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Farms to Forests in Blue Hill Bay: Long Island, Maine

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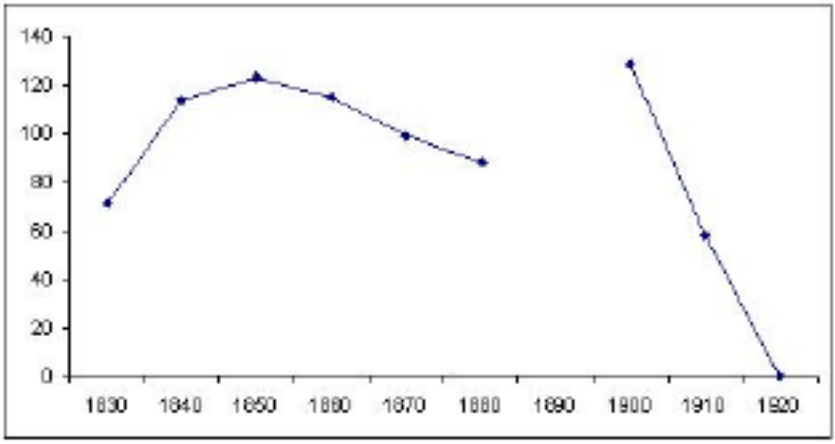
FARMS TO FORESTS IN BLUE HILL BAY: LONG ISLAND, MAINE, AS A CASE STUDY IN REFORESTATION

By Kristen Hoffman

Disturbance histories are important factors in determining the composition and structure of today's forests, and not least among these disturbances is the human use of the land. Land clearing in Maine peaked in 1880 at six and a half million acres, beginning on the coast and lower river valleys and spreading northward and eastward. The forests of Maine's coastal islands have endured a longer period of clearing than any other in the state. Long Island, located in Blue Hill Bay, was first settled in 1779, primarily by farmers. Sheep-herding, lumbering, fishing, and granite quarrying provided supplemental livelihoods. By 1920 all of the island's year-round residents had moved to the mainland, leaving only a few summer camps scattered along the coast This article looks at Long Island from a historical perspective, then compares this land-use history to modern vegetation data and tree core samples. Kristen Hoffmann earned her M.S. in Forest Management from the University of Maine in 2007. She is currently working as a forestland steward for the Forest Society of Maine in Bangor.

SETTLEMENT ALONG the Maine coast required determination and perseverance. Beginning as early as 1604 with the devastating failure of the St. Croix Island colony, Mainers worked hard to tame the land. Colonial migration and settlement into Maine began in earnest in the late eighteenth century. Maine's population was 17,500 in 1761; 24,000 in 1764; and 96,000 in 1790. According to the U.S. agricultural censuses, the number of farms peaked in 1880 at 64,309, covering more than six and a half million acres, or about one-third of Maine. The distribution of this cleared farm land was skewed to the central and southern areas of the state, with about 75 percent cleared land in central Maine and just over 20 percent cleared land in northern Maine. These numbers declined after 1880 and still continue to decline.[1] Settlement began along the coast and river valleys where farmers had access to better transportation, commerce, and community support.



Population of residents on Long Island, 1830-1920 (The 1890 records were destroyed by fire).

As settlement expanded in the late eighteenth century, island communities became common. Blue Hill, a mainland coastal town in Hancock County established in 1761, included Long Island, located slightly over a mile off shore in the frigid but busy waters of Blue Hill Bay. It is a large island for the coast of Maine, encompassing 4,555 acres — approximately four and a half miles long and two miles wide. Today, the waters surrounding the island are frequented by lobster boats and sailboats, seals warming themselves upon the rocks, and pairs of porpoise feeding upon schools of fish. Visitors to Long Island inevitably stumble upon miles of deteriorating stone walls scattered through long-abandoned fields and grown-in forests. Large, open-grown maples and birches emerge from empty cellar holes; stones surround deep wells and outline the derelict barn foundations. Stretches of rusted barbed wire lie scattered on the forest floor, and sometimes are found encased in large spruce trees. One might wonder about the history of this island, where only the skeleton of a bygone community peeks through blooming lilac bushes and fruiting apple trees.

Charles B. McLane's very thorough *Islands of the Mid-Maine Coast,* along with records in the Hancock County Registry of Deeds in Ellsworth, provide some insights into the lives of Long Island residents. The island was originally surveyed in 1762, but the first evidence of activity occurred in 1768, when a sawmill, simply labeled "improvement" on early maps, was built near the northeastern shore by Ebenezer Hinckley and James Candage. The mill was powered by a dam on the appropriately named Mill Stream. In spring 1770, the citizens of Blue Hill de-

cided Long Island should be cleared for settlement. James Carter, the first recorded settler on the island in 1776, cleared a farm on the southern tip. His children and grandchildren established themselves across the island for many generations.[2]

In 1818, the Governor of Massachusetts, James Bowdoin, sold the island to Nathan Ellis and George Stevens of Blue Hill. Under the new ownership, all settlers were to negotiate with Ellis and Stevens for land, and a thousand acres were set aside on the northern part of the island for the trustees of the Blue Hill School Fund.[3] One of the trustees was George Stevens, and the income generated from this land was later used to create the George Stevens Academy in Blue Hill. Another two thousand acres on the southern part of the island was purchased in 1824 by James, John, David, and Samuel Carter and Charles Chatto.

The Reverend Jonathan Fisher, who maintained a parish on Long Island, recorded many details of activity on the island, and his hand-drawn maps of the homesteads have proved to be an accurate and invaluable record of the island's history. By 1824 Ellis and Stevens had disposed of their claims on Long Island, and in 1829 Fisher recorded thirteen households on the island. Particularly harsh winters kept Fisher from ministering to the island residents, and each spring he would be busy performing marriages for couples that had parented children over the previous months.[4]

Maine became a state in 1820, and in 1830 its first population census recorded 71 individuals living on Long Island. The population peaked at 123 in 1850, and then began to decline, only to surge again in 1900, reaching 128 individuals, and fall sharply in succeeding years. By 1920, no year-round residents remained on Long Island.[5]

Farming

Statewide, land clearing in Maine peaked in 1880, with approximately 6.5 million acres in farms.[6] This number was not limited to the mainland but extended to Maine's off-shore islands. In the mid-nineteenth century, islands afforded inhabitants certain advantages: more coastline on which to settle, more access to the shore and its resources, and ease in pursuing a profitable sideline in fishing and lobster catching. Long Island residents set up homesteads along the periphery of the island with nearby shoreline and docking spots. They gravitated to the southern end of the island, where a small community formed. Their fields began just up from the shore and extended inland to an orchard of

apple trees, and they planted sugar maples to shade their homes. The small root cellars hidden in the bramble and forest today offer no indication of the size and grandeur of the long-dismantled houses and barns, but a few revealing images remain. One photo depicts the homestead of Clarence Chatto at the turn of the twentieth century, when Long Island was in its heyday. The Chatto homestead is no longer standing.

Clearing and tilling the land was a difficult task. The island was forested predominantly with spruce and balsam fir when the settlers arrived. Whether they used the land for agriculture, pastureland, or hay production, it had to be cleared.[7] Settlers felled trees in late fall using several different methods. If the "driving" method was used, a single large tree was cut down on the upper slope, and it tumbled into the

Entrance to cellar with descending stairs.

Overgrown foundation of side of main house.

Foundation of back house, connecting the main house and barn.

Footprint of barn foundation.

Clarence Chatto homestead in the late 19th century. Photograph courtesy of Denny Robertson.

down-slope trees, which had been notched earlier to ease felling. The stumps were removed the following summer, often using oxen.[8] Another method was the "cut and burn" process, in which trees were cut down to about two or three feet above the ground. After the trees and stumps were allowed to dry over a period from several months to two years, they were burned. The remaining material was then placed in piles and burned again. Another common process was to girdle the trees, or remove a wide strip of bark from around the entire tree. Left standing, these trees would die, opening up the canopy to permit light to penetrate to the ground so that crops could be cultivated around them. This was the least expensive, time consuming, and labor intensive method of land clearing. However, as the wood decayed, branches fell from the trees, endangering farmers, their livestock, and their crops. After girdling, the snags remained for three to nine years, depending upon the species and site qualities. If the land was cleared for a pasture, the logs were left to rot in place in order to fertilize the ground. The most expensive and least utilized method was to remove the trees completely and extract their entire root system. The increase in land value was rarely sufficient to warrant the cost of this process. Even after the trees were removed, settlers had to tackle the often shallow, rocky soil, which could contain very large stones and boulders.[9]

By the middle of the nineteenth century, the demand for wood from the Knox County lime kilns had created another opportunity for the islanders. By 1846, the lime kilns burned nearly 43,000 cords of wood annually, and the demand increased over time.[10] Not only was wood needed to fire the kilns, it was needed to manufacture casks for trans-

porting the finished product. In 1869, 1.1 million casks filled with lime were shipped out of Rockland's lime kilns. This demand soon depleted the wood supply around Rockland and the nearby islands, and wood coasters, a type of ship designed to carry large amounts of firewood, brought in wood from islands east of Penobscot Bay — including those in Blue Hill Bay. These boats were constructed with relatively flat bottoms, enabling them to ground out on a falling tide for easier loading if no docks were available.[11]

Spruce, the most abundant tree species on Maine's coastal islands, was used for both burning in the kilns and manufacturing casks. During the winter, farmers cut in their own woodlots to supply the next wood coaster that stopped at their island. The prices for the wood were good for the time, giving the farmers some additional income. In 1851, 120 coasters were actively transporting wood to the kilns, accelerating the deforestation of the islands.[12]

Clearing the land for farming entailed more than tree removal. The numerous and lengthy rock walls that crisscross the island are evidence of the profusion of rocks farmers had to pull from the soil. New England's abundance of rocks is due to the glacial erratics deposited by the four glaciers that moved over the area during the Pleistocene Age. Unbeknownst to settlers, the clearing and plowing of fields exacerbated the problem of these rocks surfacing. The seasonal cycle of freezing and thawing causes frost heave, which "pushes" rocks to the surface. Fields used for cultivation have bare mineral soil, which freezes deeper and more frequently, intensifying the heaving process. Farmers received a new crop of rocks in their fields every spring.[13] Most settlers erected fences on their property soon after arriving in order to keep animals in the pasture and out of the garden or to delineate property boundaries.[14] These first fences were likely constructed of wood, but as the farmers extracted their annual crop of rocks, they would "toss" them to the edge of their fields or along their fences. Eventually, the wood would rot away, leaving a rock wall standing in its place. Rock walls of this sort became known as "tossed walls."

Farmers were resourceful in facing this excess of rocks, some of which were extremely heavy. Many of these larger rocks were used to mark boundaries, a task that did not require much height. Walls used to keep livestock in or out were often composed of a bottom layer of rock, and then piled with wood or brush to achieve the desired height. In his *Reading the Forested Landscape,* forester Tom Wessels notes that if a stone wall contains many small rocks, the adjacent land was likely used

for cultivation, as the rocks had to be removed from the field and were tossed on top of the fence. If, however, the wall is comprised of only large rocks, it was probably to keep livestock in a pasture, as it was not necessary to remove small stones from these areas.[15]

Even today, stone walls litter the landscape of New England. As early as 1633, the courts held farmers responsible for enclosing their fields to keep others' livestock out. In addition, the condition of a farmer's stone walls became a measure of their character. Farmers were considered lazy if they did not have sufficient fencing, or if the fencing they had was constructed in a sloppy or haphazard way. These trends, along with the inexhaustible supply of rocks, led to the erection of about 100,000 miles of stone walls across the New England countryside. Many of the tossed walls were improved or even rebuilt by subsequent generations, and more care was taken in building walls near houses and around cemeteries.[16]

Today on Long Island, large granite outcroppings are scattered throughout the forest, a swampy area claims a large portion of the center of the southern peninsula, and the trees' thick roots spread out from one tree to the next. Historian and ecologist Gordon G. Whitney remarked that "it is said that it required one generation to clear the land of trees and another generation to remove the stones and level the 'cradle knolls' or tip-up mounds of the trees." Agriculturalist Samuel Wasson's comparison to Hancock County was more direct: "a primary farming county, this can never hope to be. There are natural obstacles, which art cannot remove. Its peculiar proximity to the ocean, its geographical position as the battle-ground of arctic and torrid temperatures, with their alternating climatic waves of heat and cold, producing long, cold, and uncertain springs, with irregular extremes of thawing and freezing, so fatal to grass roots, the inexhaustible hydraulic power within its borders, the facilities for coasting and fishing, and the extraordinary aversion to farm labor, become characteristics in common, which forbid a prosperous and productive agriculture."[17]

The agricultural census sheds more light on island farm life. Improved land is defined as all land regularly tilled or mowed, land pastured in cropped rotation, land lying fallow, land in gardens, orchards, vineyards, and nurseries; and land occupied by farm buildings.[18]

In 1870, twenty residents owned property with a total of 538 acres of improved land, which rose slightly to 564 acres by 1880. This is an average of 27 acres of improved land per household lot. Only one resident owned land in a woodlot, which totaled 40 acres in size. Other unimproved land was found on eight properties, for a total of 423 acres. This

is an average of 53 acres per household. Improved land was more abundant than woodland, and slightly more than other unimproved land at 423 acres. In 1880 improved land was placed into two distinct divisions: land that was tilled on the one hand, and pastures or orchards on the other. This time only thirteen residents claimed they had improved land that was tilled, for a total of 216 acres, or an average of 16.5 acres per property. Eleven of these residents also claimed improved land in pasture or orchards for a total of 163 acres, or an average of 15 acres per property. Unimproved land totaled 540 acres across all thirteen residents, averaging 41.5 acres per household.

All of these farmers had grassland as well, totaling 185 acres, or about 14 acres per household. Every home seemed to have milking cows, sheep for wool, and work animals such as cattle or oxen, used for tilling the fields or hauling lumber. Potatoes were a predominant crop, but they also grew other vegetables and wheat, churned large amounts of butter, and grew hay for their livestock. Some families with very wet land cultivated cranberry bogs. Local historian R.G. F. Candage stated that the island families "raised their own corn and grain, cattle, sheep and swine for the use of their families, spun, wove and knit their clothing from the wool of their sheep, and lived within their own resources."[19]

Although settlers produced most of their own staples, historians point out that few farms were actually self-sufficient. It took an entire community to achieve sustainability. A complex economy consisting of sharing, bartering, and trading emerged over time. One family might exchange work on a barn for health care, for instance. The oxen necessary for stump removal were often borrowed from a neighbor in exchange for help during harvest season. This neighborly exchange extended to town affairs. The agricultural census indicates that very few islanders had a woodlot. Fortunately, the town owned a 100 acre woodlot on the island. If a family did not have their own source of wood for heating and building supplies, they could work on the roads or other town-maintained land in exchange for wood from the town woodlot.[20] In a small, compact community such as Long Island, it is not hard to imagine such a network of cooperation.

Fishing

The 1870 Agricultural Census listed twenty-one households on Long Island, each with one or more working men. It appeared that many sons stayed with their parents, helping out on the farm. In four cases, the sons worked "at sea" or went "fishing" while their fathers tended the farms,

and in three cases the sons worked on the farm as well. The wives kept house. Many or even most island men were involved in both farming and fishing for their livelihoods. Although the agricultural census does not delve into the occupation of fishing, most island fishermen did not stray too far from shore. They took short day-trips to nearby fishing grounds. The Gulf of Maine's waters were rich, offering fishermen a decent chance at success even close to shore. They most likely fished for cod, hake, and haddock, and if they were able to fish in deeper waters, their catch could include pollock, halibut, and mackerel. Menhaden, commonly called pogies in the nineteenth century, were also a valuable commodity. These migratory fish were very abundant in Maine waters, and were used mainly as sheep feed, oil, or, if one could stand the smell, as fertilizer. Herring, or sardines, were shipped to fishing ports for use as bait, then to canneries after the 1870s. After the 1880s, herring was used to make fish oil to be used for mechanical purposes. It is believed twenty-five or more weirs were maintained in Long Island's waters, pulling in schools of herring. Clam-digging was also common. When reading the census, one should consider that farming was an occupation of higher status than fishing; thus many men would claim to be farmers, even though they mostly fished for a living. In addition, the timing of the census determined the responses. Fishing and farming are seasonal occupations, and if asked for their occupation in the summer, respondents might answer fishing; during the harvest, farming would be the obvious response.[21]

Sheep Herding

Long Island's early settlement period was dominated by subsistence agriculture. While resident human population was low and the land was still largely unimproved, sheep farming was popular. In 1810 the Portuguese-bred merino sheep were first imported into the United States. Shortly after, a tariff was placed on English woolens. This combination began a period of large-scale sheep herding across New England. As Ludlum notes, "A wool craze swept the region, a mania as powerful as any religious fanaticism."[22]

This New England craze found its way to Long Island, where farmers could keep large sheep herds with minimal care. Sheep could wander uninhibited, without fences, since they could not stray beyond the boundaries of the island, and they could graze in the forest without the threat of predators. During winter, when vegetation is scarce, both deer and sheep ate kelp and seaweed. Several carding mills emerged in Blue

Hill in response to the influx of wool. In a 1936 interview with the *Bangor Daily News,* George W. Grindle, who was born on Long Island in 1857, stated that 6,000 sheep roamed Long Island at the time of the Civil War. This equates to about 1.3 sheep per acre. Susan Allport reports that Martha's Vineyard held 20,000 sheep at once, which equaled about 0.8 sheep per acre. It is possible that Long Island's 4,555 acres could have supported that many sheep, but the 1870 agricultural census reported only 231 sheep under ownership. Possibly, sheep belonging to nearby mainland residents were placed on the island intermittently due to its advantages. Much of the northern half of Long Island remained uninhabited and was thus suitable for grazing sheep. The fact that wool was an important commodity on the island is supported by a petition sent to the State Legislature by two island residents stating that it was the largest part of their income. The petition requested recompense for sheep killed by dogs brought to the island by deer hunters.[23]

Such a large flock undoubtedly devastated the island's vegetation. The navigational maps used by early seafarers often included an artist's rendition of the area from the perspective of the entry point of the harbor or strait. One of these maps indicates that from Sand Island, due south and just southwest of Tinker Island, Long Island appeared bare.[24]

Granite Quarry

The opening of a granite quarry in the 1880s by the Brown and McAllister Company presented another opportunity for Long Island residents. Production peaked in the 1890s, when the company employed approximately 150 workers, including Italian quarrymen and Scottish stone cutters.[25] Most of the granite from the quarry was shipped off the island and used for buildings and as paving blocks and curbing. The company erected a boarding house and general store on the island for the influx of workers and a dock for the large boats laden with supplies and orders from the islanders. A post office delivered mail daily, brought over from Blue Hill in a rowboat, or during a harsh winter, by foot over the ice.[26] The new town was named, appropriately, "Granite." Its school enrolled over thirty students each year, and its church services were held in the schoolhouse once or twice a week. Unfortunately, these boom years did not last long; the quarry closed in 1898, only fifteen years after it opened.

The closing of the quarry on Long Island did not cause the mass exodus common on other islands with the same fate. The boarding house closed, as did the post office, but the original islanders stayed on. School

attendance remained stable, and the post office re-opened in 1907 under the name "Seaville." The 1908 census showed eighteen households on the island — which was consistent with previous census data. A dance hall opened on the second floor of Allen Cole's boat shop, proving that it took more than the closing of the quarry to demoralize the community of Long Island.[27]

Abandonment

Both settlement and abandonment came later to Maine than to the rest of New England. Land clearing peaked in New England around 1830, and abandonment took hold by 1850. The turning point in Maine occurred in 1880 when land clearing peaked and then slowly dropped off. Between 1880 and 1920 land in farms dropped over 1,125,000 acres.[28] On Long Island the decline was delayed, but only slightly. Many factors contributed to this wide-spread abandonment.

Most early farmers found it a struggle to meet their subsistence needs, much less to make a profit. The farming done by many of the initial settlers was crude and primitive. Their tools were heavy and bulky, and they followed the zodiac, the *Maine Farmers' Almanac*, and advice from old proverbs when planning timetables for the year. There were other factors that exacerbated their hardships. Wheat was an important and somewhat lucrative crop grown in Maine during the colonial period, and on newly cleared fields, it thrived; however, as the years went on, yields declined. In 1800, blight nearly eradicated Maine's wheat crop; the salvageable harvest was not sufficient to cover the costs of exporting it out of state. Another drawback to farming in Maine relates to the unpredictability of the weather. An extreme case was in 1816, a year known as "Eighteen Hundred and Froze To Death," or "The Year With No Summer." A frost occurred every month of the year, and settlers had to rely on game and fish for survival.[29] Contributing to this was a climactic event known as the Little Ice Age, which began around 1100, peaked near 1850, and continued until the end of the century.[30] As one historian remarked, "these hardships discouraged thousands and prompted a mass migration to the Ohio Valley, the beginnings of a long New England exodus that reached epidemic proportions after mid-century."[31]

Transportation improved quickly in the early nineteenth century with the completion of the Erie Canal in 1825, which connected midwestern grain producers to markets in the eastern United States. The Western Railroad, completed in 1833, picked up from there, beginning at the Erie Canal in Albany and running to Boston and points north and

south. It became easier, cheaper, and faster to transport goods from the Midwest to the East. By the mid-nineteenth century it cost only one cent per ton-mile to transport goods over the Erie Canal, as opposed to twenty cents per ton-mile by wagon. By 1860 thousands of miles of inland waterways were constructed, and a railway network of over 30,000 miles served all of the states east of the Mississippi.[32] The first railroad in Maine was the Bangor, Old Town and Milford, which opened in 1836, and the next railroad, the fifty-one-mile-long Portland, Saco and Portsmouth, connected Maine to the rest of New England.[33]

By 1840, farmers were abandoning their sheep farms and pastures at a swift rate in Vermont and New Hampshire. New England soils are notoriously thin and poor, and overgrazing and erosion compounded the problem of western competition. Eastern farmers simply could not keep up with their counterparts in the Ohio Valley, who grazed their sheep and grew their crops on farms with rich, unglaciated soils. Hancock County had 48,000 sheep in 1840, but only 20,000 by 1870. Many remaining farmers shifted to dairy production, supplying the mill towns that were expanding in the post-Civil War era, and Long Island followed this trend as well. Nearly every household owned milking cows and produced large amounts of butter and cheese, compared to other crops and commodities produced by the islanders.[34]

The Civil War seemed to exacerbate the migration to the west, although the movement was already in full swing in the lower New England states. Wessels noted that 100,000 Vermonters, nearly one-half of the state, had moved west. Most rural, central New England towns experienced an equally severe demographic decline, as word of the rich midwestern soils traveled among the soldiers. The Homestead Act of 1862 offered families 160 acres for a fee of eighteen dollars once they had settled and improved the land. After the war, many packed up and moved west or to the larger cities from which soldiers disembarked during the war. Others, tired of coaxing crops from the thin New England soils, chose to work in the booming textile or lumber industries. The inconsistency of farming, the hard work, and the stiffening competition from the Midwest combined to ruin the Maine farmer.[35]

Other developments drew island residents to the mainland. The internal combustion engine was developed around 1910, and the transition from sloop to motorboat took place between 1914 and 1920. Since it was easier and faster to get to the offshore fishing grounds in a motorized vessel, island life lost its advantage. Schools were better on the mainland, and while medicine was primitive in Maine in general, living on an island only exacerbated that problem. Although families were

commonly large, infant mortality ran high, and average life expectancy was twenty-five years. Rural Maine was frequently hit with epidemics such as measles, whooping cough, scarlet fever, smallpox, diphtheria, and pulmonary tuberculosis, and these dreaded diseases required quick medical attention. Because farms required large amounts of work from men and women, the death of a spouse could quickly send the family into an economic tail-spin — and the prospects for remarrying were better on the mainland.[36] Moreover, many islanders had extended family on the mainland, and these relatives were also important to economic and social well-being. Many islanders met death in tragic ways, as was the case among a population of fishermen and quarrymen. When Abel Fogg was killed in the quarry, his wife packed up the children, and with the dishes still on the table, moved off Long Island. By 1920, all the year-round residents of Long Island had removed to the mainland (figure 1.7). Most ended up in Sedgwick, Brooklin, or Blue Hill, although some found their way to Trenton and Ellsworth. Life on the island had become too severe, too lonely, and too difficult for the times.

Tourism and Industry

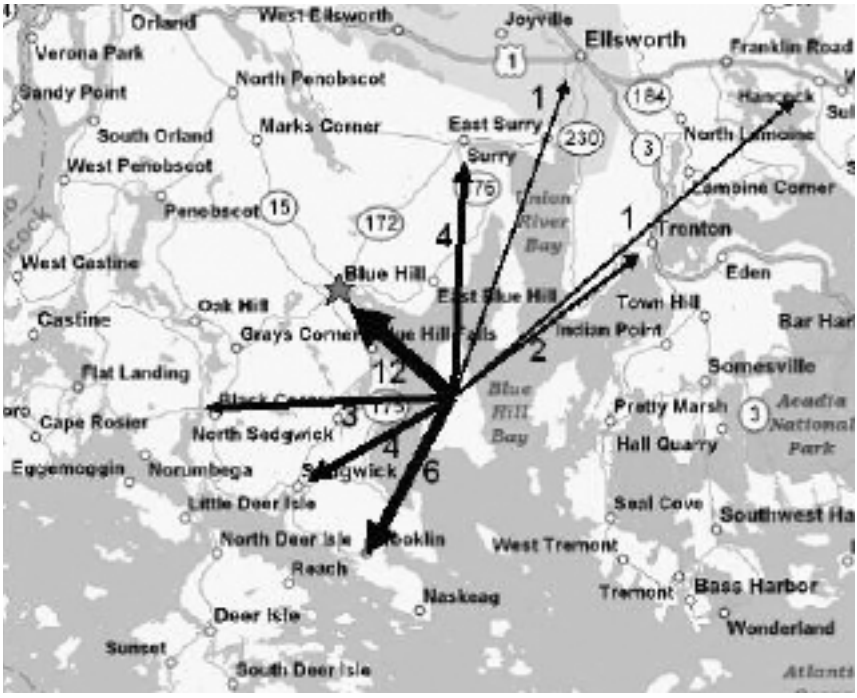
Land ownership on the island changed hands many times since the first arrivals. In the early 1910s, Frank Sibley began buying up much of the land from residents moving to the mainland. Hoping to establish a game preserve near the center of the island, he constructed an eight-foot fence spanning the entire width of the island to contain the deer population. Unfortunately, he did not take into account the fact that even the smaller coastal deer can clear a fence of that height without a running start — and they can swim around it. Sibley sold his land to the Blue Hill Lumber Company, and it eventually fell into the hands of Roy Allen, who used the land to cultivate blueberries. The southern end of the island was burned for blueberries numerous times during the 1930s and 1940s. Allen used a World War II "duck" vehicle to haul blueberries to his processing plants. By this time, he had acquired all but 100 acres of Long Island. Finally, the land changed hands again in the 1950s. Local legend has it that Allen lost the island in a game of poker to the Florian family, but Roy Allen's widow claimed that her husband exchanged the land for land in Florida — with no poker game involved. The Florians intended to establish the "Blue Island Game Preserve," with guests-only hunting, but for some reason the endeavor never developed. They did release a herd of about ten bison onto the island, where they roamed free for seven years.[37]

Perhaps the Florians' past did catch up with them, as they were caught and prosecuted for tax evasion. They paid their back taxes and offered Acadia National Park an option to purchase their development rights. Park officials bought the rights and placed easements on 3,300 acres, and many homes, including Allen Cole's boat shop, were moved off the island to the mainland. Between the looting after the island was abandoned, the metal-stripping to support the war effort, the blueberry field burning, and the alleged burning of buildings by the Florians to collect insurance, not much is left on the island.

Park rangers removed the bison in 1995 and placed them in a park, but numerous other fauna — spruce grouse, coyotes, moose, raptors, turkey, deer, and even bears call Long Island home.[38] Today, the island is used by a few hunters, campers, and kayakers. It lacks a truly sheltered anchorage and so is used very little for yachts. Along the southwest shore, four lots were exempted from the Acadia easements. These are home to a community of summer residents who maintain isolated camps, mow a few of the old pastures, and maintain the approximately seven miles of road left on the island. In the twenty-first century, Long Island is still a unique place with many people dedicated to it and to its past.

Historic Land Use and Natural Vegetation

In 2004 and 2005 the author surveyed Long Island to determine the impact of past land use on present forms of vegetation. The survey included a study of historic maps and deed descriptions to ascertain ownership and a GIS program used to plot the boundary lines — coupled with on-the-ground searches for physical evidence of historic settlement along and within the defined property lines. In order to capture the most comprehensive view of vegetation composition and structure on the southern part of Long Island, the author used a variable-width transect sampling method within each property, encompassing as many different soil types and vegetation classes as possible. The survey, which included tree coring along these transect lines to analyze vegetation age trends, suggested that all merchantable stands and arable land had been cleared at one time or another. The new forest began growing in the abandoned agricultural fields and pastures following the general trend of abandonment, with older trees growing in the first-abandoned inland pastures, and younger trees occupying the last-abandoned homesteads and gardens nearer the shoreline. Subsequent disturbances, such as partial logging, blueberry field burning, and wind throw, opened gaps to allow new pioneer species. Coupling an understanding of past land use



Map showing the resettlement trends of Long Island residents. The numbers indicate the number of families that relocated off of Long Island, and the arrows indicate where they moved (compiled using census data from 1840 to 1930).

with this survey of current forest composition, structure, and age suggests ways in which farming has altered the forest environment of coastal Maine.

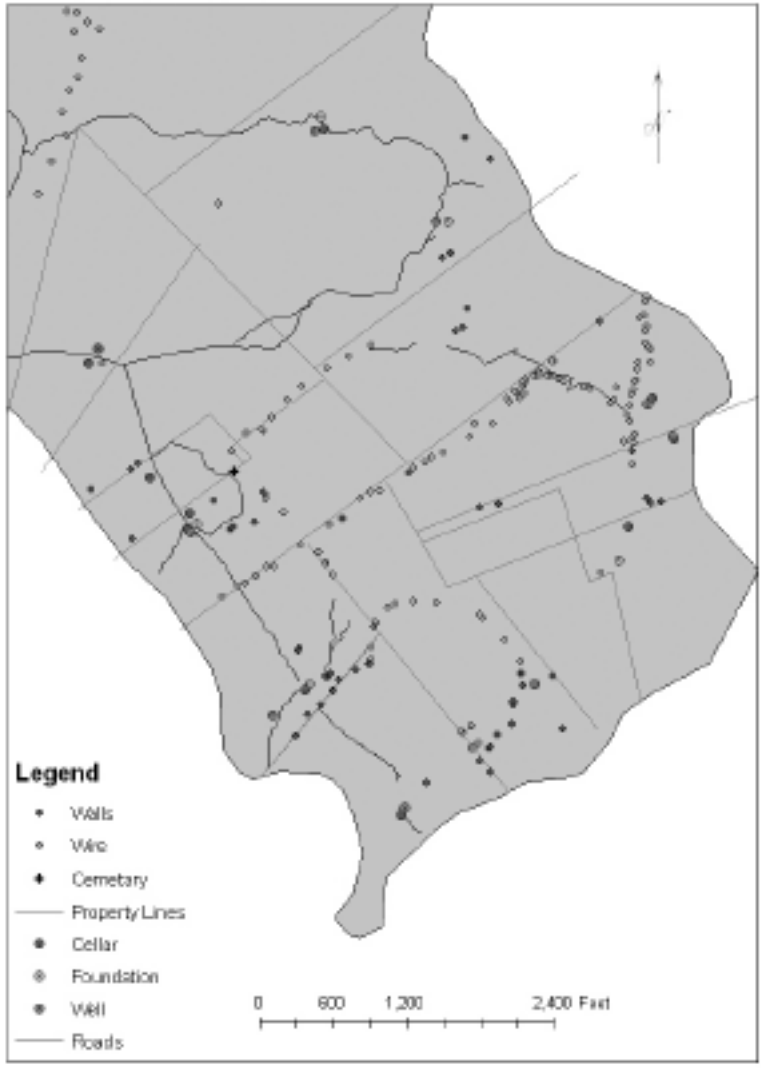
GIS and Historical Methodology

Charles McLane conducted research on the people and families who had historically resided on the islands along the coast of Maine. He also published a series of maps, originally drawn by the Reverend Jonathan Fisher, surveyor H. F. Walling, and others, showing the relative locations of families on Long Island in the 1820s, 1860s, 1880s, and early 1900s. The family names and maps he published for Long Island provided a basis for this property ownership research.[39] These, combined with GPS surveys, GIS, deed information, aerial photos, and maps, provided a reasonably accurate overview of landownership on the island.[40] The property lines were then placed upon orthophotographs to see if they corresponded with changes in vegetation and the shoreline. These newly

1829 Map of Long Island. Derived from the notes of Jonathan Fisher.

1860 Map of Long Island. Derived from Walling Map of Hancock County, 1860.

Map of Long Island. Derived from Colby Map of Hancock County, 1881.



Physical evidence and roads found within the parcels on Long Island.

delineated property lines were then uploaded into a Garmin Rhino GPS unit. By following the coordinates depicting the separate properties and their boundaries on the GPS unit, the areas were searched on the ground for any physical evidence of a boundary, such as barbed wire, stone walls, blazed trees, stakes, and stones. Surveyors employed a metal detector to search for and follow buried barbed wire. Evidence of homesteads, such as foundations, cellars, or wells, provided further confirmation of property boundaries. All of these data were then downloaded into a GIS program and compared to the properties generated by the deed descriptions and the orthophotographs. In most cases, the deed refered to markers not easily found, such as a "white rock," a "brick yard" (by now merely a depression in the earth), or a ledge.

Property Delineation and Physical Evidence

These procedures yielded twelve adjacent properties. The first parcel to be mapped and georeferenced initially belonged to Samuel Carter. His property was the southernmost lot on the island, comprising 250 acres. Because the ground evidence was strong for his property line — particularly the stone walls and barbed wire — it became the anchor for subsequent property boundaries. Land ownership was confused by the fact that individual parcels changed hands frequently and transferred back and forth among parties. One parcel transferred from a brother to another and back at least three times. Over time, some parcels appeared to overlap previous property boundaries. With Carter's property as a base line, subsequent parcels hinged off in identifiable patterns if Carter's property was mentioned in the deed descriptions, but in some cases, plotting parcels became like placing jigsaw puzzle pieces together.

Ownership patterns provide a better understanding of the history of Long Island's vegetation, since past disturbances are important factors in determining the composition, structure, and function of today's forests. Disturbances encouraged some species and discouraged others, and these reactions shaped the forest community as a whole. Surveys of fossil pollen from the last 1,000 years suggests, in fact, that New England's forest composition is not returning to what it was before settlement; human-induced disturbances set an entirely new dynamic in motion. Historical land-uses might influence vegetation patterns for centuries after the disturbance itself has ceased.[41] Forest ecologist Norman L. Christensen argues that in order to predict future changes in any ecosystem, we must first understand its history and how that has helped shape what is there today.[42] Land use histories have been researched elsewhere in

New England, such as the Harvard Forest in Petersham, Massachusetts, and the Holt Research Forest in Arrowsic, Maine.[43] These studies help us to understand why certain landscapes are what they are today, and to predict what will be there tomorrow.

Long Island was nearly entirely cleared for agricultural fields and pastures. After abandonment it continued to endure logging, fire, and wind disturbances. It is likely that the forest in the study area was originally even-aged, but following the land-clearing and subsequent disturbances, it has numerous cohorts, or age classes, today. The variable-width transect sampling method employed for this project captured a comprehensive view of vegetation composition and structure on the southern part of Long Island, and transects within each property encompassed as many different soil types and vegetation classes as possible in a straight line. The transect lines were generated using the GIS layer of property boundaries superimposed over a layer of soil types and a layer of vegetation classes.

Tree core samples determined the age trend along the transect lines and in twenty-eight plot centers on ten of the eleven properties. Each transect contained three core plots, each with a maximum radius of 100 feet. Within each plot, every species of tree present was cored in each crown class available (dominant, co-dominant, intermediate, and overtopped). Cores were taken as close to the ground as possible, in order to get a more accurate total age for the tree.

Overall, trees near the middle of the island tended to be older (see map) and those nearer the shore were younger, except in the northeast corner of the study area and along part of the eastern shore, where the near-shore cohort remained older. On the plot in the northeast corner, three trees were aged 100 years or older, including a 110-year-old yellow birch *(Betula alleghaniensis)*, a 108-year-old paper birch *(Betula papyrifera)*, and a 100-year-old basswood *(Tilia Americana)*. A plot near the eastern shore held six trees between thirty-three and sixty-three years old, and a 106-year-old red spruce *(Picea rubens)*.

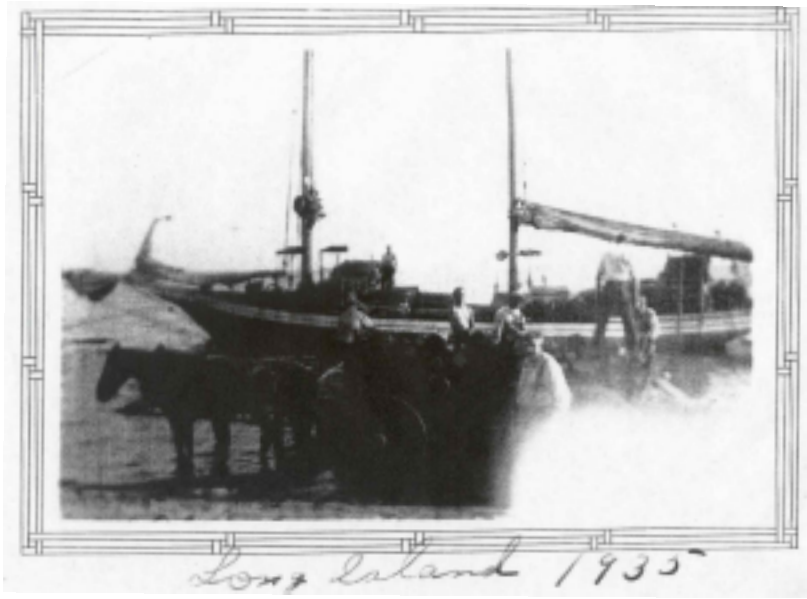
It is probable that all harvestable forest stands and arable lands on Long Island were cleared at one time. The height of land clearing in Maine was the 1880s; sheep herding peaked sometime before 1870; and logging for the Rockland lime kilns was well underway by the 1850s.[44] From the perspective of the water, Long Island would have appeared incredibly bare in spots by the late 1800s. The southern end of Long Island was grassy except on its southwestern side, where there was a fringe of scrub.[45] The oldest trees measured in this study would have germinated

after the original clearing of most of the island. Generally, the spatial trend of the cohort ages followed the pattern of farm abandonment, with older trees near the center of the study area where abandonment of the upper pastures occurred first, and those toward the shore progressively younger where abandonment of gardens and homesteads last occurred. But the actual pattern was more convoluted at the level of the individual transect; there are many reasons why each parcel had different temporal patterns of growth. Thus overall, the pattern holds across the landscape, but each parcel displays differences. The trees on the southern and western side of the island, for instance, are much younger, amounting to a mixed deciduous shrubland of mostly dense-growing speckled alder *(Alnus incana* ssp. *Rugosa)* and winterberry holly *(Ilex verticillata)*. It is probable that this vegetation resulted from, or has persisted through, blueberry burning. The southwestern side of the study area was burned for blueberries from the early 1930s until 1951, mainly because it was more accessible, with a gradual slope to the shore. While the roads on the eastern side of the island are grown in and have mostly vanished, those on the western side are still quite visible. Landowner G. M. Allen & Son, a blueberry canning company, was based out of Blue Hill, which is closer to the western side of the island, making transportation easier from there than around to the eastern side of the island.

Settlers also logged the island, beginning even before the actual settlement in the late 1700s, and in 1768 they built a sawmill on a stream on the northeastern side of the island.[46] Logging continued as farmers cleared fields, pastures, and home sites and cleared timber for building materials and firewood. It is likely that landowners also exported fuelwood to the lime-kiln operators in Rockland and cooperage to manufacture the casks needed to transport lime.[47]

After the era of farm abandonment, logging continued up until the mid-1960s, with the wood most likely destined for the Bucksport paper mill. The last documented logging effort within the study area was in 1935, when logs were loaded onto schooners at Fogg Cove on the eastern side of the island and shipped to Bucksport. Loading was mostly from the west side of the island, but loggers established roads to draw from the forest stands across the island.

Along with human activities, wind disturbance, or windthrow, was also a pervasive forest disturbance. In the fall and winter the coastal winds originate from the north or northwest, and winds up to ninety miles per hour accompany these powerful nor'easters. Forests near the shore are subject to higher wind speeds and more frequent winds than

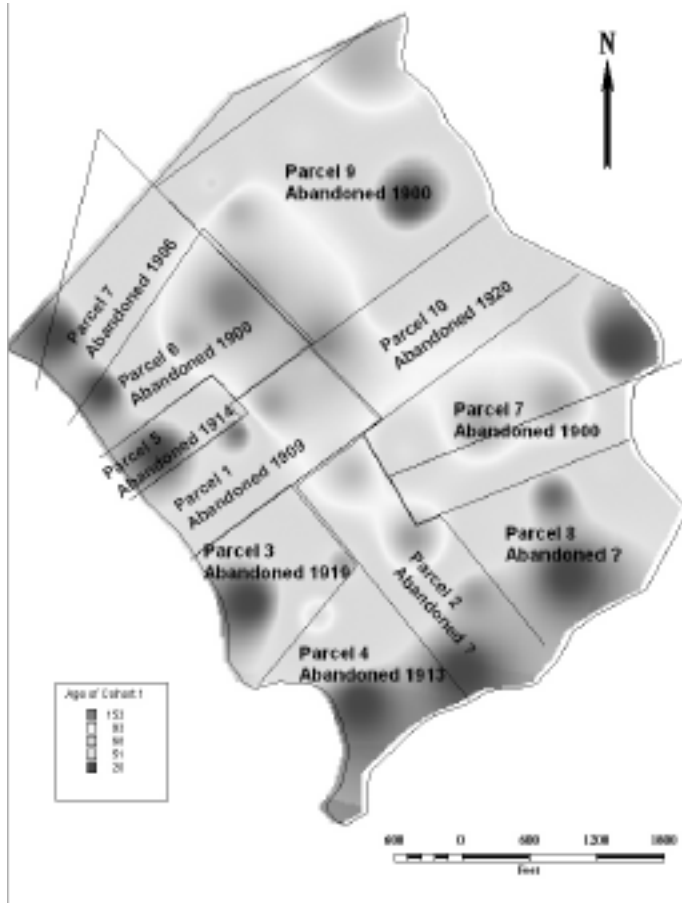


Lumber being loaded onto a schooner in Fog's Cove, Long Island in 1935. Photograph courtesy of Denny Robertson.

the more sheltered inland areas. Historical records describe at least seven major storms that impacted Maine forests, and three of them coincide with pulses of cohort establishment on Long Island. These three, the New England Hurricane of 1938, the Great Atlantic Hurricane of 1944, and Hurricane Donna of 1960, produced wind speeds high enough to cause substantial windthrow across the island. Due to their shallow roots and their evergreen needles, which resist wind during fall and winter storms, conifer stands are significantly more susceptible to windthrow than hardwood stands.[48] This is significant for Long Island, since its forests consist mainly of spruce and fir.

Although most of the soil types on Long Island are not shallow, they have a high potential for windthrow. The trees left standing after logging were less protected and more susceptible to breakage in the high wind speeds along the coast, and after a strong blow, loggers may have visited the island to salvage the fallen trees. Whether salvaged or not, blowdowns cause various-sized gaps that encourage new, younger cohorts in scattered areas.

The age interpolation map shows an area in the northeast corner of Parcel Nine consisting of older trees. Because the terrain is steep, the landowner probably did not use it for farming or grazing. Nor was it



Map of interpolation of ages of cohort 1 around the study area, showing parcel boundaries and dates of abandonment.

likely burned for blueberry cultivation or logging, again due to the steep terrain and its location on the east side of the island. Thus trees grew to an older age than those in surrounding stands.

Parcel Seven was officially abandoned in 1900. This parcel was handed down in the Fogg family for generations, and the head of the Fogg household in 1900 was Abel Fogg, who had given up most of his farm activity to work in the granite quarry on the island. Unfortunately, he was killed on the job, and his wife immediately moved the family off the island. Most likely, farming and perhaps grazing had already declined on the Fogg parcel when Abel went to work in the quarry, explaining the older trees in the center and towards the shore of Parcel

Seven. Still, this may not be unique; other landowners no doubt cut back on farming to take more lucrative work in the quarries.

As farms like these were abandoned, trees spread into the fields, creating the oldest trees, or Cohort One. There are two large pulses of reforestation within Cohort One: the first from 1885 to 1904; and the second from 1935 to 1964. After an initial decline in 1850, the island's population recovered and hit a peak in 1890 or 1900. The 1890-1900 repopulation was not caused by settlers hoping to farm the land, but rather by quarrymen. Sheep herding became unprofitable in the mid to late 1800s, causing many settlers to cut back their flocks or give them up entirely. Likely they stopped maintaining their pastures by mowing or fire. Also, the granite quarry opened around 1883, perhaps drawing many islanders from their farms. These trends perhaps explain the first pulse. The population on Long Island dropped precipitously after 1900, and the island was completely abandoned — at least by year-round residents — by 1920, just before the second pulse. After final abandonment, it would have taken years for the fields to grow in with measurable trees. Assuming these trees produced a growth ring each year, 1935 could have been the beginning of widespread seedling initiation and growth across the island.

Cohorts Two, Three, and Four are the products of disturbances subsequent to abandonment on Long Island. These cohorts show three large pulses of forest establishment. The first is 1915 to 1924. This is likely the result of periodic logging and wind disturbance. The second cohort initiation was 1935 to 1954. Logging and wind, especially the hurricanes that hit in 1938 and 1944, still played a role, but blueberry burning was also responsible. Burning began in the 1930s and did not end until 1951. Fire did not reach every part of the island every time they burned, and conditions were constantly changing; one year may have been drier than others, allowing the fire to penetrate farther and move faster than it normally would have. The company may have burned on days when the wind was stronger or it was blowing in a different direction than in previous or subsequent years, again causing the fire to carry into other areas. This explains why cohort initiation was spread over a twenty-year period. Finally, the last pulse was from 1965 to 1984. Again, logging was probably a factor, along with general wind disturbance and Hurricane Donna in 1960. After the burning and the logging reduced the sheltering effect of the forest, strong coastal winds could cause a substantial amount of windthrow across the island.

Conclusions

The first new cohort of trees began growing in the abandoned agricultural fields and pastures, and their ages generally followed the pattern of abandonment, with older trees growing on the less accessible inland pastures, and the younger trees on land closer to the shore and on the homesteads. Subsequent disturbances, such as partial logging, blueberry field burning, and wind events, opened gaps to allow establishment of the following cohorts. The youngest trees of all the cohorts are located around the periphery of the island. This is probably because the edges of the island were easily accessible and already had established roads for logging and burning, and were more susceptible to windthrow.

Hardwood density is higher closer to shore, and inland areas have a much higher density of older, shade-tolerant softwoods, predominantly red spruce *(Picea rubens)* and balsam fir *(Abies balsamea)*. Disturbance was more common closer to the shore, as well as more recent, allowing the shade-intolerant paper birch *(Betula papyrifera)*, speckled alder *(Alnus incana* ssp. *Rugosa)*, and winterberry holly *(Ilex verticillata)* to remain dominant in some areas. Overall, Long Island is predominantly covered by a spruce-fir forest. This forest composition does not seem to be controlled by soil type, soil drainage class, slope, or aspect. The only environmental factors that seemed to have had a slight affect on forest composition and structure are distance from shore and elevation. However, the elevation generally increases as one travels inland; therefore, this project was unable to determine which one was the driving factor in the forest variations. Since anthropogenic disturbances are now minimized, the stress- and shade-tolerant species, red spruce *(Picea rubens)* and balsam fir *(Abies balsamea)* will likely continue to expand their areas of dominance to the more coastal areas.

Whether land use determines the direction of forest succession or the land itself determines the type of use is a circular question that perhaps cannot be answered, but with each new study some factors may be isolated and investigated as determinants of the succession process.

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