

The History of Boston: The Impact of Geology

Boston's location and geology suited settlement and expansion into a major city.

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Boston is situated on Massachusetts Bay, a large body of water bounded by Cape Ann to the north and Cape Cod to the south (about latitude $42^{\circ} 21'$). Boston is the oldest city in the United States (Florida claims that St. Augustine, settled in 1546, is the oldest permanent European settlement). Boston occupies the smallest land mass of any major city and sits in its sheltered bay with snug harbor and 38 islands that act as a buttress to the Atlantic Ocean (the Pilgrims counted at least 50 islands in 1621). Affectionately called the Athens of America, the Hub, God's Own Capitol, and plain old Bean Town, Boston serves as the capital of Massachusetts and is the largest city in New England.

History of Founding

As one might expect for such an old city, the literature of its history and founding is voluminous. In particular, Winsor, Whitehill, Kaye and, most recently, the *Boston Globe* have provided comprehensive and interesting looks into the city's history.^{1,2,3,4}

The earliest settlers of Boston were the Indians in about 2500 B.C. In about the year 990 the Norseman Biarne visited the area and many early traders and explorers came here during the 16th and 17th centuries. Captain John Smith first mapped the Boston shoreline in 1614. Captain Miles Standish with his small group of Pilgrims and Indian guides entered Boston Harbor in a shallop, a large open sailboat, on September 19, 1621, having come up along the shore from Plymouth.

The actual credit for the founding of Boston can be given to John Winthrop and his band of Puritan followers representing the Massachusetts Bay Company. On March 22, 1630, they set sail on the *Arbella*, *Ambrose*, *Talbot* and the *Jewell* from the exact spot the Pilgrims had departed from, down the 10-mile estuary of Southampton, England, to Cowes on the northernmost tip of the Isle of Wight. The Puritans anchored at Cowes until sailing conditions were favorable. Eventually, as a passenger on the *Arbella* named Thomas Dudley recorded, a total of 17 ships with 1,000 passengers assembled to make the journey to New England. On April 8, 1630, Winthrop set sail on the *Arbella*, along with nine other ships, some of which were bound for Newfoundland, and headed on to their perilous journey to escape religious persecution and to found a "city upon a hill." The settlement would be founded under the sponsorship of the Massachusetts Bay Company and its duly elected governor, John

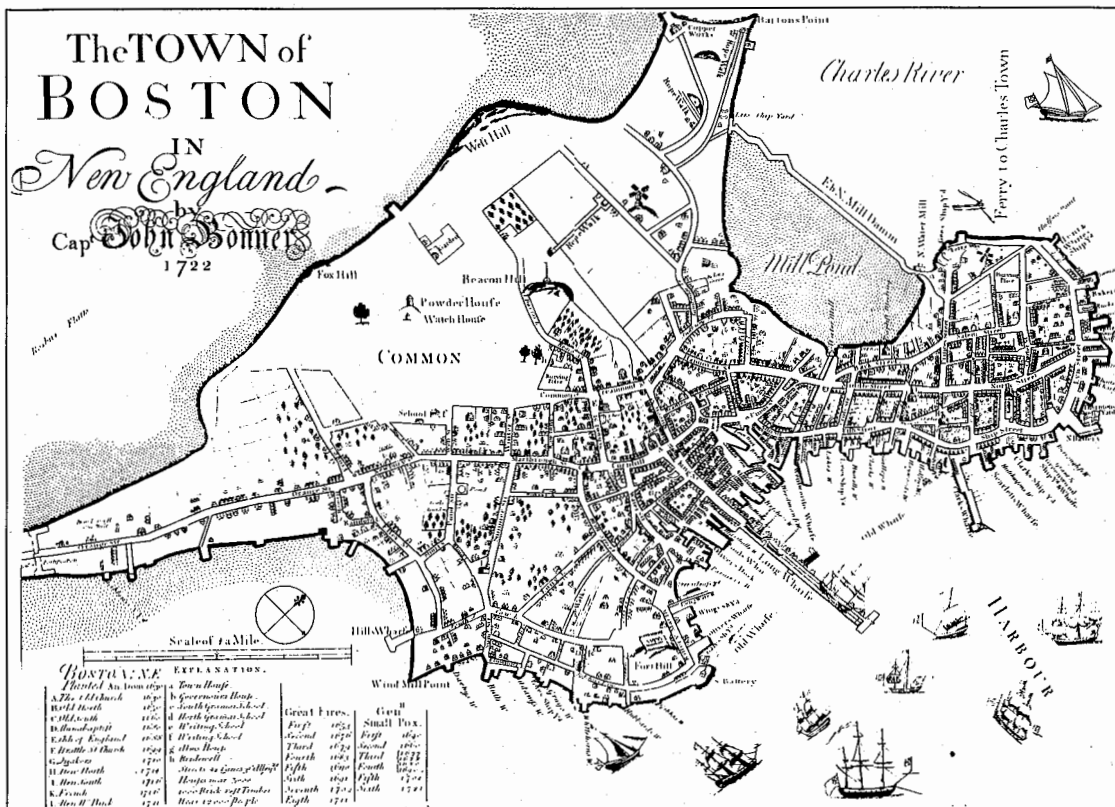


FIGURE 1. Map of Boston on Shawmut Peninsula in 1722, by John Bonner.

Winthrop. Their destination was Salem, about 25 kilometers (15 miles) north of Boston, where more than 100 English settlers had been living for almost one year.

On June 12, 1630, the hardy group reached Salem and was greeted by a landscape of barren rock and little soil, a brutal contrast to their native, fertile southern England. Pressured by his followers, Winthrop, after spending just five days in Salem, left for Charlestown (now a section of Boston) where a group of Englishmen had already settled. By July 6, 1630, eleven ships had arrived at Salem or Charlestown; the people on board those ships were the survivors of stormy seas and sickness that had decimated their ranks.

Within a couple of weeks, the new settlers at Charlestown were nearly defeated by sickness, death and lack of water. Winthrop blamed his troubles on the one source of water available, a brackish spring that was only exposed at low tide. Their sickness was compounded since the English traditionally drank from springs rather

than dug wells. Help came in the person of the hermit William Blaxton (Blackstone), a retired Episcopal minister who had been living across the Charles River on Beacon Hill since 1625.

Blackstone had been the chaplain of the unsuccessful Robert Gorges' Plantation that had settled at Wessagusett (now known as Weymouth) in 1623. Blackstone was the first English settler of what would become Boston (then called the Shawmut Peninsula), having built a cottage on the south side of Beacon Hill near the Common, where Spruce Street now meets Beacon Street (see Figure 1). Blackstone told Winthrop of the abundant and refreshing spring water available on his land. Accepting his invitation, Winthrop and his group moved across the river to the Shawmut Peninsula. Shawmut is the Indian name for "living waters" and, indeed, such living waters did exist on Spring Lane, in Louisburg Square and on Pemberton Hill. The group settled near Spring Lane, the North End and at the Great Cove at the head of what is now State Street.

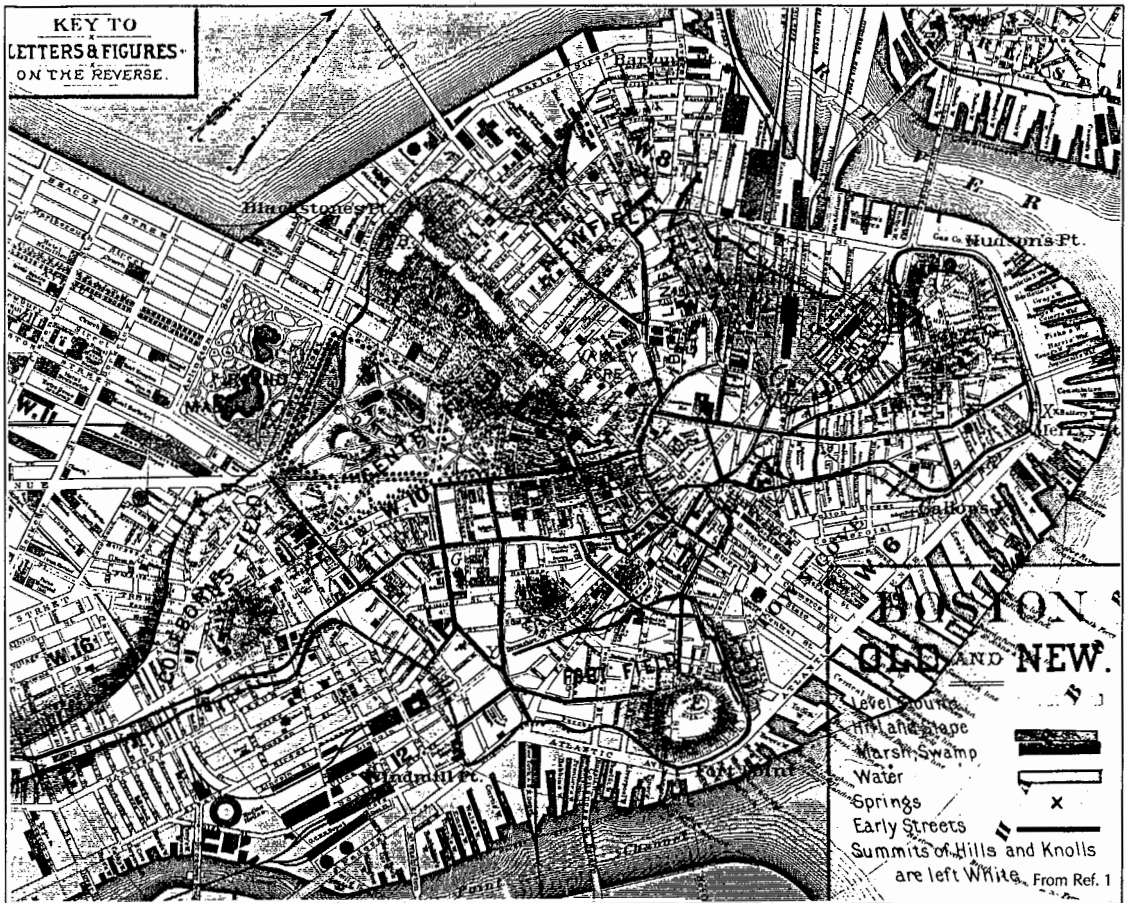


FIGURE 2. Map of the colonial Shawmut Peninsula from the 1700s superimposed on an 1890 map of Boston.

Thus it was that Winthrop had founded his "city on a hill." The "hill" was called the Trimountain (its old spelling was "Trimontaine," and it was sometimes called Tra-mount, Tremount, or Tramontaine, and is now called Tremont), the three prominent hills of Boston (see Figure 2). The westernmost hill was Mt. Vernon (also called West Hill or Copley's Hill), the central peak was Beacon Hill (or Sentry Hill) and the easterly hill was Pemberton Hill (or Cotton Hill). An order of the Court of Assistants, with Winthrop presiding as Governor, proclaimed "[t]hat Trimontaine shall be called Boston," on September 7, 1630 (which later became September 17 after the calendar change of 1752, which added 10 days to the calendar).

Boston was named after Boston, England, which was located in the parish of St. Botolph. The name itself was a contraction of "Botolph's

town," after "bot," meaning boat, and "ulph," meaning help. St. Botolph was the patron saint of fishing. Boston's roots were thus established.

Geological Influences Affecting the Founding

There were four major geological influences that affected the founding of Boston. Being a seafaring people, the early settlers looked for a safe harbor. Boston's island-studded harbor is formed by a deep indentation in the coastline of Massachusetts. The indentation exists primarily because the underlying rock of Boston is softer and more easily eroded than the harder, granitic rocks that surround the Boston Basin, as this large topographic depression is called. Glacial ice eroded a valley or depression in these soft rocks; and, with subsequent melting of the ice, the sea level rose and flooded the

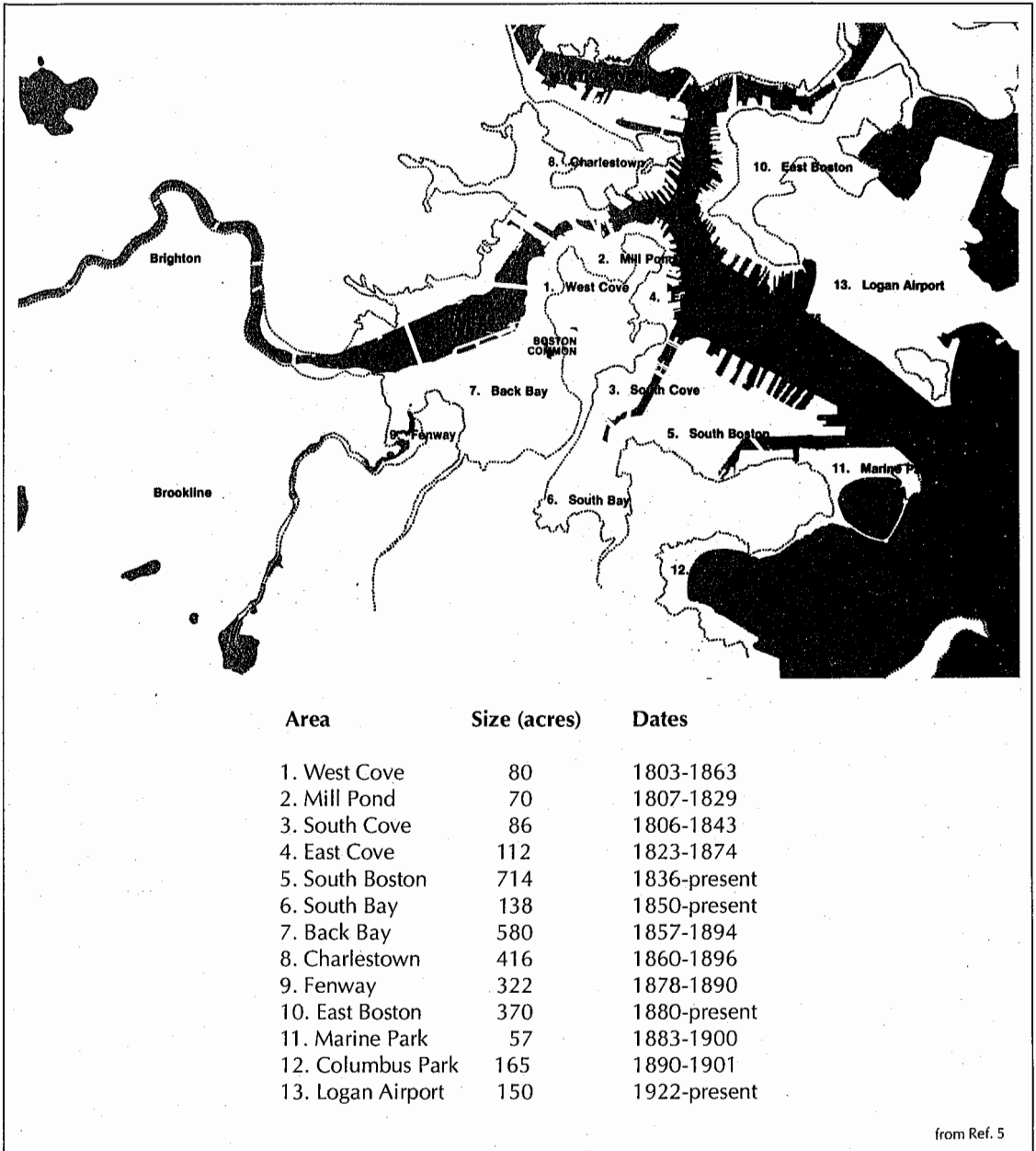


FIGURE 3. Map of the Boston metropolitan area showing the history of land filling that expanded the city's original 783 acres to over 3,000 acres today.

depression, thereby forming the harbor.

The second important factor was that the settlers looked to the land for protection from their enemies. Boston was naturally situated for fortifications, with its "Trimountain" rising 46 meters (150 feet) above the surrounding land; Copp's Hill (also called Windmill Hill, from the one built there in August 1632, and

Snow Hill) in the North End rising 15 meters (50 feet) above the water; and Fort Hill (also called Corn Hill) rising 24 meters (80 feet). Both Copp's Hill and Fort Hill are situated on points of land facing the sea. Smaller hills or knolls were found, such as Fox Hill and Powderhouse Hill (also called Flagstaff Hill), but probably did not play a significant role as fortifications.

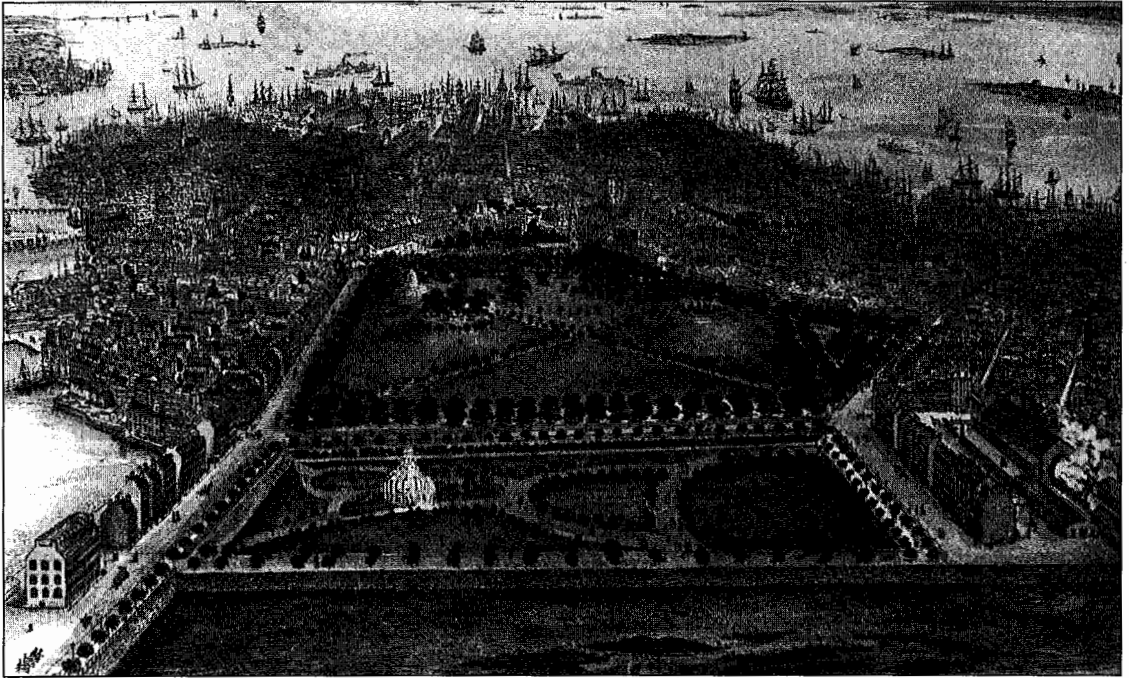


FIGURE 4. A view of Boston prior to the filling of the Back Bay.

Hills around Boston are predominantly drumlins, including many of the harbor islands. However, the "Trimountain," now represented by Beacon Hill, is not a drumlin as originally postulated by geologists. Numerous excavations into the hill have exposed deformed, faulted and folded sediments such as clay, sand and gravel, and till.

Third, the 319-hectare (789-acre) Shawmut Peninsula was an island at high tide. The land to the south, called the Neck, that connected Roxbury and Boston, was very narrow and low, and at best served as a causeway for travelers.

The fourth and last geologic factor, the primary and literally life-giving factor, was the abundant fresh water available to the settlers. The Shawmut Peninsula became the Town of Boston because several good springs were found, and the shallow dug wells that were dug produced water of good quality under artesian pressure. Most of the area is underlain by a sandwich of thick, pervious sand and gravel between lodgement till and marine clay soils.

These factors all contributed to a notable population increase and considerable development of the Shawmut Peninsula during the 17th and 18th centuries (see Figure 3). To

reclaim the surrounding marshy lowlands in order to meet the needs of development and expansion, early land developers looked to the three hills of the Trimountain as a ready source of fill.

In 1799, about 15 to 18 meters (50-60 feet) of Mt. Vernon was excavated by the Mt. Vernon proprietors to fill in the cove at its base, thus creating Charles Street. The Mill Pond created in 1643 was the next area attacked in the enthusiasm for increasing the land area of Boston. The central peak of Beacon Hill, in itself a source of gravel since 1758, was lowered by 18 meters (60 feet) by John Hancock's heirs and the pond filled in. The last hill, Pemberton Hill, had its top shaved off by Patrick Tracy Jackson, a railroad man, in 1835 to fill new land north of Causeway Street and develop Pemberton Square. The remaining ridge connecting the former peaks of Pemberton and Beacon Hills was leveled in 1845.

The latter half of the 19th century saw the last major filling as the Back Bay was created from sand and gravel brought in from Needham (a town to the southwest of Boston) by railroad (see Figure 4 for a view of the area before filling). This filling of the bays around

Boston has added character to the city as well as causing engineering problems. It was a factor in social change and created a very peculiar patchwork street network, since each in filled area has its individual street pattern.



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Since receiving his undergraduate and graduate degrees in geology from Boston University, he has worked as an engineering geologist for over 20 years with major geotechnical firms in the Boston area. This experience has given him valuable insights into the complex geological and soil problems in the Boston area. He has also developed a keen interest in its history since the colonial times.

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