

**PORTLAND'S WORKING RIVERS:
The Heritage and Future of Portland's Industrial Heartland**



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EXECUTIVE SUMMARY

Portland is one of a handful of U.S. cities whose riverside location is nearly as important to prosperity and growth today as it was a century ago. The water, rail and energy complex that converges around the lower Willamette River has long supported several industrial sectors, especially primary metals, machinery and equipment manufacturing, distribution and logistics.

Unfortunately, however, the vast majority of the general public isn't familiar with Portland's industrial heart – its history, its function, its importance. If there is a public image of Portland's working waterfront and heavy industry, it tends to be about problems, such as the Superfund designation or the environmental costs of maintaining the navigation channel.

This report traces the stages of development of Portland's industrial heartland and industrial mix, identifies current issues and places Portland in a comparative context. The report touches on:

- Portland's strategic location at the intersection of the Columbia River Valley and the Puget-Willamette Trough.
- The growth of various sectors in Portland: lumber and wood products, agricultural processing, metals and machinery, and electronics.
- Recognition of how the natural river can live in concert with the commercial and industrial uses on the river.
- How Portland's economy is supported by river-dependent and transportation-oriented businesses.
- Trends in the region's industrial land preservation and the working waterfront.
- Considerations as Portland plans for the future of its harbor and industrial areas.

The report concludes by offering specific recommendations for planners, governments, employers, investors and the general Portland populations, including some of the following:

- The public sector should continue to recognize the importance of Portland's industrial heart with supportive land use regulations and protections.
- Portland needs to take extreme care and caution before determining that industrial land is no longer viable for industrial uses.
- It is vital to protect and enhance this transportation infrastructure as an economic asset that would require billions of dollars to replace or reproduce, and to promote public awareness of its value.
- Public agencies and private organizations that promote sustainable development have an opportunity to increase their effectiveness by taking advantage of a supportive industrial base.

- As private activity increases in the first decade of the 21st century, it is important to keep the industrial economy on the public agenda.
- Deliberate efforts to maintain this diversification by supporting the continued development of the waterfront transportation/industry complex should be a central element of all regional planning and development efforts.

Historically, Portland has been committed to investing in its working waterfront and industrial complex. Moving forward, the community should remain committed to preserving the resources the city has built over the last hundred years.

PROTECTING PORTLAND'S INDUSTRIAL HEARTLAND

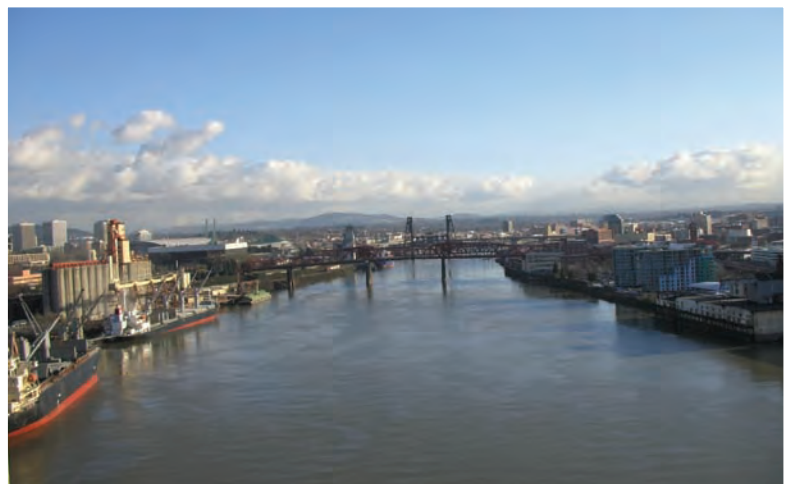
There's a common sentiment with regard to real estate: "They're not making any more land." It is even truer that "They're not making any more rivers."

It's a thought that everyone in Portland should keep in mind. Most cities grew originally because of access to water transportation, whether ocean harbors or navigable rivers. Portland is one of a handful where the riverside location is nearly as important to prosperity and growth as it was a century ago. Rivers are many things: ecological systems, recreational opportunities and real estate amenities. The Willamette and Columbia rivers are all of these, but they are also essential parts of the working economy of the Portland-Vancouver metropolitan area.

Closely tied to the rivers are the city's workhorse railroads, which sought vital connections to river commerce from their beginnings in the 1870s. Because the Columbia River cuts a relatively easy route eastward, Portland has been a natural rail center that pulls freight for eastern markets from Puget Sound as well as the Willamette Valley. The president of Portland and Western Railroad, which serves much of the Portland harbor, has commented that "industrial land with rail access is also a finite resource." With a few exceptions (like the enormously expensive Alameda Corridor in Los Angeles), the railroad-building era in the United States ended two generations ago, so it's also true to say that they're not really making any more rail-industrial land.

The water/rail/energy complex that converges around the lower Willamette has long supported several industrial sectors, especially primary metals, machinery and equipment manufacturing, and distribution and logistics. These industries have one foot planted solidly on the waterfront, but have also thrived in other industrial areas such as northern Clackamas County and the Columbia Corridor, where companies have also depended to varying degrees on river and rail transportation. To talk about an industrial heartland is to look simultaneously at place and an intertwined set of industries.

This report takes Portland's working waterfront, with its tens of thousands of jobs and its thick infrastructure of transportation facilities, as a starting point. It traces stages in the development of Portland's industrial heartland and industrial mix, identifies current issues and places Portland in comparative context with similar cities.



Portland, like most cities, grew due to access to water transportation.

I. INVISIBLE INDUSTRY

The twenty-first century has brought renewed public attention to the Willamette River as a defining feature of Portland. Popular interest in the last decade, however, has focused on the river's environmental and recreational aspects. Waterfront locations have been developed with new upscale housing. City officials have improved general public access with the East Bank Esplanade and other trails. Public and private actors have worked to preserve parts of the natural riverscape, such as Oaks Bottom and Ross Island, within the urban fabric. To different groups of Portlanders today, the Willamette River encapsulates fishing, dragon boat races, scenic cruises, the Rose Festival fleet and an annual armada of decorated Christmas ships. The Columbia means more fishing, pleasure boating, sailing races and summertime camping on Government Island.

At a "Central City Summit" in 1998, 200 civic leaders placed "a healthy river that centers our community" as one of the two highest priorities for the city, along with strong schools. Movers, shakers and idea people agreed that the Willamette "should be more fully embraced as the center and essence of downtown" and that it should function as "a transportation way, a playground, a theater, and a scenic resource." Economic uses were noted, but the emphasis was clearly on the river as a personal amenity.

When delivered in September 2007, the final report of a multi-year visioning process organized and overseen by Mayor Tom Potter summarized the ideas of 12,000 Portlanders in forty-five statements about the desired city of 2030. The report lays out six points about the economic future, but none that talk about preserving the working waterfront. It envisions brownfields regenerated into greenspaces and wildlife habitat, not employment sites. Its eleven points about the physical environment include "healthy rivers, streams, wetlands, and ponds" and a Willamette that is "clean enough to swim in and provides abundant wildlife habitat and safe fishing," but mentions nothing about industrial uses, marine terminals, ship repair yards or ocean-going commerce.

Additionally, survey interviews done for the Port of Portland indicate that the general public has little knowledge or information about the Port and its marine terminal operations.

If there is a public image of Portland's working waterfront and heavy industry, it tends to be compounded by a set of problems including the possibility of breaching Snake River dams, the environmental costs of dredging a 43-foot channel and the Superfund designation for the lower Willamette. The issue was brought home in the recent debate over rezoning the site of an inactive plywood mill in the Linnton neighborhood for housing. Although the site lies in the heart of the industrial waterfront, sandwiched between tank farms that have been functioning since the early twentieth century, it took a concerted effort by the newly organized Working Waterfront Coalition to convince three Portland City Council members to go against public opinion and block the permanent loss of waterfront industrial land.

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II. PORTLAND: THE RIVER CITY FOR MORE THAN 160 YEARS

The Willamette and Columbia rivers have always been central to Portland's economy. They have been arteries for trade among Native American peoples, avenues of European exploration, pathways for Anglo-American settlement, and channels of commerce that made – and still make – Portland the commercial gateway to the American Northwest. To put the history another way, since Asa Lovejoy and Francis Pettygrove first claimed a wide clearing on the west bank of the Willamette River in 1844 and ambitiously staked out streets and lots a year later, Portland has grown alongside and because of its working rivers.

Geographers make a distinction between a city's site and its situation, terms that roughly translate as land and location. The first deals with the microlevel influence of the particular landscape, the second with the macroscale interactions of the city with the nation and world beyond. For Portland, both aspects are deeply – and inextricably connected to its rivers.

1. Portland's selection as preferred port

Portland grew originally because it was the head of navigation for the ocean-going ships of the mid-nineteenth century. The river shallowed above Ross Island, effectively blocking the hopes of Milwaukie and Oregon City. Captain John Couch, who moved his operations from Oregon City to Portland in 1846, announced that the river at Ross Island was surrounded by water only four feet deep and claimed to have ridden across the river on horseback. The fact that Oregon's first steamship was based on the Willamette in Milwaukie was not enough to overcome that town's limitations for ocean-going commerce.



Photo courtesy of Oregon Historical Society

Grain & lumber ships crowded Portland's harbor in the first decades of the century.

The battle between Portland and St. Helens was tougher. Thirty miles closer to the ocean and on the main stem of the Columbia River, St. Helens built a road over Cornelius Pass to the rich Tualatin Valley wheat farms. Portland countered with a road of wooden planks through a lower and more direct pass, the route of Canyon Road. It was the first “paved” road in the Sunset Corridor. Another sandbar, this time at Swan Island, nearly swung the balance to St. Helens, but Portland had better access to the Tualatin Plains and Willamette Valley and therefore more reliable cargoes. When the Pacific Mail Steamship Company decided to terminate its San Francisco-to-Oregon runs at Portland, the contest was over.

One additional point about the Portland waterfront being a prime commerce destination is worth noting: Portland was incontestably on U.S. territory. From 1818 to 1848, the United States and Great Britain controlled the vast Oregon Country as diplomats tried to find an acceptable dividing line. It was clear by the time the Oregon Trail migration started that land on the south side of the Columbia River would end up American. The fate of what is now western Washington was less certain, meaning that Fort Vancouver and its very buildable surroundings were not attractive to settlers from the United States until Portland already had a head start.

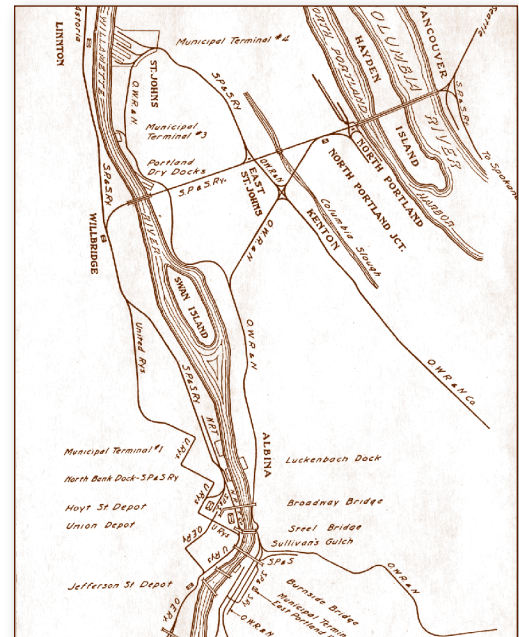
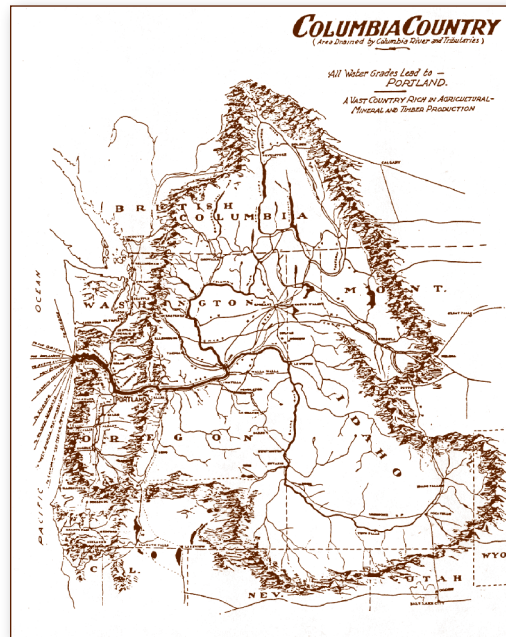
2. Portland’s strategic location

The Portland metropolitan region lies at a natural intersection. Running east to west is the valley of the Columbia River. Extending north to south is the Puget-Willamette Trough, where fault lines have dropped great blocks of land below the parallel coastal mountains and Cascades. To the north, the trough dips below sea level to form Puget Sound and the Strait of Georgia. Further south, it has captured rivers that drain the west side of the Cascade Range, diverting the Cowlitz River southward in Washington and the Willamette River northward in Oregon. Even the powerful Columbia bends north between its confluence with the Willamette, where it enters the trough, and the Cowlitz, where it turns again toward the sea. This natural lowland was the obvious route for the first telegraph line in the 1860s, for railroads in the 1870s and 1880s, and for 20th century highways.

The Columbia, of course, is the Great River of the West that connects the Pacific Ocean to the interior of the Northwest. The river’s discharge at its mouth is three quarters of the flow of the Great Lakes/St. Lawrence system and two-fifths of the flow of the Mississippi River. The closest analogy for the Columbia is the Danube, which draws the same volume of water from a comparably sized region (imagine Spokane as Vienna, the Tri Cities as Budapest and The Dalles as Belgrade). The natural geography of the Columbia, which was interrupted by rapids 40 miles upstream from the Willamette, also made Portland the easiest and most logical place for ocean-going shipping exchange cargoes with upstream shipping and then railroads and trucks.

The result of this dual geography is a “city that gravity built.” Portland is one of the last generations of American cities that was founded and developed as an ocean-to-river port first and rail center second (the others are Houston and Sacramento).

Since the 1840s, transportation policy has centered on maintaining the functionality of these transportation corridors.



Upstream on the Willamette, commercial navigation was feasible for only a few decades. In 1870, six of the seven largest towns in Oregon were on the Willamette, and steamers regularly served Albany and Corvallis, picking up produce that farmers laboriously hauled to the riverbank. Riverboats even reached up the Yamhill River to Lafayette and McMinnville. With intensive farming and logging, however, the upper Willamette silted up and filled with snags by the end of the century. Railroads had already taken up the slack, with lines on both sides of the valley that connected strings of towns collecting farm and forest products. The 20th century brought highways – 99E, 99W and Interstate 5.

The Columbia River gained an integrated transportation system in the 1860s when Portland entrepreneurs created the Oregon Steam Navigation Company by consolidating transportation interests into an integrated system of steamers, wagon and stage lines, and short railroads. It was a “millionaire making machine” for its investors and the transportation key that helped unlock the mineral and agricultural wealth of eastern Oregon, eastern Washington and Idaho. Navigation improvements included a canal and locks around the Cascades and another canal and lock system around The Dalles and Celilo Falls in 1915. In the middle decades of the 20th century, a series of dams across the Columbia and Snake rivers opened barge navigation to Idaho.

Downstream, the Columbia required maintenance and repeated deepening of the channel from Portland-Vancouver to the sea. The Oregon legislature in 1891 created the Port of Portland to construct and permanently maintain a 25-foot ship channel in the Willamette and Columbia rivers “at the cities of Portland, East Portland, Albina, St. Johns and Linnton, and from these cities to the sea.” Subsequent federal legislation specified and mandated cooperation between the Port of Portland and the U.S. Army Corps of Engineers in maintaining and deepening the Columbia and Willamette channels.



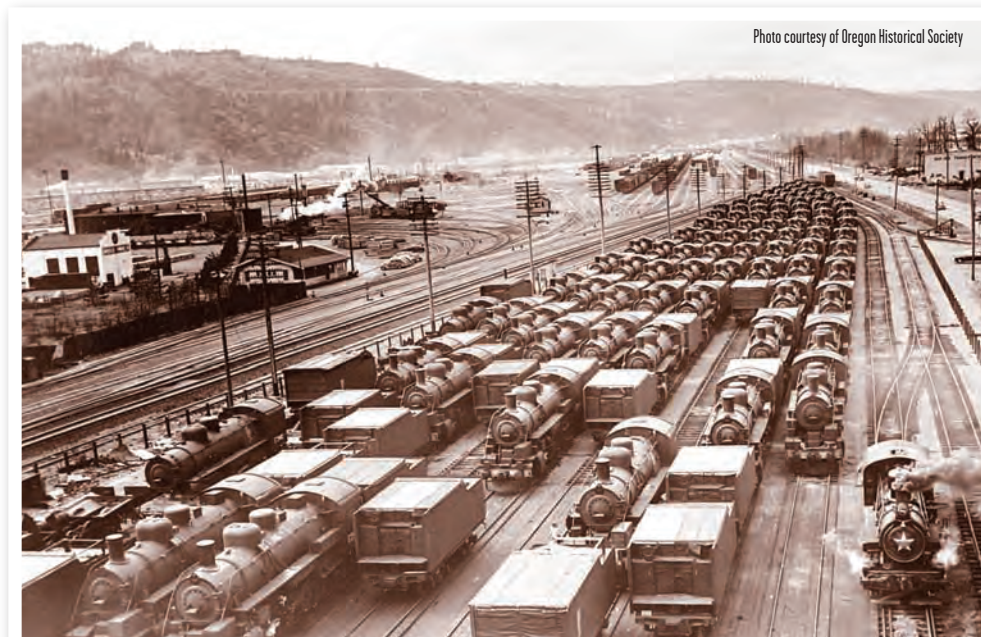
Dredging and fill repeatedly created new industrial land and reshaped the harbor. Couch Lake northwest of the Portland city center turned into Northern Pacific rail yards. Guild's Lake was filled for what is now Portland's Northwest Industrial District. On the east bank, fill made possible the warehouse district between Southeast Grand Avenue and the river. And in the 1920s, the Port of Portland shifted the channel of the Willamette from the east side to the west side of Swan Island, attaching the “island” to the east bank. Rivergate is the most recent example, filled with dredge spoils in the 1960s after it passed from private ownership (as a duck shooting area) to Willamette University and then to the Port of Portland.

In 1910, Portland voters established a Commission of Public Docks over the objections of the mayor. The purpose was to build public docks and marine terminals as alternatives to those owned by railroads or individual businesses. The new Commission opened Terminal 1 on the west side of the Willamette at Northwest Front and Upshur, just north of today's Fremont

Bridge in 1913, following with an east side terminal at the foot of Oak Street across from downtown and then by a terminal at St. Johns.

Railroads, of course, were a second part of the transportation story. In the 1870s, west side businessmen hurried to build a rail line south toward California while upstart Ben Holladay, a California transplant with money from freighting and stage coach lines, pushed a rival line southward along the east bank of the Willamette. The city got its first transcontinental rail connection in 1883 with a connection to the Northern Pacific. Board of Trade President Donald MacLeay summed up the excitement in one sentence: “We are now connected to the rest of the world.” When a Union Pacific branch linked up with the Northern Pacific in eastern Oregon the next year, MacLeay was doubly right. A towering – and still standing – symbol of the maturing economy was the Union Pacific smokestack in the rail yards below the Albina bluff, built in 1887 on “a foundation that would last for all time.”

Nearly a century later, Portland is the meeting point of a 110-mile, deep-draft channel to the ocean that carries 30 million tons of foreign cargo each year and a 355-mile barge route to Idaho that carries 8.5 million tons of cargo per year. The Port of Portland owns four marine terminals, Portland International Airport, a general aviation airport and several industrial parks. Private docks handle construction materials, fuels, grain and other bulk commodities. Two Class 1 railroads handle heavy freight while trucks rumble in and out of the city on two interstate highways.



These locomotives were built for the Soviet Union under the Lend-Lease program during World War II. They awaited shipment to Russia at Guild's Lake (ca. 1945).

Photo courtesy of Oregon Historical Society

III. BASELINE INDUSTRIES

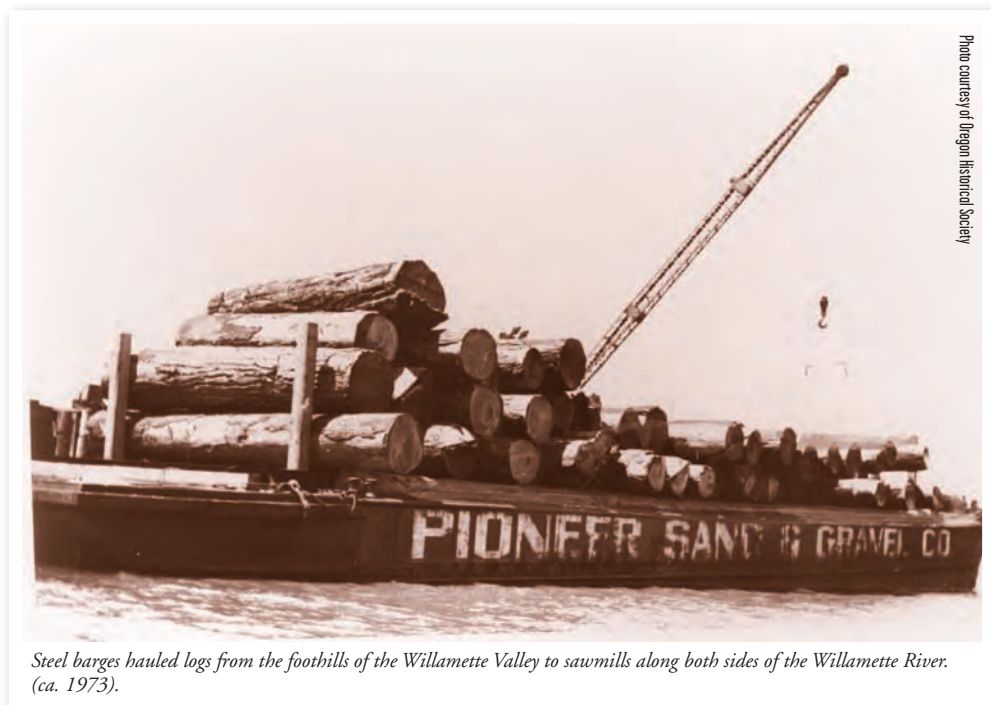
The baseline for Portland's development has remained its ability to link the Northwest and the North American interior with national and world markets. Comprehensive comparisons of the economic roles and functions of American cities have consistently described it as a "commercial hub" or a "regional metropolis." Like Minneapolis-St. Paul, Kansas City or Denver, Portland has had a disproportionate number of workers in transportation, warehousing, wholesaling and finance compared to national averages, making it "a commercial center for the Pacific Northwest."

Principal employers in the early 21st century are still wholesaling, transportation, finance, professional and health care. The interrelated complex of finance, insurance, transportation and wholesaling accounted for 14 percent of Portland-area jobs in 1994, a proportion that is one-third greater than for the United States as a whole. A closely related growth sector is high-end competitive business and professional services. Portland continues to thrive as the regional transportation hub and trading post for Oregon and much of Idaho and Washington. Major exports that move through its marine terminals include wood products, farm products, minerals and electrical machinery. Leading imports are Korean and Japanese automobiles, petroleum and miscellaneous manufactures. On the whole, its bulk export cargos such as minerals and agricultural products account for high tonnage but relatively low value compared to other West Coast ports. In contrast to the high tonnage of exports, Portland has struggled in recent years to attract container lines that bring in high-value, containerized manufactured goods.

Portland's manufacturing sector has been characterized by the emergence in sequence of four industrial clusters: first lumber and wood products, then agricultural processing, then metals and machinery, and most recently, electronics. The first two passed their peak as industrial clusters more than two generations ago, although individual companies still thrive. The second two are still large, viable and capable of further innovation and growth.

1. Wood products

The dominant industrial cluster from the mid-nineteenth century into the 1930s was lumber and wood products. This dominance coincided with the rise and maturity of the Pacific Northwest as the nation's most productive timber region from the early 1900s into the 1960s. Portland sawmills and shingle mills first processed logs from the Willamette Valley foothills, then from the Coast Range and lower Columbia. Logs arrived by water and then by rail for huge mills on both sides of the Willamette, including the Weidler mill in northwest Portland and the Inman-Poulson mill on 37.5 acres in southeast Portland. Using the products and byproducts were factories that turned out crates and boxes, window sashes, doors, architectural features and furniture (memories of some of these companies survive in the names of Doernbecher Hospital, Nicolai Street and John's Landing). Lumber schooners bound for California loaded in the Portland harbor. Portland was the No. 1 lumber shipping and manufacturing center in the world, according to Harper's Weekly of May 24, 1913, and it remained the premier shipper of lumber and wood products into the mid-1920s.



Steel barges hauled logs from the foothills of the Willamette Valley to sawmills along both sides of the Willamette River. (ca. 1973).

Activity spanned both sides of the river, combining with railroads and rail yards to create an industrial waterfront that stretched from Fulton (now the Terwilliger neighborhood) to Slabtown and Linnton on the west side and from Brooklyn to St. Johns on the east side. Mills, factories and transportation facilities were interspersed with working class housing, immigrant neighborhoods and skid row institutions for single male workers.

2. Agricultural processing

Agricultural processing is a relatively loose cluster that emerged in the later 19th century, developed over the next 50 years and faded in the later 20th century. Its growth was tied to the spread of railroads and agriculture east of the Cascades. The Upper Columbia region grew by 79 percent in the 1900-1910 decade alone as the Northern Pacific and Union Pacific rail systems extended lines and competed for business. Grain and livestock poured into Portland. The Portland waterfront already boasted the Pacific Coast elevator, which could unload grain from eight rail cars and load two ships at the same time and whose million-bushel capacity was unrivaled west of the Twin Cities. Now the city emerged as the nation's No. 1 wheat port in 1910s as Palouse and Pendleton farms came into production. Meanwhile, the expanding livestock industry east of the Cascades in the early 20th century supported two additional industries.

One of the industries was woolen textiles and woolen goods, with Jantzen and Pendleton the most prominent names. Eastern Oregon produced great quantities of wool in the early



An all-steel barge constructed especially for hauling bulk wheat from the Inland Empire lays at Terminal 4 on the Willamette, waiting to discharge its 18,000-bushel load (ca. 1939).

decades of the 20th century, and small woolen mills sprung up around the state. Jantzen began as Portland Knitting Mills in 1910 and enjoyed explosive success in the 1920s when it developed and marketed lightweight woolen swimwear. Pendleton grew from small mills in Salem and Pendleton but expanded from a Portland headquarters that coordinated production sites from Washougal, Washington, to northern California. Other firms also were part of the industry, such as Portland Woolen Mills in St. Johns, with 500 workers at its peak.

The other agriculture-based industry was meat packing. When the North Bank railroad (now part of the BNSF system) completed its Columbia River line and railroad bridge to Portland in 1907, Swift and Company opened a huge meat packing plant near the Columbia where 1,500 workers processed cattle from eastern Oregon and Washington. Another dozen plants soon followed, and the industry peaked in the years before World War II.

3. Metals, machinery and transportation equipment

Metals, machinery and transportation equipment is a long-lived cluster that grew up with the 20th century. The industrial complex originated with small manufacturers of building materials (such as iron for office building construction), farm machinery, logging tools and supplies, and ship repair. In effect, it was a smaller regional version of the manufacturing powerhouse that the San Francisco Bay Area developed to serve California mining and farming.

World War I brought a dramatic change. The German U-boat campaign destroyed cargo ships faster than European nations and East Coast shipyards could replace them. In 1916, the Northwest Steel Company at the foot of Sheridan Street in south Portland began to fill orders from European shipping lines. The Albina Engine and Machine works soon followed on the strength of orders from Norway. When the U.S. entered the war in April 1917, the U.S. Emergency Fleet Corporation commandeered the ships under construction and declared itself the sole customer for all the merchant shipping Portlanders could build. From 1917 through 1919, Portland shipyards launched 96 steel ships. Total employment in steel shipbuilding peaked at 12,000, with thousands of support jobs in foundries and machine shops.

In the same years, up to 16,000 other Portlanders built 80 wood-hulled cargo ships, particularly at the Grant-Smith-Porter yard at the foot of Baltimore Street in St. Johns. They bought their material from booming Portland sawmills, drew their workers from the large pool of men with woodworking skills and fitted the ships with hardware from many of the same plants that supplied the steel-hull shipyards.

Shipbuilding returned like an economic tornado during World War II. The first federal contract went to the Commercial Iron Company in 1940. New orders for minesweepers and patrol craft came to the Albina Shipyard and the Willamette Iron and Steel Company in 1941. In the same year, Henry Kaiser, fresh from helping to build Boulder and Grand Coulee dams, partnered with Todd Shipbuilding to create Oregon Shipbuilding with 11 construction



Photo courtesy of Oregon Historical Society

Kaiser shipyard workers.

Photo courtesy of Oregon Historical Society



Portland shipyards built more than 1,000 ocean-going ships during World War II.

ways in St. Johns. It produced the first of 330 Liberty ships and 120 Victory ships in September 1941. Kaiser bought out Todd early in 1942 and opened Kaiser Company-Portland on Swan Island to build T-2 tankers and Kaiser Company-Vancouver to build LSTs, cargo ships and escort carriers. At the peak in 1943-1944, metropolitan Portland counted 140,000 defense workers – 92,000 with Kaiser, 23,000 at other shipyards and 25,000 in other defense industries. Portland and Vancouver together produced more than 1,000 ocean-going combat and cargo ships.

Portland emerged as one of the nation's largest shipbuilding centers for multiple reasons. It had no large military bases to compete for workers, but its climate allowed year-round work, its inland location protected it from direct attack and the rivers had good depth for medium-draft vessels. It also had a pool of metal workers and a set of small shipyards that provided a foundation for the Kaiser effort.

Partially concealed by the meteoric rise and fall of shipbuilding was a steadily evolving set of specialized producers of construction materials, transportation equipment, machinery and tools, many of them oriented originally to serving the needs of western resource industries.

The following is a small sampling of these firms.

- Schnitzer Steel originated as a scrap recycling company and has grown into one of the nation's leading metal recyclers and is an important manufacturer of steel products.

- The Electric Steel Company (ESCO) poured its first steel casting in 1914 and has prospered by making steel castings for a wide range of customers, first logging and mining operations and now spanning a gamut of industries from logging and mining to aerospace and petrochemicals.
- The Iron Fireman Company, which developed from the Portland Iron and Wire Works, prospered in the 1920s and 1930s by building automated stokers for coal furnaces. It benefited from the pool of skilled workers and from the fact that Portland’s transportation connections made it easy to collect and reuse scrap iron from the hinterland – broken log chain, worn-out farm machinery and the like – and ship its output to eastern markets via the Panama Canal.
- Beall Corporation, which located in Portland in the 1930s as Beall Pipe and Tank, now produces specialized trailers and truck beds in north Portland and in other locations inside and outside of the Portland area.
- Hyster grew out of the Willamette Iron and Steel Company in the 1930s, with forklifts replacing steam engines in the product line.
- Precision Castparts is a 1953 offshoot of Oregon Chain Saw (later Omark and then Oregon Cutting Systems), itself founded in 1947 to manufacture an innovative product for the forest industry.

4. Electronics

The fourth and most recent addition to Portland’s baseline industries has been the “high-tech” complex of measuring and sensing devices, electronics and related software. The industry is the combined result of entrepreneurial accident and location. Tektronix is the most significant homegrown electronics company. Howard Vollum and Jack Murdock started their firm in an old factory building on Southeast Hawthorne Street in 1946 and moved to Washington County in 1951. Demand for Tektronix’s oscilloscopes and scientific instruments boomed as the United States invested more and more resources in Cold War science and medical research. Reaching its peak employment in the 1970s, Tektronix was a fertile source of innovation and a seed bed for new start-ups. Floating Point Systems, Planar Systems, TriQuint, Mentor Graphics, InFocus and Merix all came spinning out of the Tektronix orbit.

A new surge in electronics created Oregon’s Silicon Forest, developed courtesy of California. In 1976, Intel chose Portland for a major branch plant. One attraction was the pool of workers trained by Tektronix, the other was a location only two hours by air from San Jose. Hewlett-Packard came to Oregon in 1979. Foreign companies followed: Wacker Siltronics in 1980, and then Japanese firms such as SEH, Fujitsu, Epson, Sharp and NEC, attracted in part by the city’s closeness to Tokyo by the great circle air route. Intel, too, has been an important source of spin-off companies that have kept the Silicon Forest alive despite the recent technology shakeout.

Statewide, high-tech employment passed timber-related employment in the mid-1990s, explaining why the Portland-Salem Consolidated Metropolitan Statistical Area in 1996 ranked 10th in the nation in the value of its exports at \$9.2 billion. High-tech and software companies, broadly defined, employed roughly 70,000 people in the Portland area in 1997, double the number a decade earlier. In 2006, in the aftermath of the industry's readjustment, statewide employment in electronics manufacturing and software was 42,500.

The more sophisticated technology firms are concentrated in Washington County. This first industrial cluster that is independent of water and rail transport (but not air service) was dubbed the "Silicon Forest" in the 1980s. Silicon wafer and semiconductor plants were more widely scattered in Portland and Gresham in Oregon and Clark County, Washington. In contrast, software and multimedia firms clustered in central Portland in proximity to advertising, publishing, art galleries and financial services. Telecommunications scholar Mitchell Moss (1998) used the registered location of commercial Internet domains (.com addresses) at the end of the 1990s to assess the relative standing of 85 cities as Internet information centers. Portland's location quotient of 3.11 placed it a satisfying 16th, several steps up from earlier in the decade. Another comparison by the Progressive Policy Institute in 2001 placed Portland 13th among 50 large metropolitan areas in its engagement with the "digital economy."

IV. PLANNING FOR PORTLAND'S RIVERS

1. The first plans: nature or commerce

Self-conscious city planning as a practice and profession emerged around the beginning of the 20th century out of the intersection of landscape design, architecture, civil engineering and social reform. Portland followed the national model by engaging two of the most renowned planning consultants of the time to advise the city and its citizens on its future growth and land use. The resulting documents emphasized two different ways to understand and use the Willamette and Columbia rivers as central features.

The Olmsted Park Plan and the natural river

Most American cities began to develop public parks in the 1860s and 1870s, following the great example of Central Park in New York City. By the last decades of the century, cities were increasingly interested in comprehensive planning for park and parkway systems. Examples included Chicago, Kansas City, Minneapolis and Boston.

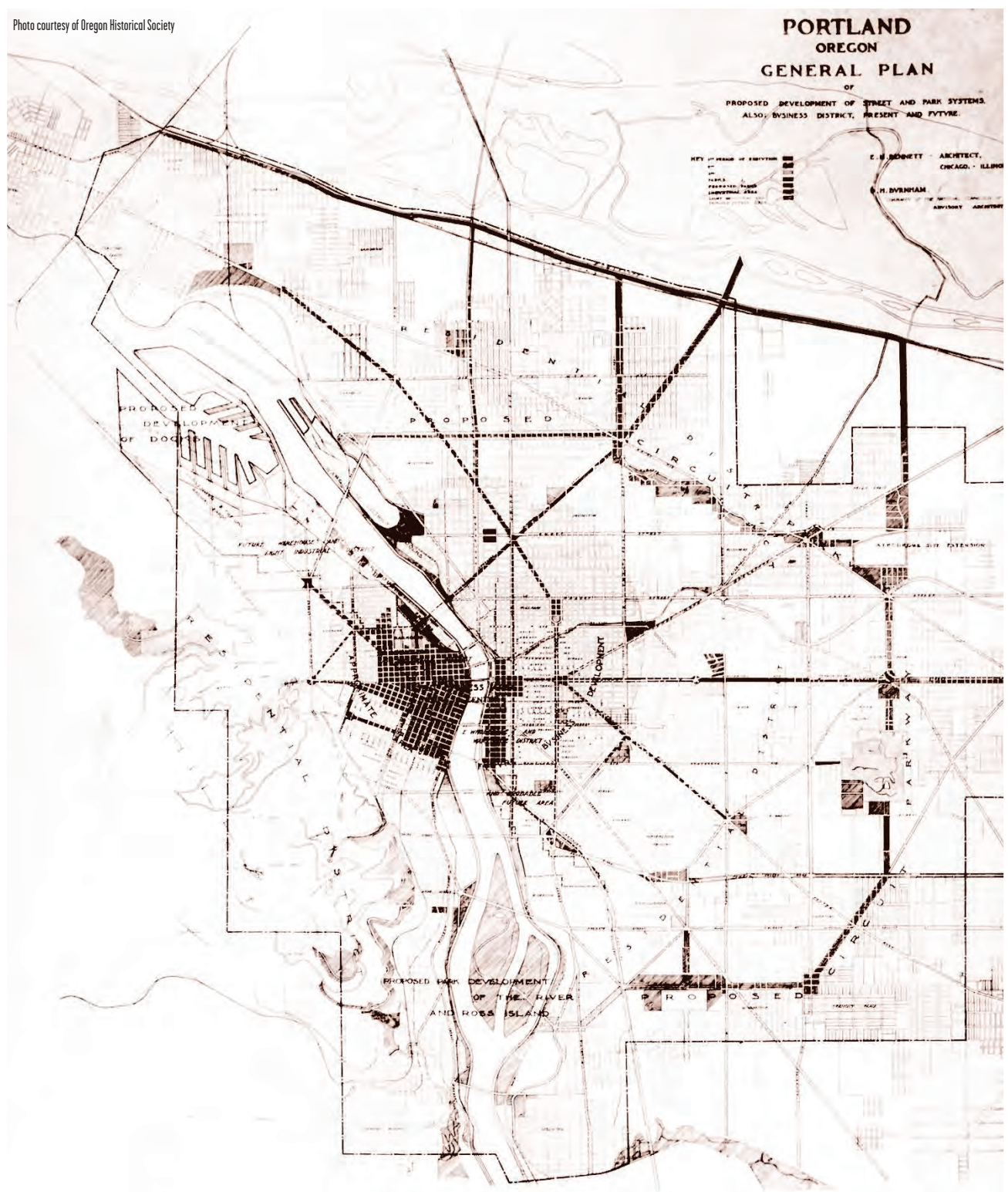
With the opening of a new century, Portland joined the trend by creating a Parks Commission. The Commission invited John C. Olmsted, son of the pioneering landscape architect Frederick Law Olmsted, to prepare a parks plan for Portland. The resulting plan, presented in 1903, proposed a series of parkways and boulevards to connect steep slopes (the crest of west hills, volcanic cones like Rocky Butte and Mount Tabor) and low-lying lands (the northwest waterfront, the south shore of the Columbia River, Ross Island, Swan Island), which would be reserved for large parks. Olmsted thus emphasized preserving open and natural space along what was a busy commercial river.

Edward Bennett, the Greater Portland Plan and the commercial river

The early 20th century also brought a set of comprehensive city-regional plans that focused on creating strong – even magnificent – city centers and linking those centers to the surrounding region with rationalized transportation systems. The key figure was Chicago architect Daniel Burnham, who was involved in the replanning of Washington, D.C., and identified with grand, comprehensive plans for Chicago and San Francisco.

As Portland boomed in the early 1900s, a group of business leaders formed the Civic Improvement League, raised \$20,000 in donations and invited the Burnham to do a Portland plan. Burnham was too busy, and they instead got his right-hand man Edward Bennett, British-born, Paris-educated and experienced in comprehensive planning. The “Greater Portland Plan” that he submitted in 1911 was described as “architectural engineering in its application to city building.” Working outward from the heart of Portland, Bennett proposed three civic centers – a government complex, a cultural complex of museums below Washington Park and a transportation center around Union Station. There were diagonal boulevards in the style of Paris to serve a future population of two million. There was to be an improved downtown riverfront in the style of Paris or Budapest. And there were to be vastly

Photo courtesy of Oregon Historical Society



The plan for Greater Portland proposed a series of diagonal boulevards and highways, eastside business development and the movement of waterfront industry down the Willamette to the Guild's Lake area.

expanded marine terminals from the Steel Bridge downstream. In short, this was a plan that devoted a small segment of the riverfront to aesthetics but largely retained and enhanced the working harbor.

In the ensuing decades, one of the key decisions concerned the Guild's Lake area, the site of the Lewis and Clark Centennial Exposition in 1905. The Exposition, whose grounds were designed by John C. Olmsted, called attention to the possibility of a large riverfront park. A variety of reasons, including the unwillingness of city and citizens to invest heavily in park land acquisition, led to the dismantling of the Exposition buildings (they were not built to last), filling of the site with dredged material and adapting it first for war-worker housing in World War II and then for industry after 1945. It is now Portland's Northwest Industrial District.

2. 21st century plans: environment and industry

The competing approaches to the river and riverfront land that marked the first generation of Portland planning remained evident a century later. Compared to other cities, however, Portland has been more aware of the tensions and tradeoffs and more willing to explicitly recognize the commercial and industrial functions of its rivers.

Industrial land supply

OREGON

The Oregon land-use planning system includes "Goal 9: Economic Development." Local jurisdictions are required to plan land uses "to provide adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare and prosperity of Oregon's citizens." The goal further states that comprehensive plans for urban areas shall "limit uses on or near sites zoned for specific industrial and commercial uses to those which are compatible with the proposed uses." Implementing rules require that local governments identify sites needed for industrial and commercial development in both the short term and the long term. Local governments are specifically required to make sure that conversions of more than two acres do not create supply deficits.

In 2003, the Department of Land Conservation and Development undertook a broad study of the state's industrial land supply at the mandate of House Bill 2001 (2003) and Governor's Executive Order 03-02 on industrial lands. DLCD convened an Industrial Conversion Study Committee and presented a report titled "Promoting Prosperity: Protecting Prime Industrial Land for Job Growth" in November 2004. The report found that conversion of industrial land to non-industrial uses occurs because of zoning changes, because the pattern of uses in multiple-use zones changes, and because adjacent lands develop in such a way as to make industrial use incompatible or unsustainable (e.g., because of increased highway congestion). The report found that "the state has an interest in discouraging conversions of prime industrial lands" and "in reinvesting in viable industrial districts including those with brownfield sites."

In response, LCDC adopted amendments (effective January 2007) to the Oregon Administrative Rule relating to Goal 9. In particular, changes added the concept of Prime Industrial Land, meaning lands that are well suited for traded-sector industries and are difficult or impossible to replicate in the planning area or region. These lands have “necessary access to transportation and freight infrastructure, including, but not limited to, rail, marine ports and airports, multimodal freight or transshipment facilities, and major transportation routes.” The changes also encourage attention to short-term supply and to consideration of market factors such as availability and ownership patterns in identifying an adequate industrial land inventory.

METRO

Metro has a mandate to identify and conserve regionally significant industrial land. Title 4 of the Metro Code requires cities and counties to adopt zoning that limits commercial uses in industrial areas. Its Title 4 map matches the industrial sanctuary and general employment areas of the City of Portland. In 2002, Metro expanded the Urban Growth Boundary for the Portland region but also determined that land inside could/should be used more efficiently. It amended Title 4 to make a distinction between regionally significant industrial areas and other industrial areas, to limit retail in industrial areas and to limit non-industrial office development in regionally significant areas. Most of the industrial zones of the Portland harbor are regionally significant industrial areas.

PORTLAND

In most cities, industrial zoning is intended to protect residential and commercial areas, so it allows other uses in industrial zones (creating a hierarchy in which industrial uses are at the bottom). The City of Portland has the reverse, using affirmative zoning to protect industry, with an industrial sanctuary policy stated explicitly in its Comprehensive Plan. The language is straightforward: “Provide industrial sanctuaries. Encourage the growth of industrial activities in the city by preserving industrial land primarily for manufacturing purposes.”

The policy is implemented through zoning that allows six categories of use outright in industrial sanctuaries: industrial service, manufacturing and production, railroad yards, warehouse and freight movement, waste-related and wholesale sales. It also allows retail, community service and office uses when they “are supportive of the industrial area or not detrimental to the character of the industrial area.” In practice, this means uses that will not adversely impact industrial transportation needs and directly serve industrial workers. The most prominent test of the policy was the city’s decision to reject a proposal for a Costco big box retail outlet in the Northwest Industrial District.

Waterfront-oriented initiatives

PORTLAND'S RIVER RENAISSANCE STRATEGY

The River Renaissance Strategy (Dec. 2004) recognizes “a prosperous working harbor” as the second of five comprehensive goals for Portland rivers, and states that “Portland’s working harbor and Columbia Corridor are among the most important contributors to the region’s economy.” The strategy goes on to identify important issues of freight transportation, including highway bottlenecks, railroad capacity and river channel maintenance. Its seven policies are:

- Stimulate Portland’s competitiveness and growth as a major West Coast marine port and distribution and industrial center. Affirm and advance the critical role that the harbor and its industries and businesses play in the economy and quality of life of Portland and the Columbia and Willamette basins.
- Invest in maritime, rail, air and truck infrastructure, and develop seamless connections among these modes.
- Protect and enhance the industrial land supply, economic health and distribution-hub functions of the working harbor and Columbia Corridor industrial districts and ensure river access to river-related and river-dependent industry.
- Maintain and enhance the buffers (riverine bluffs, major roadways and mixed employment areas) that frame these districts and separate them from other land uses, in order to prevent the loss of industrial land.
- Facilitate industrial redevelopment, particularly in brownfield sites.
- Improve the transparency, predictability and timeliness of regulatory systems, while encouraging innovation.
- Promote environmentally beneficial industrial operations and facility planning through a combination of incentives, technical assistance and regulations.

RIVER CONCEPT AND RIVER PLAN

The Planning Bureau is currently (September 2007) engaged in a River Plan, which will be integrated into a substantial revision of the city’s Comprehensive Plan. The planning process is guided by a River Concept adopted in 2006 and is first dealing with the North Reach (the Willamette River and adjacent lands from the Columbia River south to the Fremont Bridge on the west side and to the Broadway Bridge on the east side). The basic policy statement reads as follows:

The North Reach: Portland's Working Waterfront – The North Reach will continue to provide Oregon with access to global markets and support the region's economy as a West Coast distribution hub and a heavy industrial area.

WORKING HARBOR REINVESTMENT STRATEGY

The Working Harbor Reinvestment Strategy is the economic development element of this River Plan. It brings together the Planning Bureau, Portland Development Commission and Port of Portland to develop a 10-year plan for capital investment to enhance the working waterfront and promote private investment and development in harbor industrial districts. Drawing from stakeholder interviews and focus groups, the Investment Strategy emphasizes work to improve rail and highway bottlenecks and to increase the supply of useable industrial land through assistance with brownfield cleanup.

PORTLAND DEVELOPMENT COMMISSION

The Willamette Industrial Urban Renewal Area, created in 2005, gives the Portland Development Commission a tool for assisting with the investment needs that may be identified in the Working Harbor Reinvestment Strategy. The 751-acre district includes Swan Island/Mocks Landing and sections of the west shore on both sides of the BNSF railroad bridge. Because state law allows downward assessment of environmentally damaged lands, the tax increment available for appropriate projects will be small in the short run, although it is expected to increase in a 5- to 20-year time frame.

V. MARITIME AND INDUSTRIAL PORTLAND IN 2007

The economy of the Portland region in 2007 is supported by a thick ecology of river-dependent and transportation-oriented businesses and industries. The rivers and waterfronts are not only the historic focus for Portland's economy but remain central to a complex of activities. From 2004 through mid-2007, capital investment of \$440 million was completed or funded for 36 harbor sites.

1. Transportation nexus

Portland's rivers are the focal point for a multifaceted transportation system of marine terminals, ocean shipping lines, barge lines, bulk handling facilities, Class 1 railroads, short-line railroads, Interstate highways, commercial and general aviation airports and pipelines. The federal government recognized the importance of this nexus by funding replacement of the BNSF railroad bridge across the Willamette to reduce an impediment to navigation. Roughly 90 percent of harbor sites also have rail access.

- Portland and Western Railroad has seen business originating along its Astoria-Willbridge line triple in the past 10 years, from 7,000 carloads in 1997 to more than 20,000 carloads per year at present. The railroad is a link in a multimodal system. It interfaces with tank farms (which receive materials by water and pipeline) and exchanges freight with trucks, barges and other transportation modes.
- Fuel and construction materials firms have expanded and upgraded terminals and storage facilities in recent years.
- The Port of Portland in 2006 ordered a new crane for Terminal 6 to serve post-Panamax vessels.
- Portland is the largest wheat export port in United States, just as it was a century ago, drawing from as far as Minnesota and Kansas. Including Vancouver and Kalama, lower Columbia ports account for 40 percent of wheat shipments. The Columbia system also draws cargo from east of the Mississippi, making the lower Columbia the nation's second largest corn export center. Portland is also the most important bulk mineral port on the West Coast.
- Port of Portland cargo forecasts anticipate that the volume of trade through Portland will double by 2035.

2. Wholesaling and distribution

The North Reach of the Willamette River and the Columbia Corridor taken as a single crescent of industrial land have an intense concentration of wholesaling and distribution businesses that serve both the metropolitan area and the larger multi-state hinterland.

- With a good climate for aviation, a relatively uncrowded airport and relatively non-congested regional highways, Portland has potential as a secondary air freight center. The announced expansion of FedEx at Troutdale is one indicator of the possibilities.
- Automobile import volumes have climbed in recent years. In 2006, a record number of 464,000 Hondas, Hyundais and Toyotas were handled by Portland auto import terminals. In addition, the Port of Vancouver has been receiving Subarus since the early 1990s. Toyota, which is being squeezed out of Los Angeles, is expanding its Terminal 4 import facility for a second time. Hyundai has also expanded its auto terminal.

3. Metals, machinery, transportation equipment

The Willamette River is the focal point for the metals, machinery, and transportation equipment complex of interdependent firms. Portland has countered the trend in decline of metal industries jobs.

Riverfront Expansion

- Advanced American Construction relocated from Oregon City to the North Reach in 2006, after searching the entire metro area for a suitable site.
- Evraz Oregon Steel Mills relocated to Rivergate in 1969 and has expanded several times on site, including adding a new pipe mill. It depends heavily on bringing in steel slab by water from Russia and Mexico and shipping product to western U.S. markets by water and rail. Its expansion has led to an expansion of subcontractors.
- Gunderson has utilized its flexible location between rail and water to overcome short-term business downturns, and has upgraded facilities in 2005-2006.
- Schnitzer Steel, which consolidated its Portland operations in 1973, has recently invested \$30 million in a new shredder and other capital improvements.
- Cascade General ship repair is at capacity and planning another drydock.
- U.S. Barge has recently relocated from New Orleans to Swan Island, not only because of problems with the previous location but also due to the rise of Pacific trade demand for barges.



Schnitzer Steel's many investments at its Portland yard include a new mega-shredder. These improvements significantly enhance the operation's processing capabilities and global competitiveness.

Metro-wide industry

The industrial complex extends to locations beyond the working waterfront. Related companies include Precision Castparts, Oregon Cutting Systems, Oregon Iron Works, Warn Industries, Gerber Blades, Leatherman Tools and Boeing. Most of these firms are located either in the Columbia Corridor-Gresham area or the Milwaukie-Clackamas industrial corridor. Both of these areas need to be considered as parts of Portland's industrial heart.

Flexibility and innovation

Many manufactured items follow a product cycle. As a product moves from an initial stage of innovation and small-scale production to large-scale, routine production, manufacturing tends to move from the original site to other, lower-cost sites. Headquarters and research and development may remain in the original location, but branch plants and subcontractors in other locations can be used for more efficient production. The challenge in any specific community is to nurture the next innovations and next products to fill the gap left by closed factories. The same challenge occurs when the market for a particular product is saturated or when that product becomes outmoded.

The metals and machinery complex has shown substantial flexibility over the last century. New firms and products have appeared as replacements for companies with outdated products, and Portland has suffered less from the product cycle than rustbelt cities like Youngstown or Dayton, Ohio for several reasons. First, Portland's metals and equipment industry has been a set of small and middle-sized firms rather than consisting of one or two vulnerable giants. Second, many of these firms have produced a wide range of products for multiple markets rather than depending on a single customer or single market. They have the flexibility to shift production from one item to another. Third, many of them produce intermediate items for construction or manufacturing, again providing the buffer of multiple markets. Fourth, the pool of skilled workers adds to the ability to shift directions or to develop new firms and products.

Over time, these factors have meant that this industrial sector has remained strong even as individual companies have disappeared (no one buys home coal stoking machines any more) or shifted production to other locations (Hyster, Freightliner). This is the same sort of process that has kept Oregon's computer and electronics sector viable despite the decline of Tektronix from its peak around 1980.

For example, Oregon Iron Works was founded in 1944 and has specialized in complex, large-scale metal fabrication (bridges, hydroelectric systems, patrol craft). This mid-sized company with 300 plus employees at Clackamas and Vancouver facilities recently received federal funding to build the first U.S.-made streetcar in many decades in partnership with a Czech company.

Portland is also developing bicycle manufacturing for niche markets, a spin-off both from its “green industry” sector and its metal-working sector. It may seem a stretch from Gunderson barges or Evraz Oregon Steel Mills to the bicycle industry, but manufacturing of high-end bicycles and components is an important and growing business. The business currently ranges from two-person artisan shops that build a handful of bikes at a time to firms like Kinesis in north Portland, a U.S. branch of a Taiwanese bicycle manufacturer with 40 workers, Huntco Supply, which makes bike racks and lockers, and Chris King Precision Components, a manufacturer of high-end bicycle parts that relocated from California to northwest Portland.



Bicycle headsets manufactured by King Cycle Group, a leading producer of bicycle components, which relocated to Portland in 2005.

4. Oregon export industries

Oregon stands well above the national average for value of exports relative to population. Its export history reaches back to 19th century agriculture and timber. This category remains important, but it has been eclipsed by other manufactured goods. Federal government data for 2001-2006 shows that the value of all Oregon exports increased by 72 percent in the first half decade of the 21st century. In comparison, export growth in fabricated metal products, primary metals and transportation equipment all matched or surpassed the growth of computer and electronics exports.

INCREASE IN VALUE OF OREGON EXPORTS: 2001-2006

Agricultural and livestock products	31%
Fabricated metal manufactures	69%
Computer and electronic products	71%
<u>All Oregon exports</u>	<u>72%</u>
Primary metals manufacturing	177%
Transportation equipment	205%

Computers and electronic products made up 43 percent of the total value of Oregon exports in 2006. Metals, machinery and transportation made up 28 percent, while agricultural and lumber products accounted for only 17 percent.

5. Industrial employment concentration

The Portland harbor area, as defined by planning agencies and the Working Waterfront Coalition, counts 35,000 industrial jobs and 4,000 to 5,000 other jobs.

State employment data for 2004, aggregated by Metro staff for all of the major industrial districts, show the importance of the several districts that utilize and/or abut the Willamette and Columbia rivers. The following table shows industrial employment in these districts.

EMPLOYMENT IN RIVER-RELATED INDUSTRIAL DISTRICTS, 2004

	Manufacturing	Transportation, Warehousing Utilities	Wholesale Trade	All Workers
Northwest Industrial District	8,800	2,800	2,900	22,000
Swan Island & Central Eastside	3,700	3,700	5,500	37,000
Rivergate	10,400	1,400	. . .	20,000
Columbia Corridor	7,200	8,800	4,800	40,000
Totals for river-related districts	30,100	16,700	13,200	119,000

Employment in these districts can also be compared to that in the metropolitan area's three other industrial districts: the Sunset Corridor and 217 Corridor where the electronics and computer industry is concentrated, and the Milwaukie/Clackamas Corridor, with its mix of manufacturing and distribution.

EMPLOYMENT IN ALL MAJOR INDUSTRIAL DISTRICTS, 2004

	Manufacturing	Transportation, Warehousing Utilities	Wholesale Trade	All Workers
River-related Districts	30,100	18,200	13,200	119,000
Milwaukie & Clackamas	6,200	2,500	4,500	28,000
Sunset corridor	10,500	6,600	800	42,000
217 corridor	5,000	1,400	5,000	46,000

In total, the Multnomah County and Clackamas County districts have 36,200 manufacturing jobs compared to 15,500 in the Washington County districts, and 38,400 jobs in transportation and distribution compared to 13,800.

VI. CHALLENGES IN COMPARATIVE PERSPECTIVE

1. Waterfront and industrial lands under pressure

The most powerful trend relating to older industrial districts in the last quarter century has been conversion from traditional manufacturing and transportation functions to other, more intensive uses. This pattern has been doubly true of waterfront lands with their potential aesthetic appeal.

Industrial obsolescence is certainly involved in the process. Some industries have finite life cycles because their product becomes obsolete, inputs become unavailable or their national/international competitive position changes. Few people are going to complain when offices and condos are constructed within the granite shells of old water-powered mills, whether in Edinburgh (Scotland) or Georgetown (Washington, D.C.). In the Portland region, for example, the aluminum industry had roughly a 50-year life span from the early 1940s to the 1990s. Created by an abundance of cheap electricity and a war defense market, the aluminum industry was later squeezed by a combination of growing competition for electricity within the Northwest and competition from cheaper overseas producers.

There is also a tendency for industrial waterfront uses and port facilities to move downstream toward deeper channels and wider expanses of land for manufacturing and transportation. In the long view, this trend can be traced to London and Philadelphia, Bremen/Bremerhaven and Antwerp. At the same time, river ports remain key players in the patterns of global commerce. The three highest volume ports in Europe – Rotterdam, Antwerp, and Hamburg – are all located on rivers. Shanghai is a river port. Houston, New Orleans-Baton Rouge and Savannah are among the strong river ports in the United States.

At the same time, real estate developers and public officials have seen central city waterfronts as sites to be reclaimed for new, intense development. An entire nonprofit, the Waterfront Center in Washington, D.C., was founded in 1981 “in the belief that waterfronts . . . are unique, finite resources. Like the cities they help define, urban waterfronts are dynamic places, undergoing profound change. Waterfronts often represent the best opportunity for community enhancement and enrichment.” Older central industrial districts, with loft buildings and warehouses, are often viewed in the same terms. Where more traditional uses remain, there are strong pressures to push them downstream or further away from the center of the city. As a result, old industrial waterfronts have often become bright, post-industrial redevelopment zones.

Upscale housing: Multi-story granite wharves have been converted to residences in Boston and brick buildings have been converted in Baltimore. Printers Row in Chicago now has hotels, trendy restaurants and new upmarket housing but no printing businesses. The northern branch of the Chicago River looks far different than it did even 10 years ago. San Francisco’s industrially zoned land saw the construction of 5,000 residential units between 2001 and 2005. At the same time, a combination of rising rents and complaints about industrial activities by new residents drove out many production, distribution and repair businesses. In Los Angeles, high housing prices and demand have pushed residential uses into industrial districts south of downtown.

Recreational attractors: The examples are numerous. They include aquariums for Boston and Baltimore, festival markets in Baltimore, New York, Norfolk and Vancouver, ballparks for San Francisco, Seattle, Cleveland and Denver, and parks for Seattle and Portland. Philadelphia residents and officials have been engaged in bitter debate for the past two years on whether or not to build casinos on the waterfront that Benjamin Franklin once knew.

Mixed-use developments: Waterfronts are especially attractive sites for mixed-use projects that combine retail, office, hotel and residential space – for example, the Georgetown waterfront and now the Anacostia waterfront in Washington, D.C.

A similar story has been playing out in Portland since the early 1980s: Waterfront Park was the first public investment. Private investors followed in the 1980s with McCormick Pier apartments and Riverplace on the south waterfront. Then came the emergence of the Pearl District on the bones of a railroad warehouse district and a River District on abandoned rail yards. Terminal 1, Albers Mill and a PGE power plant were redeveloped for housing, offices, and a museum, respectively. South Waterfront condo towers are currently filling in what was once a waterfront industrial district. The Burnside Bridgehead project, if it comes to fruition, will mark the encroachment of mixed-use development into the Central Eastside.

At the same time, however, many Portland firms have deliberately relocated from these older industrial areas to the remaining parts of the working waterfront. The tension between the two uses remains.



Mixed-use development in Portland's South Waterfront district.

2. Public Policies to Facilitate Change

In the common framework of city politics, the default position is to accommodate the transition of industrial land by piecemeal rezoning in response to development proposals. Rezoning, of course, generates new pressure for additional change. It has been an issue of concern at the state level in Oregon (hence the land conversion study discussed earlier). This sort of question surfaced recently in Portland over the possible future of the Linnton Plywood site.

Cities can facilitate transition by proactive rezoning and adopting plans that anticipate change. Oakland has rezoned waterfront industrial land for housing in the hope of attracting overspill for the hot San Francisco market. San Francisco envisions its southern waterfront, from China Basin southward, as the home of bioscience companies, an idea with a familiar ring in Portland. Seattle came close to adopting the Seattle Commons idea that would have totally transformed the area between downtown and Lake Union – change that is now happening piecemeal. Seattle’s first light rail line runs through the large warehousing and light industrial area south of downtown. Because the city allows housing and commercial uses of up to 70,000 square feet in the area, pressures for land conversion are intense for projects ranging from housing to the expansion of Starbucks headquarters.

Cities can promote land conversion by actively priming redevelopment with public assistance through urban renewal and tax increment financing tools, property tax abatements and similar tools to subsidize the costs of private development. All of these are options that Portland has utilized for the middle reach of the Willamette.

3. Public policies to resist change

Relatively few cities have implemented systematic policies to retard or resist the conversion of industrial lands. A review of other cities clearly indicates that Portland has been a leader.

BOSTON

Boston has identified the retention of “back streets” jobs as a city priority. It defines “back streets” as manufacturing, wholesale, construction, commercial services, logistics and food processing businesses (in contrast to “main streets” retailing). It sees “back streets” businesses as important places for entrepreneurship and sources of family-wage jobs. The city inventoried eight industrial districts in 2001, with a total of 47,000 jobs, and found that the trend in all but one was toward increased residential and commercial uses.

The city has adopted a policy goal of no net loss of industrial space, to be implemented with infrastructure improvements for industrial districts, low-interest loans to qualifying businesses, assistance in finding tenants for industrial space and strengthened zoning review guidelines “regarding development proposals that convert industrial land and buildings to office, commercial, residential or institutional uses.” Evaluations of the impacts of these policies are not available.

VANCOUVER, BRITISH COLUMBIA

In the last two decades, much of Vancouver's historically industrial land on both sides of False Creek has been converted to upscale housing (this includes the site of the 1986 World's Fair). In 1995, the City Council adopted Industrial Lands Policies for seven remaining industrial districts. These included two districts along the Fraser River, four districts located east of the city center with historic rail and water transportation services (Burrard Waterfront, Powell Street/Clark Drive, False Creek Flats, Mount Pleasant), and one with rail and truck transportation (Grandview/Boundary).

The overall policy was to "retain most of the city's existing industrial land base for industry and service businesses . . . to meet the needs of port/river related industry and city-serving and city-oriented industries." The city updated definitions of industry to better accommodate service businesses and revised provisions for conditional uses permitted in industrial areas. For each district, the city also determined how much land should be retained for industrial uses and established criteria for approving or disapproving applications to rezone industrial land. As a former Vancouver City Council member phrased it: "The main initiative we took was actually to let industrial lands go for housing. We inventoried what we had, what was in demand and what parcels made sense to 'let go.'"

Vancouver followed in 2005 with a Metropolitan Core Jobs and Economy Land Use Plan. It found that manufacturing jobs in the core sub-area of the city declined by 40 percent since 1981 and consisted largely of clothing and food manufacturing. At the same time, it reiterated the importance of manufacturing by noting that demand for industrial space is likely to increase in the False Creek Flats, Powell, Burrard Waterfront and Mount Pleasant areas (see earlier paragraph). At the same time, the city's department of community services anticipated increases in offices, services and commercial businesses in these spaces.

Taken together, Vancouver policies offer a mixed message about the future of industrial and water-dependent land uses. They identify retention of industrial land as important, but deal with the issue on a district-by-district basis. I2 and I3 zones have protected large parcels from being subdivided and prevented residential conversion, but they also allow a wider range of uses and clearly suggest that traditional heavy industry and logistics businesses will gradually give way to commercial services, big box retailing, offices, service activities, and – they hope – high-tech industries. The city currently faces a challenge in supporting hoped-for expansion of the port because supporting rail facilities are located precisely in an area (False Creek Flats) that has seen changing land uses.

CHICAGO

Chicago has 20,000 acres of industrial land, but it is scattered in more than two dozen small districts that cluster around the Chicago River and the city's thick network of railroads. In the late 1980s, the real estate market in Chicago was placing very heavy pressure on industrial land adjacent to the Loop and North Loop, which were increasingly attractive for residential and mixed-use projects. In response, the neighborhood-oriented administration of Mayor Harold Washington created the category of Planned Manufacturing District, which it applied to three areas near the North Chicago River in 1988-1990. Two additional PMDs were created in the 1990s and eight more in 2004-2005.

In PMDs, the city foregoes higher taxes revenues possible from rezoning to residential or retail use in favor of preserving and creating industrial jobs. As defined in the Chicago Zoning Ordinance, PMDs have several purposes: (1) foster the city's industrial base; (2) maintain a diversified economy; (3) strengthen suitable manufacturing areas; and (4) encourage industrial reinvestment, modernization and expansion by providing stable and predictable industrial environments. PMDs can be initiated by the mayor, the relevant alderman, or the owners of all land within proposed boundaries. Proposed areas are reviewed for suitability and established by vote of the City Council. PMD regulations are zoning overlays. Each PMD has an industrial council and an urban renewal district to generate funds for brownfield and transportation work, and a staff person to advocate for infrastructure improvements.

An evaluation of the older Planned Manufacturing Districts by the Center for Economic Development at the University of Wisconsin-Milwaukee found that two of the three districts from the 1980s had succeeded in increasing the number of businesses and jobs. However, there was a continuing shift from manufacturing to warehouse and distribution employment, marking the program partly but not completely successful in meeting its goals.

Chicago's Planned Manufacturing Districts are a relatively close match to Portland's industrial sanctuaries, although they are much newer and applied to individually smaller districts. It has been popular with local industrial businesses and with different city administrations.

VII. CURRENT TRENDS AND ISSUES

The Port of Portland likes to say that Portland is engaged in “industrial smart growth.” This is a slogan designed to appeal to Portland’s “green” constituency, but it also a good description of the facts on the ground and on the waterfront. Clustering freight-oriented industrial and distribution uses along the harbor and railroad freight corridors limits the total miles of transportation that are needed. Maintaining intensive use of industrial waterfronts and other close-in industrial land reduces sprawl and makes efficient use of a century and a half of cumulative investment.

1. Land needs and availability

There has been steady demand for waterfront industrial land and land within Portland’s transportation core. Land uptake was 21 acres per year in 1990s, slowed with economic downtown, but now is closer to 30 acres per year.

One response to the need for more close-in industrial land has been for firms to make more intensive use of their existing acreage. For example, the Columbia Sportswear warehouse at Rivergate is built high enough to stack materials in multiple layers. Tank farms are expanding to handle ultralowsulfur and renewable fuel, and Chevron is replacing low storage tanks with taller, higher-capacity tanks. Toyota is trying to move cars more rapidly through its import facility in order to maximize use of its land.

2. Environmental concerns

The Superfund listing of the Portland harbor raises serious problems for maintaining and reusing industrial land. Environmental remediation will be necessary before a number of parcels can be reused, especially highly desirable 50- to 100-acre sites. However, it is worth noting that Superfund listing has also been applied to much of the comparable land in Tacoma and Seattle (Harbor Island, Lower Duwamish).

3. Energy and construction materials

Continued growth in Oregon and southwest Washington supports the viability and expansion of energy and construction materials businesses on efficient sites on or near the waterfront.

4. Metals, machinery, transportation equipment

Since 1980, Portland has defied the national trend of declining industrial employment, even without counting high-tech employment. Several factors support the viability of the large cluster of metals, machinery and transportation equipment manufacturers. The presence of many small and moderate sized firms, rather than one giant company, provides flexibility and resilience. So does the orientation to markets in the rapid growth region of western North America markets. In addition, many firms make a variety of products for multiple markets.

5. Green industries

There are opportunities for synergy between traditional industrial firms and “green industries.”

The Portland Development Commission’s target clusters include metals and transportation equipment but also cycling and energy technologies, both of which have “hard” product dimensions as well as expertise dimensions.

6. Distribution and logistics

Several factors support continuing growth in the distribution and logistics field. As overall United States manufacturing declines and production shifts overseas, more products will be arriving through U.S. ports (especially on West Coast) and moving long distances into and across the continent. Portland has substantial advantages in a port with room to expand and with good highways and rail connections that are less congested than in California.

At the same time, the region has transportation bottlenecks and continued investment needs. Half of region’s rail users are in harbor area. The huge and growing commitment of Class 1 railroads to coal hauling puts limits on the future of Portland as a transshipment point for containers headed to central and eastern United States.

7. Labor supply and production synergies

Portland is known as an attractive location for small and medium-sized businesses in the metals and machinery industries because it has skilled workers and a network of subcontractors. For example, Schnitzer Steel has 150 accounts in the Portland region. For a comparison and model, we might think about the Los Angeles area, where the aircraft industry developed and thrived with more than 1,000 subcontractors and suppliers.

8. Industrial sanctuaries

Industrial land that is affordable and protected from competing uses remains vitally important for supporting new businesses, for new manufacturing entrepreneurs need affordable, accessible, and hassle-free space in which to grow their businesses. This was true in the 1910s when Portland Knitting Mills got its start in a 50 by 50 foot building on Southeast Stark Street. It was true in the 1940s when Tektronix started in an old loft building at Southeast Seventh and Division and the 1950s when ESI used the same building on Stark. It was true recently when Rejuvenation Houseparts grew from a storefront operation in the mid-1980s to manufacturing operation with 300 plus employees located in the Northwest Industrial District, or when Chris King Precision Components moved from California to the Northwest Industrial District.

9. Competition from non-industrial uses

Industrial districts and the working waterfront will continue to face pressures for conversion to residential areas and/or mixed-use developments. For example, not far from home, Salem is proposing to rezone industrial land with good rail service, effectively removing it from the industrial land inventory. Another example is that of Advanced American Construction. The company has a marine and industrial repair business in Vancouver, whose future has been made uncertain by the nearby construction of a new middle school and rezoning for mixed use.

Similarly to Seattle and Vancouver, B.C., the coming years may well see consolidation of railroad yards and maintenance facilities on Portland's east side, opening previously industrial lands for debate about future land uses.

Along the river, there will be resistance to the continued operation of Terminal 2 because of its proximity to new housing. There continues to be pressure against industrial uses of industrial land in Linnton. The Port of Portland will have a balancing act with environmental concerns when it needs to expand to West Hayden Island.

VIII. CONCLUSION

Portland's complex of metals, machinery and transportation equipment manufacturing is an innovative industrial sector with a strong future and growing connections to Portland's position as a leader in sustainable economic development. The public sector should continue to recognize its importance with supportive land-use regulations and protections.

Portland is known for a strong and systematic commitment to maintaining industrial land, a commitment that is more deeply rooted and more comprehensive than in any other U.S. city. It has a strong record of favoring industrial land retention over proposals for the intrusion of big box retailing and housing into industrial districts. As the metro-area economy adds more and more jobs in high-tech industries and "idea industries," it is important to keep people educated about this policy and its benefits. Policy makers and the public need to remember that the traditional industrial economy employs tens of thousands of workers at family-wage jobs and still pays more bills than fashionable software or multimedia firms.

Like many cities throughout the United States, Portland is experiencing strong and increasing demand for new housing in the center city and core neighborhoods. Some of this demand is being satisfied on land that previously housed industrial or transportation uses. Although such land conversion is sometimes appropriate, the city needs to take extreme care and caution before determining that industrial land is no longer viable for industrial uses.

Portland has a superior freight movement infrastructure that represents 150 years of investment. This infrastructure includes railroad lines developed more than a century ago, as well as much more recent investments like an enlarged lock at Bonneville Dam, a new BNSF bridge across the Willamette, brownfield remediation, and ongoing rail and highway improvements for Rivergate. It is vital to protect and enhance this transportation infrastructure as an economic asset that would require billions of dollars to replace or reproduce and to promote public awareness of its value.

Freight transportation in the 21st century is the quiet partner in Portland's transportation system. Freight movement is less glamorous than new passenger rail systems and receives less public attention than highway congestion. However, the water-rail-pipeline network that concentrates in Portland is the anchor for a trade-based economy. Regional transportation planning and investment will be most effective when addressing truck mobility and highway connections to major industrial areas, marine transportation facilities and railroad bottlenecks as coordinated elements of a single freight movement system.

There are important points of compatibility and synergy between Portland's industrial heartland and the growing desire to make the city a leader in sustainable urban growth. These include the capacity of metals and machinery businesses to engineer and build specialized, environmentally friendly products (from bicycles to streetcars to fish ladders); the important role of recycling in the metals industry; and the substantial energy advantage of moving

freight by water. Public agencies and private organizations that promote sustainable development have an opportunity to increase their effectiveness by taking advantage of a supportive industrial base.

Conserving Portland's industrial districts and its working waterfront is directly compatible with Oregon land-use planning goals. The Oregon system was established to protect the economic foundations of the state from being eroded by urbanization and sprawl. Most attention, then and now, has focused on Urban Growth Boundaries and the preservation of farm and forestland, but the protection of one-of-a-kind industrial land and transportation infrastructure is fully in synch with the system's goals. Retaining a compact industrial waterfront limits conflicts between industrial and residential uses and reduces the need for "industrial sprawl."

Portland has a history of intentional action to promote and protect its waterfront economy and industrial base. The private sector has invested and reinvested in transportation and industrial facilities, and the public sector has actively supported this investment through land-use policy, energy development and transportation improvements. As private activity increases in the first decade of the 21st century, it is important to keep the industrial economy on the public agenda.

Over the decades, Portland has benefited from a diversified economy with multiple industries and areas of activity, rather than depending on a single industry or employer. This diversification has helped smooth the peaks and valleys of the business cycle and prevented the kind of economic problems of cities like Detroit or Youngstown. Deliberate efforts to maintain this diversification by supporting the continued development of the waterfront transportation/industry complex should be a central element of all regional planning and development efforts.

ABOUT THE AUTHOR

Carl Abbott is Professor of Urban Studies and Planning at Portland State University, where he teaches courses on urban history and city planning. He has also held faculty positions at the University of Denver, Old Dominion University, and George Washington University. He has written extensively about the development of Portland and other American cities. His professional work includes six years as co-editor of the *Journal of the American Planning Association* and current co-editorship of the *Pacific Historical Review*. He has been active in civic groups such as the Oregon Downtown Development Association, Livable Oregon and the City Club of Portland. He is also part of a six-year project to enhance the teaching of American history in Portland area schools and works frequently with organizations such as the Oregon Historical Society and the Architectural Heritage Center. He has written about urban issues for *Landscape Architecture*, *Historic Preservation*, *The Next American City* and other national magazines.



