NARRAGANSETT BAY WATERSHED ECONOMY

The ebb and flow of natural capital

History Overview

Humans have always congregated in watersheds and along coasts, drawn there by a wide array of life-supporting goods and services such as water, wildlife, and vegetation to nourish and shelter them. The same applies to the Narragansett Bay watershed (NBW), where people have been harvesting shellfish from the shores of Narragansett Bay for at least the last 2,700 years.[1] By 1600, as many as 30,000 people may have lived in southern New England, about as many as live in South Kingstown today, with 4,000 Narragansetts in the West Bay and 1,500 Wampanoags in the East Bay.[2] Their numbers were small, as was their ecological footprint of harvesting fish and shellfish from the bay's waters and game from the lands they cleared to farm the fertile soil.[3]

Their efforts were appreciated by Giovanni da Verrazzano. Here is how he described Aquidneck Island to King Francis in 1524:

> We frequently went five to six leagues into the interior and found it as pleasant as I can possibly describe, and suitable for every kind of cultivation grain, wine, or oil. For there the fields extend for XXV to XXX leagues; they are open and free of any obstacles or trees, and so fertile that any kind of seed would produce excellent crops.[4]

The balance between the environment and the economy noted by Verazzanno would be tested, however, with the arrival of European settlers. They came in large numbers, and with a larger ecological footprint as they shifted from a subsistence to a pre-industrial economy. This would be the first major transition in the watershed's economy and would establish the region as an important economic center in the emerging national economy; by the 18th century, Providence was described as "one of the most wealthy and enterprising places in the union".[5]

Colonial Pre-Industrial Era

In 1635, William Blackstone settled along the banks of the Blackstone River. A year later, Roger Williams bought land along the lower section of the Moshassucket River near College Hill and established a settlement he called Providence Plantation. [6] Two years later, Aquidneck Island, the island that had caught Verrazzano's attention, was first settled. These settlers had all left the Boston

region in search of religious freedom and established an area that would become an attraction for other dissidents—much as the world's cities do today.

This openness to others and their religions would prove to be a catalyst to the area's economic growth, as would the watershed's fertile land, temperate climate, long growing season, and a cluster of islands with no natural predators, providing the region with a comparative advantage in livestock. As early as 1675, Newport was described as a town with "more sheep than in any place in New-England," and before long, there was a surplus of livestock.[7] By the late 17th century, Newport merchants had established markets for the region's agricultural surplus and demand for a shipbuilding industry that extended as far north as Taunton. The early trade with the West Indies would morph into the highly profitable triangle trade of the early 18th century, and it supported craftsmen such as the world class furniture makers whose work can still be seen in museums today. By mid-century, Newport was exporting more chairs than Boston,[8] and those same conditions that supported agriculture and trade helped establish Newport as a very early resort attracting wealthy southerners looking to escape the summer heat.

Newport emerged as one of colonial America's leading cities along with Boston, New York, Philadelphia, and Charleston. It supported growth across the watershed that was considerably faster than in the New England region as a whole (Figure 1). On the eve of the American Revolution in 1770, Rhode Island's (RI) population was nearly 180 times larger than in 1644, when Providence and Aquidneck Island merged to form the Colony of Rhode Island and Providence Plantations (Figure 1).[9] By 1790, the watershed was home to two of the nation's largest cities—Newport and Providence, but there were early signs of the ecological damages accompanying economic growth and the vulnerability of that growth to external developments.

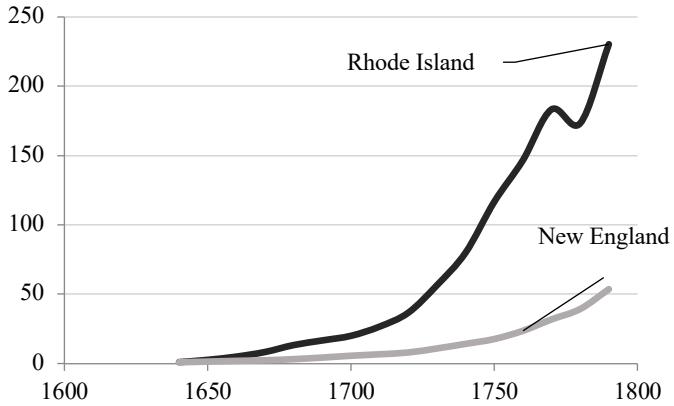

Figure 1: RI & New England Population Indexes
Source: US Census Bureau

One early indicator of that damage was the manure generated by the animals, which took its toll on the watershed.[10] A second indicator can be seen in the significant dip in the population around the time of the Revolutionary War. The watershed fueled rapid growth in the region's agricultural and

maritime economy, but the war with England was devastating and revealed the vulnerability of a region that was heavily dependent on international trade. Continued growth of a trade-based economy in Newport would be limited by a rising anti-slavery movement that would mean lost markets, a very small hinterland that would limit the growth in the livestock for sale, the expansion of trade from the Indies to Asia that increased the risk of international trade and the need for deeper pockets than available in Newport to finance that trade, and the end of favorable treatment that accompanied American independence that would increase competition and limit markets for the region's exports. The future, as described by Treasury Secretary Alexander Hamilton in his Report on Manufactures, was in manufacturing.

> The foregoing considerations seem sufficient to establish, as general propositions, that it is the interest of nations to diversify the industrious pursuits of the individuals who compose them; that the establishment of manufactures is calculated not only to increase the general stock of useful and productive labor, but to improve the state of agriculture in particular, certainly to advance the interests of those who are engaged in it...[11]

Industrial Era

The national economy shifted to manufacturing as the Industrial Revolution moved from England to America. This started when Samuel Slater, who had emigrated to New York City with a desire to make a fortune, inked a deal to create the nation's first mechanized cotton spinning factory on the banks of the Blackstone River in Pawtucket, RI. Slater, with years of work in mills in England, had the knowledge of machinery to spin cotton into yarn; Moses Brown, with money that had come from his involvement in trade, had the funds needed to finance the venture; the watershed, with many fast moving and falling rivers, would provide the power. The Industrial Revolution would take place on the banks of the watershed's rivers that were soon to be crowded with factories. Pawtucket in 1796 (Figure 2) was described by a visitor:

> There is probably no spot in New England of the same extent, in which the same quantity or variety of manufacturing business is carried on. In the year 1796, there were three anchor forges, one tanning mill, one flouring mill, one splitting mill, three fulling mills, a clothier's works, one cotton factory, two machines for cutting nails, one furnace for casting hollow ware – all moved by water.[12]

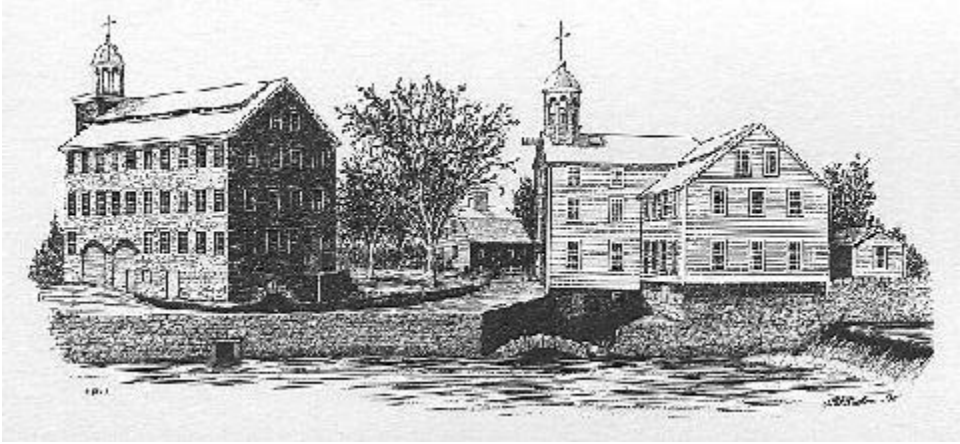

Figure 2: Slater Mill, Pawtucket, RI
Source: Slater Mill Historic Site

The extent of the concentration in the upper bay is clear in the population growth. In the early years of the Industrial Era—1800 to 1830—the movement of people to emerging industrial centers was well under way. Growth was fastest in Providence: population in Providence County increased 80% in those 30 years (Figure 3).[13] This growth was twice as fast as the state average (41%), and the growth within the City of Providence was 1.5 times as fast as the county's rate (121%). By 1830, Providence had twice as many residents as Newport and had risen to number twelve on the list of the nation's largest cities. Other centers were also appearing with some of Providence's growth spilling over into Kent County, and the cities of Taunton and Fall River in Bristol County and Worcester in Worcester County had also begun their economic climb and made it to the list of largest American cities.

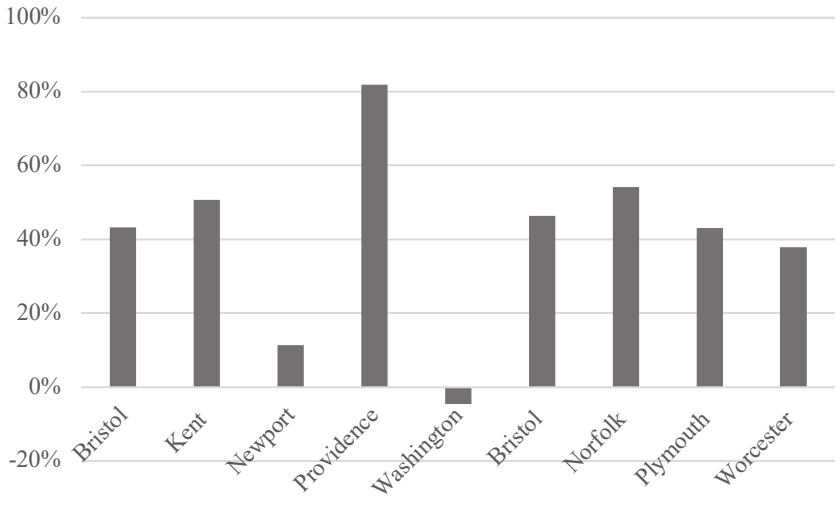

Figure 3: Population Growth Rates: 1800-1830
Source: RI Population by City, Town, and County: 1790 – 2010, n.d.

Providence, at that time, was rife with entrepreneurs and immigrants in search of success—Slater and Brown in textiles, Dodge and Lowe in jewelry, Corliss in steam power, and Browne and Sharpe in machine tools, for example (Figure 4). The economic transition was happening and it was centered in Providence, where growth accelerated from 41% to 76% between 1830 and the start of the Civil War in 1860. More than 80% of the state's population growth was in Providence County, and more than half of that was in the City of Providence. Providence quickly emerged as one of the three major U.S. centers along with New York City and Philadelphia, and five cities within the watershed made it to the list of the nation's 80 largest cities: Worcester (#36), New Bedford (#40), Taunton (#58), Fall River (#66), North Providence (#79). Newport, meanwhile, with the transition from a maritime to industrial economy, fell from #11 to #82.[14]

Once again, however, the region faced serious constraints in the face of continued growth. In the earlier transition the constraint was the size of the market. Now, it was a shortage of resources. To sustain this growth, two constraints would need to be relaxed: there needed to be a new source of energy to power the mills' machines and a new source of labor to work those machines. The power constraint was solved by George Corliss, yet another entrepreneur in search of funding who had been drawn to Providence. Within a few years of his arrival in 1844, Corliss had a patent and a new company producing steam engines. Slater had experimented with steam power in 1827, but it was Corliss' engine that finally freed mills from the need to locate on the watershed's increasingly crowded rivers.

Providence, which had been approaching the limits of water power, was now able to sustain its growth with a diversified economy that was unusual in the region. One of those industries was jewelry. Some early entrepreneurs chose Providence because of its reputation of refinement and science, its strong core of jewelers from the maritime era, and its access to external markets.[i] Another major sector was the machine tool industry that had a long history in the watershed extending at least as far back as the discovery of iron ore on the banks of the Forge River and the establishment of an iron forge in 1652 in what is now Raynham, Massachusetts (MA). A machine tool industry was essential to support the rise of manufacturing, and Providence had a leading machine and precision tool manufacturer once Browne & Sharpe opened its doors in Providence in 1833.

The labor constraint, meanwhile, was initially solved by farm-to-factory migration. Slater, in addition to his knowledge of machinery, had brought the outlines of a production model that became known as the "Rhode Island System." It was a system based on the employment of entire families, and soon those families were moving to work in mills, many of which were in cities, and a number of the smaller, more rural communities were losing people. The biggest losses were in Exeter, Glocester,

[i] At the end of the 18th century, Nehemiah Dodge had discovered a method for making gold plate and a cheaper grade of jewelry. This novelty made Dodge one of the founders of the jewelry industry in Providence, the center of less expensive jewelry and innovation with more than 200 firms employing 7,000 workers. Dodge's practice was further refined when an English jeweler Thomas Lowe came to Providence with a new process of sweating a sheet of gold onto another metal surface to produce a gold-plated substance.

and Charlestown, where population dropped by nearly 1/3rd. In addition, Jamestown, West Greenwich, and Foster had declines exceeding 20% between 1800 and 1860.[15]

There were, however, limits to this growth. The watershed could no longer meet the demand for workers, and the solution was immigrant labor. Between 1820 and 1860, more than nine million arrived in the U.S., with many heading to the watershed. After completing work on the Erie Canal in 1825, the Irish arrived to build the Blackstone Canal to expand Providence's hinterland by giving it access to the interior as far as Worcester, MA. The Erie Canal had created a canal boom, but the Blackstone Canal linking Providence with the interior was no more successful than the Pennsylvania Canal linking Philadelphia to its hinterland because of climate and terrain problems. Immigrants began arriving in such large numbers that by 1910 "only one-third of the population was of 'old Yankee' stock."[16] Woonsocket, where there had been active recruitment of citizens from Quebec, had earned the title of the "most French city in the United States with 72% of its population holding French surnames."[17] Fall River, meanwhile, "had achieved distinction as a major center of immigration in the United States. No municipality of comparable size held such an array of emigrants—who came from eighteen different nations. Among its 12,762 male textile operatives, only 3.6% had native-born parents."[18]

Figure 4: Corliss Steam Engine Co., Providence, RI
Source: New England Wireless & Steam Museum

With these constraints relaxed, the landscape changed dramatically. Factories powered by steam and linked to distant markets by railroads and steamships opened up across the watershed, although Providence remained a center of the growth. In 1850, nearly 150,000 people lived in all of RI and 500,000 in the nine watershed counties in both RI and MA. In the next 50 years Providence County's population grew by almost 250,000 people—nearly 86% of the state's growth. In 1900, RI was near the top of many lists: the highest ratio of wage earners to the population, the highest value of manufactured goods per capita, 1st in the jewelry and silverware industries, 2nd in dyeing and finishing textiles, and 4th in cotton goods.[19]

To the north, Worcester gained access to Boston with railroads after the ill-fated Blackstone Canal, and by 1900 its population had risen from 17,000 to 118,421. In the northeastern reaches of the watershed, Brockton had become the "Shoe City" by rising to the top of the national rankings in shoe and boot production by 1900. Further down the Taunton River, the city of Taunton, with a long history of iron works, had become the "Silver City" and home to Reed and Barton silversmiths.[20]

Figure 5: Fall River Line
Source: The Esoterica Curiosa Blog

Further south on the Taunton River, where it reaches the Narragansett Bay, is Fall River, which "made a heroic contribution to American manufacturing supremacy, the course of the nineteenth century, Yankee efficiency, ingenuity, technical ability, self-confidence, nurtured an infant mill industry and shaped the Spindle City … into the country's largest textile center"[21] (Figure 5). A city of 11,524 in 1850, about one-quarter the size of Providence, Fall River had been well positioned for the shift to steam power. From its location on the Taunton River, the city was linked to Boston in the north by the Fall River Railroad and to resources (cotton and coal) and markets (New York City) in the south via the Fall River Line of steamships that were "peerless among the marine architectural triumphs of the world."[22] By 1900, Fall River's population had grown to 104,863 and its factories were generating 8.6% of the value of the nation's cotton goods, 85% more than second place Philadelphia. Also making it to the top ten list of cotton goods manufactures were the four watershed cities of New Bedford (4th), Pawtucket (7th), Taunton (9th), and Warwick (10th).[23]

These success stories are reflected in the graph of population growth below.[ii] Between 1860 and 1920—roughly the beginning of the Civil War to the end of World War I—population in the watershed counties nearly doubled with the addition of 1.2 million residents. Growth also remained heavily concentrated in and around the watershed's major cities. In MA, this was a period of increasing concentration in Worcester and Bristol Counties where Worcester and Fall River are located. In 1860 these counties had accounted for 42% of the watershed's population, but in the next sixty years 75% of growth was in these counties (Figure 6). The concentration was even higher in RI, where 85% of the growth was located in Providence County, and half of that was in the City of

[ii] Middlesex was dropped from the list because there was only one small town in the watershed.

Providence. By 1900, Worcester, Providence, and Fall River all had over 100,000 residents and were ranked in the top 35 of the nation's largest cities.

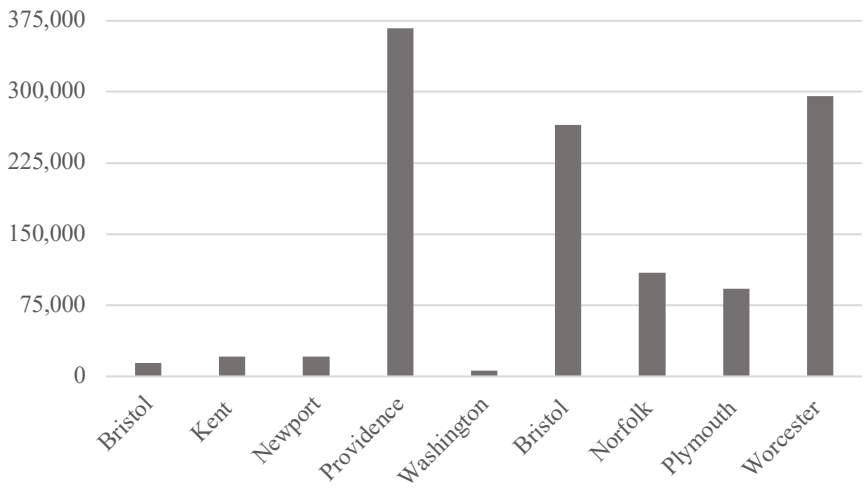

Figure 6: Population Growth: 1860-1920
Source: US Census Bureau, 1975

With this concentration of people and industry in the watershed's large industrial centers, power and wealth shifted away from those with close connections with water. The watershed's economy had become more detached from its key assets. The protected harbors and falling rivers no longer had the pull they once had. This is visible in the changes in where people lived, which was near to where they worked. In this period, populations moved away from the RI cities and towns identified as being dependent on the marine environment. At the turn of the 19th century at the peak of the maritime economy, nearly 1/2 of the state's people lived in marine-dependent cities and towns. A hundred years later at the turn of the 20th century, when the industrial economy was nearing its peak, that share had fallen to 17% (Figure 7). The center of power had shifted north, away from those whose livelihood was directly tied to a healthy watershed, to those whose livelihood was dependent on the watershed's absorptive powers.

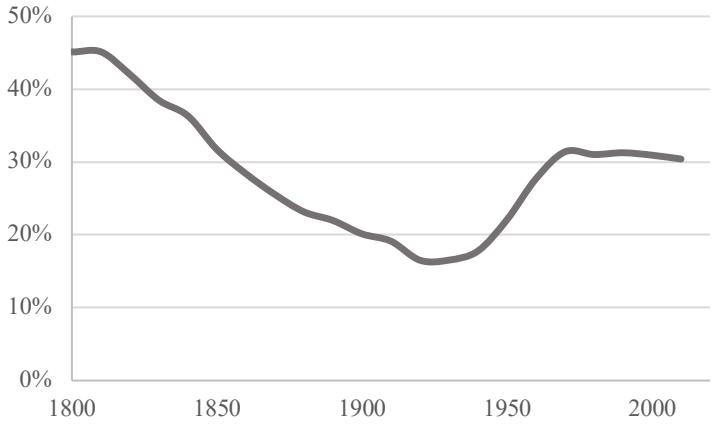

Figure 7: Share of RI's Population in Marine Dependent Cities & Towns
Source: US Census Bureau

Once again, this growth came at the expense of more rural areas. In RI, where there is population data for cities and towns, the number of communities that lost population increased from eight in the 1800-1860 period to eleven in the 1860-1920 period, with actual losses increasing five-fold. This is consistent with state data on the decline of farms in both states during this period. Farmland had fallen 41% in RI and 26% in MA between 1850 and 1920. As large as these declines were, they probably underestimate the magnitude of the decline given that an increasing share of farmland was actually woodland. In the same 70 years in both states, improved farmland fell around 60%.

There was also a darker side to this remarkable growth not adequately reflected in the traditional measures of economic success: the watershed that had sustained this growth had also been badly damaged by it. There is some evidence of the economy's adverse effect on the environment in the declining size of the shells harvested from the bay before Europeans arrived and the runoffs from the livestock industry harming its waters after the Europeans had arrived and established a vibrant mercantile economy centered in Newport. With this growth came indoor plumbing and industrial pollution that overwhelmed the watershed's absorptive powers. An early sign of this was a series of cholera epidemics in Providence. By then the city's rivers were as "filthy as any common sewer, and the stench arising from it at times pervades the whole neighborhood. . . . At any time, dogs, cats, and hogs may be seen in the water in every stage of decomposition . . . ."[24] A Public Health Commission was established to address the problem, and within twenty years a system of sewers had been constructed to disperse pollution further down the bay. In another 30 years the first sewage treatment system employing chemicals was in place at Fields Point.[25]

Figure 8: Narragansett Bay Oyster Company
Source: Providence Public Library

By the late 1800s, RI was not only number one in jewelry manufacturing, but it was also number one in oyster production (Figure 8). The brackish water in the upper bay gave the shellfish a favored flavor, which attracted outside investments to the industry. It also attracted immigrants to work in the shucking houses, many of whom were from Cape Verde and lived in the Fox Point area of Providence.[26] By the century's end there were over 60 oyster shucking houses, East Greenwich Bay was home to Scalloptown, and the watershed was experiencing the "golden age of the oyster."[27] At its peak in the 1900s, the oyster industry was the state's largest industry on land or sea, employing over a thousand people with an annual output of 1.4 million bushels of oysters, worth upwards of $4 million and occupying almost 21,000 leased acres.[28] The boom, however, would not last. In 1895 restrictions were imposed on harvesting off Fields Point and by 1910 conflicts between the industrialists and fishers ended up in court. The end was inevitable, however, as increased runoff from deforestation changed the composition of the bay and damaged the industry.[29]

While farming and the watershed's ecosystem may have been victims of the watershed's industrialization, a new industry was emerging in the watershed, one that would eventually become very important to the watershed's economy—tourism and recreation. With the growth of manufacturing came higher incomes and a shorter workweek (although those incomes were low and hours long by today's standards). The average annual earnings for manufacturing workers in 1910 were $487, which translates into $14,102 in 2016 dollars.[iii] For these earnings, they were working 289 days and 9.9 hours a day, which is a workweek of about 5.5 days.[30] By today's standards, it is hard to understand how families living on these low earnings had enough discretionary income to support a recreation and tourism industry, but people were able to do it. In large numbers, they

[iii] There is a BLS calculator for years after 192, so to get from 1900 to 1913 the data from the Minneapolis Federal Reserve Bank, https://www.minneapolisfed.org/community/teaching-aids/cpi-calculator-information/consumer-price-index-1800. These data were then converted to today's $s using the 1990 data from the U.S. Census, Historical Statistics of the United States, Colonial Times to 1970, http://www.census.gov/library/publications/1975/compendia/hist_stats_colonial-1970.html and then the CPI calculator https://data.bls.gov/cgi-bin/cpicalc.pl

boarded boats and trolleys to enjoy the amusements and shore dinner halls in Rocky Point in Warwick, Fields Point in Providence, and later Crescent Point, Boyden Heights, and Vanity Fair in Riverside (Figure 9). Further south, majestic hotels opened in Narragansett and Jamestown to serve a wealthier clientele, and further east Newport had become the "City by the Sea." Newport remained a preferred destination of those with the means to seek relief from summer heat as the Fall River Line, along with bales of cotton as cargo heading east to the mills in Fall River and bolts of cotton textiles headed to New York City, ferried the era's robber barons who were building summer "cottages" in Newport.

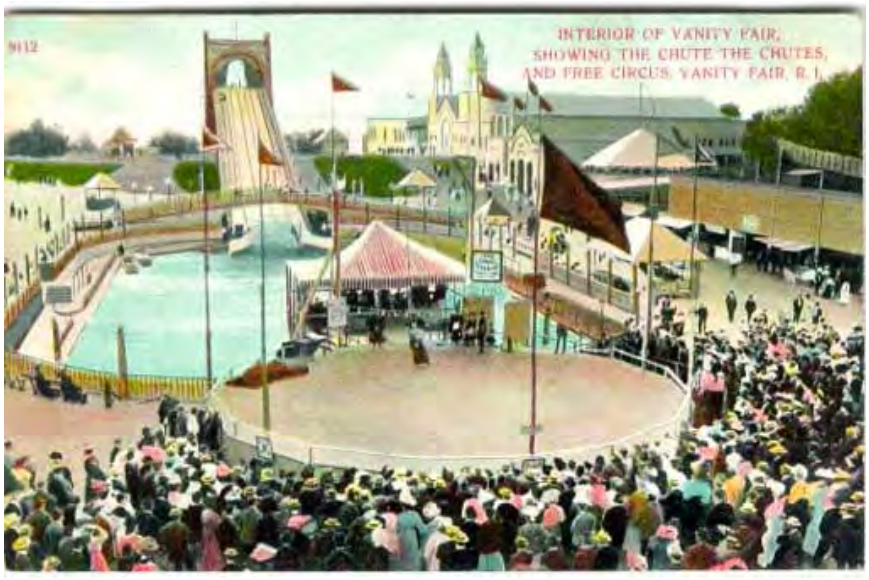

Figure 9: Vanity Fair, RI
Source: Old Post Card

The rise of tourism was not enough, however, to overcome weaknesses in the regional economy. By 1920 it was not only the oyster industry in the bay that had passed its peak, but tourism had as well. The engine of economic growth was now slowing, and while the previous transition—from mercantile to industrial economy—had been remarkable, the region now faced yet another transition period. Manufacturing was the future after Slater's mill opened in 1790, and while nowhere made the transition to an industrial economy better than the watershed, manufacturing was not its future in 1920. Demographic and technological change together with public policy shifts would greatly reduce the locational advantages upon which the watershed's firms had built their success. This time it was to a post-industrial world, and this would not be nearly as smooth as the last transition.

Post Industrial Era

Just as the watershed had been on the leading edge of the move to an industrial economy, in the 1920s it was on the leading edge of a transition to a post-industrial society. Once again, the watershed was facing uncertain times. A surge from wartime spending for WWII extended the life of many factories,

but it was only temporary. By 1950, the numbers made it very clear to the newly formed Council of Economic Advisors that is was enough of a problem to form a committee to explain the decline of New England's economy and maybe identify ways to change the trajectory. It was not a watershed problem—this was a regional problem that was simply more pronounced in the watershed.

Demographic trends were poor. Since Slater's mill opened, the center of the country had moved 600 miles west by 1920—from just outside Baltimore, MD to just outside Bloomington, IN—which left the region's factories far from emerging markets. Its supply of workers was also at risk. For 100 years, immigrants had been drawn to the region's factories in such large numbers that by 1920 more than 1/3rd of the region's population was foreign-born, nearly twice the national average. Its economy had become dependent on immigrants, but new restrictions in the National Quota Act of 1924 would reduce the supply of workers and drive up wages, which were already well above those in the south where governments imposed fewer restrictions on work and pay.

Transportation advances were unfavorable. Technological advances in transportation and communications combined with massive investments in infrastructure drove down the cost of traveling long distance. In the 19th century this brought bigger markets, but by the 20th century it was bringing more competitors. Massive infrastructure investments in rails had increased the competitive position of southern factories.

Industry mix was poor. In the 19th century the textile industry matured. With that maturity came a weakening of the forces that had bound the factories together in the watershed. The textile industry was the region's largest:[31] in 1919, more than one of every three wage earners was in the cotton and worsted goods industries. Adding in related sectors, such as knit goods and cotton lace, the share approaches one of every two. Factories were there because much of the 19th century was a period of rapid technological change in the textile industry, first in spinning and then in weaving. In new industries, or industries experiencing a rapid rate of change, there are great advantages to a clustering of firms. All industries employ a mix of skilled and unskilled workers, and in an industry's early days it depends heavily on skilled workers. They built the machinery that was often custom built for each factory, so the factories would be small because it was difficult to retrofit a factory to the new machinery, and the "life expectancy" of the new machinery was short. For this reason, supply chains were short and factories clustered together in the region's major cities that were often specialized in specific industries—Shoe City, Silver City, and Spindle City.

As the industry matured and the rate of technological change slowed, the factories grew bigger. In 1919, the average cotton goods establishment employed over 425 people, while the average for all industries was 56. For the jewelry industry, which still relied on skilled artisans, the average employment was 36. Factories also employed large numbers of women and children, many of whom lived in mill housing and shopped in mill stores (Figure 10). Shutdowns became a regular occurrence as the textile industry was again on the move, and this time it was out of the watershed. In the new environment, the decision by American Printing Company, Fall River's largest employer in its largest industry, to open a factory in Tennessee in the early 1920s before moving its operations out of Fall

River, would be duplicated by many others. And those factories are still on the move, most recently from China to Vietnam and Bangladesh. Unfortunately for the watershed, the legacy of rapid industrial growth came to an end when outsourcing of manufacturing became increasingly popular in the 1920s. As a result, employment in local factories started to decline as manufacturing jobs shifted to different countries. In 1920, fewer than 1/3rd of the nation's workers were employed in manufacturing, and in the watershed, more than half of the workers were employed in manufacturing; this rate was higher in the watershed's big industrial centers such as Fall River where more than seven of every ten workers were employed in manufacturing.[32]

Figure 10: Workers at the Globe Yarn Mills, Fall River, circa 1882
Source: Fall River Historical Society

As factories closed, population growth slowed as more people were pushed out by their inability to hang on without work while fewer were pulled in by the prospect of a job. Overall population in the watershed's cities and towns managed to increase by nearly 700,000, but in six of the eight core cities, population declined by 170,000. The big three—Providence, Worcester, and Fall River—all suffered double-digit losses. Providence lost more than 1/3rd of its population in these 50 years, as the exodus from the cities and factories had begun to accelerate.

Those leaving for jobs would now be joined by those moving to the suburbs. The investment in railroads, which rewrote where people worked and lived in the previous era, was now being followed by a massive investment in the interstate highway system that would rewrite it again. The cost of traveling would continue to fall, except where it had previously fallen most on long distance travel, it would now fall fastest on short distance travel. The centripetal forces would now be overwhelmed by the centrifugal forces and the beginning of urban sprawl (Figure 11). People were leaving the cities, but not going too far. Nearly 25% of RI's growth was in Warwick, with another 25% in Cranston and East and North Providence. In the MA portion of the watershed, the largest gains were in the areas surrounding Boston including Brockton.

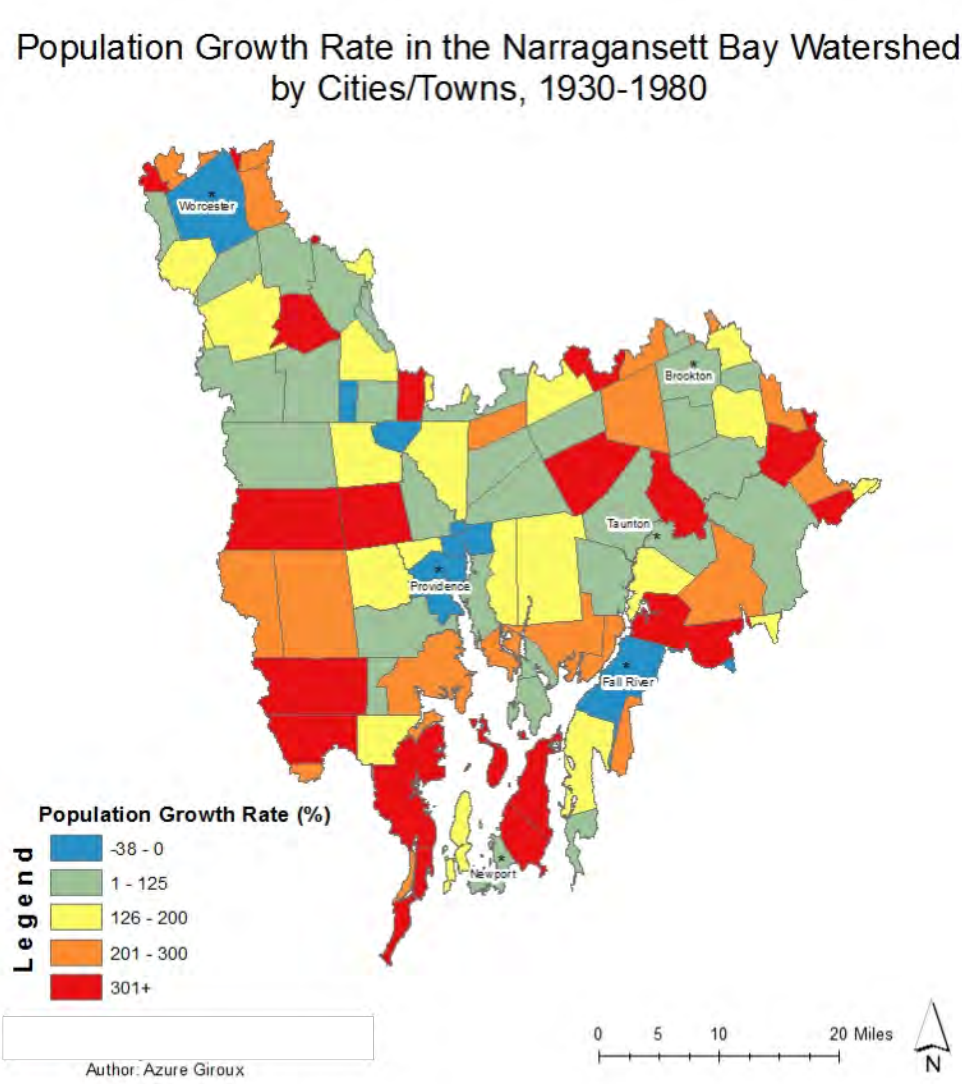

Figure 11: Population Growth Rate in the NBW by Cities/Towns, 1930-1980

There were also a few other communities in the watershed that showed exceptional growth. Middletown and Portsmouth on Aquidneck Island and North Kingstown all had growth rates that exceeded 300%, and Middletown's reached almost 600%. This reflects one of the bright spots in the local economy—the defense industry—which has a long history in the watershed. The British recognized its strategic value, which is why they occupied Newport during the Revolutionary War. Since then, state and federal governments have funded the building and rebuilding of several forts to protect Narragansett Bay. During the Civil War, the Naval Academy was temporarily moved to Newport (1861-65), and by that decade's end the Navy had established a Torpedo Station on Goat Island.

By the outbreak of WWI, the Navy had opened a recruit training station in Newport (1884), the Naval War College in Newport (1885), and a coaling station in Melville that attracted battleships to the bay,

a precursor to the arrival of the USS Massachusetts to Battleship Cove in the early 1960s. In WWI, 7,215 men were stationed in Newport and an average of 15,000 men were arriving each month for training: [33] this in a city with a population of only 30,000 in 1920. This would look small, however, during WWII as the Navy expanded its operations in Newport County where 200,000 recruits received their training during the war. Many of them lived in Quonset huts, while many others worked at the Quonset Point Naval Air Station and the Construction Battalion Center at Davisville (Seabees) that were both built then. The Torpedo Station on Goat Island that had opened in 1869, would employ more than 13,000 people at its peak during the war.

The buildup can be seen in the population growth of North Kingstown and Newport between 1940 and 1960. In these 20 years, the population in Newport and Middletown increased almost 80%. This increase was more than four times faster than overall growth in the state, while in North Kingstown it increased over 300%. These were spectacular numbers, even more impressive than manufacturing's earlier growth. Unfortunately, like the textile industry, the external environment changed and the defense sector began its decline. In 1973, Quonset Point and Davisville closed and the Navy moved its fleet from Newport to Norfolk, VA and the regional economy slowed. In the 1970s, employment growth in the region was well below the national rate—40% lower in RI and 50% lower in MA—and by the peak of the 1980 recession both states had double-digit unemployment rates. The transition to a post-industrial economy was not going nearly as smoothly as the earlier transition, and the search was on for a way to revitalize the economy (Figure 12).

In RI, the state's economic crisis deepened in the 1970s and was cited as the reason why the state's voters chose to embrace the Greenhouse Compact. This was a plan to speed up the transition and, interestingly, at the center of their plan was the recommendation to increase risk taking behaviors. This was an essential ingredient in a mix that produced the two previous economic successes. Another was identifying industries in which to invest, and at that time the list included tourism, fishing, boatbuilding, jewelry, and wholesaling. The Compact proposal failed, but other reports have followed with new lists of industries in which the state should invest. The most recent was *Rhode Island Innovates: A Competitive Strategy for the Ocean State* in 2015.[34] Citing much the same problem—an underperforming economy—another set of industries in which to invest was proposed. The industries were different, but at the center of their vision was another link to the region's past successes. Growth in the 21st century will depend on the nurturing of industry clusters, just as it did in the 19th century.

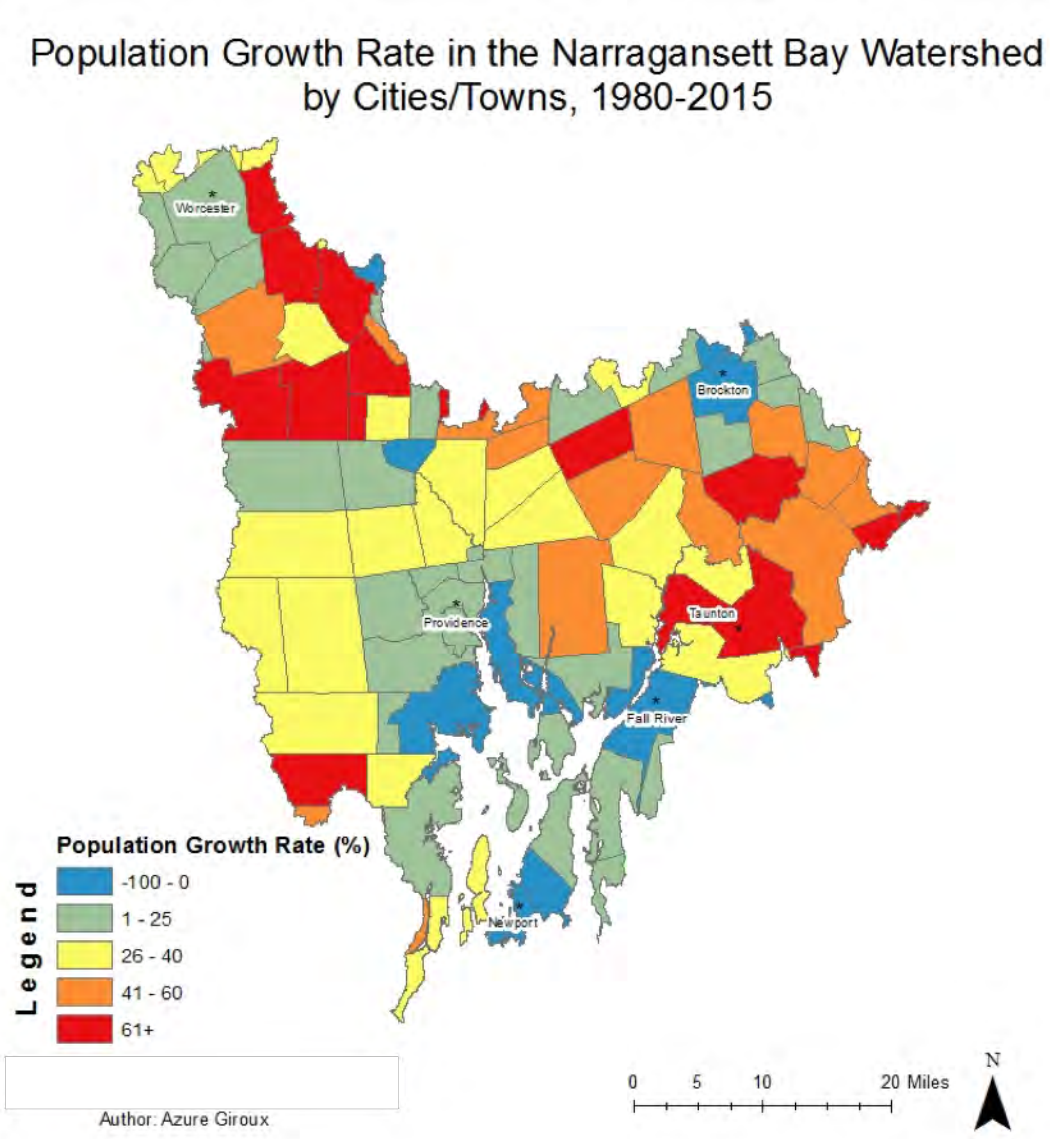

Figure 12: Population Growth Rate in the NBW by Cities/Towns, 1980-2015

In the early 1980s the world was taking notice of the "Massachusetts Miracle." Policy makers across the country and in Europe wanted to know how a declining region rediscovered economic growth. Not much of that growth filtered far down into the watershed, however, because in the state the growth industries were clustering, and they were doing so around Boston and Route 495—America's Technology Highway. This is why the northern reaches of the watershed have experienced above average growth.

The Future

There was no one in 1650 that envisioned a thriving economy centered in Newport, and there was no one a hundred years later that could have envisioned a thriving economy centered in Providence, and there is no one today who can envision the watershed's economy in 2050. As a result, it is uncertain if policy makers in the watershed will do a better job of identifying sectors than they have in the past. There is, however, an important lesson to take away from the past: the watershed has been a catalyst to eras of remarkable growth in the past and there is a chance it could do so in the future. There is no guarantee, however, because growth in the past has taken a toll on the environment and the same forces are in play today. While some of the damage has been reversed, there is reason to believe it will be more difficult to do so in the future. The environment is not unlimited. As development occurs, and retaining walls and septic systems are built, fields are paved over, and forests cut down, it will be harder to reverse the damage to the watershed and the projections for government finances suggest the government will not play the role they have played in the past.

There are, however, reasons to be optimistic. The history of growth in the watershed increases the possibility of another successful economic transition. Here are a few of the take-aways.

Comparative advantage matters. What are the strengths of the NBW? What is its comparative advantage? The watershed remains a key resource: once it was a great harbor and then it was a series of falling rivers, and both times that comparative advantage fueled remarkable growth. The watershed by itself is neither a necessary nor sufficient condition for growth, but it can play a key role in the watershed's economic future.

Being first matters. This was true when Newport's merchants helped revolutionize, and it was true when the industrialists of Providence, Worcester, and Fall River revolutionized manufacturing, and it will be true in the hypercompetitive future. The difference will be the speed at which competitors arrive to erode the monopoly profits going to those early innovators. It is hard to predict the speed of change, but it seems certain the region will be able to sustain its above average income only if there is an ample supply of entrepreneurs operating in the new "new economy." There has to be a new cluster—a set of industries on the cutting edge that employ highly paid skilled workers. The good news is some of those may exist. One is a research cluster, and at this time there is the concentration of universities that could form the nucleus of such a cluster.

A second is one that is closely related to what in the past has been called the Water Cluster and a Marine Trade Cluster.[35] These are a set of industries with strong ties to Narragansett Bay, and in 2012 the estimate was that the Marine Trade Cluster would support nearly 7,000 jobs with a payroll of over $25 million.[36] A third—and there is some overlap between this and the other two—would be a defense/technology cluster. This would be similar to the blue tech that exists in San Diego. There is a long history of defense presence in the area, and since 1970 it has shifted away from Navy personnel to private-sector high-tech firms. In 2013, it is estimated that the direct impact of the defense spending was nearly 17,500 jobs with nearly 40% of that in the private sector.[37]

Demographics matter: New England is aging rapidly, growing slowly, and diversifying quickly. This is also the case in the watershed, and while slow growth will put less pressure on the watershed's environment, it will slow economic growth. One way to reverse this is to reverse the outflow of young, college educated youth from the area. The region attracts some of the best and brightest to its institutions of higher education, but they do not often stay. This is a problem, as skilled labor is a scarce resource in the world today. If there is to be another period of great success in the watershed's future, those students will have to come for education and stay to work. The bad news is this is a very mobile group, and the region has seen what greater mobility could do to the region. The good news is that skilled, mobile college grads weigh quality of life higher in their location choices today, and the quality of life in the watershed should be enough to attract them, just as the falling waters attracted those early industrialists.

Another demographic will impact growth—a legacy of a high concentration employed in factories is a significant number of individuals with limited educational background, so success in the future will also require a number of jobs with low barriers to entry. The good news here is that the watershed can generate a number of jobs with low barriers to entry.

At this point it should be clear there is a link between the economy and the environment, one that is not always appreciated or understood. It is the goal of this report to quantify as best as possible that linkage to improve the odds that the region can realize its potential and avoid choices that would reduce those odds.

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