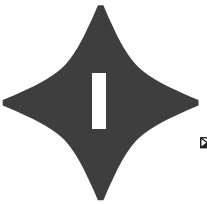

THE INDUSTRIAL FOUNDATION

For more than a century, heavily capitalized industry drove the growth of Pittsburgh and its metropolitan region. Before 1900 the iron and steel industry defined the region both locally and nationally. Several other industries, from railroad equipment and electrical machinery to glass, aluminum, and all manner of associated manufactures, also thrived throughout southwestern Pennsylvania. The coal and coke, oil and natural gas, sand, clay, and limestone industries provided essential raw materials and energy inputs. Transportation and communication networks connected the widely scattered parts of the sprawling industrial region. The omnipresent river system and complex hill and valley topography presented both opportunities and challenges for entrepreneurs. Industrial and natural resource firms manipulated, engineered, and abused land, water, and air in pursuit of industrial growth and financial success.

The first essay of this section explores the resulting complex landscape and environmental consequences of natural resource exploitation, industrialization, and urbanization. Many southwestern Pennsylvania residents accept the landscape around them as "natural" without appreciating how altered and dynamic it is. The second essay provides a brief overview of the region's industrialization and the emergence of industrial corridors of mills,

factories, mines, and working-class communities along the waterways and railroads that threaded their way through the winding valleys. The third essay describes the decentralization of industries in search of suitable production sites for large operations and efficiencies of excellent transportation facilities. This centrifugal movement by the early twentieth century created a vast industrial region that in spite of its sprawling, dispersed character was strikingly interconnected by communication, transportation, and production linkages. The final essay focuses on the manipulation of the rivers and riverbanks for industrial ends, concluding with a brief discussion of the slow but tangible restoration of the rivers into environmental and recreational assets in the postindustrial phase of the modern city.

1 THE INTERACTION OF NATURAL AND BUILT ENVIRONMENTS IN THE PITTSBURGH LANDSCAPE

Edward K. Muller and Joel A. Tarr

> The capacity for being seen with the eye in the Large . . . is the birthright of Pittsburgh. Where from so many different points one sees the involved panorama of the river, the various long ascents and steep bluffs, the visible signs everywhere of movement, of immense forces at work,—the pillars of smoke by day, and at night the pillars of fire against the background of hillsides strewn with jets of light,—one comes to have the convincing sense of a city which in its ensemble is quite as real a thing as are the separate forces which go to make it up.
>
> —Robert A. Woods

There is probably no city in the nation that can match the dramatic landscape changes that have marked the city of Pittsburgh during the last two centuries. The natural environment itself provided a striking panorama of flowing rivers and streams, steep bluffs, and deep valleys that would shape the configuration of the built environment (see Figure 1.1). With nineteenth- and twentieth-century technology and the characteristic American disregard for the natural environment, however, Pittsburghers engineered and abused the landscape to accommodate the imperatives of industrial production, efficient transportation, communication, and city building such that it often became difficult to discern the land's original configuration. Early in the twentieth century, Pittsburgh elites became concerned with the perceived relationship between environmental degradation and a deteriorating civic culture and set in motion a countertrend toward consciously planning urban growth and controlling damages to the natural environment. In the decades after the Second World War, a publicprivate partnership made

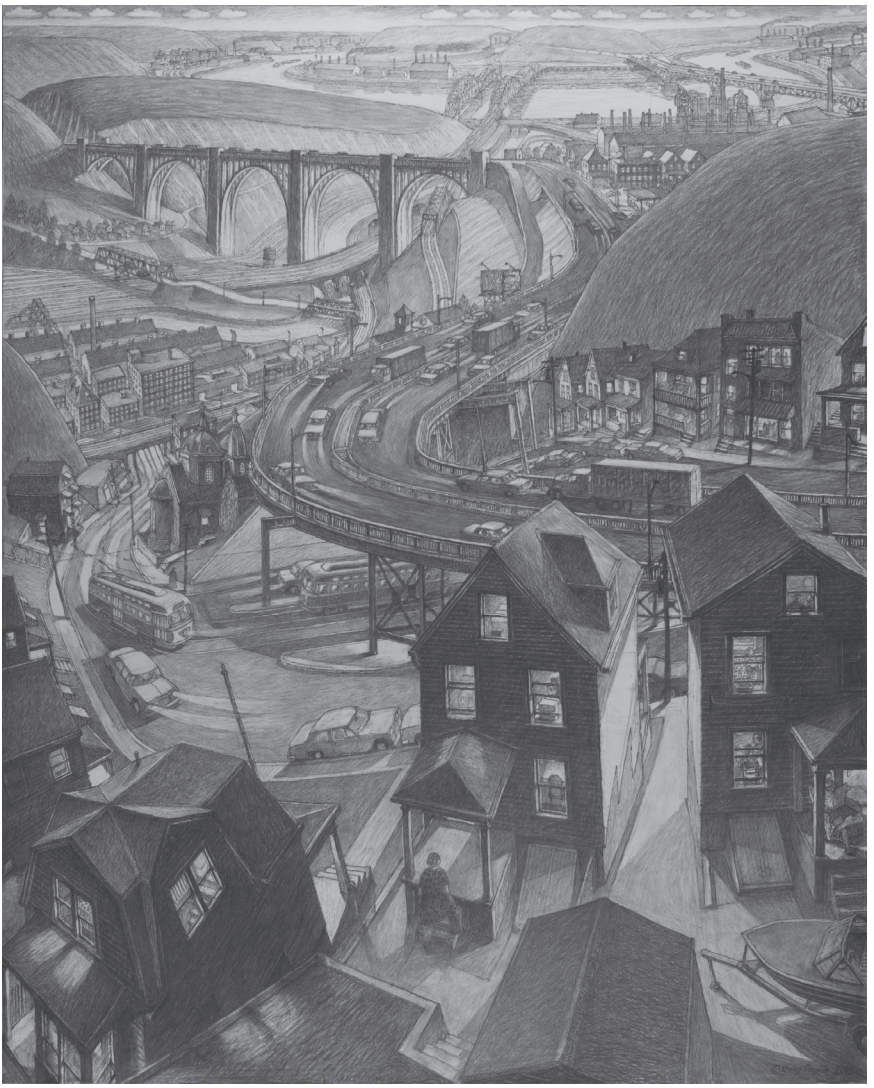

Fig. 1.1 Doug Cooper etching and overview of Pittsburgh topography. The etching dramatically demonstrates the interaction of the Pittsburgh built environment with the region's topography (permission by Doug Cooper).

further attempts at restoration, driven in this case by fears of economic decline. Most recently, the collapse of the steel industry has again suggested possibilities for renewal, although the scope and quality of these endeavors are still open questions.

Many Americans have difficulty conceiving of an urban-industrial land-

scape because "landscape" conjures up images of natural scenery. For the geographer, however, the term "landscape" becomes the central organizing concept in contemplating both natural and built environments. It includes the physical properties of the land, flora and fauna, and climate as well as human-built features. The construction of an industrial city on a complex natural site produced a landscape that encapsulated inherent conflicts and tensions over issues of environmental quality and ecological protection.

We will explore some of these conflicts and tensions by examining Pittsburgh history over time, illuminating the city's impacts upon its physical landscape. Many of these changes were deliberate, resulting from the construction of a built environment designed to either control or re-form the natural environment of rivers, streams, and landforms. At times the forces of city building and industry were able to shape the rivers and landforms of the region to meet their needs, but at other times nature's forces surged out of control, wreaking havoc on the landscape.

ENCOUNTERING THE WESTERN PENNSYLVANIA REGION

In the eighteenth and early nineteenth centuries, westward-bound Euro-American settlers in Pennsylvania found themselves challenged by a massive mountain barrier, what the Native American populations called the "endless mountains"—the ridges and valleys of the Appalachian Mountains. After climbing the abrupt fifteen-hundred-foot-high Allegheny front that separated the mountain chain from the broad Appalachian Plateau stretching far to the west, they confronted two more ridges and a sea of hilltops as far as they could see. Descending down into that "sea," these pioneers encountered mature forests draped over a complex network of knobby hills and steep valleys. Small creeks, larger streams, and rivers further impeded their progress except where long floodplains offered some respite from the hills. The many small creeks flowing down steep grades to the larger rivers and streams cut a complicated pattern of sharply sloped narrow ravines. They were, in fact, traversing the eastern province of the great Appalachian Plateau.[1]

As the pioneers looked westward from atop the most western ridge, they might have noticed that most hilltops unfolding before them were nearly the same height. This uniformity, from roughly twelve hundred to thirteen hundred feet above sea level, is the plateau; the complexity of hills and valleys derives from the protracted erosion of this upland surface by the many streams and rivers. In short, the hill and valley character of southwestern Pennsylvania is really a dissected upland. Over millions of years fluctuating inland seas laid down layer upon layer of sedimentary rocks. When the seas

periodically retreated, dense vegetation, peat swamps, and marshes emerged and flourished, only to be submerged again when the seas rose once more. The seas deposited strata of sand, mud, shells, and pebbles, which turned into layers of sandstone, shale, slate, limestone, and conglomerates. Under the increasing weight of this layering, the decomposed vegetation and peat became coal, petroleum, and gas intermingled with layers of sedimentary rock. Strata of clay—some soft, sticky, and unstable like the red-bed clays that make the region landslide prone—complete the profile. Compared to regions of the Appalachian Plateau to the west, the soils of this region are thin, sandy, rocky, and relatively acidic.[2]

Two more geological events shaped southwestern Pennsylvania's natural landscape. Buckling of the earth's crust thrust upward the two long parallel ridges—Chestnut and Laurel Ridges—running northeast to southwest across the region's eastern edge. Later, across the northern portion of the region north of a line from Beaver to Warren, glaciers covered the land and disrupted the original northward flow of the major rivers. They created the now familiar and distinctive three rivers geographical framework for the settlement and development of the region—the Allegheny River flowing southward to meet the northward-flowing Monongahela River to form the Ohio River, which courses generally westward to the Mississippi Valley. The glaciers also widened and deepened the Allegheny River valley, filling it with the sand and gravel detritus of glacial scouring action. After the glaciers retreated, the river cut into this sediment, leaving relatively broad fertile terraces and deep gravel deposits below the riverbed. All three rivers flow in broad sweeping meanders that create alternating arch-shaped floodplains on the inside of the curves and steep bluffs on the outsides.[3]

Given this geological history, southwestern Pennsylvania's potential for commercial agriculture paled in comparison to that of regions to the west or to the east in southeastern Pennsylvania, which possessed richer soils and flatter lands. However, the regional landscape still contained abundant resources to attract pioneer settlement. While eighteenth-century Euro-American explorers, traders, and trappers depended on the region's natural resources, they caused relatively minor and spatially concentrated impacts on the landscape, much like the Native Americans they encountered.

At the time of Euro-American contact, Native Americans only sparsely settled the region and the area was a crossroads for hunting and trading. This settlement pattern resulted from conflict between the powerful Iroquois, who claimed the land, and eastern tribes such as the Delaware and Shawnees, whom whites had forced to migrate westward.[4] Village sites, small crop plots, and overland trails were probably the most recognizable

human imprints, though Native Americans sometimes burned forest undergrowth for hunting and agricultural purposes. Traders and trappers, trading for beaver and other animal hides, attached themselves to this pattern. In the 1760s the armies of Generals Braddock and Forbes constructed roads through the wilderness, probably having more of an impact on the environment than any Native American activity. Both of these roads became major overland routes in subsequent years.[5]

In the second half of the eighteenth century, major clashes for regional control occurred among Native Americans, French and British traders and troops, and American colonists. By the end of the century permanent Euro-American occupancy was assured, and regional development accelerated, thus beginning a dramatic transformation of the landscape.[6] Southwestern Pennsylvania settlers exploited the waters, forests, and wildlife of the region, and the primary rivers provided serviceable transportation routes during large portions of each year for migrants as well as access to slowly emerging markets.

Between the 1780s and 1830s, settlers carved farms out of the hills and valleys of southwestern Pennsylvania, wherever reasonably level or moderately sloped land permitted. Slowly they cleared the trees from arable land. The spreading market economy allowed farmers, self-sufficient at first, to add some cash crops, especially wheat and rye, and to make whiskey from grain for an especially marketable product. Compared to highly productive agricultural regions, however, southwestern Pennsylvania was not especially fertile or densely settled, and travelers frequently commented on the "rough and uncultivated" character of the land.[7]

Some observers, often from the more fortunate social classes, described the landscape in the picturesque terms that were fashionable after the first third of the century. A few eyewitnesses painted romantic views of the region's streams and countryside, while local painters of the Scalp Level School such as George Hetzel painted sublime landscapes of the western Pennsylvania wilderness in a manner derivative of the Hudson River School.[8] As Rina C. Youngner notes in her study of art and industry in Pittsburgh, local artists turned to nature at a time "when the city stood as an antithesis to pastoral values in its steady encroachment of the landscape along the three rivers."[9]

The growing commercial city of Pittsburgh presented a striking contrast with these wilderness and pastoral landscapes. Commercial activity focused on the busy Monongahela wharf, a mudflat stretching down to the river, while urban development spread across the point of land formed by the convergence of the Allegheny and Monongahela Rivers. Organized by

a gridiron street plan that paralleled the rivers and the centering of trade around the wharf, the city featured artisan shops, inns and taverns, small offices, and residences, crammed densely into the confined space (see "Downtown Pittsburgh" in this volume). Only church spires and steamboat stacks broke the uniformly low skyline of two- and threestory brick and frame buildings. Small industries occupied the riverfronts around the edges of this settlement core. More rapid economic and population growth after 1830, especially with the opening of the terminal basins of the Pennsylvania Main Line Canal, pushed new manufacturing firms up both the Allegheny and Monongahela floodplains and across these rivers. Many settled in communities that Pittsburgh later annexed, such as Allegheny City on the north bank of the Allegheny River (annexed in 1907) and several smaller towns (annexed in 1872 and called Pittsburgh's South Side) on the south bank of the Monongahela River.[10]

Even in the initial decades of the nineteenth century, visitors remarked on the pall of smoke that lingered over the basin formed by the hills surrounding the city. As one visitor to the city noted in 1829: "After traveling for two weeks through white, clean, cheerful-looking villages and towns, to come all at once upon dirty streets and dark, filthy looking houses stretching away in rows continuously ahead and enveloped in an atmosphere of smoke and soot which blackened everything in sight, was not a pleasant transition."[11] Although covering only a land area of less than two miles in radius from the Monongahela wharf, this collection of several contiguous communities housed nearly eighty thousand residents at mid-century.

EMERGENCE OF THE INDUSTRIAL LANDSCAPE

Although Pittsburgh's massive industrialization occurred primarily in the second half of the nineteenth century, its identification with industry and industrial landscapes actually emerged at a relatively early time in its history. The rich diversity of minerals embedded in the sedimentary rock layers of the Appalachian Plateau supported the city's growth. Local manufacturers fashioned the region's clay into pottery wares and bricks. Others used local sand for making glass products, and Pittsburgh for a time was the nation's leading manufacturer of glass. Ironmasters refined the iron ore of Chestnut and Laurel ridges in nearby blast furnaces fueled with charcoal made from hardwood trees. The pig iron product of these country blast furnaces was usually sent to Pittsburgh foundries and rolling mills. Most important of all, however, was cheap energy, as outcroppings of coal or easily worked shallow drift mines provided fuel for local industries and residences.[12]

The focus on iron manufacture was so prominent that, as early as 1821,

the British visitor George W. Ogden observed the city could be called the "Birmingham of America." Views of Pittsburgh painted by various artists before the Civil War also began to feature industrial scenes, as they felt less compelled to emphasize picturesque subjects. Especially striking, for instance, is Sherman Day's *Pittsburgh from the Northwest, 1843*, which highlights the smoke and industrial buildings that dominated the city when viewed from Mount Washington. William Schuchman's view of *Pittsburgh, Pa., 1859* also profiles industries such as ironworks, foundries, and cotton mills as well as riverfront activity.[13]

Much of Pittsburgh's industry up to the 1870s was concentrated either within the city or close to it in the neighboring city of Allegheny and in the South Side communities of Birmingham, East Birmingham, and South Pittsburgh. Otto Krebs's 1870s paintings, for instance, reflect the density of industry in these towns. In the late nineteenth century, as railroads increasingly penetrated the region and the rivers were made navigable through the construction of locks and dams (slack watered), large firms spread up and down the rivers, locating particularly in the river meanders (see "Pittsburgh's Industrial Corridors" in this volume). It is in this context that Pittsburgh's "meta-landscape" emerged, as is fully illustrated in representations of the industrial city in the major journals of the late nineteenth century.[14]

In his enlightening study, *Metropolitan Corridor: Railroads and the American Scene*, the historian John R. Stilgoe discusses the growth of what he calls the "industrial aesthetic" that emerged in the industrial zone outside cities east of the Rocky Mountains after 1880 or so.[15] One of the major features of these zones was the shift in the scale of enterprises. Even though Pittsburgh had had major industrial complexes before the late nineteenth century, they paled in comparison to those that emerged after this date, and the Pittsburgh region became renowned for presenting an unmatched urban industrial landscape to those that encountered it.

The most striking examples of the industrial aesthetic in the Pittsburgh region were its integrated steel mills.[16] These enormous complexes, each covering several hundred acres and sometimes both sides of the river, presented a chaotic assemblage of huge brick and metal sheds, towering blast furnaces, hot ovens, Bessemer converters, open-hearth furnaces, rolling mills, giant ore loaders and ore yards, all framed by river and rail. Most observers commented on fiery, dramatic displays of the converters and furnaces: "Particularly remarkable is the weird spectacle presented at night, with the furnaces fiercely gleaming, the fresh ingots smoking hot, the Bessemer converter 'blowing off,' the great cranes moving about like things of life, bearing giant kettles of molten steel." In a recent description, the writer

Laurie Graham captures the bewildering mass and complexity of a steel mill: "The view on approaching the mill was of another world—the looming plant sheds, the convoluted tubing of blast furnaces, the trusswork of ore bridges over mounds of reddish ore, the winding roads through hundreds of acres of buildings large and small, metal platforms and stairs, ductwork and railroad tracks, trucks and locomotives, torpedo and thimble and other types of railroad cars. . . . Plumes of water vapor rose from rooftops as steam issued into the cold winter air."[17] Many other industries, including glass and refractory brick makers, locomotive and railroad equipment manufacturers, carriage builders, metals fabricators, and electrical equipment firms, operated out of large brick multistoried structures that covered a full block or more, providing a solidity to the urban landscape.[18]

Stilgoe notes that travelers passing through the industrial zones found them "extraordinary, intriguing, beautiful places. Refineries, steel mills, locomotive plants, coal breakers, and mysterious factories combined . . . to make an awesome landscape of built forms." For many, the zone "hummed with enterprise," and these landscapes drew an appreciative response in trade journals, engineering magazines, and even more general circulation periodicals. Booster publications and materials prepared for Pittsburgh's many conference visitors proudly illustrated the industrial strengths of the city through facts and figures and multiple drawings and photographs.[19]

Whether the city was greeted with praise or blame, however, depended upon the perspective of the viewer. For Paul U. Kellogg, director of the Pittsburgh Survey, a "matrix" of pipelines, electric, telegraph, and telephone wires, mile-long river barge tows, and extensive railroad tracks had almost completely obliterated the natural features of Pittsburgh's rivers, hills, and valleys—in short, the industrial environment had replaced the natural environment.[20] Others, however, found it a fascinating landscape, reflecting the power and authority of dedicated human forces.

Critical to this industrial complex, of course, were the railroads that came to form a ubiquitous part of the Pittsburgh landscape.[21] The first railroad to enter Pittsburgh was the Pennsylvania & Ohio, which linked the city with Philadelphia in the east in 1852. This was soon followed by other major trunk line railroads including the Baltimore & Ohio from the south, the Allegheny Valley from the north, and the Pittsburgh & Lake Erie. By the First World War, the city was served by six major trunk lines and sixteen industrial and switching railroads.[22] In addition to the trunk line railroads, many short lines and feeder lines also honeycombed throughout the Pittsburgh region.

The railroads blanketed the city, tunneling through the hills, bridging

the rivers and ravines, and usurping the riverbanks. Seeking flat land in order to run their tracks, they occupied both sides of river valleys and the bottoms of ravines. In some places two lines shared the same narrow shelf along the river. The Pennsylvania Railroad, which carried more passengers and freight than any other Pittsburgh line, was four-tracked throughout the city and much of the region. Until the first decades of the twentieth century, the railroads disrupted city traffic flows with numerous grade crossings; trains ran down Liberty Avenue through the middle of downtown to terminals at the Point until 1905.[23]

The railroads built massive freight and marshalling yards, roundhouses, and shops at convenient locations. The largest marshalling yard in the region until 1952, when the Pennsylvania Railroad established the Conway Yard, was the Pennsy's Pitcairn Yard, built in 1892 on a 250-acre site east of the city. On this site four major tracks fanned into thirty-six tracks to make possible the assembly of freight trains up to fifty cars long.[24] Other marshalling yards were scattered at points throughout the region, including sites close to the downtown.

The railroads established their presence downtown by locating their stations at important throats and disgorging thousands of commuting passengers into city streets every weekday morning (see "The Cable and Electric Streetcar Networks" in this volume). These architecturally prestigious stations furnished major landmarks in the city's downtown, surrounded by cabs, omnibuses, private vehicles, and horse-drawn drays, all competing for space. Railroad smoke formed a large fraction of the city's air pollution burden, creating especially bad conditions at locations such as marshalling yards, roundhouses, and terminals. Not until after the Second World War did diesel-electric engines replace the smoke-belching steam locomotives.[25] The shriek of the steam locomotive whistles pierced the Pittsburgh atmosphere day and night as they wended their way through the torturous Pittsburgh topography, hauling long trains of cars filled with coal, coke, and other goods.

FUELING THE INDUSTRIAL LANDSCAPE: COAL AND COKE

Without coal, Pittsburgh would have remained a relatively small commercial city for, as Willard Glazier wrote in 1883, all of Pittsburgh's industry was "rendered possible by the coal which abounds in measureless quantities in the immediate neighborhood of the city."[26] The rapid growth of steam railroads, steam-powered manufacturing plants, and the iron and steel industry, especially after mid-century led to a burgeoning demand for coal and the development of the bituminous coal and coke industry across the region.

Pittsburgh possessed a magnificent coal seam, which extended throughout southwestern Pennsylvania. Coal outcroppings and seams close to the surface in the city itself and in its outskirts were mined first, but as demand increased mining spread rapidly. Coal production in the four southwestern Pennsylvania counties of Allegheny, Westmoreland, Fayette, and Washington mushroomed from less than 0.5 million tons in 1850 to 5.5 million tons in 1870, 11.6 million in 1881, and 66.5 million in 1911.[27] By the early 1900s, coal mines and coke plants pockmarked the region's hills and valleys, existing uneasily with the earlier agricultural landscape in some areas and supplanting it in others.

The coal industry had major impacts on the landscapes of both the natural and the built environments. Coal mining scarred the natural environment wherever it took place, as men and technology ripped the coal out of the hills. As mining proceeded, huge heaps of mining waste or slate dumps (also called gob piles) accumulated near the mines and loomed over the patch towns. Debris from mining filled the streams and disrupted water supplies. Acid drainage from the mines turned the water in nearby streams rust colored and coated the hillsides with rivulets of orange- and rust-colored drainage, and land often subsided in areas where deep mines had been dug.[28]

Structures relating to mining were scattered over the landscape. The most recognizable structural feature of the mining complex was the coal tipple standing high above the landscape near the mine entrance or protruding from a riverbank. Depending on the age and size of the mine, other structures also stood nearby, including a head frame, hoist house, boiler house or powerhouse, fan house, repair shop, lamp house, and mine office.[29]

Near the mine complex, most coal firms built small company towns called "patches" or "patch towns." The companies owned and operated these patches in order to attract workers to inaccessible mine sites, have a stable labor supply, increase control over the workers, and turn a profit. Usually companies erected rows of identical cheaply built, wooden houses for workers and their families in a linear pattern along a road leading to the mine or on a grid plan rising up a hillside. The houses were generally two-story, semidetached structures on large lots equipped with double outhouses and coal bins in the backyards. Mine managers occupied more elaborate houses in a separate row. The largest building, mostly brick, was the company store. Streets and walkways were unpaved, except for rust-colored waste ("red dog") from the gob pile or coke ash that was spread on the surface to keep down dust.[30]

The towns presented a drab, monotonous, and temporary scene, for the

companies believed the town would lose its utility when the coal was exhausted and the mine closed. Ironically, in the years after the Second World War when many mines were shut down, tenants often bought their homes, which they usually had upgraded with running water, indoor plumbing, and electricity. Those patches enveloped by urban development remained low-income housing and frequently deteriorated. In the rural areas, they evolved into residential pockets amid the countryside.[31] Many of the other physical remains of the coal industry, however, such as the large gob piles that loomed over the towns and streams tainted with mine acid, often remained as disfigurements on the landscape.

While much coal was shipped directly to markets, coal used for the coking process presented a different picture (see "Searching for a Sink for an Industrial Waste" in this volume). Carbon was a basic requirement of iron making, and for approximately the first half of the century iron manufacture took place primarily on charcoal iron plantations that drew on surrounding forest resources. After the 1850s coke made from bituminous coal increasingly substituted for charcoal as a source of carbon, making it possible to locate iron blast furnaces in the city. The best coking coal in the world—the so-called Connellsville Coke—was discovered in southwestern Pennsylvania in a narrow seam that ran approximately forty miles from northeast to southwest.[32]

From about 1850 to 1920, most coke was made by distilling bituminous coal in beehive coke ovens at high temperatures to drive out the volatiles (oils, gases, and tars) through holes at the top, leaving a high carbon residue that could be used in iron making (see "Searching for a Sink for an Industrial Waste" in this volume). Therefore, it made economic sense to process it near the mines and ship it to the city by river and rail.[33] Operators built rows of beehive ovens into the hillsides (called "bank" ovens) or in freestanding rows or blocks of fifty ovens, with some installations holding as many as three hundred ovens. The dome-shaped ovens had a base diameter of approximately twelve feet and rose to about seven feet in height. The coal cooked for between forty-eight and seventy-two hours and was then removed from the oven by laborers or, after 1900 or so, by mechanical unloaders.[34]

When demand warranted, the ovens operated around the clock. The coke plants themselves were dirty, noxious operations of several hundred ovens, busy railroad yards, and a proximate mine complex and gob pile, with cinders and ash everywhere. With thousands of ovens of several operators working in a relatively small area, the smoke, fumes, and ash cast a pall over the valleys. Muriel Sheppard captured the scene well:

> It depends on the wind and weather, the season, the time of day, and the coke market how much there is to see from the Chestnut Ridge lookout. Early on an autumn morning with a damp wind blowing up plumes of smoke traveling sideways, a violet curtain full of moving particles of soot blots out the valley. The spring smoke is apt to be whitish-blue, that of winter brown or gray, and any time of year it ranges from pinkish-lavender to gun-metal tinged with purple at evening. . . . It is a country of extremes, ugly by day with banks of coke ovens, tipples, sidings, and fields gnawed to the rock with strip-coal operations: luridly beautiful by night when the glare of the ovens paints the sky and works magic with head frames and sooty buildings.[35]

A regional urban network of towns arose to service the coal and coke industry, including administrative offices, repair facilities, and stores of machinery and parts. Estimates for 1910 suggest a population of more than one hundred thousand in the two major coke areas, including the urban centers. The railroads and, after 1900, interurban cars provided some connections within the region. And the rivers, railroads, and capital tied the whole area to Pittsburgh, which in ownership of the number of coal mines, coke plants, and coke ovens dominated the industry. In this manner Pittsburgh capitalists controlled the coke region, although considerable local fortunes were also made.[36]

In the years after 1910 the making of coke in by-product ovens began to emerge as an important alternative to beehive ovens. The by-product oven was a narrow slot oven constructed in batteries in which coking chambers alternated with heating chambers. Coal was charged through openings in the top of the oven, and the coke was pushed out by a powerdriven ram at the end of the combustion process, to be quenched outside the oven. The gas evolving from the coal supplied the heat required for distillation and was also used for other purposes throughout the mill. The by-product oven had the advantage of capturing the volatile elements such as coke oven gas, tar, and ammonia freed by the coking process as well as producing a higher coke yield per ton of coal than the beehive.[37]

While beehive coke ovens were customarily located close to the mines, by-product coke oven works were sited closer to the mills in or near urban areas. The various by-products such as coke gas could thus be utilized not only in the integrated steel mills but could also be sold to various users such as municipalities. US Steel opened the first full by-product coking plant in the region in 1916 at Clairton, twenty miles south of Pittsburgh on the Monongahela River. The plant occupied a riverfront site 5,200 feet long and

1,800 feet in width, the largest plant in the world at the time of its construction. The Clairton Works had fifteen hundred by-product ovens that consumed enormous amounts of coal, which was largely moved to the plant by river barge. Jones & Laughlin Steel (J&L) constructed a by-product coke oven between 1918 and 1920 at its Hazelwood complex (see "Searching for a Sink for an Industrial Waste" in this volume). While not as extensive as the Clairton Works, the location of the J&L plant within the city made it both highly visible and a producer of extensive air pollution and odor that plagued the nearby community. On a windy day, the odor of sulphur would carry far beyond the mill communities into middle-class neighborhoods.[38]

The by-product coke works, then, along with the iron and steel mills consumed huge amounts of land along the rivers, using the latter for purposes of cheap transportation and wastewater disposal as well as sources of process water. Their presence was indicated not only by the flaring of waste gases and columns of black smoke but also by plumes of white steam that rose as the red-hot coke was cooled with process and river water. Since the plants worked twenty-four hours a day, these plumes constantly appeared in the visible landscape. In addition, the companies constructed major networks of pipes to ship the coke oven gas to the linked steel mills and to other users, often running these pipes along the sides of hills of the river valleys. The plumes of steam and the pipelines provided additional visible evidence of the impact of industrialism on the landscape.[39]

THE RIVERS

The three rivers—and especially the point of land they form, which signifies the beginning of the Ohio River—have always been a defining feature of the Pittsburgh landscape. Although the rivers' relentless current makes them seem like the one constant amid the ever-changing man-made industrial landscape, the river landscape itself, in fact, also underwent significant changes. In the city's initial fifty years or so when its economy depended on being the "gateway to the West," river commerce dominated the urban scene. The city's street plan, merchant houses, and goods handling together focused on the busy Monongahela mudflat—that is, the city's wharf.

All kinds of craft, but mostly steamboats as the years went on, tied up at the wharf, which was a beehive of activity. The solid row of brick two- and three-story merchant buildings along Water Street at the top of the wharf was the city's face to the river and the world. Boatyards and factories claimed the riverfronts away from the wharf, and the riverbanks reverted to their natural state at the urban periphery, where the recreational activities of fishing, hunting, rowing, and picnicking took place.[40]

Industrialization changed the river landscape as profoundly as it did the rest of the urban area. Shippers, mine owners, and industrialists demanded greater control over the rivers' flow in order to enhance the shipping of resources, especially coal, essential to the region's burgeoning industries. Beginning with the Monongahela River in the 1840s, private and public construction of locks and dams successfully created slackwater pools between the dams on all three rivers. Slackwatering the river through the construction of dams and locks raised average water levels, narrowed their fluctuations, and thereby extended the navigation season. By the late nineteenth century huge rows of many barges lashed together (a "tow"), characteristically piled high with coal and pushed by powerful steamboats, plied the region's waters. Loaded barges were moored to enormous round piers or mooring cells, queued up for unloading or waiting for river conditions to be favorable for navigation.[41]

As railroads, mills, and factories spread for miles on every available floodplain, vegetation largely disappeared from the riverbanks, and the river edges became hardened with man-made structures. Industries built wood, brick, and concrete bulkheads; cranes towered over the river shorelines; industrial waste, sewage, and storm-water outflow pipes stuck through the banks; and mooring cells rose above the river surface near the shores. Some industries dumped fill beyond the river edges to extend the floodplain and then built bulkheads against erosion around the new land. The Pittsburgh municipal government raised the levels of many streets near the rivers with fill in order to diminish flood damage (see Figure 1.2).

Industrial and urban growth increased the release of toxic chemicals, effluent, and storm water into the rivers, and the water often took on a muddy brown color. Discarded rubbish and garbage littered the riverbanks along with abandoned barges and other debris stranded during high water episodes. At the same time, urban industrial development required the erection of numerous railroad and highway bridges over the rivers with their massive stone piers thrust into the channels. By the early twentieth century and for decades thereafter, the rivers became increasingly inaccessible to residents, unsightly and unnatural in both appearance and fact.[42]

CREATING A TECHNICAL NETWORK ABOVE AND BELOW GROUND: STREETS, STREETCARS, AND SEWERS

Much of the city building process took place above the surface of the ground with the construction of various networks—streets, transportation lines, along with electrical, telegraph, and telephone wires as well as buildings. By the late nineteenth century, canopies of wires shrouded the downtown

Fig. 1.2 Landslide damage, Shaler Street, June 17, 1920. Throughout its history Pittsburgh has suffered extensively from landslides (Pittsburgh City Photographer Collection, courtesy of the Archives Service Center, University of Pittsburgh).

streets, while steel tracks ran along the surface. At the same time, other construction activities took place below ground with the placement of water- and sewer-pipe networks as well as tunnels of various sorts. All of these features of the built environment had to cope with the constraints imposed by the natural environment.[43]

Pittsburgh's topography prevented a typical gridiron street pattern. Even without this constraint, however, streets were badly designed and poorly configured. Correspondent Ernie Pyle wrote, "Pittsburgh is undoubtedly the cockeyedest city in the United States. Physically, it is absolutely irrational. It must have been laid out by a mountain goat."[44] Nineteenth-century streets, aside from major corridors, were often narrow and poorly integrated with the street grid frequently having very steep grades. The municipality made major efforts in the first quarter of the twentieth century to widen streets, align them, reduce steep grades, and pave them. Beginning in 1899, city government constructed several boulevards, reflecting an attempt to improve communication between districts. In addition, because of the threat of flooding, the city raised a number of streets along the floodplain between eight and ten feet.

In the years after 1859 streetcar systems increasingly traversed the city streets, becoming a major element in the Pittsburgh landscape (see "The Omnibus, Commuter Railroad, and Horsecar" in this volume). Horsedrawn streetcars first appeared in that year, and by 1888 entrepreneurs had built fifty-six miles of track in Pittsburgh and surrounding towns, with their cars carrying twenty-three million passengers for the year. In the 1890s traction companies replaced the horsecars with electric streetcars and cable cars and extended their lines throughout the region (see "The Cable and Electric Streetcar Networks" in this volume). The replacement of the horsecar by the electric trolley was a great environmental improvement. It helped eliminate the manure, urine, and carcasses that dirtied the streets during the previous dependence on the horse.[45] By 1902, there were 469.5 miles of track linking city neighborhoods and regional towns and carrying 168,632,339 passengers for the year. Thus, the trolley became a constant feature of the urban landscape, occupying major streets, taking a large part in the downtown street congestion, and running precariously on trestles along the slopes of steep hills.[46]

Other aspects of the landscape and its alteration were related to the reshaping of the city's hydrological patterns. This change involved the physical transition from a hilly landscape cut by many streams to a landscape in which most streams were placed in culverts, becoming part of the sewerage system.[47] Initially the streams themselves were used to dispose of domestic waste and storm waters, but in the late nineteenth century the city began to develop an extensive combined sewer system. This system was based upon the natural drainage basins of the region and required the Pittsburgh Department of Public Works to culvert most of the city's streams. By 1910 the sewers drained over seven thousand acres of the city, discharging into the neighboring rivers. The outlets ranged in size from fifteen-inch terra-cotta pipes to twelve-foot brick sewers. Forty-seven public sewer outlets flowed into the Monongahela River, with another ninetyeight flowing into the Ohio and Allegheny Rivers. As of 1910 the four major streams that were still not culverted or only partially culverted—Nine Mile Run, Street's Run, Becks Run, and Saw Mill Run—became open sewers serving as the receptacles for sewage from both private and public sewers (see "The Metabolism of the Industrial City" in this volume).[48]

Urban development, therefore, created a need to dispose of both storm water and domestic wastes. This need transformed the hydrological landscape of the city from one marked by flowing streams and a healthy stream ecology into a site almost completely devoid of waterways except for the large rivers that transected it. The floodplains, valleys, and ravines where

the runs had flowed were transformed into corridors for infrastructure, including sewer systems, railroads lines, and highways, as well as for industry. Increasingly, the untreated sewage and industrial wastes flowing into the rivers consumed their oxygen, destroyed their fish and plant life, and transformed them into open sewers rather than environmentally healthy natural bodies of water.

HILLSIDES AND VALLEYS

Dense development in the city was initially confined to the level lands of the river floodplains where the construction of infrastructure to provide for transportation and communication was not problematic. Expansion of settlement and infrastructure beyond the Point and low-lying areas of the sibling communities across the rivers often confronted the region's pervasive hills and valleys. Some adventuresome Pittsburghers attempted early on to move out of the flats. In 1843, for instance, traveler Mary Ann Corwin wrote in her diary that "the town with the surrounding hills and subberbs [*sic*], the roads winding up the hills, and houses up the sides of the hills, and on the top of some of them, [was] the grandest sight we have had."[49] As population grew, however, dealing with what the Department of Public Works called the city's "broken" topography was not easy. In his 1910 plan for Pittsburgh, Frederick Law Olmsted Jr. succinctly stated the problem: "No city of equal size in America or perhaps the world, is compelled to adapt its growth to such difficult complications of high ridges, deep valleys and precipitous slopes as Pittsburgh." Tributary stream valleys offered routes to many of the areas beyond the Point, but eventually the hills had to be climbed or breached, and the ravines bridged.[50]

The steep slopes of many hillsides not only presented a barrier to transportation but also meant that the hillsides were not usable for either commercial or residential purposes. Olmsted reported that "excessively steep hillsides [comprised] as much as 30 to 35 percent" of the Pittsburgh district outside of downtown and East Liberty. During the course of the nineteenth century, hillside forests were largely cut down for fuel and building materials. Acrid industrial and railroad smoke further harmed vegetation. The deforested hillsides eroded, gullies formed, earth slumped, and small landslides plunged to the valley floors.

Billboards sprouted up on some as if a new species was taking its place with the scrubby vegetation of secondary growth. People illegally and surreptitiously dumped trash and garbage on many hillsides. As Olmsted observed: "In far too many cases they [hillsides] are apt to be wholly uncared for and to become shabby, dirty, and altogether unsightly, depreciating

adjacent property and contributing largely to the slatternly conditions in the midst of which so many of Pittsburgh's working people . . . are compelled to live."[51]

Building a road up a hill either was impossible or created a grade so steep as to be impractical. Nonetheless, a few incredibly steep roads such as Rialto Street to Troy Hill and Negley Avenue in the East End still exist today to intimidate the unwary driver. Local governments and private transportation companies turned to more elaborate engineering solutions to get around the hills. Although expensive tunnels provided the most direct route, in 1831 an 810-foot-long tunnel was dug to connect the Pennsylvania Main Line Canal from its tidal basin near the Allegheny River across the east end of downtown through Grant's Hill (later referred to as the Hump) to the Monongahela Wharf.[52] In the second half of the nineteenth century, railroad companies built many tunnels around the region. In 1899 a major tunnel penetrated Mount Washington (Coal Hill) for streetcar use, opening up areas beyond the bluff for settlement.

In the early twentieth century, public officials realized that an automobile tunnel through the escarpment of Mount Washington would, like the 1899 street railway tunnel, accelerate suburbanization of the South Hills. While consensus existed on the need for the tunnel, debate raged for years over its trajectory. Proponents for a lower-level tunnel into downtown won the political battle, and the 5,889-foot-long Liberty Tunnel (also known as the Liberty Tubes), the longest vehicular tunnel of its day, opened in 1925 at the cost of nearly six million dollars. The Liberty Bridge connecting the tunnels to downtown was completed three years later.[53] Two more tunnels for automobiles (the Squirrel Hill Tunnel and the Fort Pitt Tunnel) opened after the Second World War; together the three tunnels defined the commute to downtown. Despite the successful penetration of the hills, the tunnels functioned as bottlenecks in the flow of traffic during rush hours, with cars queued up in long lines behind the entrances. In contrast, the exits from both the Fort Pitt and Liberty Tunnels facing the Pittsburgh Point treated the motorist to dramatic views of the downtown landscape.[54]

Cuts across the sides of hills became the commonest means of getting around the hilly barriers. While the earliest roadways wended along valley floors, subsequent development and congestion in the valleys led to the placement of higher speed highways such as Bigelow Boulevard (1916) and the Boulevard of the Allies (1922) along the hillsides (see "The Automobile Comes to Pittsburgh, 1910–1935" in this volume). These cuts destabilized the slopes, especially when the red-bed clay strata were exposed. Because these strata are not porous, soils above them move along the slippery red

clay and plunge downward at the cut. Although the secondary growth of vegetation on the hillsides enhanced stability, enormous retaining walls of wood, stone, or reinforced concrete provided the best deterrent of falling debris and landslides. In 1876 the city enacted an ordinance permitting the city's Bureau of Engineering to build on private property when grading streets. Many embankments extended for more than a mile. Along West Carson Street, for instance, on the city's South Side, the Bureau of Engineering constructed over 6,600 feet of reinforced concrete retaining walls from 13 to 17.5 feet high to buttress the hillside. Other parts of the city similarly required extensive construction of retaining walls, some of which were in need of constant reinforcement. Large sandstone blocks, which absorbed soot from smoke and turned black, were used for many and became an especially striking feature of the urban landscape.[55]

Smaller hills that obstructed traffic flows were sometimes simply lowered or removed. The most famous instance involved Grant's Hill, known as "the Hump," on the east end of downtown. Grant's Hill had been partially reduced in the first half of the nineteenth century, the dirt removed being used to fill in ponds in the downtown area, but it still posed difficulties since it had a steep enough grade to impede the smooth flow of traffic and discourage higher value retail and office development. Nonetheless, street, sewer, gas, water, and street railway infrastructure, as well as buildings, were already in place on the Hump. On the downtown edge of the Hump stood architect Henry Hobson Richardson's 1888 Allegheny County Courthouse, which some consider among his finest buildings. Across the street stood the industrialist Henry Clay Frick's 1902 skyscraper, designed by D. H. Burnham. Lowering the streets of this area would incur not only the considerable disruption and typical costs of excavation and street reconstruction but also the extraordinary expense of replacing infrastructure and the reimbursement for damages to the buildings. As a result, the Hump project remained the subject of debate for several years. Proponents, including Olmsted, argued for cutting the Hump and simultaneously widening the major streets in order to provide major routes to the city's rapidly developing East End neighborhoods. The director of the Department of Public Works in his 1912 annual report observed that the Hump cut was a "proposition of such magnitude and everlasting benefit . . . that the public will only realize its vast importance after . . . [its completion when] the city will be so greatly improved in appearance, convenience, and increased property valuation."[56]

Begun in 1912 with the funding of a council bond issue, the project involved an area of twenty acres, parts of eight streets, cuts as much as sixteen

feet deep, and the demolition of many buildings. The entrances of extant buildings such as the courthouse and Frick Building had to be reconfigured to accommodate the new street levels. The total cost of the project to the city exceeded three million dollars at its completion in 1913. Today the rise eastward along the streets is very gradual; few people suspect that the Hump had ever existed.[57]

Although Olmsted aptly recognized that the steepness of many hillsides prevented residential development, numbers of Pittsburghers did build houses precariously sited on precipitous slopes. As development consumed the floodplains, people often turned to the hills for housing sites that were still within walking distance to factories and mills but also above the densest smoke. Many of these homes were owner built rather than constructed by professional builders.[58] Two-story and two-and-a-half-story row houses, built in party wall clusters or freestanding, climbed some hillsides along streets crossing the slopes at sharp angles or rose nearly straight up the slope along a stairway street. In some instances, houses sat isolated on hillsides. Others seemed to cling perilously to hilltop edges. Houses with two stories fronting on a street sometimes had a few more stories and/or outdoor terraces on the back side running down the hill. The slopes and instability of the hillsides forced these homeowners to build retaining walls made from a variety of materials to secure small yards, gardens, stairs, and driveways.

Over the years some of these hillside communities became affectionately embraced as emblematic of Pittsburgh's landscape, but heavy smoke pollution, scarred hillsides, and inadequate incomes during the industrial era rendered a less favorable residential landscape. In 1927 H. L. Mencken, Baltimore's renowned journalist, commented on this hillside residential landscape in his signature overheated style: "By the hundreds and thousands these abominable houses cover the bare hillsides, like gravestones in some gigantic and decaying cemetery. . . . On their deep sides they bury themselves swinishly in the mud. Not a fifth of them are perpendicular. They lean this way and that, hanging on to their bases precariously."[59]

Some residents of the hills could reach their homes and jobs by another man-made feature of the Pittsburgh landscape, the incline. The inclines were steep rail viaducts constructed along the hillsides to transport coal, freight, and passengers, and to open up hilly areas to settlement. Steam engines powered drums that operated endless cables pulling the cars. The Monongahela Incline, the first intended for passengers alone, was opened in 1870. Eventually, fifteen inclines operated in the city, hauling passengers and freight to and from hilly areas. The most inclines were on the city's

Fig. 1.3 Indian Trail Steps. Pittsburgh is renowned for its hundreds of wooden and concrete stairways. The city erected a wooden stairway up Mount Washington in 1909, along what had formerly been a Native American pathway (Pittsburgh City Photographer Collection, courtesy of the Archive Service Center, University of Pittsburgh).

South Side where the steep bluff of Mount Washington raised a formidable four-hundred-foot wall several hundred yards from the river shore, but they could be found in other parts of the city as well.[60]

Other steep slope residents had to reach their homes by traversing precipitous wooden and concrete stairways. Stairways began appearing in the nineteenth century, but the first year for which we have a measure of their length is 1937, when thirteen miles of stairways were recorded. By 1952 the total had reached twenty-nine miles, of now mostly concrete steps. In hundreds of cases, sets of these steps were legal streets, complete with street names, and they provided the only access to steep slope homes. During the nineteenth and the early twentieth centuries stairways were sometimes the only way that working-class families could access water supplies and privy vaults. The steps were the responsibility of the municipal Bureau of Steps and Boardwalks, part of the Public Works Department. In 1999 sixty-six of Pittsburgh's identified ninety neighborhoods possessed steps (see Figure 1.3).[61]

The valleys of tributary streams (usually named creeks or runs) to the region's primary rivers presented a different set of problems than did the

hillsides. Early settlers established roads in these valleys or hollows, as they are often called. After the mid-nineteenth century, railroads appropriated space in the valley floors as well. Mines, factories, homes, and commercial enterprises soon followed. In the broader valley plains close to the mouths of the tributary streams, small neighborhoods or suburban, often industrial, towns occupied the level land. But the valleys narrowed and rose quickly toward the stream sources, forcing development into linear patterns with buildings aligned along road, rail, and stream. In search of space, some working families built homes on the lower portion of the adjacent hillsides, terracing upward for yard and garden space. The irregular placement of these houses contrasted with the linearity along the valley floor. Inadequate sanitary and storm sewers (if any at all), periodic flooding, bald hillsides, and the proximity of industry led to deteriorating and at times squalid environments. Municipalities placed many streams in culverts to contain the flow, and numerous small bridges crisscrossed them for access to homes and industry. Long high-level bridges passed overhead to connect developments on the adjacent hilltops with each other, bypassing the congested valleys below.

These linear valley or hollow settlements became isolated communities unto themselves. In 1909 the Pittsburgh Survey highlighted the dilapidated houses of Skunk Hollow, tucked out of the way below the Bloomfield neighborhood, as one illustration of the city's atrocious housing conditions for low-income families. In 1926 residents of a small Italian community, sometimes called Basso La Vallone (down in the hollow), inhabited a collection of wooden houses along a dirt road, Chianti Way, in a valley well below the large Italian Larimer neighborhood. The Meadow Street Bridge passed high overhead. Besides the dirt road, steps rose upward to connect the hollow residents with the Larimer community.[62]

Although picturesque in natural or park settings, countless small ravines were perceived as land that inhibited travel and defied development. The "useless ravines," as one engineer termed them in 1909, attracted illegal dumping of industrial waste and sewage and were candidates for filling with earth removed by excavations, rubble from construction and demolition, street sweepings, and a myriad of other sources.[63] Filled ravines created level, usable land. The filling of St. Pierre's Ravine in the years before the First World War illustrates the propensity to not just alter but obliterate this characteristic topographical feature of the region, even at substantial cost. It also reflects the elite's desire to manipulate the landscape for social and aesthetic goals, as well as economic ones.

St. Pierre's Ravine in the city's Oakland area was a small offshoot of

two larger valleys that formed the western edge of the new major city park, Schenley Park. With the establishment of the park and Andrew Carnegie's library, Museum of Natural History, and concert hall in the 1890s, a developer, a public official, and an architect self-consciously set out to develop Oakland as a civic center in the current fashionable style of the City Beautiful movement. In addition to being a good investment opportunity, Oakland was to be a counterpoint to the haphazard and deleterious landscape of the industrial city. St. Pierre's Ravine commanded the key site at the entrance to Schenley Park and the front of the Carnegie Library. In recognition of this location, the city in 1898 erected at considerable expense a long stone arch bridge with balconies on each side for enjoying the view of the ravine.[64] But the increasing civic pride in the emerging civic center and blossoming park during the subsequent ten years sparked interest in a more formal design than the picturesque bridge and ravine presented. Partially at the request of Mayor William Magee, who apparently already had a plan before him on his desk, Olmsted advanced two proposals for the ravine; one that he favored involved filling the ravine and making it a grand plaza. Although some filling may have already occurred, the Department of Public Works directed thousands of loads of fill to the ravine in 1913 and 1914 (some of which reputedly came from the Hump cut project). Meanwhile, the city's Art Commission sponsored a competition for a plan of the filled site. With the bridge buried and the ravine filled, a plaza and a grander park entrance were ultimately completed in 1923.[65]

Few people today could imagine the site's original topography. The tension between development and conservation of the region's hilly topography continues today in the constant drive to flatten and extensively grade hills as well as to fill ravines and wetlands for new building sites. One critic of the plan to fill St. Pierre's Ravine captured this dilemma when he wrote in 1910: "Here in the foot hills of the mountains we possess a feature of natural beauty which we should appreciate and treasure—the ravine. Throughout this city the practical problems of transportation have demanded the filling up of ravines. . . . But here [St. Pierre's Ravine], in our little oasis, . . . why should the hand of man try to improve that refreshing slope, so restful to the eye of the jaded victim of the transportation system. . . . Shall we have beds of red geraniums and coleus in geometrical rows to mark the grave of our ravine?"[66]

Akin to the filling of ravines was the wanton depositing on the land of wastes of various sorts, including steel mill slag, coal mine debris, ashes, and garbage. These wastes have historically marked and shaped the landscape of the Pittsburgh region in the form of huge slag mountains or gob piles of

coal wastes, filled-in wetlands, altered riverbanks, and open garbage dumps. These practices are well illustrated by the destruction of the beautiful valley of Nine Mile Run, which Frederick Law Olmsted Jr. identified as a perfect opportunity for a park but which, instead, was used by the steel industry as a dump for the waste product of slag from iron and steel manufacturing (for a discussion of development of Nine Mile Run as a green corridor after 2000 see "The Metabolism of the Industrial City" in this volume).

BRIDGES

The numerous rivers and streams in the region, along with the sharp valleys and ravines, created a particular need for bridges in the Pittsburgh region. As Allen T. Burns wrote in the *Pittsburgh Survey* in 1911: "No city in America, if in the world, has had such physical obstacles to overcome in securing free communication and access between its different parts. Not only the rivers, but also hills, gorges, cliffs, and precipices cut the land into separate districts."[67] Pittsburgh became known as the "City of Bridges," or a "bridge museum," spanned by many bridges of different styles.[68] Thus bridges, many of "great architectural and engineering skill and beauty," became a distinctive feature of the Pittsburgh landscape.

The first bridge built in Pittsburgh was the Monongahela Bridge, completed in 1818, followed by the Allegheny Bridge in 1819. Both were covered wooden toll bridges. Other bridges were constructed in subsequent years, three by the famous engineer John Roebling. By the 1850s five bridges crossed the Allegheny and two the Monongahela River. Perhaps the most striking was Roebling's Sixth Street Bridge (1859), which previewed his Brooklyn Bridge in its suspension cables and tall towers. All were private bridges aside from the suspension aqueduct that Roebling constructed in 1844 for the Pennsylvania Main Line Canal, the first bridge he ever built.

Entrepreneurs continued to build toll bridges of various styles over the rivers in the coming decades, but in the twentieth century, Pittsburgh bridges became public, free of tolls. Many reflected unusual styles, such as Gustav Lindenthal's Smithfield Street Bridge (1883), which featured a lenticular truss; the Point Bridge (1876) of Edward Hemberley, a suspension bridge that utilized pairs of Howe trusses as stiffening features; and George Richardson's George Westinghouse Memorial Bridge (1932) with the longest span in a reinforced concrete arch in the United States. By 1916 the city owned ninety bridges and was continuing to build new ones and replace deteriorating structures with more elaborate bridges.[69]

Railroad bridges are another type of structure that marks the Pittsburgh landscape. Within a few years of the railroad's initial entry into Pittsburgh

in 1852, a dozen railroad bridges crossed the district's main rivers. These bridges were largely deck and through-truss bridges. An especially unique type of Pittsburgh bridge was the hot metal span, constructed to transport molten iron from blast furnaces on one side of the Monongahela River to Bessemer and open-hearth furnaces on the other. All rail bridges were designed to carry heavy loads, but the hot metal bridges had especially heavy construction. In addition to spans over water, the serrated Pittsburgh landscape required land bridges to connect sections of the city that were otherwise divided. Bridges crossed railroads, streets, ravines, and streams and were constructed and maintained by the city. In 1930 the city owned and maintained 149 land bridges, of which 33 were for pedestrian travel and 119 for vehicles. They ranged in size from spans of fifteen feet to half a mile in length.[70]

Allegheny County as well as the city of Pittsburgh constructed many bridges in the twentieth century. In the eight-year period between 1924 and 1932, the county built ninety-nine bridges.[71] Today the county claims to possess over two thousand bridges of more than eight feet in length, of which more than one-half are small single-span metal and masonry structures. These bridges reflected many types of design, including covered wooden, arch, cantilevered, suspension, and truss, with many design variations within these categories. Bridges, therefore, form a seemingly ubiquitous aspect of the region's landscape, taken for granted by residents but noticed by visitors.

RESHAPING THE LANDSCAPE IN THE TWENTIETH AND TWENTY-FIRST CENTURIES

By the early twentieth century many of Pittsburgh's elites were becoming concerned about the shabby appearance of their industrial city. In concert with the Progressive spirit of the times, they believed that a good natural and social environment not only boosted their city's economy but also uplifted the physical and moral health of the citizenry.[72] The Chamber of Commerce, the Civic Club of Allegheny County, the local chapter of the American Institute of Architects, and other voluntary groups entered into a public conversation about civic improvement, which by 1900 included, among many other issues, the beautification and civic design goals of the then fashionable City Beautiful movement. Although the city government had been developing a grand park system in the 1890s roughly following the principles of Frederick Law Olmsted Sr., it had not yet addressed the many design concerns of these advocacy groups. However, before the end of the decade the city adopted planning and beautification as part of its formal responsibility. This emerging partnership between private groups

and government, though fluctuating in character over the century, has had a significant impact on the region's landscape.[73]

In 1904, for example, the Civic Club established a Forestry Committee that encouraged the municipality to protect and maintain the city's trees and that undertook a program to educate the public about the benefits of tree planting along the streets. In 1909 the city established a Shade Tree Commission within the Department of Public Works. The commission built a tree nursery, which by the end of 1914 had fifty-four hundred trees growing in it. In the first four years of operation, it planted over seven thousand trees along the city streets, which had to be regularly pruned, sprayed, watered, and replaced when vandalism, disease, and other factors such as pollution killed them. The commission optimistically viewed its ability to transform the landscape when it reported: "The coming generation will behold the wonderful transformation of the desiccated scarred hills of Allegheny County reverting to their former glory of forested crowns of green, and traversed not by wagon roads of former days but by miles of boulevards and broad avenues lined with symmetrical rows of fruit and shade trees."[74] The Shade Tree Commission assiduously continued to pursue its mission through years of fluctuating budgets. With improving air pollution conditions and the determined tree-planting program, the city's streetscape inevitably became greener in the later decades of the twentieth century. Pittsburgh is a reforested city.

If the urging of voluntary organizations succeeded in getting the city to undertake the greening of its streetscapes, their advocacy for the beautification of the shabby hillsides had much less success. Both the Chamber of Commerce and the Civic Club formed committees to study the proliferation of billboards at key intersections and on deforested hillsides. They tried to educate the public about the nuisance and to prod, without success, the city government to regulate the industry.[75] In 1910 Olmsted argued in his city plan that "the City ought to pursue a definitely active policy" in the case of shabby hillsides. It should "insist upon the maintenance of such vacant lands in a clean and orderly condition" and acquire some hillsides for return to "natural vegetation" and for views, terracing, walkways, and places to sit. Moreover, he recommended a number of designs based on European precedents for roads and even houses on those slopes not too steep for at least some development. Despite the new City Planning Commission's advocacy of "the beautification of the bluffs and hillsides," few of Olmsted's hillside recommendations were implemented in the following decades.[76] Three decades after Olmsted's recommendations, for example, a new nonprofit organization, the Greater Pittsburgh Parks Association, finally tackled the

landscaping of the bald and unstable hillsides along one of the city's main boulevards. Bigelow Boulevard was opened in 1916 not only as a main artery to the East End but also as a parkway to Schenley Park in the manner of the famous designs of Frederick Law Olmsted Sr.[77]

Other design issues advocated by the private groups involved the refurbishment of downtown waterfronts, the creation of a civic center, and the rejuvenation of the Point, which had deteriorated into a rundown area of railroad yards, traffic congestion, warehouses, and other unsightly structures. Discussion of these concerns led to the mayor's appointment of the Pittsburgh Civic Commission, another voluntary elite organization that engaged Frederick Law Olmsted Jr. in 1910 to prepare a city plan. The decadelong conversation over environmental, social, and design issues along with the completion of the Olmsted plan resulted in the creation of the Pittsburgh City Planning Commission and an art commission in 1911 to plan for the long range physical development of the city. During the next three decades, the city and Allegheny County tackled an ambitious highway and bridge program. But, as with Olmsted's hillside recommendations, design plans for public spaces such as the Point infrequently left the drafting table, and few serious reforms of environmental problems materialized.[78]

Since the Second World War, however, two developments have markedly reshaped Pittsburgh's landscape. The first involved a reformulated public and private partnership that undertook a series of developments known as the Pittsburgh Renaissance. This partnership between the city government and an elite but corporate-dominated nonprofit organization attempted to reshape the city landscape in a number of ways both physically and environmentally. The most striking of these changes, which was essential for improving Pittsburgh in other ways, addressed the city's greatest environmental need, the elimination of the heavy smoke. Other major projects involving the environment included the erection of eight flood control dams (the first in 1941, the next seven after the war) by the US Army Corps of Engineers and the formation of the Allegheny County Sanitary Authority in 1946, with the mission to construct a regional sewage collection and treatment system.

Alterations of the built landscape under Renaissance programs involved the construction of new skyscrapers, downtown parks, automobile "parkways" along the rivers, and in the late 1940s and 1950s, the clearing of the structures and railroad tracks that desecrated Pittsburgh's historic Point. The latter action made possible the creation of Point State Park and the adjacent Gateway Center high-rise office complex. In the 1960s and 1970s two new bridges, a new stadium (Three Rivers Stadium), and a dramatic

fountain at the Point joined the earlier redevelopment. Travelers entering the city from the west through the Fort Pitt Tunnel and bridge were presented with a striking view of the confluence of the rivers and downtown.[79]

Other significant landscape changes, often with less positive overtones, resulted from large-scale urban renewal projects. The most infamous one, the Lower Hill renewal, occurred in the 1950s. This project took place in what was one of the most densely inhabited areas of the city, adjacent to downtown. Residences and businesses involving over five thousand persons (80 percent African American) were demolished and replaced with the Civic Arena, a major sports arena surrounded by surface parking lots. A crosstown boulevard separated the renewal area from downtown. Two other massive demolition and renewal projects destroyed and reconfigured major neighborhood business districts of the city.[80] Thus, while the city's air and water were markedly improved in quality and its infrastructure greatly upgraded, changes to the built landscape largely replaced densely congested nineteenth-century areas with mid-twentieth-century modernistic, open, and geometrically designed spaces.

Renaissance II, which lasted from approximately 1978 to 1988, produced further landscape changes in the downtown. Most noticeable were major skyscraper additions to the city skyline, which further enhanced Pittsburgh's dramatic city entrance. The movement to preserve rather than demolish historic structures (which had begun in 1971 with the symphony's movement to Heinz Hall, a converted downtown movie palace) gained momentum. The growing recognition of the aesthetic quality and advantage of river locations resulted in the municipal construction of the Allegheny Landing and Sculpture Garden in 1984.[81]

Even as the municipality and its private partners labored to reshape the city, devastating changes to the region's economy dramatically affected the industrial landscape. Structural change in the national economy—most notably, deindustrialization—destroyed much of the region's manufacturing base, especially the major steel firms and allied manufacturing businesses in areas such as the by-product coking industry, machinery production, and railroad and electrical equipment. From approximately the mid-1970s through the late 1980s, mills and industries lining the riverbanks closed down, in the process eliminating many thousands of jobs; some closings continued into the 1990s. Thousands of acres of shuttered factories, rusting steel mills, abandoned rail yards, and vacant land contrasted starkly with the vibrant scene of decades earlier, described by John Stilgoe. Adjacent to the mills, city working-class neighborhoods and suburban towns sputtered, and their business districts began to deteriorate. The human cost

was incalculable.[82] As the flow of investment capital shifted, the emerging brownfields of inactive industrial sites along the rivers contrasted markedly with the sprawling office parks, retail shopping centers, and residential developments sprouting up on suburban greenfields near the interstate highways on the urban periphery.

Clearing of the brownfield sites began slowly during the latter part of the 1980s and continued into the 1990s. The Urban Redevelopment Authority, which had coordinated much of the renewal of the Pittsburgh Renaissance, cleared sites in the city. Private salvaging firms and a regional nonprofit organization called the Regional Industrial Development Corporation (RIDC), working under the direction of county government, undertook redevelopment of brownfields around the county. The primary goals were to attract new tenants and provide for new taxes and jobs. This singleminded focus resulted in the sweeping destruction of the old industrial landscape and, except for a few isolated structures, almost a complete disregard for the history of the region.[83]

A new landscape began to emerge on the sites along the rivers, although only some of them took advantage of their river location. The Research and Development Park, a high-tech office project developed through the cooperation of the Urban Redevelopment Authority, Carnegie Mellon University, and the University of Pittsburgh on the former site of the LTV (formerly Jones & Laughlin Steel) integrated steel mill on the north bank of the Monongahela River near downtown, is designed as a suburban office park and makes only a limited attempt to take advantage of its river location. Although paying more attention to the river, the private Waterfront development on the mammoth site of the famous Homestead Steel Works on the Monongahela River southeast of Pittsburgh is a retail, entertainment, office, and light industrial complex seemingly designed to be more at home in a landlocked suburb than a river-based former mill town.[84]

In contrast to these brownfield redevelopments are several projects in the city and in a few former industrial towns that do recognize the opportunities of river locations.[85] The redevelopment of a former slaughterhouse and industrial site on Herr's Island—renamed Washington's Landing to distance it from its industrial past and tie it to the region's more distant history—uses proximity to downtown and great river views for housing, light industrial and commercial facilities, a marina, and a rowing club, along with space devoted to the public for biking, walking, and other recreational possibilities. The success of this project has helped to make city riverside real estate very attractive. The city reoriented its vastly expanded convention center in downtown to the Allegheny River and placed its two new sports stadiums

on the opposite shore. The nonprofit Cultural Trust, enjoying the city's full cooperation, has expanded its orchestration of a downtown cultural district to include a linear park on the south shore of the Allegheny River. As a result of this focus on the Allegheny River, private firms are busily planning and erecting new projects in the river corridor. And another elite sponsored nonprofit organization, the Riverlife Task Force, has proposed a river park for the segments of the three rivers surrounding downtown with the imaginative concept of the rivers as the park's core.

In addition to these major redevelopment projects, the river landscape is changing in many smaller but no less profound ways. Despite the deteriorated conditions of Pittsburgh's industrial rivers they had remained a landscape of recreational interest and romance to some boaters and recreational boating grew in the years after the Second World War. A few marinas hugged the riverbanks, protected from powerful currents by proximate islands, or sought the calmer waters of tributary streams, where they widened near their confluence with the main rivers. In recent decades the improving environmental quality of both water and air and the collapse of "smokestack" industries have encouraged the proliferation of pleasure boating, boat tours, and cruises. Increasingly, they have replaced the diminishing number of commercial tows on the rivers. Marinas with lattices of docks occasionally dot the river shores; boat storage yards and launch facilities sit on the banks above the docks, although public access to the rivers is limited to only a few sites. Crews row past the new river-oriented stadiums, convention center, and restaurants of the city's core. Beyond this central area, riverbanks and edges are softening again with rapid vegetation regrowth, biking trails on former railroad track beds, and new community riverfront parks. Residences, office buildings, and even a shopping center are replacing the industrial character of riverfront land uses. Fishermen and picnickers again share the river shorelines with the blossoming flora and reviving fauna. Indeed, the river water more often is blue these days than the muddy brown that was the characteristic color of the industrial era.[86]

The former industrial riverfronts are not the only sites of renewal. Most striking, perhaps, are the developments of a regional shopping mall and an upscale housing complex on massive slag dumps. But, for every brownfield that has sprung back to life with new activity, many more await redevelopment. Suburban office and industrial parks still prove to be more attractive to businesses than settings in older industrial parts of the region. While industrial sources of air and water pollution have been largely eliminated, toxic residues remain in riverbeds and former industrial sites. Moreover, despite improving river conditions, the region still has nearly half of its days

during the recreational season when sewage plunges water quality below acceptable levels.[87] Like other American cities that are dependent on fossil fuels for power and mobility, Pittsburgh constantly struggles to meet clean air standards, particularly during the hot and humid summer season.

Even though the distinctive industrial structures of the region's coal and steel days have largely disappeared from the built landscape, some river infrastructure and commercial, residential, and public buildings remain, along with the engineered river and land contours. Developers who propose new concepts for older areas frequently encounter a battle between those wanting to preserve the built landscape and those wishing to present a modern appearance free of the smoky past. This struggle over the city's image once again pits powerful public and private interests—informed by experts on both sides—against each other for control over shaping the landscape.

In the past, as today, average working-class Pittsburghers had little to say about the shape of the environment in which they lived. Low incomes, inadequate housing, and pedestrian mobility constrained workers in industrial Pittsburgh to live in noisy, congested, and smoky neighborhoods, while middle-class families rode streetcars to leafy, less crowded communities, which on certain days were still vulnerable to industrial soot and odors. While the upper class hired landscape architects to fashion plush gardens and grounds from the region's complex topography, working families had to make do with the industrialists' perceptions of a productive economic and social landscape in an individualistic, private society. But this does not mean that workers did not exercise agency in their landscape. Small vegetable and flower gardens, some with religious icons, represented only a small portion of the fashioning of ethnic and racial landscapes. Churches, fraternal societies, and small shops marked the neighborhoods more explicitly. Some workers trespassed onto industrial sites to fish and swim in the rivers; others by the 1930s became passionate hunters in the Pennsylvania mountains and golfers on local public courses. There is another landscape to be discovered and described, which existed outside that of the industrialists' world.

We have written in this chapter about the transformation of the Pittsburgh region's natural landscape by the creation of a built environment and the forces of industrial capitalism. Many of these changes were made to ensure and regulate the workings of the city—to guarantee that traffic would flow, that water would be available where needed, that wastes would be removed, and that streets would not flood. Urban civic leaders and experts such as engineers and planners competed with political interests (often unsuccessfully) in the attempt to shape the ideal of a more orderly and efficient urban system. The powerful currents of industrial capitalism also

reshaped the landscape—but driven more by the imperative of productivity than by urban efficiency concerns. The two forces of the city-planned and efficient and the city-productive often clashed, even though there was considerable overlap in their aims. Over time the pendulum, driven both by conscious planning and by economic decline, has gradually swung toward coexistence with and regeneration of the natural environment rather than its mastery. How far these changes will be reflected in the landscape of the future has yet to be seen.

NOTES

Reprinted with permission from Joel A. Tarr, ed., *Devastation and Renewal: The Environmental History of Pittsburgh and Its Region* (Pittsburgh, PA: University of Pittsburgh Press, 2003), 11–40. The epigraph is from Robert A. Woods, the Pittsburgh Survey, 1909.

1. See Ben Marsh and Peirce Lewis, "Landforms and Human Habitat," in E. Willard Miller, ed., *A Human Geography of Pennsylvania* (University Park: Pennsylvania State University Press, 1995), 17–43; David Cuff et al., eds., *The Atlas of Pennsylvania* (Philadelphia: Temple University Press, 1989), 11–33. For a description of such a journey in the 1840s, see Jack D. Warren, ed., "A Young Woman's Vision of Western Pennsylvania: The Diary of Mary Ann Corwin, 1842–1843," *Pittsburgh History* 75 (Summer 1992): 91–107.

2. Henry Leighton, *The Geology of Pittsburgh and Its Environs* (Pittsburgh: Carnegie Institute, 1927).

3. Leighton, *Geology of Pittsburgh*, 37–43.

4. Fred Anderson, *Crucible of War: The Seven Years' War and the Fate of Empire in British North America, 1754–1766* (New York: Vintage, 2000), 18–24. See also Richard White, *The Middle Ground: Indians, Empire, and Republics in the Great Lakes Region, 1650–1815* (New York: Cambridge University Press, 1991); Daniel K. Richter, *The Ordeal of the Longhouse: The People of the Iroquois League in the Era of European Colonization* (Chapel Hill: University of North Carolina Press, 1992).

5. Solon J. Buck and Elizabeth Hawthorn Buck, *The Planting of Civilization in Western Pennsylvania* (Pittsburgh: University of Pittsburgh Press, 1938), 19–45.

6. See Buck and Buck, *The Planting of Civilization*, 19–45.

7. John Melish, *Travels in the United States of America* (Philadelphia, 1812), excerpted in John W. Harpster, ed., *Crossroads: Descriptions of Western Pennsylvania, 1720–1829* (Pittsburgh: University of Pittsburgh Press, 1938), 251. See also Jennifer Ford, "Landscape and Material Life in Southwestern Pennsylvania, 1798–1838" (PhD diss., University of Pittsburgh, 2001).

8. Paul A. Chew, *Southwestern Pennsylvania Painters: Collections of the Westmoreland Museum of Art* (Greensburg: Westmoreland Museum of Art, 1989). See, for instance: Eugene A. Poole, *River Landscape with Cows*; Jasper Lawman, *Trout Stream Landscape*; and William Coventry Wall, *River Scene at Sunset.*

9. Rina C. Youngner, "Paintings and Graphic Images of Industry in Nineteenth Century Pittsburgh: A Study of the Relationship between Art and Industry," 2 vols. (PhD diss., University of Pittsburgh, 1991), 1:4; published as Rina C. Youngner, *Industry in Art, 1812–1920* (Pittsburgh: University of Pittsburgh Press, 2006).

10. Verna L. Cowin, *Pittsburgh Archaeological Resources and National Register Survey* (Pittsburgh: Carnegie Museum of Natural History, 1985); Leland D. Baldwin, *Pittsburgh: The Story of a City, 1750–1865* (Pittsburgh: University of Pittsburgh Press, 1937).

11. Essay by Russel Errett in *Magazine of Western History* 7 (1887): 33–44, quoted in Harpster, *Crossroads*, 287–88.

12. For early manufacturing in Pittsburgh, see George Thurston, *Pittsburgh as It Is* (Pittsburgh: W. S. Haven, 1857); Catherine Reiser, *Pittsburgh's Commercial Development, 1800–1850* (Harrisburg: Pennsylvania Historical and Museum Commission, 1851). For iron and steel, see John N. Ingham, *Making Iron and Steel: Independent Mills in Pittsburgh, 1820–1920* (Columbus: Ohio State University Press, 1991), 21–46. For coal, see Howard N. Eavenson, *The First Century and a Quarter of American Coal Industry* (Pittsburgh: Privately printed, 1942), 155–204.

13. Rina Youngner and Emily Hetzel, "The Artist Looks at Industrial Pittsburgh, 1836–1993," (catalog, University of Pittsburgh Art Gallery, June, 1993); Youngner, "Paintings and Graphic Images," 74.

14. Youngner, "Paintings and Graphic Images," 144–202. See, for instance, G. E. Muller, "The City of Pittsburgh," *Harper's New Monthly Magazine* 62, no. 367 (1882): 49–68.

15. John R. Stilgoe, *Metropolitan Corridor: Railroads and the American Scene* (New Haven: Yale University Press, 1983), 81. See also David E. Nye, ed., *Technologies of Landscape: From Reaping to Recycling* (Amherst: University of Massachusetts Press, 1999).

16. For a discussion of the siting and development of these mills, see Kenneth Warren, *The American Steel Industry, 1850–1970: A Geographical Interpretation* (Oxford: Clarendon Press, 1973).

17. Reuben Gold Thwaites, *Afloat on the Ohio: An Historical Pilgrimage of a Thousand Miles in a Skiff from Redstone to Cairo* (Chicago: Way and Williams, 1897), quoted in Dan Hughes Fuller, "Roughing It on the River: Reuben Gold Thwaites in Western Pennsylvania," *Pittsburgh History* 79 (1996): 116; Laurie Graham, *Singing the City: The Bonds of Home in an Industrial Landscape* (Pittsburgh: University of Pittsburgh Press, 1998), 35.

18. "There are squares of great foundries, streets of machine shops and locomotive-works and engine-making establishments, besides huge shops that send wrought iron and steel bridges into the world. Muller, "The City of Pittsburgh," 62–63.

19. Stilgoe, *Metropolitan Corridor*, 78; also 96–97. George H. Thurston was a famous Pittsburgh booster who wrote a number of fact-filled books about the city in the nineteenth century. See, for instance, George H. Thurston, *Pittsburgh and Allegheny County in the Centennial Year* (Pittsburgh: W. W. Anderson, 1876), which contains chapters on the different industries. See also David Demarest and Eugene Levy, "Visualizing the Industrial Landscape: The Photographers of Pittsburgh's Westinghouse Air Brake Company, 1900–1960," *Pittsburgh History* 77 (Spring 1994): 4–21.

20. Quoted in Joel A. Tarr, "The Pittsburgh Survey as an Environmental Statement," in Maurine W. Greenwald and Margo Anderson, eds., *Pittsburgh Surveyed: Social Science and Social Reform in the Early Twentieth Century* (Pittsburgh: University of Pittsburgh Press, 1996), 172.

21. Some of the best discussions and images of the railroad landscape are in the illustrated volumes written by amateur railroad historians. See, for instance, Ken Kobus and Jack Consoli, *The Pennsy in the Steel City: 150 Years of Pennsylvania Railroad in Pittsburgh* (Kutztown, PA: Kutztown Publishing, 1996); Ken Kobus and Jack Consoli, *The*

Pennsylvania Railroad's Golden Triangle: Main Line Panorama in the Pittsburgh Area (Pittsburgh: Pennsylvania Railroad Technical & Historical Society, 1998); Howard V. Worley Jr. and William N. Poellot Jr., *The Pittsburgh & West Virginia Railway* (Halifax, PA: Witheirs Publishing, 1989). For a more detailed discussion of the effects of the railroad on the region, see David Hounshell, Mark Samber, and Joel Tarr, "Economic Impact of Rail Transportation in Western Pennsylvania, a Report to the National Park Service," Department of History, Carnegie Mellon University, Pittsburgh, August 1993.

22. Engineers' Society of Western Pennsylvania, *Pittsburgh* (Cramer Printing & Publishing, 1930), 113–19.

23. See the photograph in Stefan Lorant, *Pittsburgh: The Story of an American City* (Lenox, MA: Author's Edition, 1988), 264.

24. For the Pitcairn yards, see "PRR-Pitcairn Yard," at http://www.trainweb.org/horseshoecurve-nrhs/Pitcairn.htm; for the Conway Yard, see "Conway Yard," at http://home.swbell.net/jwacht/ambridge/id53.htm.

25. See Sherie R. Mershon and Joel A. Tarr, "Strategies for Clean Air: The Pittsburgh and Allegheny County Smoke Control Movement, 1940–1960," in Tarr, *Devastation and Renewal*, 143–75.

26. Willard Glazier, "The Great Furnace of America," quoted in Roy Lubove, ed., *Pittsburgh* (New York: Franklin Watts, 1976).

27. *Coal and Coke Resource Analysis: Western Pennsylvania and Northern West Virginia* (America's Industrial Heritage Project, Department of the Interior Washington, DC, 1992), Appendix A, 77; Carmen DiCiccio, *Coal and Coke in Pennsylvania* (Harrisburg: Pennsylvania Historical and Museum Commission, 1996), 37.

28. Kenneth Warren, *Wealth, Waste, and Alienation: Growth and Decline in the Connellsville Coke Industry* (Pittsburgh: University of Pittsburgh Press, 2001), 221–28.

29. DiCiccio, *Coal and Coke in Pennsylvania*, 113–14.

30. Companies sometimes put whitewashed wooden picket fences around the houses and encouraged tenants to plant vegetable and flower gardens. "Garden" competitions were often held in the towns. Margaret M. Mulrooney, *A Legacy of Coal: The Coal Company Towns of Southwestern Pennsylvania* (America's Industrial Heritage Project, Department of Interior, Washington, DC, 1989), 9–29; DiCiccio, *Coal and Coke in Pennsylvania*, 89–95; *Coal and Coke Resource Analysis*, 47–49.

31. David Demarest and Eugene Levy, "Touring the Coke Region," *Pittsburgh History* 74 (Fall 1991): 105–8.

32. Warren, *Wealth, Waste, and Alienation*, 11–24.

33. Jones & Laughlin broke from this pattern by constructing a major beehive installation (1,504 ovens) within the Pittsburgh neighborhood of Hazelwood between 1898 and 1903. See William L. Affelder, "Jones & Laughlin's Coke Plant." *Mines and Minerals* 29 (December 1908): 195–99.

34. John A. Enman, "Connellsville Coke: Catalyst and Victim of Change," in Dennis F. Brestensky, ed., *The Early Coke Worker* (Connellsville: Southwestern Pennsylvania Heritage Commission, 1994), 2–29.

35. Muriel Early Sheppard, *Cloud by Day: The Story of Coal and Coke and People* (Chapel Hill: University of North Carolina Press, 1947), 2. For a discussion of some of the environmental effects of coke production in beehive ovens, see Warren, *Wealth, Waste, and Alienation*, 221–28; Joel A. Tarr, ed., *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (Akron: University of Akron Press, 1996), 388–91.

36. Warren, *Wealth, Waste, and Alienation*, 195–203.

37. M. Camp and C. B. Francis, *The Making, Shaping and Treating of Steel*, 4th ed. (Pittsburgh: Carnegie Steel, 1919), 101–29.

38. For environmental problems caused by by-product coking, see Tarr, *Ultimate Sink*, 385–412; Charles O. Jones, *Clean Air: The Policies and Politics of Pollution Control* (Pittsburgh, PA: University of Pittsburgh Press, 1975).

39. Joel A. Tarr, "The Plume Is Gone, but We Can't Forget Hazelwood," *Pittsburgh Post-Gazette*, May 27, 1998, A-13.

40. Cowin, *Pittsburgh's Archaeological Resources*; Reiser, *Pittsburgh's Commercial Development*, 124–40.

41. Leland R. Johnson, *The Headwaters District: A History of the Pittsburgh District, US Army Corps of Engineers* (Pittsburgh, PA: US Army Engineer District, 1979).

42. Edward K. Muller, "The Legacy of Industrial Rivers," *Pittsburgh History* 72 (1992): 64–75.

43. See Joel A. Tarr, "Infrastructure and City Building in the Nineteenth and Twentieth Centuries," in Samuel P. Hays, ed., *City at the Point: Essays on the Social History of Pittsburgh* (Pittsburgh, PA: University of Pittsburgh Press, 1989), 213–39.

44. Quoted in Albert W. Atwood, "Pittsburgh: Workshop of the Titans," *National Geographic Magazine* 96 (July 1949): 117.

45. Clay McShane and Joel A. Tarr, "The Centrality of the Horse in the Nineteenth-Century American City," in Raymond A. Mohl, ed., *The Making of Urban America*, 2nd ed. (Wilmington, DE: SR Book, 1997), 12–23. The electric streetcar, however, was not pollution free. Its demands for electricity contributed to the smoke burden produced by electrical generating plants.

46. Joel A. Tarr, *Transportation Innovation and Changing Spatial Patterns in Pittsburgh, 1850–1934* (Chicago: Public Works Historical Society, 1978), 6–21.

47. For a discussion of this issue, see Richard Pinkham, "Stream Restoration and Daylighting: Opportunities in the Pittsburgh Region," in Tim Collins, ed., *Three Rivers Second Nature Project Reports: Phase II 2001, Monongahela River Valley* (Pittsburgh: Studio for Creative Inquiry, June 2002).

48. Among the major culverted streams flowing into the Allegheny River were Negley Run, Haights Run, Cemetery Run, and Two Mile Run in the city's eastern end. On the city's North Side, Jack's Run, Butcher's Run, and Spring Garden Run also flowed into the Allegheny River and were culverted. Flowing into the Monongahela River from the city's eastern section were Soho Run and Four Mile Run, fully culverted, and parts of Nine Mile Run, partially culverted.

49. See Warren, "A Young Woman's Vision," 99, 105. Interestingly, Corwin made this observation in 1843 on the western leg of her trip from Philadelphia to Cincinnati. When she had passed through Pittsburgh going west in 1842, she noted that it was "the very dirtiest city that I ever saw in all my life, and as noisy as it can well be."

50. *The City of Pittsburgh and Its Public Works* (Pittsburgh, 1916), 21; Frederick Law Olmsted Jr., *Main Thoroughfares and the Down Town District* (Pittsburgh, PA: Pittsburgh Civic Commission, 1911), 93.

51. Olmsted, *Main Thoroughfares*, 109–10.

52. Cowin, *Pittsburgh's Archaeological Resources*, 73–74.

53. Steven J. Hoffman, "The Saga of Pittsburgh's Liberty Tubes: Geographical Partisanship on the Urban Fringe," *Pittsburgh History* 75 (1992): 128–41.

54. For images of Pittsburgh's downtown landscape, see Carnegie Library of Pittsburgh, "Photos and Scenes of Pittsburgh," at http://www.carnegielibrary.org/pgh/photos.html.

55. *Digest of the General Ordinances and Laws of the City of Pittsburgh* (Pittsburgh, 1938), 475; *The City of Pittsburgh and Its Public Works*, 29–31; Charles M. Reppert, "Recent Retaining Wall Practice," *Proceedings, Engineers Society of Western Pennsylvania* 26 (1910): 316–17.

56. Joseph G. Armstrong, "Annual Report of the Department of Public Works," *Annual Reports of the Executive Departments of the City of Pittsburgh, 1912*, 6.

57. *City of Pittsburgh and Its Public Works*, 26–28.

58. John Bodnar, Roger Simon, and Michael P. Weber, *Lives of Their Own: Blacks, Italians, and Poles in Pittsburgh, 1900–1960* (Champaign: University of Illinois Press, 1983), 153–80.

59. H. L. Mencken, *Prejudices: Sixth Series* (New York, 1927), 187–93.

60. Tarr, *Transportation Innovation*, 10. See also "Pittsburgh Incline Tribute," at http://members.tripod.com/riid/inclines.html.

61. Information on steps supplied to the editor by Bob Regan. Robert D. Regan, *Pittsburgh Steps: The Story of the City's Public Stairways* (Lanham, Md.: Rowman and Littlefield, 2015). See also "'Steptrek' Raises Profile of Pittsburgh's 700 Hillside Stairways," *Pittsburgh Post-Gazette*, March 22, 2000. For the burden imposed by steps, see F. Elizabeth Crowell, "Painter's Row: The Company House," in Paul Underwood Kellogg, ed., *The Pittsburgh District: Civic Frontage*, vol. 5 in the Pittsburgh Survey, 6 vols. (New York: Survey Associates, 1914), 132–33; S. J. Kleinberg, *The Shadow of the Mills: Working-Class Families in Pittsburgh, 1870–1907* (Pittsburgh: University of Pittsburgh Press, 1989), 90.

62. Florence Larrabee Lattimore, "Skunk Hollow: The Squatter's House," in Kellogg, *The Pittsburgh District: Civic Frontage*, 124–30; James Zanella, "From the *Paesi d'Italia* to the Village of Larimer: A Study of Pittsburgh's Forgotten Little Italy, 1920–1925" (unpublished paper, University of Pittsburgh, 2001), 5.

63. "Rapid Transit for Pittsburgh: A Discussion," *Proceedings: Engineers Society of Western Pennsylvania* 25 (1909): 468.

64. Ralph Brem, "341-Foot Stone-Arch Bridge Buried near Proposed Research Park," *Pittsburgh Press*, June 16, 1963.

65. Olmsted, *Main Thoroughfares*, 101–6; Barry Hannegan, "Schenley Plaza—Place of Dreams," *PHLF News* 144 (1996): 10–15.

66. Jessie Welles to Allen T. Burns, letter, February 1, 1910, in Papers of Frederick Law Olmsted, Manuscript Division, Library of Congress, Washington, DC, reel 200. For some decades the "Plaza" served as a parking lot but in 2006 a public-private coalition opened a redesigned Schenley Plaza as a welcoming public green space managed by the city and the Pittsburgh Parks Conservancy. See https://en.wikipedia.org/wiki/Schenley_Plaza.

67. Kellogg, *The Pittsburgh District: Civic Frontage*, 44–45.

68. For Pittsburgh bridges, see Walter C. Kidney, *Pittsburgh's Bridges: Architecture and Engineering* (Pittsburgh: Pittsburgh History & Landmarks Foundation, 1999); also "Bridges and Tunnels of Allegheny County and Pittsburgh, Pa.," at http://pghbridges.com/.

69. *The City of Pittsburgh and Its Public Works*, 38.

70. See Kidney, *Pittsburgh's Bridges*, 130, for the Monongahela Connecting Bridge. On land bridges, see Engineers' Society of Western Pennsylvania, *Pittsburgh*, 129–33.

71. Robert J. Gangewere, *The Bridges of Pittsburgh and Allegheny County* (Pittsburgh: Carnegie Library of Pittsburgh, 2001), 4.

72. Tarr, "The Pittsburgh Survey," 170–89.

73. John F. Bauman and Edward K. Muller, "The Olmsteds in Pittsburgh: Part II. Shaping the Progressive City," *Pittsburgh History* 76 (1993/1994): 191–205.

74. "Annual Report, Department of Public Works," *Annual Reports of the Executive Departments of the City of Pittsburgh, 1913*, 396, quoted in Roy Lubove, "City Beautiful, City Banal: Design Advocacy and Historic Preservation in Pittsburgh," *Pittsburgh History* 75 (1992): 30.

75. Kristin Szylvian Bailey, "Fighting 'Civic Smallpox': The Civic Club of Allegheny County's Campaign for Billboard Regulation, 1896–1917," *Western Pennsylvania Historical Magazine* 70 (1987): 3–28.

76. Olmsted, *Main Thoroughfares*, 106–12; "Annual Report of the Department of Public Works: City Planning Commission," *Annual Reports of the Executive Departments of the City of Pittsburgh, 1913*, 108.

77. M. Graham Netting, *Fifty Years of the Western Pennsylvania Conservancy: The Early Years* (Pittsburgh: Western Pennsylvania Conservancy, 1982), 67–68.

78. Bauman and Muller, "The Olmsteds in Pittsburgh: Part II"; and Roy Lubove, *Twentieth-Century Pittsburgh, Vol. 1: Government, Business, and Environmental Change* (New York: John Wiley and Sons, 1969), 87–105.

79. Lubove, *Twentieth-Century Pittsburgh, Vol. 1*, 63–78, 106–41; Sherie R. Mershon, "Corporate Social Responsibility and Urban Revitalization: The Allegheny Conference on Community Development, 1943–1968" (PhD diss., Carnegie Mellon University, 2000); Robert C. Alberts, *The Shaping of the Point: Pittsburgh's Renaissance Park* (Pittsburgh: University of Pittsburgh Press, 1980).

80. Lubove, *Twentieth-Century Pittsburgh, Vol. 1*, 142–77.

81. Roy Lubove, *Twentieth-Century Pittsburgh, Vol. 2: The Post-Steel Era* (Pittsburgh: University of Pittsburgh Press, 1996), 57–85; Shelby Stewman and Joel A. Tarr, "Four Decades of Public-Private Partnerships in Pittsburgh," in R. Scott Fosler and Renee A. Berger, eds., *Public-Private Partnerships in American Cities* (New York: Lexington Books, 1982), 95–99.

82. For the collapse of the regional steel industry and related impacts, see John P. Hoerr, *And the Wolf Finally Came: The Decline of the American Steel Industry* (Pittsburgh: University of Pittsburgh Press, 1988); William Serrin, *Homestead: The Glory and Tragedy of an American Steel Town* (New York: Times Books, 1992); Judith Modell, with photographs by Charlee Brodsky, *A Town without Steel: Envisioning Homestead* (Pittsburgh: University of Pittsburgh Press, 1998).

83. The Steel Industry Heritage Corporation (managing organization for the Rivers of Steel National Heritage Area) has played an active role in attempting to preserve structures, artifacts, and records relating to the steel industry region. See, for example, Jan Ackerman, "Steel Industry Preserved," at http://www. riversofsteel.com/articles/postgazette39.asp.

84. For case studies of these brownfield sites and their redevelopment, see the website of the Carnegie Mellon University Brownfield Center, at http//www.ce.cmu.edu /Brownfields/.

85. These developments are mostly reported in the newspapers. See, for example, Eve Modzelewski, "Rolling on the Rivers," *Pittsburgh Post-Gazette*, August 5, 2001; Tom Barnes, "Task Force Lays Out Grand Plan for Riverfronts," *Pittsburgh Post-Gazette*,

October 23, 2001; Tom Barnes and Dan Fitzpatrick, "Renaissance III," *Pittsburgh Post-Gazette*, March 22, 1998.

86. See, for example, Roxanne Sherbeck, "We're Rolling on the Rivers," *Pittsburgh Post-Gazette*, September 17, 2000.

87. Pennsylvania Economy League, *Southwestern Pennsylvania Water and Sewer Infrastructure Report* (Pittsburgh, 2002), 18.