

# Reclamation and reconciliation: land-use history, ecosystem services, and the Providence River

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**Abstract** Throughout time, American cities have been consciously or unconsciously designed to provide efficient access to *ecosystem services*. The land-use history of the Providence River serves to illustrate this point. Transformed through land-filling in the nineteenth century, the construction of a hurricane barrier in the twentieth century, and a civic renaissance in the twenty-first century, the shifting landscape of downtown Providence, Rhode Island, reflects a shifting relationship with the land. The area that was once the Great Salt Cove has undergone numerous iterations in the past 400 years—each of these transformations based upon which ecosystem services were most-valued at the time. In this sense, land-use history can serve as a valuable tool in evaluating the societal relationship between nature and culture.

**Keywords** Ecosystem services · Environmental history · Providence · Rhode Island · Urban planning

## Introduction

An *ecosystem service* is defined as a vital service performed by the ecosystem, such as the production of goods (e.g. carbon sequestration, fisheries), life support processes (e.g. pollination, flood control, water purification), life-fulfilling conditions (e.g. serenity, beauty), and options values (e.g. genetic diversity). Implicit to this definition is the idea that nature efficiently provides services without human

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intervention—humans are the passive recipients of services conferred by intact, unfettered ecosystems.<sup>1</sup> Modern conceptualizations of ecosystem services derive from a broader American tendency to dichotomize society (culture) and *wilderness* (nature), the untrammelled non-human world.<sup>2</sup> Yet such dichotomies between man and nature ignore the fact that societies, both modern and historical, manipulate their environments to enhance the flow of ecosystem services. The environmental history of downtown Providence, Rhode Island, illustrates this interplay between human capital and natural capital.

Transformed from a productive salt cove to an environmental art installation, the Providence River reflects 300 years of shifting relationships with the land. Many versions of the riverscape have been realized along the way, including a recreational park and an industrial railway. In the early eighteenth century, riverfront property was highly valued, as it provided access to fisheries and transportation. Today the former riverfront is the site of Kennedy Plaza, the centrally-located transportation center of Providence. These various land-uses are not accidental: they reflect the ecosystem services in highest demand during their respective time periods.

Despite its transformations, downtown Providence has never transcended its place in the larger landscape, or indeed the larger ecosystem. On 21 September 1954, the “Great Hurricane” swept through Rhode Island, devastating towns across the state. The most notable damage was to the coastline, where an estimated \$100 million dollars in damage was incurred (approximately \$3 billion dollars in 2005 USD). The residents and policymakers of Providence, having manipulated their environment to provide the service of “transportation” rather than the service of “storm protection,” were reminded of their place within the larger ecosystem.

Today, downtown Providence is protected by a concrete hurricane barrier. Development on reclaimed-land persists due to cultural value of this landscape. Meanwhile, the rivers of downtown Providence have been uncovered after being paved over for a good part of the twentieth century, and now serve as the focal point of the city’s renaissance. Perhaps it will prove possible to reach a middle ground, a balance between nature and culture, that is neither neglectful of the city’s place within the larger ecosystem, nor ignorant of human wants and needs.

### From great salt cove to railway

Downtown Providence is situated upon the former site of the Great Salt Cove, an important source of shellfish for Narragansett groups and early European colonists. Beyond a food source, these salt marshes provided other important ecosystem services to early residents, such as agricultural land, flood protection, and accessible transportation.<sup>3</sup> Settlers began reclaiming land by the nineteenth century, filling the Great Salt Cove and building on top of the fill (Staples 1948). The Cove was reduced to an elliptical basin by 1848, and was completely filled by the Providence and Worcester Railroad Company in 1868. The filling of the Providence estuary had profound impacts on the local ecosystem, a fact which did not go unnoticed at the time of construction.

Many Providence residents opposed the decision to allow the Providence and Worcester Railroad Company to fill in areas of the Cove; their reasons were both aesthetic and practical. Tristram Burges writes, in “A Remonstrance to the City Council of Providence,” 1846, “Will you

<sup>1</sup> Daily et al. (2000); see also Daily (1997); Westman (1977). For a through discussion of the problems with the definition of Daily et al. see Boyd and Banzhaf (2006). The authors argue that many biological entities considered “services” by Daily 1997 are in fact production functions. For example, under their definition, nutrient cycling is an ecosystem function, not a service. Ecosystem services are defined as things such as surface waters and fish. Recreational benefits arise from the joint use of ecosystem services and conventional goods and services.

<sup>2</sup> For a comprehensive discussion, see Cronon (1995): 69–90.

<sup>3</sup> In this paper, I use the term “*ecosystem services*” as defined by Daily et al. (2000).

then give this Cove to this corporation, cutting off the land owners from the waters and taking the water from the uses of navigation? (Burgess 1846)” To Burgess, the unaltered Cove provided ecosystem services of economic value: namely, the transportation value of water and nature’s value as a “ground for the health and amusement of the people.”<sup>4</sup> Against the wishes of Burgess and others, the Providence Common Council decided to give the railroad company permission to cover areas of the Cove and create the “Cove Basin,” an elliptical basin of 1,300 ft by 1,180 ft, ringed by a pedestrian walkway (Snow 1868). Numerous council members, the governor, and the mayor of Providence were stockholders in the Worcester and Providence Railroad Company, and their stockholder status was not unbeknownst to the public.<sup>5</sup>

In 1848, William R. Staples wrote a pamphlet defending the legality of the state decision to sell the Great Salt Cove to the Worcester and Providence Railroad. He states that farmers who had been accustomed to mowing portions of the lands had been “trespassing in every instance, without exception.” He writes, “It is strange that the state has for so long a period resorted to taxation on the hard and ungenerous land, where it possessed such countless wealth in these shore lands. Out of the cove lands, enough can be raised to erect a new state house. We can pay our nation’s debt with them.”<sup>6</sup> To officials, the value of the cove land lay in its potential to serve as a transportation and industrial center. Construction of the new state house began in 1895 (Cady 1957: 54).

In 1868, the Worcester and Providence Railroad Company revealed plans to completely fill the basin.<sup>7</sup> The City Council requested that Edwin M. Snow, M.D., write a report upon public health issues related to the Cove, in what was entitled *A Report upon the Sanitary Effects of Filling the Cove Basin*. Snow refuted the popular idea that the Cove Basin promoted the growth of mosquitoes, stating that the water was constantly flowing because of the tide. He argued that the Cove Basin posed no sanitary threat, other than the occasional drowning of street animals. Astutely, he remarks, “There is too much reason for believing that if the water is converted into land, it will, at no distant period, be covered with buildings.”<sup>8</sup> Snow shows concern for the ecological integrity of the region, stating that if the Basin were to be filled, the channels would become fresh water canals. Yet ultimately Snow opposed the filling of the Cove for progressive reasons: the Cove Basin was a city ornament and a source of recreation for the people, and therefore should not be altered.

Despite Dr. Snow’s recommendations, the Providence Common Council decided to grant the Worcester and Providence Railroad permission to fill the Cove area.<sup>9</sup> The decision marked the end of the Providence salt marshes, and the beginning of urbanization on top of the filled lands. As Dr. Snow had predicted, by the late 1800s the area that was once the Great Salt Cove had buildings upon it. By the twentieth century, Providence boasted a bustling downtown commercial district. The district, however, was soon proven vulnerable to the whims of natural disaster. Progress had not transcended the city’s place within the larger landscape.

## The great hurricane

In the first half of the twentieth century, Providence was ravaged by two major hurricanes: the storm of 1938, and Hurricane Carol of 1954. Little remembered today, these hurricanes

<sup>4</sup> Burgess, “Remonstrance to the City Council of Providence.”

<sup>5</sup> Burgess, “Remonstrance to the City Council of Providence.”

<sup>6</sup> Staples, “Cove Lands.”

<sup>7</sup> Snow, “Report upon the Sanitary Effects of Filling the Cove Basin in the City of Providence,” 4.

<sup>8</sup> Snow, “Report upon the Sanitary Effects of Filling the Cove Basin in the City of Providence,” 3.

<sup>9</sup> Cady, *Civic and Architectural Development of Providence*: 115.

shaped the current landscape of downtown Providence. In these particular instances, commercial concerns motivated subsequent land-use changes. It may seem that commercial concerns are outside of the realm of ecosystem services, but if not for the landscape upon which to live and trade, commerce would not exist.

Downtown businesses were hit particularly hard by the storm of 21 September 1938. The hurricane totaled 13 ft 9 in. in floodwaters, and during its 2 h peak it boasted sustained winds of 121 mph (Cowley and Campbell 1983: 185). On top of water damage, there was a serious problem with looting: “They came neck deep or swimming, holding flashlights dry above them, rising out of the water and disappearing through the demolished store windows... they were brazen and insatiable; they swarmed like rats.”<sup>10</sup> The day of the storm, Secretary of State Louis Cappelli called out the National Guard. Chief of Police Edward Murphy shut down the downtown area in an attempt to prevent further looting during the many hours of tedious salvage operations awaiting store operators. Marital law lasted for 4 days.<sup>11</sup>

The area of downtown Providence that was most impacted by the storm of 1938 was the commercial district. At the time, the hurricane was the costliest natural disaster in American history (Minsinger 1988, 10). The political response to the hurricane was largely shaped by the New Deal. In Providence, 63% of families had annual incomes under \$1,500 dollars (approximately \$19,000 in 2005 USD) and over 5% were unemployed.<sup>12</sup> The area was greatly benefited by the Works Progress Administration, which “was a huge, available, and willing work force for emergency duty (The Rhode Island Historical Society 2004: 10).” Most disaster funding came from the state, with some federal aid, and a minimal amount of aid from the Red Cross.<sup>13</sup>

Commercial losses were staggering; the Rhode Island Hospital Trust Company alone experienced a net loss of \$238,520.89 for salaries lost, equipment damage, and building damage. The company’s bank vault was flooded, and newspapers wrote of the “watered stock” that was sent to New York to be pressed dry. The owners ensured the public that the documents had lost “a seal or two” but were otherwise unharmed.<sup>14</sup>

Providence’s next devastating natural disaster was to occur a short 16 years later. On 31 August 1954, Hurricane Carol struck the Narragansett Bay region. The next morning, the Providence Journal ran the headline: “Hurricane Leaves 16 Dead, Scores Hurt, \$100,000,000 Damage along Rhode Island Coast.”<sup>15</sup> It ran this headline from the Woonsocket Journal printing office, due to the fact that the downtown offices of the Providence Journal had been flooded.<sup>16</sup> The devastation caused by the hurricane dominated the newsprint in the subsequent week. In a headlining article, Francis Murphy wrote: “a salty, oily rubbish littered lake was formed as the waters of the river and the polluted canal overflowed Dyer, Water, and South Main Streets.”<sup>17</sup>

News articles published on 2 September 1954, focus upon the industrial and commercial damage wrought by the hurricane, with headlines such as “Business, Industrial Life Almost at a Halt, Power Still Lacking” and “200,000 Workers Idled by Power Shortages and Water-

<sup>10</sup> *Providence Journal* (Providence, R.I.) 22 September, 1938, 1.

<sup>11</sup> *Providence Journal* (Providence, R.I.) 22 September, 1938, 2,3.

<sup>12</sup> Minsinger, *The 1938 Hurricane: An Historical and Pictorial Summary*, 10.

<sup>13</sup> RI Historical Society “What Do You Do With A Disaster?": 14.

<sup>14</sup> John H. Wells “The Hurricane and Flood of Sept 21, 1938 as they affected the Rhode Island Hospital Trust Company,”: 16, 20.

<sup>15</sup> *Providence Journal* (Providence, R.I.), 1 September 1954, 1.

<sup>16</sup> *Providence Journal* (Providence, R.I.), 1 September 1954, 20.

<sup>17</sup> *Providence Journal* (Providence, R.I.), 2 September 1954, 12.

Damaged Plants.”<sup>18</sup> Just as in 1938, the business district was the most heavily impacted sector in Providence. The New England Power Association, for example, lost \$3,402,200 dollars in the catastrophe. Approximately 607,054 customers were affected.<sup>19</sup>

A state of emergency was declared in Providence at 2 p.m. by acting mayor Edward P. Quigley, in absence of Mayor Reynolds, who was out of the city at the time. The following day, President Eisenhower proclaimed the entire state a disaster-devastated area. For more than a week, gasoline-driven pumps sucked out seawater from cellars, while truckloads of water-soaked merchandise were sent away to the dump. Despite the appearance of disaster, the city was back to life in a mere 7 days. Business owners had announced the goal of reopening the day after Labor Day, and many achieved this goal through a colossal effort.<sup>20</sup> Officials boasted that electricity was restored in 6 days, as opposed to the Hurricane of 1938, when it took 10 days to restore power (Aihern 1938: 3).

Hurricane Carol floodwaters totaled 13 ft, with 1 h of sustained peak winds, climaxing at 105 mph.<sup>21</sup> Although the Hurricanes of 1938 and 1954 were of a similar force, the striking difference in death tolls (317 dead in 1938 versus 19 dead in 1954) was not a matter of improved disaster planning, but rather visibility: Hurricane Carol had struck in the morning, while the Hurricane of 1938 did not reach its zenith until 5:15 PM.<sup>22</sup>

The devastation following Hurricane Carol was worsened by the fact that no major protective actions had been taken after the Hurricane of 1938. A Providence Journal reporter comments, “[The storm of 1938] was a freak, said many, as they picked through debris, and it will never happen again.”<sup>23</sup> Yet by 1954, “Rhode Island realized that it must learn how to live with hurricanes. The hard fact was driven home. Another huge cyclonic storm, spawned in the subtropics, had come and gone.”<sup>24</sup> Nineteen people had perished in the storm, and total property damage was estimated around \$200 million dollars.<sup>25</sup> As a Providence Journal editor writes, “The real story was in the hearts and eyes of the people who suffered, the waterfront homeowners who clambered to rooftops in terror as the great gray waves chewed out the insides of their neat dwellings, the storeowners in Providence who saw the flood tides thrust down the isles, swell over countertops, and destroy millions of dollars worth of choice merchandise.”<sup>26</sup>

The first federal efforts to prevent natural disasters were undertaken in the aftermath of Hurricane Carol. On 15 June 1955, in cooperation with the Department of Commerce and the Weather Bureau, Congress authorized a survey of the Atlantic and Gulf coasts (McAleer 1958: 1–20). Researchers collected data on hurricane frequency, the possibility of preventing loss of life and damage to property, the cost-effectiveness of proposed breakwaters, and the potential for development of seawalls and levees. General Robert J. Fleming headed the survey in Rhode Island, where it was determined that protective measures should be taken for potential wave action of up to twenty-five feet above average sea level.<sup>27</sup>

A report assessing the response to Hurricane Carol was issued in October 1954 by Thomas Monahan, head of the Rhode Island Development Council, for Governor

<sup>18</sup> *Providence Journal* (Providence, R.I.), 2 September 1954, 1.

<sup>19</sup> Aihern “Flood and Hurricane Issue,” 4.

<sup>20</sup> *Providence Journal* (Providence, R.I.), 8 September 1954, 1.

<sup>21</sup> *Providence Journal* (Providence, R.I.), 1 September 1954, 1.

<sup>22</sup> *Providence Journal* (Providence, R.I.), 3 September 1954, 2.

<sup>23</sup> Minsinger, *The 1938 Hurricane: An Historical and Pictorial Summary*, 13.

<sup>24</sup> *Providence Journal* (Providence, R.I.), 2 September 1954, 4.

<sup>25</sup> *Providence Journal* (Providence, R.I.), 3 September 1954, 10.

<sup>26</sup> *Providence Journal* (Providence, R.I.), 2 September 1954, 2.

<sup>27</sup> McAleer “Hurricane Protection in New England,” 3.

Dennis J. Roberts.<sup>28</sup> Researchers concluded that the state needed a comprehensive program for the commercial development of the Rhode Island shoreline in order to assess the threat to life and property in the event of a future hurricane, and in order to develop potential shoreline resources: “Like Florida and Texas, Rhode Island now knows it is in the hurricane zone. Just as these fast-developing states have learned to live with hurricanes and have flourished in spite of the very real dangers they represent, so must Rhode Island adjust its ways of acting and working (Monahan 1954).” Further recommendations included the establishment of a regional weather office, the preplanning of Civil Defense and the State Police Departments, and the banning of construction in “storm danger zones,” requiring structures to be at least ten feet away from sea level.<sup>29</sup> The latter suggestion was not realized.

The protective structures recommended by the Development Council were chosen based “upon the relationship between the cost of the structures involved and the values of the property that will be affected.” Groins were proposed to protect sandy beaches, artificial dunes to reduce break force, and seawalls or riprap (sloping walls of stone) to protect land from tidal waters.<sup>30</sup> Inlet safety was of top priority. At least fifteen plans involving twenty-five locations for hurricane barriers were soon proposed by private engineering firms, state and municipal agencies, and other interested parties. By 1958 a two-unit solution had been agreed upon.<sup>31</sup> For the protection of Providence, the construction of a concrete barrier across the Providence River at Fox Point, and for the general protection of the Narragansett Bay area, the construction of three rock-fill barriers in the East and West passages of Lower Narragansett Bay and across the Sakonnet River at Tiverton.<sup>32</sup> The benefit-cost ratio for the Fox Point barrier, based upon the value of protected structures versus the cost of barrier building and maintenance, as determined by the Boston Society of Civil Engineers, was determined to be 2.4 to 1.0, whereas the benefit-cost ratio for the proposed Lower Bay barriers was calculated at 1.6–1.0 to 1.0. As barrier location moved further down Narragansett Bay, the magnitude of the structure and the estimated cost of building increased dramatically.<sup>33</sup> Due to its greater benefit-cost ratio, the Fox Point barrier was endorsed more enthusiastically by policymakers.

By the time of construction, environmental issues had increased in visibility on a national scale. In 1960, on behalf of the U.S. Army Corps of Engineers, the U.S. Department of Health prepared a study on the effects of the proposed Fox Point hurricane barrier. At the time, three regional rivers (the Blackstone, Pawtuxet, and Woonasquatucket) and five major sewage treatment plants (Providence, East Providence, Bristol, Blackstone, and Fall River plants) were the main polluters of Narragansett Bay. Through analysis of dissolved oxygen and coliform bacteria, the U.S. Department of Health determined that the primary effects of barrier construction on water quality would be wholly due to the changes imposed on the principal tidal regime of Narragansett Bay. It was hypothesized that the barriers would have little effect on dissolved oxygen levels, but that the degree of vertical

<sup>28</sup> A total of \$16,000 dollars was given to the Development Council by the State of Rhode Island to fund the report, with assistance from the New England Division of the Corps of Engineers and the State Division of Harbors and Rivers.

<sup>29</sup> Monahan, “Interim Report for Governor Dennis J. Roberts,” 41.

<sup>30</sup> Monahan, “Interim Report for Governor Dennis J. Roberts,” 24, 26.

<sup>31</sup> U.S. Army Engineer Diversion (1954) Ms. Rhode Island Historical Society Library, Providence, R.I., 15.

<sup>32</sup> U.S. Army Engineer Diversion, “Hurricane Protection Project Fox Point Hurricane Barrier, Design Memorandum No. 9: River Gates,” 15.

<sup>33</sup> U.S. Army Engineer Diversion, “Hurricane Protection Project Fox Point Hurricane Barrier, Design Memorandum No. 9: River Gates,” 3.

stratification would increase. The study mentioned that there may be “unforeseen benefits” to this increased stratification. The change in local water temperature caused by operation of the Narragansett Electric Plant stood to affect the ecosystem of the Bay.<sup>34</sup> The fate of the Providence River had been decided; changes in the currents would result in insufficient velocity to push upper-bay water into the Providence River, thus shifting the river from estuarine to fresh-water. It was the final closing of the Great Salt Cove.

The proposed barrier design was authorized by the Flood Control Act of 3 July 1958, and by January 1960, construction of the Fox Point Hurricane Barrier was underway.<sup>35</sup> River gates were designed to accommodate normal hydrologic flows and to pass a major flood flow without increasing water levels in downtown Providence.<sup>36</sup> Many Rhode Island residents wanted to preserve the area upstream of the barrier for navigational purposes, but the Army Corps of Engineers deemed submersible flap gates to be too dangerous; policy makers did not heed the demand for the ecosystem service of river transportation, and construction began in the fall of 1960.<sup>37</sup>

The Fox Point Barrier was completed in March of 1966. The barrier was advertised as being able to hold tidal flooding 4.8 ft above that therefore experienced. The pamphlet published on the day of the dedication boasts, “The Fox Point Barrier will provide virtually complete protection against hurricane tidal flooding for the major portion of Providence, the chief manufacturing city and capital of Rhode Island. It will prevent damages estimated at about \$34,600,000 in a recurrence of the August 1954 hurricane and about \$45,600,000 in a recurrence of the record September 1938 hurricane. It will protect the commercial and industrial center of the city, extensive transportation facilities, public utilities, and many homes.”<sup>38</sup> In total, the project cost \$16 million dollars. Of this amount, the State of Rhode Island financed 10% and the City of Providence 20%; the remainder was federally funded.<sup>39</sup>

The barrier that stands at Fox Point today is nine-hundred feet upstream from the confluence of the Seekonk and Providence Rivers. Hurricane loading experiments deemed the barrier to be able to withstand a hurricane greater in magnitude than that of 1938. The base mat is made of reinforced concrete, 61 ft 6 in. wide, 148 ft 0 in. long, and 8 in. thick. Approximately two-thousand feet of stone and earthen dikes connect to each side of the structure, and continue to high ground on either side. An electric motor drives the gate-hoisting machinery, and pumps are online constantly.

In the aftermath of Hurricane Carol, no choice remained but to substitute human capital (the capacity to construct a concrete hurricane barrier) for natural capital (in-tact

<sup>34</sup> U.S. Department of Health, Education, and Welfare, 1960, 5. Effects of the Proposed Hurricane Barriers on the Water Quality of Narragansett Bay Prepared for the U.S. Army Corps of Engineers by the U.S. Department of Health, Education, and Welfare. Regions I and II. Ms. Providence Historical Society Library, Providence, RI; Cowley, *Providence: a Pictorial History*, 153. The Narragansett Electric plant is currently a main supplier of electricity in the area.

<sup>35</sup> *Pamphlet from the Dedication Ceremonies of Fox Point Hurricane Barrier*. Available at the Rhode Island Historical Society Library, Providence, R.I., 19 March, 1966, 3.

<sup>36</sup> U.S. Army Engineer Division, “Hurricane Protection Project Fox Point Hurricane Barrier, Design Memorandum No. 9: River Gates,” 4.

<sup>37</sup> United States Department of Health, Education, and Welfare, 1960. The construction contract for the Fox Point Barrier was given to M.A. Gammino Construction Company, based in Providence, Rhode Island. Under the \$8.2 million dollar contract, the company was responsible for building the pumping station, river barrier gates, and the east and west dikes. J.F. White Construction Company built the cooling water canal for \$1.3 million dollars, and the Worthington Cooperation of Harrison New Jersey supplied the five pumps, each of which was among the largest in the world at the time, towering at 54.7 feet high and 4,500 horsepower.

<sup>38</sup> *Pamphlet from the Dedication Ceremonies of Fox Point Hurricane Barrier*, 3.

<sup>39</sup> *Pamphlet from the Dedication Ceremonies of Fox Point Hurricane Barrier*, 3.

wetlands). Anthropogenic changes to the land had rendered the landscape of downtown Providence unable to provide the valuable ecosystem service of “storm protection,” and yet the area that was the former Great Salt Cove remained of high intrinsic value to state residents for historical and commercial reasons. In general, reduction of coastal salt marshes is strongly correlated with increased devastation following strong tropical storms.<sup>40</sup> It is likely that natural capital could have more efficiently provided the service of “storm protection,” yet the contingencies of history dictated a different fate for the downtown region.

Providence residents had decided: the downtown commercial district was worth protecting, despite its vulnerable position in the landscape.

### ***WaterFire* and civic engagement**

Today’s visitors to downtown Providence are unlikely to find many reminders of salt coves, booming railroads, or devastating natural disasters. They are more likely to be greeted by glittery mermaids, stoic gargoyles, and bonfires gleaming off of a winding river. On summer nights, one hundred bonfires blaze along the Providence River, accompanied by world music, live performances, and food vendors. The event is *WaterFire*, an award-winning environmental art installation created by Barnaby Evans. There is little trace of the Providence and Worcester Railroad, and even less of the floods that wreaked havoc upon the same downtown commercial district half a century ago—yet these events are no less a part of the civic and environmental history of Providence. The city is currently in the process of redefining its relationship with the environment, reclaiming the Providence River as a place of recreation, reflection, and community: all indirect ecosystem services.

The first *WaterFire* was created by Barnaby Evans in 1994 to celebrate the tenth anniversary of First Night Providence; the second was installed 2 years later for the International Sculpture Conference and the Convergence International Arts Festival. Due to widespread popularity and volunteer support, it was established as a permanent installation in 1997. Since then, it has been named as one of the “Best 100 Things in America” by Reader’s Digest, one of the “Top 20 Events in the Country” by National Geographic Traveler, and one of a “Top New England Attraction” by Yankee Travel Guide.

Prior to the nineties, the Providence River lay under concrete. The commercial district had expanded to engulf the Cove lands, and demand for more land resulted in the diversion and paving over of the urban rivers. Early efforts at reclaiming Providence waterfront were spearheaded by William Warner, a local architect who secured \$100,000 dollars in 1982 to study the possibility of restoring waterways.<sup>41</sup> Opportunity for urban re-planning beckoned with the reconstruction of the Northeast Railroad Corridor in 1981. The city relocated

<sup>40</sup> Hurricanes quickly weaken when making landfall, but the fragmented landscapes of the Gulf coast marshlands offer little protection. In 1992 the Department of Natural Resources noted that Hurricane Andrew’s surge height lost 3.1 inches of height for every mile of marsh landscape it traversed (J. McQuaid and M. Schleifstein, “Washing Away, Part 4: In Harm’s Way,” *Times-Picayune Special Report*, June 23–27, 2002. Rampant wetland degradation has only increased the severity of hurricane impacts. America’s Wetland, an organization based out of Baton Rouge, estimates that more than 1,900 mi<sup>2</sup> of the Louisiana wetlands have disappeared since the 1930s due to the development of levees, canals, and deforestation (America’s Wetland: see <http://www.americaswetland.com>) Perhaps it was these same alterations of natural ecosystems which worsened the damage done to downtown Providence by the infamous hurricanes of the early 20th century.

<sup>41</sup> Dennis Frenchman and J Mark Schuster, Mass Institute of Technology. “Event Places in North America: Waterfire, Providence, Rhode Island.” Paper delivered in Barcelona, Spain, January 2004. Available in press packet from WaterFire Providence organization.

downtown tracks, eliminated freight yards, built a new train station, and established a new development district, Capital Center. Downtown Providence, once derided as the “the world’s widest bridge,” was to be transformed. The Woonasquatucket, Moshassuck, and Providence Rivers were unearthed. Twelve new bridges were built, and traffic was rerouted. Eleven acres of pedestrian parks were built alongside the banks of the Providence River, linking downtown to the historic East Side for the first time since the existence of the Great Salt Cove. Barnaby Evans’ second *WaterFire* installation coincided with the completion of the project.<sup>42</sup>

*WaterFire* is just one example of what urban planners have deemed “daylighting”—the restoration of long-observed waterways. From Arcata, California, to Barrington, Illinois, countless American communities are unearthing and restoring historic rivers. Richard Pinkham explains that daylighting represents the wish of citizens to return to “an earlier, richer relationship with nature, ‘setting right something we messed up.’”<sup>43</sup> *WaterFire* itself may be inspiring other endeavors; an Iowan columnist writes, “We don’t have mountains. We don’t have ocean beaches. But we’ve got rivers. We can do more with what we have. Just as Providence has done so brilliantly.”<sup>44</sup>

The *WaterFire* installation is deliberately designed to have no central focus, requiring viewers to meander through the park to obtain the full experience.<sup>45</sup> Evans’ vision for *WaterFire* was largely populist; he states, “I had hoped that one could create a work that would be open to the entire community, a type of art that you wouldn’t have to go inside a museum to see and that would speak to everyone, from a 5-year-old to his grandparents, whether they are art aficionados or not (Imbrie 2006).” Indeed, each visitor interprets the installation in a different way, deeming it akin to a “European festival,” “Zen moment,” “Viking funeral,” “tribal ritual,” “extended jazz riff,” or “Fellini movie.”<sup>46</sup> But most of all, *WaterFire* has become a symbol for Providence’s self-proclaimed renaissance (Frenchman 2005). Mike Stanton states, “Fire is a symbol of life and rebirth, death and destruction. It illuminates and it burns. In the mid-1990’s, fire became the defining element of [former mayor] Buddy Cianci and his reborn Renaissance City... Providence became the paradigm for the New American city, defined by culture rather than manufacturing (Stanton 2003).” Local restaurant owner Bob Burke states, “We felt beaten down for a long time. We felt like an empty rustbelt city that had gone bad and that was dangerous and was sour and was bitter and had nothing to hope for. Well, *WaterFire* was a major piece of restoring our psychology, of making us proud of our city again, of making us believe in our city again, making us realize that we could do it. And that is one of the most significant changes.”<sup>47</sup> By facilitating the interaction of citizens with their environment, *WaterFire* provides an ecosystem service.

The reclamation of Providence waterways reflects the fact that by the early 1990s, urban water features were highly valued. Approximately \$60 million dollars was invested in the park, river relocation, and bridges, with surrounding investment in hotels, Providence Place Mall, and office buildings estimated at over \$1 billion dollars.<sup>48</sup> *WaterFire* now attracts

<sup>42</sup> Frenchman, “Event Places in North America: Waterfire, Providence, Rhode Island.”

<sup>43</sup> Quoted in Hapgood (2002).

<sup>44</sup> David Yepsen, “What can flow from a river,” *Des Moines Sunday Register* (Des Moines, Iowa, 5 August 2001), 16A.

<sup>45</sup> Frenchman, “Event Places in North America: Waterfire, Providence, Rhode Island.”

<sup>46</sup> Erin Graves, “WaterFire: Self Referentiality on the River,” Massachusetts Institute of Technology, available from WaterFire Providence, 12. Comments taken from official WaterFire guestbook.

<sup>47</sup> Bob Burke, interview with WaterFire Providence, available in WaterFire press release information.

<sup>48</sup> Frenchman, “Event Places in North America: Waterfire, Providence, Rhode Island.”

more than 1.1 million visitors a year, bringing over \$2.2 million dollars annually in new tax revenue to the city and state.<sup>49</sup>

Although the appearance of downtown Providence has changed dramatically over the past 400 years, this much is clear: the city has been shaped and reshaped by both natural and societal forces. Historically, the Upper Bay was an important shellfishing and trade center. By the nineteenth century, waterfront spaces were devoted to commerce and industry. Two hurricanes in the early twentieth century reinforced local commitment to preserving the downtown commercial district. The Providence River was subsequently paved over, only to be unearthed in the 1990s. A post-war shift from a predominantly manufacturing economy to a predominantly service-based economy witnessed a parallel shift in land-use. Once industrial centers, urban waterfronts are increasingly redesigned to meet other civic uses, largely recreational. Downtown Providence, now protected by Fox Point barrier after harsh lessons learnt from the hurricanes of 1938 and 1954, is the site of a burgeoning urban renaissance. As Providence embarks into the twenty-first century, surely the landscape will be wrought by new cultural understandings of place.

Most conservation biologists would not think to include services such as downtown commerce and urban revitalization under the umbrella of ecosystem services. However, if we extend our conceptualization of the ecosystem to include a place for humans, the line that divides ecosystem service and *cultural service* becomes blurred. Both natural and human capital contribute to economic activity: without the interference of humans, ecosystem services such as storm protection and water purification would not be efficiently harnessed. Following Hurricane Katrina in 2005, numerous people suggested that areas of New Orleans should not be rebuilt, but rather allowed to return to a “natural state.” To suggest this is to ignore the cultural ecosystem services that are conferred by specific place. Providence, Rhode Island, serves as an example of how urban planning and community considerations can coalesce to restore some of the services of an environment. In this way, history can inform ecology, and ecology can inform history.

## References

- Aihem JI (1938) Flood and hurricane issue. *Journal of the New England Power Association* 14(11) (October)
- Boyd J, Banzhaf S (2006) What are ecosystem services? The need for standardized environmental accounting units,” Discussion Paper (Washington DC: Resources for the Future, January) RFF DP 06-02: 1–26
- Burges T (1846) Remonstrance to the city council of Providence. Editorial, *The Daily Gazette* (Providence, R.I.), 29 Jan
- Cady JH (1957) Civic and architectural development of Providence. The Book Shop, Providence
- Cowley P, Campbell PR (1983) Providence: A pictorial history. Donnig, Norfolk
- Cronon W (1995) The trouble with wilderness; or, getting back to the wrong nature. In: Cronon W (ed) *Uncommon ground: Rethinking the human place in nature*. Norton, New York
- Daily G (1997) Nature’s services: Societal dependence on natural ecosystems. Island, Washington DC
- Daily GC, Söderqvist T, Aniyar S, Arrow K, Dasgupta P, Ehrlich PR, Folke C, Jansson AnnMari, Jansson B-O, Kautsky N, Levin S, Lubchenco J, Mäler K-G, Simpson D, Starrett D, Tilman D, Walker B (2000) The value of nature and the nature of value. *Science* 289(5478):395–396
- Frenchman D (2005) Event places in North America: City meaning and making. *Places: A Forum of Environmental Design*, January

<sup>49</sup> Acadia Consulting Group and Timothy J. Tyrrell, “The future of WaterFire: Executive Summary, WaterFire Economic Impact,” (2004).; “Economic Impact study shows WaterFire Key Revenue Generator for State and City,” WaterFire Economic Impact (3 pgs) available from WaterFire Providence.

- Hagood F (2002) Points of interest: Providential happening. *Smithsonian*, November, 40
- Imbrie K (2006) WaterFire kicks off its season. *Providence Journal* (Providence, R.I.), 11 May, 4
- McAleer JB (1958) Hurricane protection in New England. *Journal of the Boston Society of Civil Engineers, U.S. Army Engineer Division (New England Corps of Engineers)*: 1–20
- Minsinger WE (ed) (1988) *The 1938 hurricane: An historical and pictorial summary*. Blue Hill Observatory, Milton
- Monahan T (1954) Interim report for Governor Dennis J. Roberts: Hurricane rehabilitation study. Rhode Island Development Council, Providence October
- Snow EM (1868) Report upon the sanitary effects of filling the cove basin in the city of Providence. Ms. R.I. Historical Society Library, Providence
- Stanton M (2003) *The Prince of Providence: The true story of Buddy Cianci, America's most notorious mayor, some wiseguys, and the feds*. Random House, New York
- Staples W (1948) "Cove lands," Providence, Unknown publisher, Rhode Island Historical Society Library, Providence, R.I
- The Rhode Island Historical Society (2004) What do you do with a disaster?: Providence and the hurricane of 1938. *The Rhode Island Historical Society* 62:10
- U.S. Army Engineer Diversion (1954) Hurricane protection project fox point hurricane barrier, Design Memorandum No. 9: River Gates. New England Corps of Engineers, Waltham M.A. January
- Westman WE (1977) How much are nature's services worth? *Science* 197:960–964