1986 and 2001, a higher annual growth rate (2.6 percent) than many developing-world megacities. This rapid growth has brought two key challenges: maintaining transportation options for an increasingly crowded region and protecting green space and farmland from runaway development.

- Greater Vancouver has met both challenges by channeling growth inward into compact neighborhoods, which consume less land and maintain more transportation options than does sprawl. Greater Seattle, in contrast, has grown outward, at the expense of both farmland and transportation choices.

- Fully 62 percent of greater Vancouver's residents now live in compact neighborhoods (defined as having 12 residents or more per acre), up from 46 percent in 1986. In contrast, only 25 percent of Seattle-area residents live in compact neighborhoods.

- Eleven percent of greater Vancouver's residents live in highly compact, pedestrian-oriented neighborhoods (40 residents or more per acre), the gold standard for compact growth.

- Not all Vancouver-area jurisdictions have been equally successful at containing sprawl. New Westminster and the cities of Vancouver and North Vancouver have done best, with between 78 and 90 percent of their residents living in compact neighborhoods in 2001; West Vancouver, Port Moody, and Langley District have lagged, with only about 25 percent of their residents living in compact communities. The metropolitan area's continued success depends on intensifying development of a few dense residential areas.

- One reason for Vancouver's success is BC's provincewide farmland protection policies, which established the Agricultural Land Reserve (ALR) in the 1970s. The ALR has protected farmland within greater Vancouver and, almost inadvertently, helped promote compact communities. In contrast, metropolitan Seattle's system for establishing land-use policies has long been more localized and, as a result, more susceptible to development pressures. Recently the BC provincial government has made changes to the Agricultural Land Commission Act that allow for more local control over farmland protection.

- Had greater Vancouver sprawled like Seattle during the 1990s, it would have developed an additional 18,000 acres—an area about four-fifths the size of Burnaby.

- Compared with greater Vancouver, greater Seattle spreads across three-quarters more land per resident. If greater Vancouver had the same overall population density as Seattle, about 650 square kilometers of additional land would be covered with suburban development—an area equivalent to all the remaining developable land in the Greater Vancouver Regional District (GVRD), plus four-fifths of the remaining agricultural land.

INTRODUCTION AND METHODS

To examine patterns of metropolitan growth in the greater Vancouver and greater Seattle areas, researchers at Northwest Environment Watch (NEW) and the nonprofit research group CommEn Space examined population trends using data from satellite images and digital mapping, as well as data from the 1986, 1991, 1996, and 2001 Canadian censuses and the 1990 and 2000 US censuses.

NEW and CommEn Space analyzed data for each city or suburban block in the Greater Vancouver Regional District, except for 1986 information on sparsely populated portions of Vancouver Electoral District A, the majority of Lion's Bay, and a small portion of Maple Ridge, for which we lacked data. We did similar analyses of greater Seattle using data from the US census. For each metropolitan location, we used a digital mapping technique to expand a circle outward from that point until the circle contained at least 500 residents (or 1,000 acres, whichever came first).[1] We then calculated the number of people per acre within that circle and assigned that density to the location at the circle's center. This measurement provides a proxy for the density of the neighborhood surrounding each location in greater Vancouver and greater Seattle.

NEW and CommEn Space also analyzed Landsat satellite images from 1987 and 1999 for greater Vancouver, and from 1988 and 1999 for greater Seattle to determine the extent to which impervious surface—roads, rooftops, and parking lots—covered the landscape. This analysis let us 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. These two data sets—population density and land covered by built surfaces—provided a variety of ways to measure growth in the two metropolitan regions.

THE CHALLENGE OF RAPID POPULATION GROWTH

Over the past 15 years, the greater Vancouver region added an average of nearly five new residents an hour. Vancouver's population swelled from 1.4 million to just over 2 million. This increase translates to an average annual growth rate (2.6 percent) higher than megacities such as Cairo, Egypt; Jakarta, Indonesia; and Rio de Janeiro, Brazil (see Table 1).[2] Greater Vancouver also grew faster over the last decade than metropolitan Seattle (1.7 percent per year from 1990 through 2000) and on a par with metropolitan Portland, Oregon (2.4 percent per year from 1990 through 2000). Although the growth rate slowed slightly after 1996—to 4.2 people per hour, down from 5.2 people per hour during the previous five years—greater Vancouver still grew at a pace that, if sustained, would double the region's population by 2038.

The challenge of rapid population growth underlines the importance of planning growth well. Typically, expanding ranks of people worsen traffic and consume more open space for urban and suburban development. If the region chooses to

Table 1. Vancouver's annual population growth rate has rivaled rates of many Third World megacities

	Recent annual population growth
Karachi, Pakistan	2.6%
Vancouver, BC	**2.6%**
Jakarta, Indonesia	2.3%
Cairo, Egypt	2.3%
Rio de Janeiro, Brazil	1.9%

Sources: Vancouver population, Census of Canada; international cities, see endnote 2.

accommodate new residents by sprawling outward, Fraser Valley farmland—the most fertile in British Columbia—could be used for a different, and permanent, crop: tracts of suburban housing. Given the speed of greater Vancouver's growth and its limited surrounding land, the region does not have the luxury of poorly planned growth. If Vancouver is to preserve farmland and improve transportation choices for residents, it has to grow smart, which means concentrating population increases in existing neighborhoods.

SMART GROWTH AND SPRAWL IN GREATER VANCOUVER

Researchers comparing 68 cities on four continents have identified population density thresholds that increase residents' transportation options. In neighborhoods with fewer than 12 people per acre, a car is needed for virtually every trip; most residents must drive to work, stores, and basic services, and those without access to cars are often stranded. We term these neighborhoods "sprawling" or "car-dependent" in this report. (Below 1 person per acre, communities are still car-dependent but are called "rural.") Above roughly 12 people per acre, public transportation becomes cost-effective. Research shows that in such neighborhoods—which we refer to as "transit-oriented"—bus ridership increases, private vehicle ownership dips, car trips become shorter, and gasoline consumption falls. Above roughly 40 people per acre—typical downtown densities—destinations are close enough together that walking and biking flourish and driving decreases substantially. In these "pedestrian-oriented" neighborhoods, as many as one-third of households do not own a car at all.[3] Together, transit- and pedestrian-oriented communities are called "compact" or "smart-growth" neighborhoods in this report (see Figure 1).[4]

Compact neighborhoods use land more intensively but pave over less of the landscape. Person for person, compact neighborhoods cover less land with impervious surfaces such as roads, rooftops, and parking lots than do more-sprawling development patterns. 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.[5]

Figure 1. Neighborhood density thresholds

Rural

Less than one person per acre: dependent on motor vehicles; developed little or at extremely low density.

Car-dependent or sprawling

1–12 people per acre: virtually all trips taken by car or private truck.

Compact or smart-growth

Transit-oriented

12–40 people per acre: driving declines; transit become viable.

Pedestrian-oriented

More than 40 people per acre: steep decline in driving and vehicle ownership; walking, cycling, and transit flourish.

Not only do compact communities help preserve more green space close to home, but they also take less of a toll on the Earth by fostering alternatives to driving and minimizing reliance on fossil fuels. In British Columbia, for example, the largest single source of greenhouse gases is fossil fuels burned by cars and trucks; reduced driving results in fewer planet-warming emissions, less air pollution, and fewer dangers to wilderness areas threatened by oil drilling.

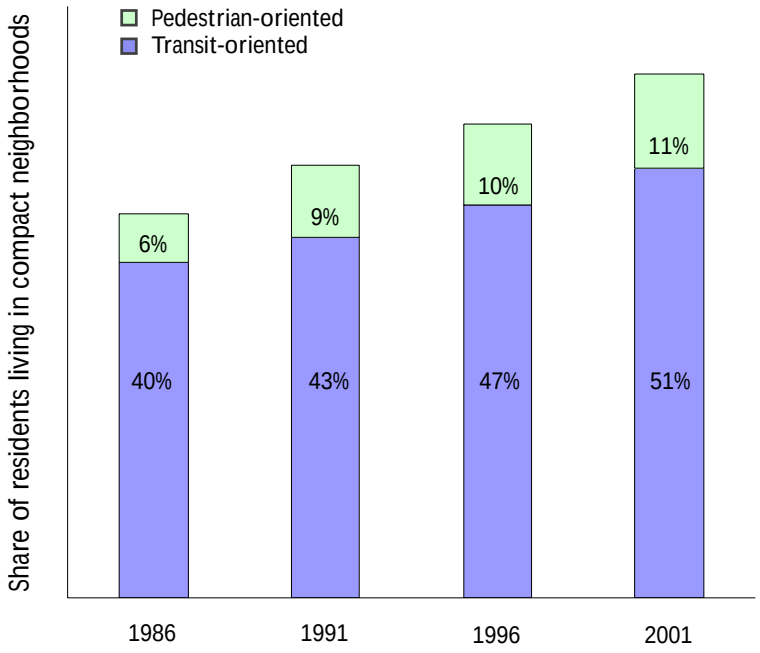
From 1986 to 2001, the population of greater Vancouver's compact communities surged, rising from 46 to 62 percent of the total (see Figure 2). Its population in car-dependent neighborhoods, meanwhile, actually shrank. During the period, the population living at pedestrian-oriented densities in greater Vancouver increased from 6 to 11 percent of all metropolitan residents, while the share living at transit-oriented densities increased from 40 to 51 percent. About three-fourths of the growth in compact neighborhoods occurred as new residents moved into neighborhoods that were already compact. Threshold effects caused the remainder: the addition of new residents lifted some neighborhoods above the 12-people-per-acre threshold.

Developing more pedestrian-oriented neighborhoods is one key to further success in Vancouver's quest to protect open space and provide transportation choices

Greater Vancouver did slightly better at channeling its development into compact neighborhoods between 1996 and 2001 than during either of the previous two five-year periods (1986–91 and 1991–96). But it did better at channeling development into pedestrian-oriented, as opposed to transit-oriented, development between 1986 and 1991 than during the subsequent two periods. Developing more pedestrian-oriented neighborhoods is one key to further success in Vancouver's quest to protect open space and provide transportation choices.

The share of greater Vancouver residents living in compact communities contrasts sharply with Seattle. In greater Seattle roughly a quarter of residents lived in compact neighborhoods in 2000—well under half the share of residents living at such densities in greater Vancouver. In fact, greater Vancouver's development pattern is beginning to resemble that of cities laid out before ownership of automobiles was widespread—a remarkable accomplishment for a relatively young city such as Vancouver.

Figure 2. More than three out of five greater Vancouver residents now live in compact neighborhoods



Despite greater Vancouver's overall achievement, different municipalities have not been equally effective at concentrating growth in compact neighborhoods. At 90 percent, the city of Vancouver had the largest share of residents in compact neighborhoods in 2001. North Vancouver, New Westminster, White Rock, Richmond, and Burnaby followed, at 70–80 percent each. Most sprawling were Port Moody, West Vancouver, and Langley District, where about three-fourths of residents lived in car-dependent neighborhoods (see Table 2).

The gold standard in compact growth is pedestrian-oriented neighborhoods, because they bring the steepest reductions in driving and the largest savings of land. Leading in this regard, New Westminster, North Vancouver, and Vancouver each housed 20 to 30 percent of their residents in neighborhoods with pedestrian-oriented densities, but no other municipalities except Burnaby and Richmond logged even double-digit figures. For pedestrian-oriented populations, New Westminster was the most improved city in the area; it raised its pedestrian-oriented share by 17 percentage points over the past 15 years.

The most improved municipality overall since 1986 was Pitt Meadows, which had no residents in compact communities in 1986 but had clustered together 42 percent of its people into such neighborhoods by 2001. Least improved was West Vancouver, which still has few compact neighborhoods (see Table 3).

Of course, compact growth does not by itself guarantee better transit or walkable neighborhoods. A community can have a large share of residents living at transit-oriented densities but still lack an effective transit system. Reducing car

Table 2. Share of residents in compact neighborhoods by municipality or district*

Municipality/ District	Compact (total)	Transit-oriented	Pedestrian-oriented
Vancouver	90%	67%	24%
North Vancouver City	80%	51%	29%
New Westminister	78%	51%	27%
White Rock	78%	75%	2%
Richmond	76%	64%	12%
Burnaby	70%	57%	13%
Port Coquitlam	53%	52%	0%
Surrey	48%	48%	1%
Delta	47%	45%	2%
Coquitlam	43%	39%	5%
Pitt Meadows	42%	42%	0%
Langley	42%	38%	3%
North Vancouver District	29%	25%	4%
Maple Ridge	29%	26%	2%
Port Moody	26%	26%	0%
West Vancouver	23%	22%	0%
Langley District	22%	21%	1%

**Numbers shown in these tables were rounded to the nearest whole number*

Table 3. Pitt Meadows showed the largest 15-year gain in compact neighborhoods

	Share of residents in compact neighborhoods				Total increase
	1986	1991	1996	2001	1986–2001
Pitt Meadows	0%	8%	25%	42%	42%
Port Coquitlam	15%	16%	44%	53%	37%
Surrey	15%	24%	36%	48%	34%
Maple Ridge	4%	12%	18%	29%	24%
Burnaby	46%	58%	63%	70%	24%
Richmond	52%	68%	74%	76%	24%
Delta	25%	34%	41%	47%	22%
Langley District	0%	7%	15%	22%	22%
Port Moody	6%	21%	21%	26%	20%
White Rock	59%	63%	63%	78%	19%
Coquitlam	24%	27%	34%	43%	19%
Langley	25%	34%	37%	42%	17%
North Vancouver District	13%	15%	20%	29%	16%
North Vancouver City	65%	72%	75%	80%	15%
New Westminster	67%	70%	76%	78%	11%
Vancouver	83%	87%	89%	90%	8%
West Vancouver	17%	18%	18%	23%	6%

dependence requires a variety of complementary strategies, including effective planning, sufficient funding for transit, and measures to encourage mixed residential and commercial land uses. Still, creating compact communities is a key first step to reducing residents' dependence on cars.

With a limited land base and a population that's expected to grow steadily for decades, greater Vancouver confronts a large but not insurmountable challenge. Growth need not mean sprawl: growth can even bolster transportation alternatives if it is concentrated in pedestrian-oriented zones. The metropolitan area could add another million residents without developing any new rural land by accepting modest increases in density in existing car-dependent and transit-oriented neighborhoods (adding 2.5 people per acre across the metropolitan region) and dedicating just 5 percent of current lower-density residential areas to new pedestrian-oriented neighborhoods. The alternative to such infill development is to sprawl across open space and farmland, which, as described in the next section, is the course that Seattle has followed.

LOSS OF RURAL LAND AND OPEN SPACE: A COMPARISON WITH SEATTLE

To gauge the long-term effects of land-use policies in greater Vancouver on the region's development, one need look no further than metropolitan Seattle. In many ways, the two cities present a natural experiment on the effects of growth management policies. In both cities, growth has been constrained by geographic barriers: Lake Washington and Puget Sound in Seattle, Georgia Strait and the North Shore mountains in Vancouver. Both cities are adjacent to fertile agricultural land. Both have experienced tremendous population growth over the last three decades.

But the metropolitan areas differ in two key ways. First, greater Seattle has several major highways that promote car dependence and development on the urban fringe, while greater Vancouver has not constructed a major freeway system. Second, metropolitan Seattle has had no equivalent to British Columbia's Agricultural Land Reserve, the strict provincial farmland protection law passed in the early 1970s, or the GVRD's Green Zone, which, in the mid-1990s, consolidated planning for greater Vancouver's parkland and open space. These policies, reinforced by other measures at the local, regional, provincial, and even federal levels, have helped to curb suburban sprawl and to channel development into compact neighborhoods.

Greater Seattle's protections for farmland and rural open space have been weak, uncoordinated, and predominantly driven by local politics, rather than state or regional concerns. Various farmland easement programs, both public and private, have protected parcels of farmland in the Puget Sound area, and Washington's Growth Management Act may have slowed the loss of farmland after the mid-1990s. But for most of the past three decades, local zoning commissions have overseen development of the Seattle region's farmland, and all too often they allowed, and even encouraged, car-dependent growth.[6]

These policies have etched themselves on the landscape in sharply contrasting patterns. Greater Vancouver has grown in large, contiguous transit-oriented neighborhoods punctuated by a few sizable pedestrian-oriented zones and surrounded by fringes of car-dependent sprawl (see Map 1). Greater Seattle has developed in vast expanses of sprawl. Transit-oriented pockets emerged here and there, but these compact neighborhoods were scarce and fragmented, and thereby less effective at tempering dependence on the automobile (see Map 2). (Also see animated maps online, showing population density changes in the two cities at *www.northwestwatch.org/press/vancouvergrowth.html.)*

Differences in growth patterns between Seattle and Vancouver are readily visible but challenging to quantify. One proxy for the amount of land affected by new development is the rising density of residential population at each site. As census enumeration areas cross the population threshold from "rural" to suburban, or "car-dependent," we can presume some degree of development.[7] Analysis by this method suggests that greater Seattle's development in the 1990s overran roughly twice as much land per new resident as did greater Vancouver's.[8]

If Vancouver had grown like Seattle over the last decade, data suggest it would have converted approximately 18,000 additional acres—an area equivalent to about one-eighth of the Agricultural Land Reserve within greater Vancouver, or to about four-fifths the size of the city of Burnaby—to sprawling suburban development.

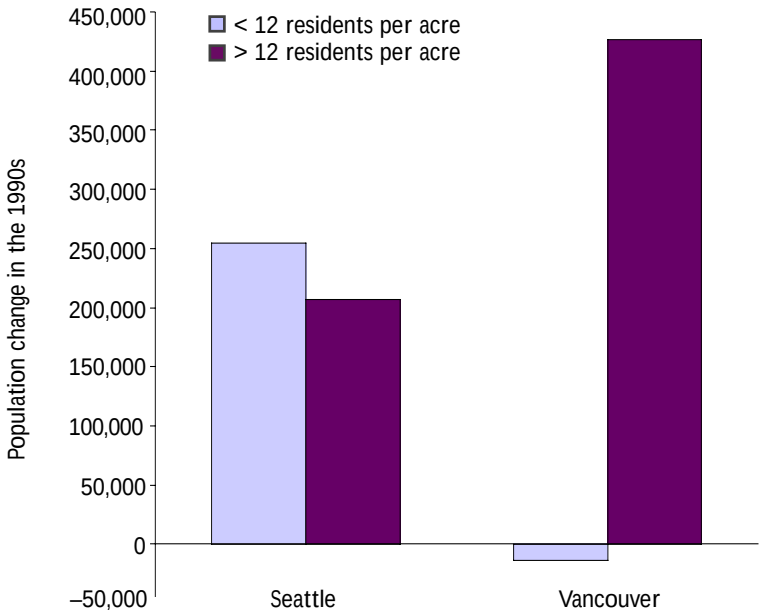
These estimates are supported by measures of new impervious surfaces—roads, rooftops, and parking lots—derived from satellite data. From the late 1980s through the late 1990s, greater Seattle's new impervious surface affected at least four times as much of the landscape as did greater Vancouver's. Although land may have been paved more intensively in Vancouver, Seattle's new roads and buildings were spread over a much larger area. Furthermore, much of the new pavement in Seattle was at the suburban fringe—taking the form of scattered, sprawling development—whereas new pavement in Vancouver typically filled in or was adjacent to existing developed areas (see Maps 3 and 4).

If Vancouver had grown like Seattle over the last decade, it would have converted approximately 18,000 additional acres to sprawling suburban development

When one compares growth rates in sprawling neighborhoods and suburbs, the differences in growth patterns become even more evident. The share of greater Seattle's residents living in transit- or pedestrian-oriented communities grew from 21 percent in 1990 to 25 percent in 2000, an increase of 4 percent. This modest increase was about the same in outcome and pace of improvement as in Port Moody, one of GVRD's least-successful smart-growth practitioners.

The share of greater Vancouver's residents living in compact neighborhoods grew nearly three times as fast, from 51 percent to 62 percent during the 1990s. Vancouver started the decade with more residents in compact communities than Seattle and extended its lead, increasing the number of residents living in compact communities by over 400,000 while seeing a 13,000-person decline in residents living at sprawling densities. Greater Seattle, in contrast, had more growth in car-dependent neighborhoods than in compact communities (see Figure 3).

Figure 3. Greater Vancouver saw tremendous gains in compact neighborhoods



Over time, greater Vancouver's land-use policies have conserved enormous amounts of agricultural land and open space. Per capita, urban and suburban development occupies nearly three-quarters more land in the Seattle area than in the Vancouver area. Had greater Seattle's overall development patterns been the norm in greater Vancouver, about 650 additional square kilometers would be covered by suburban sprawl. More concretely, if Vancouver had grown the way Seattle did over the last century, all remaining developable land in greater Vancouver, along with four-fifths of the remaining agricultural land, would be covered with tracts of suburban housing.[9]

CONCLUSION

Greater Vancouver's land-use policies, including the provincial Agricultural Land Reserve, have restrained suburban sprawl, slowed the loss of rural land and open space over the last 30 years, and made transportation alternatives viable by channeling development into compact neighborhoods. Seattle's historically weaker, locally controlled zoning protections for agricultural land have led to rampant car-dependent sprawl and attendant losses of rural land and open space on the metropolitan fringe.

Metropolitan Vancouver can do better still if it holds the line on conversions of rural land and concentrates new development in dense, pedestrian-oriented neighborhoods. Growth that emulates the city of North Vancouver, rather than the district of Langley, for example, would occupy about a quarter as much of the landscape, while channeling nearly four times as many residents into transit- or pedestrian-oriented communities.

Earlier this year, BC's provincial government localized some control over the agricultural land reserve. If Seattle's experience is any guide, a more decentralized system of land-use controls will make it even more necessary for local governments to make wise and informed choices about the region's agricultural lands. Greater Vancouver's successes so far have resulted from conscious decisions at the local, regional, and provincial levels to protect farmland, limit sprawl, and minimize the amount of land consumed by suburban development. What happens next is up to the people of greater Vancouver.

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's research programs are focused on two efforts: to monitor the Northwest's progress toward sustainability and to identify the most important reforms for the region to implement. This report expands on research completed for NEW's most recent publication, *This Place on Earth 2002: Measuring What Matters,* the first product of the group's multiyear project to develop an index of true progress for the Northwest.

Authors of the report include Alan Durning, executive director; Clark Williams-Derry, research director; Eric de Place, research associate; and Dan Bertolet, research intern. Tim Schaub of CommEn Space, Seattle, conducted geographical information system (GIS) research and analysis. For more information about NEW and NEW's publications, please see *www.northwestwatch.org*.

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ABOUT SMART GROWTH BC

Smart Growth BC is a province-wide nongovernmental organization with a mission to create more livable communities. Working with community groups, businesses, and local governments, the organization promotes compact and complete communities, sustainable transportation, affordable housing, protection of agricultural land and greenspace, efficient use of infrastructure, and more-effective citizen engagement.

NOTES AND SOURCES

1. Locations within census enumeration areas or "blocks" identified as having no residents are assigned a population density of zero, regardless of the density of adjacent areas.

2. 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.

3. Relationship between density thresholds and transportation modes 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.

4. Though there is no single, universally recognized definition of "smart growth," the term typically refers to areas that have compact residential densities, a mix of commercial and residential land uses, and preserved open spaces and that use transportation and other municipal infrastructure efficiently. In this report, "smart growth" has a more limited meaning, referring only to areas with compact residential development without regard to whether other features associated with "smart growth" are present. Compact residential development is a necessary precondition for cost-effective public transit and locally supported stores, but compactness does not by itself guarantee that an area possesses all the features ascribed to "smart-growth" development.

5. 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*.

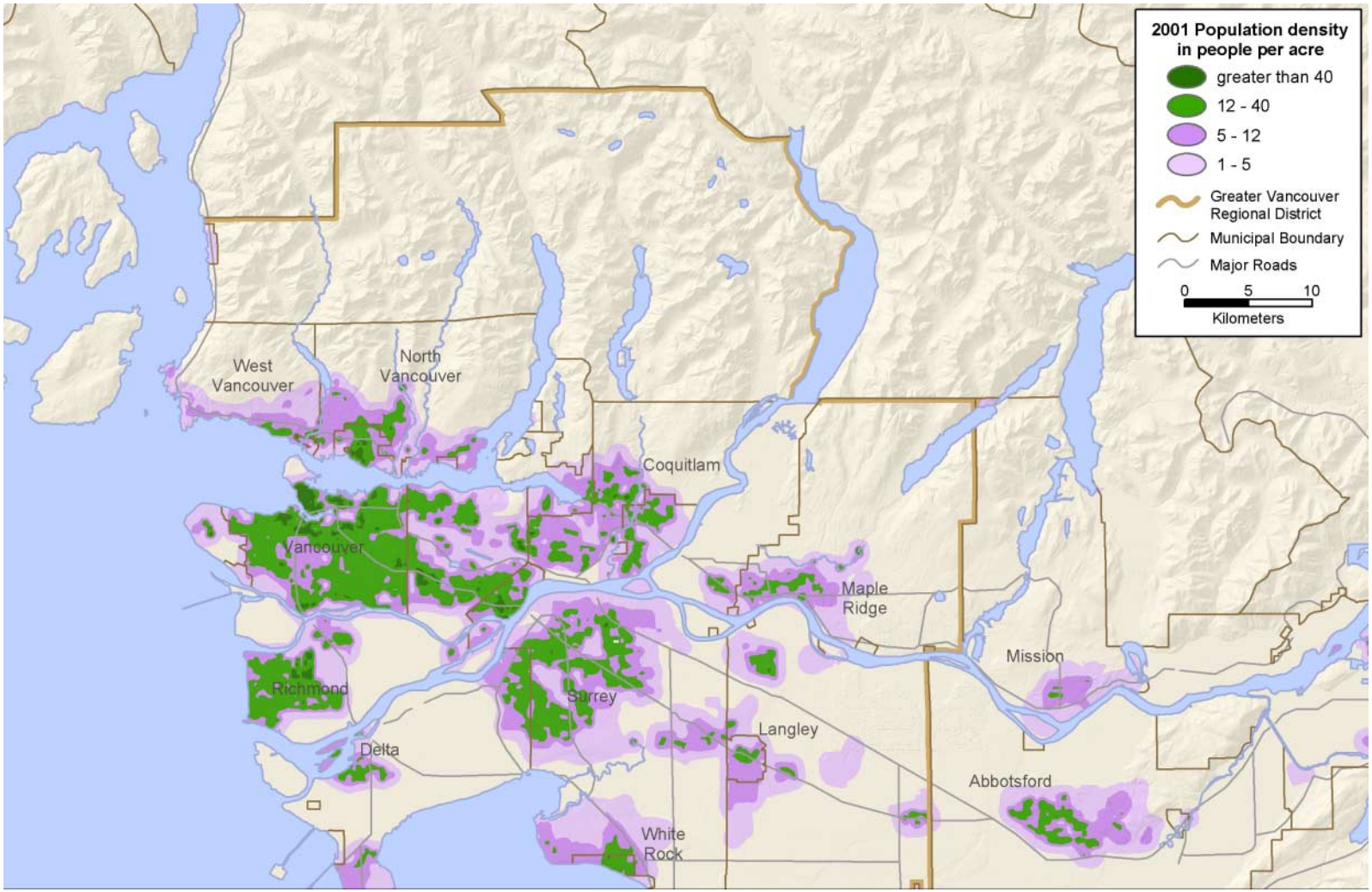
6. Zoning commissions' acceptance of farmland losses and effects of farmland easements and Growth Management Act from Don Stuart, American Farmland Trust, Pacific Northwest Regional Office, private communication, June 26, 2002, and Tim Trohimovich, 1000 Friends of Washington, private communication, June 28, 2002. Farmland easements and Growth Management Act effects also from Rich Hines, American Farmland Trust, Pacific Northwest Regional Office, private communication, June 20, 2002; and Judy Herring, King County Farmland Preservation Program, private communication, June 20, 2002.

7. For this report, "rural areas" are defined as those having local population densities lower than one person per acre. "Urban and suburban" areas have local population densities higher than one person per acre. Small amounts of land in the region may be identified as having "rural" density even if used for commercial or industrial purposes.

8. For this analysis, greater Vancouver is defined as the Greater Vancouver Regional District (GVRD), which had a population of roughly 2 million in 2001 and a population increase of 413,000 over the preceding decade. Greater Seattle, which is defined as those portions of King, Snohomish, and Pierce Counties, Washington, that are pictured in Maps 2 and 4, had roughly 3 million residents in 2000 and a population increase of 461,000 over the preceding decade. In greater Seattle, the amount of land in census blocks with at least one person per acre (suburban densities or greater) increased by roughly 43,000 acres during the 1990s. In greater Vancouver, this increase was 20,500 acres. By this measure, greater Seattle's development covered roughly twice as much land per new metropolitan resident over the decade as did greater Vancouver's. This estimate may be conservative: census blocks are the smallest areas for which census data are tabulated, so some newly developed blocks—particularly in commercial areas or large-lot residential development—might be typically described as suburban but not register as having been developed over the decade. By a slightly more expansive definition of suburban land, to include areas where the average population density of a circle containing at least 500 residents exceeds one person per acre (see "Introduction and Methods"), new development consumed roughly 59,000 acres of previously rural lands in greater Seattle over the decade but only 22,000 acres in greater Vancouver. By this gauge, greater Seattle's sprawling development overran about 2.4 times as much land as did Vancouver's during the 1990s. The rapid loss of farmland in the Puget Sound region (41,000 acres, or 21 percent of the total, in King, Pierce, and Snohomish Counties from 1987 through 1997) is consistent with rapid suburban development of rural land in greater Seattle. Farmland losses from US Dept. of Agriculture, National Agricultural Statistics Service, "1997 Census of Agriculture," *www.nass.usda.gov/census/.*

9. Remaining vacant urban land from "Livable Region Strategic Plan: Part One," Greater Vancouver Regional District, at *www.gvrd.bc.ca/services/growth/lrsp/lrsp_toc.html*. Area of Agricultural Land Reserve within GVRD from 2001 Annual Report, Livable Region Strategic Plan, Policy and Planning Department, Greater Vancouver Regional District, December 2001, p. 4.

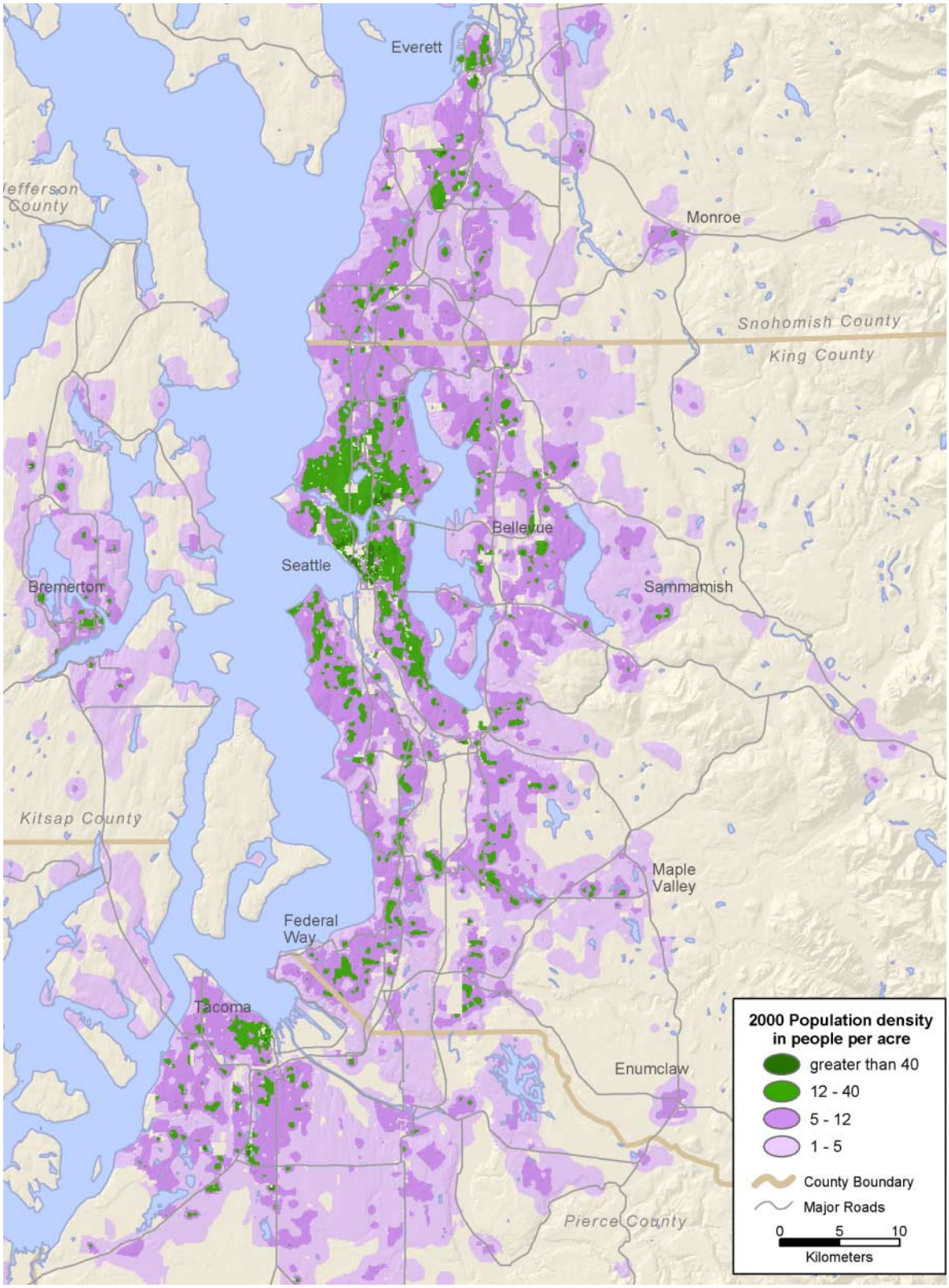
Map 1. Sixty-two percent of greater Vancouver residents lived in compact neighborhoods in 2001, up from 46 percent in 1986



Map and analysis by CommEn Space, *www.commenspace.org*

Northwest Environment Watch 2002, *www.northwestwatch.org*

Map 2. Only 25 percent of greater Seattle's residents lived in compact communities in 2000



Map and analysis by CommEn Space, *www.commenspace.org*

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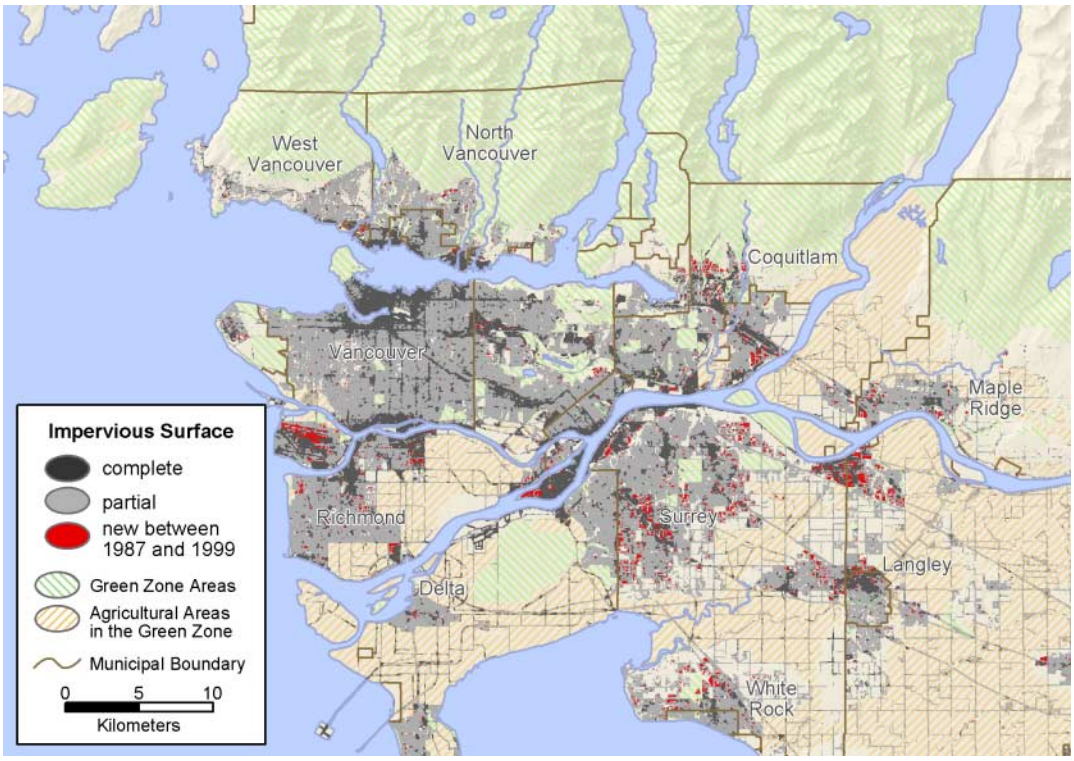
Map 3. New pavement in greater Vancouver typically filled in or was adjacent to existing developed areas



Map and analysis by CommEn Space, *www.commenspace.org*

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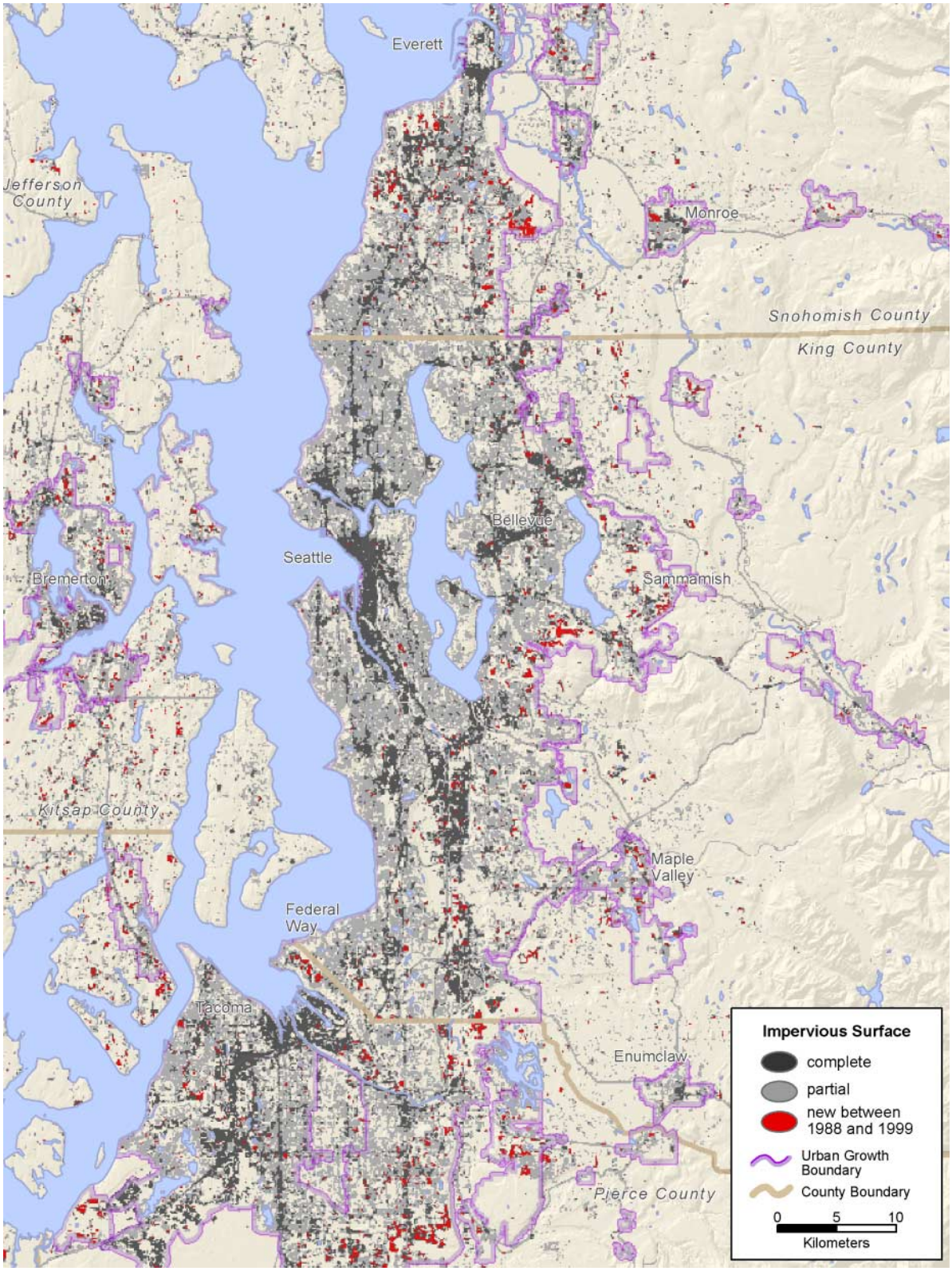
Map 4. In greater Seattle, much of the new pavement was at the suburban fringe



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