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ECOLOGICAL DYNAMICS AND RURAL NEW ENGLAND HISTORICAL SITES

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Abstract

The economic decline and depopulation of rural New England during the last half of the nineteenth century has been explained largely in terms of specific historical and economic events. Analysis of archaeological survey data from Middlefield, Massachusetts and Sandwich Notch, New Hampshire has resulted in an alternate explanation. Long term ecological processes associated with the environmental impact of rural industry and intensive agriculture were more important than unique historical events in determining the changes in settlement pattern. A four stage ecological model is proposed for further testing on historical period archaeological sites.

The depopulation of rural communities in New England during the last half of the nineteenth century has received very little attention in historical archaeology. Economic and social historians have discussed the industrial, agricultural and demographic decline of the region, primarily in terms of economic and historical causes (Thomson 1958).

During the late 18th and early 19th century, hundreds of small "hill communities" sprouted up throughout the Green and White Mountains of Vermont and New Hampshire, the uplands of central and western Massachusetts, as well as the Connecticut-Rhode Island border region. The earliest settlers of these hill communities were almost exclusively subsistence farmers. Their economy needed to be mixed and varied in response to the rugged environments they were inhabiting. Their subsistence was based on the cultivation of wheat and barley, apples, sugar maple orchards and hunting. Home manufacture provided the tools, building materials, clothes and utensils needed in daily life.

From the seventeenth century on, there had been urban markets for rural products, but during the settlement of interior uplands in the last half of the 1700's, the coastal population centers were still being supplied by their immediate hinterlands (McManis 1975), and the far interior communities were largely self-sufficient.

During the early years of the 19th century, New England as a whole began a transformation from an agrarian economy to one based on industry. This transformation subsequently affected great shifts in population. For example, two-thirds of southern New England's population were living in rural areas in 1810. This figure was only one-third by 1860 (Turner 1965: 59).

The growth of urban centers affected the hill communities in two ways. First it created a dependable market for produce from the rural areas. Hill community farmers began producing crops for market and, in turn, relied on the manufactured goods to replace those previously manufactured in the home. Secondly, the combination of the elimination of home manufacture, increasingly scarce land, and the demand for labor in the cities influenced many young people to seek work in the urban industries, or to emigrate out of New England seeking land. In an 1832 debate over the protective tariffs, a New Hampshire congressman voiced his opposition to the rise of industrialization on grounds that it was destroying home industry and depriving the state "of at least 20,000 of her most active population" and leaving the farms unattended (Register of Debates in Congress 1832: 233).

Perhaps the most important effect urban industrialization had on the rural areas of New England was the shift from a subsistence to a market economy during the first half of the nineteenth century. But with the completion of the railroads linking the western states to the coastal manufacturing centers between 1840 and 1870, the demand for New England rural goods was virtually eliminated. The small-scale rural industries and cash cropping collapsed and the rural interior was depopulated.

At least, this is the conventional explanation of the changes in the rural settlement pattern in the interior uplands of New England during this period. However, the accuracy of this reconstruction rests upon a large number of untested assumptions.

As a specific example, it has been suggested that the depletion of forest cover in the hinterland was driving up the price of wood as fuel stock just when coal was being developed as a low-cost alternative. Since rural industries could not adjust for the fuel substitution, they could not successfully compete with large, urban operations (Hindle 1975). However, recent research has questioned many of the assumptions behind such purely economic explanations. For in fact there was no decrease in national or regional production of wood for fuel stock during the nineteenth century, and coal was not significantly cheaper than wood until the present century (Berg 1978:608-9).

The rationale of economic determinism rests on even more fundamental assumptions about cause and effect relationships between micro and macro economic forces and cultural change. Historical archaeologists have questioned this logic, but to date most of the research has focused on investigating the role of cultural processes, such as changing world view, to account for the archaeological and documentary record (Deetz 1977). We would like to take the matter a step further. Our contention is that many of the important cultural processes in rural New England were ecological in nature. Specifically, the environmental impact of rural industries such as water-powered textile mills combined with intensive agriculture on marginal lands may have led to ecological crises which had economic and demographic consequences. Furthermore, we suggest that historical archaeology can make an important contribution to the understanding of these processes.

The town of Middlefield, Massachusetts contained a thriving rural industry including fulling, carding, grist and sawmills in Blush Hollow from 1793 to 1901. The mills were powered by Factory Brook at the headwaters of the West Branch of the Westfield River, a tributary of the Connecticut River in the central Berkshires. At the height of prosperity, the village contained 1,717 residents and the third largest sheep herd (9,840) in the Commonwealth. In the same year, the owners of the mills constructed a large earthwork dam on Factory Brook ostensibly to increase the available water power. In July 1874, this dam burst and heavily damaged the mills. The dam and mills were rebuilt but when the dam gave way again in April of 1901, the operation was abandoned.

At the start of the twentieth century, the town's population had dropped to around 400 residents, most of whom maintained small cattle herds. Some of the suggested causes for the economic and demographic collapse of this community include the reduction in tariffs on foreign woolens in 1846, railway construction which bypassed Middlefield, and, of course, the failures of the earthen dam (Thomas 1975:14-17). Reanalysis of an archaeological survey of Middlefield conducted for the Soil Conservation Service

has indicated that the causes of the industrial decline and depopulation involved complex ecological processes as well as historic/economic events.

The settlement pattern and land use of Middlefield during the late eighteenth and nineteenth centuries can be characterized as a ridge and valley bottom system. The earliest settlement in town was apparently at the Taggart Farm Site (c. 1760) on the valley floor of Factory Brook. It was abandoned in 1792, the same year that the mills in Blush Hollow were begun (Smith and Smith 1924). Farming on the valley bottom was continued at sites such as the Smith-Emmons Farm above the Factory Brook reservoir. Documentary and archaeological evidence point to an 1874 abandonment date, the same year that a summer freshet first destroyed the dam.

However, from the 1780's, the highest density of settlement was along the ridges east and west of the stream. Abandoned sites along West Hill Road date from 1800 to the early 1900's and may well have been associated with the sheep herding which supplied the mills. The village center and outlying farms to the east on Skyline Drive are still occupied, but it is here that farms shifted from sheep to cattle herds over the past century.

Table 1 combines and summarizes the survey data on the settlement and land use pattern.

The archaeological survey data correlates well with the documentary evidence and in some cases fills in important gaps. Often, studies in historical archaeology are considered complete at this point. However, it is possible to take the study further by proposing a preliminary ecological model to explain the observed events. This model can be discussed in five ecological/temporal stages:

Stage I (1769-1792) Taggart and Emmons settled on the valley bottom farms in order to take advantage of the most productive soils in the area.

Stage II (1793-1800) The first mills were built downstream of valley bottom farms affecting the watercourse and possibly the water table. The site closest to the mills was abandoned and never reoccupied, but the Emmons Site continued to be occupied. This suggests that the mills may have had an adverse impact on agriculture in the valley bottom.

Stage III (1800-1840) Industrial activity increased in the valley bottom and the West Ridge was settled to support larger population and to increase acreage in pasture for sheep. Construction, heating and industrial needs for wood (such as charcoal, feedstock for lime burning) stimulated cutting of the standing forest crop. However, acreage available for woodlots fell as sheep herds increased. Sheep

TABLE 1

SETTLEMENT AND LAND USE, MIDDLEFIELD, MASSACHUSETTS

1769-1901

Date	Valley Bottom	Ridges	Population
1769	Taggart Site occupied		N.D.
c. 1780	Emmons Farm occupied	Middle Center occupied	N.D.
1792	Taggart Site abandoned		608
1793-1800	First mills in Blush Hollow	Silas Bush Site occupied	877
1808-1831	Woolen Industry expands including workers' housing		822
1840-1845	Factory Brook dammed	Maximum Sheep Herds	1717
1874	Dam bursts Mills damaged Emmons Farm abandoned		603
1901	Dam bursts Blush Hollow abandoned	West Ridge Sites abandoned	410

Sources: Thorbahn, Paynter and Ulrich, 1975.

Smith and Smith, 1924.

are especially destructive grazers and pressure on ground cover would also have increased. The combination of decreasing forest cover and grazing pressure may have led to increased soil erosion and greater seasonal variation in stream flow as uphill runoff increased.

Stage IV (1840-1873) Human and animal populations reached their peaks in the 1840's. Likewise, the adverse environmental impact on soils, vegetation and hydrology of the valley and ridges were at their maximum. Damming of Factory Brook may have been in direct response to increasing variation in the uncontrolled stream flow due to a lower water table and higher seasonal run-off. However, this also had the effect of removing valuable acreage for lumber and sheep pasturage which would have further increased pressure on the remaining land. Most of the remaining land was on the ridges which was more ecologically fragile than the river bottom. Population decline was precipitous from 1840-1850 (1717-737). In comparison to 1800's population of 877, it is clear that although more land was occupied along the east and west ridges, it was supporting fewer people (even including the workers living in the mill complex in the valley). The environmental degradation of the previous five decades certainly played a part in the population decline. At a minimum, soil quality and quantity were declining because of erosion.

Stage V (1874-1901) The immediate cause of the dam failure was a freshet after a day of torrential rain. However, increased silting behind the dam from slope erosion could have combined with increased runoff to have gradually weakened the dam leading to the breach of July 12, 1874. It may be significant that the mills of Blush Hollow were rebuilt but Emmon-Smith Farm above the reservoir was abandoned after the dam collapse. By the late 1800's, the environmental risks of farming the valley bottom may have simply been too high. The final breach of the dam in 1901 was the last event in over a century of environmental degradation. From 1875 to 1900 population declined slowly from 603 to 410. This suggests that the economic disaster of 1874 was less important than the long-term effects of industry and land use on the environment around Factory Brook.

This model certainly accounts for more of the data than explanations based on isolated historic events. Yet how general is its application to New England as a whole? This is difficult to assess since archaeological studies of nineteenth century New England communities are few and far between, but there is evidence available for Sandwich Notch, New Hampshire, in the foothills of the White Mountains.

Between the years of 1803 and 1884, the road through Sandwich Notch and the surrounding hillsides fostered a community which at its peak in

1830 contained as many as 32 families (Sandwich Historical Society 1935:3). The Notch population supported at least three schools, two sawmills as well as a tavern. However, by the end of the 1880's, the Notch was virtually abandoned leaving behind little evidence of its demise.

The Sandwich area itself was first explored by hunting parties in the early 1760's. One such hunting party led by Israel Gilman, Jacob Smith and Simeon Smith provided the first permanent European settlers to the area. These three men and their families along with others started farming the valleys or intervales as early as 1763. During these early years settlement appears concentrated in the valleys as opposed to the surrounding hillsides considered by some to have been the primary focus of initial occupation (Goldthwait 1927:532).

It was not until 1803, with the completion of a road through Sandwich Notch, that settlement of the surrounding hillsides began in earnest. By the early 20's and 30's, the Notch was a bustling community based on a widely diversified economy. While the majority of these earlier settlers were subsistence farmers, they also incorporated the cultivation of apple orchards, maple syrup production, sheep herding and cattle grazing. Some of the more adventurous inhabitants experimented with crops such as coffee, tobacco, and the raising of silkworms (Sandwich Historical Society 1835:13).

The Notch Road itself acted as a commercial artery for the farm goods of Vermont and western New Hampshire. During the late fall and early winter steady streams of teamsters travelled through the Notch carrying "meats, hides, tallow, potash and other farm products toward Dover and Portsmouth" (Sandwich Historical Society 1935:7).

By 1830 the Notch community was prosperous and economically stable. The combination of a diverse subsistence base and the commercial traffic through the Notch seems to have provided, up to this point at least, the necessary elements for surviving in the harsh environment.

However, soon after 1830, the population begins to decline. This depopulation, which was virtually complete 30 years later, has been attributed to a number of factors. A severe blizzard in 1852 was considered responsible for the routing of many of the Notch families. High import tariffs, the expansion of industry and the railroads are all explanations often suggested for the decline of rural populations such as that of Sandwich Notch.

In comparing the chronologies of settlement and abandonment of Sandwich Notch and Middlefield, it is striking how similar the sequence and timing of events were in these widely spread communities. However, the economies were quite different. Middlefield was a specialized, rural industrial community while Sandwich Notch had a diversified economic base of subsistence farming, cash cropping, light industry and activities related to the road through the Notch such as the tavern.

It is difficult to see how different economic processes could have exactly the same effect on these two communities. Yet the two villages were in very similar environmental settings. It is possible that similar ecological processes were involved in the collapse and depopulation of these upland communities.

Archaeological investigations conducted in Sandwich Notch during the summer of 1976 provided evidence which tends to support the ecological hypothesis. On a number of sites including the three dwellings tested in 1976, complex systems of terraces were developed to support the building foundations. These terraces were constructed of fieldstone and earth. In some cases they were up to 400 x 400 feet in size and up to six feet in depth.

Excavations in and around the terrace which surrounds the Colonel Lewis Smith dwelling indicate erosion may have been an increasing problem over the span of occupation. The site itself, which was occupied from approximately 1805 to 1884, exhibited one of the most elaborate terraces found within the Notch. Initial testing indicated that in addition to the terrace a large trench was dug around the foundation and filled with large field stones and trash. Ceramics from the deposit were mean dated to 1852 which suggests, considering the factor of ceramic time lag (Adams and Gaw 1977), that the terrace alteration was completed sometime after this date. In addition, a trash deposit unearthed at the base of the terrace wall contained primarily late creamwares and red earthenwares. Neither of these ceramic types were recovered from excavations around the foundation. This suggests that the terrace was constructed prior to 1852 and that the activity around the house was not part of the original construction. It is our contention that such alterations are examples of the increasing erosion problems the Notch inhabitants would have experienced.

Documentary evidence also supports the archaeological interpretation of severe erosion in the Notch after the period of first settlement. Contemporary sources note that later homes had to be placed on the higher areas of the Notch where spring runoffs would create fewer problems (Sandwich Historical Society 1935). Additionally, it was only the homesteads at the highest points in the Notch that were inhabited throughout the period of community occupation. In other words, the downslope sites, which were most likely to be affected by erosion, were the first to be abandoned (Ingle and Mrozwski 1976).

One resource which was necessary for all Notch inhabitants was wood. Wood provided many of the raw materials for building homes and barns. It also furnished all the energy needed for the heating of the homes and the preparation of food. As noted by Hindle, "man's dependence on wood was ubiquitous, not only in America but throughout the part of Europe from which settlers came" (1975:3). Colonel Lewis Smith, an early Notch resident, also burned wood to make charcoal for market (Sandwich Notch Historical Society 1935).

The need to clear the hillsides of wood was also increased by demand for agricultural and grazing land. Sheep were abundant throughout the notch and large expanses of hillside were cleared for their pasture.

Recent experiments conducted within the Hubbard Brook Experimental Forest, which is located a few miles from Sandwich Notch, have indicated that widespread cutting and clearing severely affect the hydrology and nutrient content of soils. The conclusions of the study demonstrate that rapid deforestation: 1) increases the annual water runoff by as much as 39%, 2) greatly increases the export of dissolved nutrients from the deforested ecosystem due to an alteration of the nitrogen cycle, and 3) significantly increases soil acidity (Likens and others 1970:45).

Flannery has suggested that "to be useful a model need only organize a body of disorganized data in such a way that hypotheses can conveniently be tested, accepted, modified, or rejected" (1972:107). Our simple ecological model seems to meet this criterion for both the Middlefield and Sandwich Notch data. In general terms, historical settlement and land use of rural New England can be divided into four stages which correspond to hypotheses:

1. Initial settlement by largely self-sufficient subsistence farmers during the late eighteenth century led to removal and alteration of the natural, stable vegetation communities. In upland regions these would have been communities within the Hemlock-Northern Hardwood Association (Braun 1952). The resulting alteration of soil nutrient balance would have been localized to the deepest, most fertile soils, and would have little effect on the equilibrium of vegetation, soils and hydrology of a total ecological community.

2. Around the beginning of the nineteenth century, the rural communities became increasingly tied to regional, urban-oriented markets. A combination of increasing population and increasing intensity of resource exploitation brought more marginal areas into the settlement pattern. This accelerated alteration of forest communities, especially at higher elevations and on steeper gradients. At this point, large scale perturbations in nutrient and hydrological equilibria resulted in rapid environmental degradation.

3. In the second and early part of the third quarter of the 1800's, declining environmental quality reached a critical level. Larger areas of land supported fewer people. Soil quality was decreasing and soil erosion was increasing. Regardless of what the local economic base was, rural New England began to lose population.

4. In the last half of the century, whole communities were depopulated, or at the very least, the populations had fallen below the levels prior to expansion of rural industry and agriculture in the early nineteenth century. This suggests the ecological system had reached a new equilibrium which could support few, if any, people.

We recognize that this model is at best preliminary. It is based on initial survey of two upland rural communities. However, it is known that between 75% and 85% of the southern half of New England had been deforested by 1850. In contrast, over three-quarters of New England is presently covered with second growth forests, and the rate of reforestation is outstripping the clearing of woodlands as urban populations stabilize or slightly decline (Jorgensen 1971:140-142).

It is precisely in these abandoned, second growth woodlands where eighteenth and nineteenth century archaeological sites can be found. Analysis and interpretation of these rural sites in an ecological framework hold the potential for major contributions to our understanding of New England history and human ecology.

This is not to say that traditional socio-economic interpretations are valueless. On the contrary, there is solid evidence that economic opportunities in areas west of New England were stimulating emigration early in the nineteenth century, long before the effects of our postulated environmental degradation would have been important (Bidwell 1916). We are only pointing out the fact that complex processes do not have simple explanations and that a variety of social, cultural, economic and ecological variables must be considered before a clear understanding of New England's past can be constructed.

The rationale for this approach need not be purely academic. An immediate application would be the development of an integrated framework for the analysis of cultural resources identified in public conservation archaeological surveys. Additionally, it may become important to identify environmental problems that have occurred in New England over the past three centuries because there have been a series of recent proposals, advocating increased use of wood and water power as energy sources in New England. There is even a pilot project aimed at the reintroduction of large scale sheep herding in the region (New York Times July 16, 1978, p. 26). A common thread that runs through these proposals is the argument that wood, water power and sheep were economically successful during New England's history. Our analysis indicates that these were primary factors in bringing about an environmental crisis in rural New England. The ultimate irony of history may not be that it repeats itself but that there is no need for the repetition.

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