

Field Clearing: Stone Removal and Disposal Practices in Agriculture & Farming

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with a Case Study of Stone Removal Activities in Joshua Hempstead's Diary by Mary E. Gage

Abstract

Using descriptions of field clearing activities drawn largely from 19th century agricultural literature, this paper details the methods, tools, and different options farmers had for removing and disposing of stones found in their fields. The paper also presents a case study of field clearing activities as described in Joshua Hempstead's diary (1711-1758). Based upon an analysis of these period sources, the authors argue there is a need for scientific testing to distinguish agricultural field clearing stone piles from Native American ceremonial structures.

Introduction

Field clearing involved (a) cutting down the trees; (b) the removal and disposal of stumps, stones, & brush; (c) the filling of holes and leveling the surface as needed; and (d) breaking the ground. It was a labor intensive and time consuming process. American farmers employed a number of different approaches to accomplish this task. Some farmers completed the entire field clearing process over a number of weeks, while others spread the task out over a several year period. The order in which these steps occurred varied from one farmer to another. For example, some farmers broke ground and sowed seeds before removing the stumps and stones, while others completed the clearing process before cultivating the land. Although farmers drew from the same basic pool of techniques and tools, field clearing was far from a standardized practice. Period agricultural journals and manuals indicate American farmers engaged in a diversity of field clearing practices.

This diversity and complexity of practices is in particular evident in a subset of the field clearing process - stone removal and disposal practices – which is the focus of this study. The purpose of this study is to document through period historical sources all the aspects of this subject and to place them in context. Context in this study means both the context of American agricultural practices and, more specifically, the context of the collected body of references. It is tempting to single out one or two sources, but to do so is to remove it from this larger context. Given the diversity and complexities of practices, a single source may or may not be representative of the larger trends in American agriculture. Joshua Hempstead of New London, Connecticut kept a diary for 47 years (1711 to 1758). There are extensive references in the diary to a wide range of stone related activities and, therefore, the diary serves as an excellent case study.

Study Methodology

This study is based upon an intensive search of Google Books, Cornell's *Core Historical Literature of Agriculture*, and genealogybank.com's historic American newspaper database using keyword and phrase base search strategies. The search primarily covered the 1700-1920 time period. An initial read through of all the sources was conducted. Based upon that initial assessment, a list of key components of the stone removal and disposal process was developed. These components form the major subheadings used in this study. Each source was subsequently reread to evaluate what information it had to contribute and that information tracked on individual data collection forms for each source. In addition, a search was made of the Library of Congress of Prints and Photographs database searching for relevant Farm Services Administration photographs (FSA) from the 1930s and 1940s.

The focus of the study was on the northeastern United States and, secondarily, on other regions of the United States. A total of 48 northeastern and 13 other U.S. references were found. The search also resulted in finding references to field clearing practices in Great Britain, Scotland, Ireland, and Canada. A sampling of examples from these non-United States sources was obtained. All of these source materials were compiled and are available at www.stonestructures.org/field-clearing-sources.html.

Agricultural Lands

Archaeologists and other researchers have noted that approximately 70% of the land in southern New England was part of farms or other agricultural lands. This statement is factually correct but needs to be qualified and placed into context. New England farms had a mix of different land uses. These different land uses have a direct bearing on the discussion of stone removal and disposal activities as will be demonstrated shortly.

Massachusetts conducted a state-wide census including a highly detailed agricultural census in 1875. The agricultural census defined four major classes of farm land and defined them as follows:

"By Land under Crops is meant all land from which any crop, including hay, was harvested ... Unimproved Land comprises all land devoted to pasturage and other purposes than actual cultivation, and which may be made arable and is capable of improvement other than clearing. By Unimprovable Land is meant that which is absolutely incapable of cultivation. ... Woodland includes all that is actually wooded."¹

In one table the census groups *Land under Crops*, *Market Gardens*, *Nurseries*, and *Orchards* under the heading of *Cultivated Lands*. The census provides separate statistics for hay crops and acreage, which allowed the *Land under Crops* to be further subdivided into crops and hay. Table 1 summarizes those statistics. The statistics reveal a strong emphasis on livestock farming. Nearly 20% of the farm land was devoted to hay production and 43% was used for pasturage (63% total). Crop production accounts for only 6.3% of farm land usage. Woodlands including woodlots account for 27.4% of the active farm land.

¹ Wright 1877: 229.

| Land Usage | Acres | % farm land |
|-----------------------------------|-----------|-------------|
| Cultivated Land (Total) | 912,521 | [26.82%] |
| Land under Crops (Total) | 882,179 | [25.93%] |
| Crops | 213,996 | 6.29% |
| Hay | 668,183 | 19.64% |
| Orchards | 25,617 | 0.75% |
| Market Gardens & Nurseries | 4,725 | 0.14% |
| Unimproved Lands (pasturage, etc) | 1,469,988 | 43.20% |
| Unimprovable Land | 89,457 | 2.63% |
| Woodland | 930,402 | 27.35% |
| Total Farm Land | 3,402,368 | 100% |

Table 1. Classification of Agricultural Land Usage in Massachusetts in 1875. NOTE: Total State Acreage 4,992,000 (from census); Farm land as percentage of whole State 68.16%.

Rationale for Stone Removal

Clearing stones from agricultural land was a labor-intensive and time-consuming process. For farms that employed hired labor to perform this task it also involved a financial expense. Some farmers carefully considered the reasons for removing the stones and, in some cases, conducted a cost-benefit analysis to assess whether a particular piece of land was worth clearing. (Would the value of the crops or hay grown on the land justify the initial expense of clearing it?) However, for most farmers the reasons for removing stones were simple and practical.

Obstruction to and Interference with Cultivation

This is the most often cited reason for stone removal. The farmers used this as a broad catch-all reason to encompass more specific reasons like damage to equipment, increased labor, and additional time needed to plow rocky soils.²

Damage to equipment

In plowed fields farmers were concerned about the damage caused by plows striking subsurface rocks. It could take a day or more to have the damaged equipment repaired, which resulted in a valuable loss of time. In hay fields scythes could be dulled or nicked by strike with a stone. This required the farmer to stop and sharpen the scythe or grind out the nicks. Stones could easily damage

² Commissioner of Agriculture 1868: 6; Shaler 1895: 310; Platt 1873; Connecticut State Agricultural Society 1858: 206; Anon 1858: 801; Anon 1879; Anon 1881; Anon 1886; Anon 1886a; Myers 1922: 357.

hay mowing machines, which came into use in the mid-1800s on some farms.³ Mr. French of Exeter, New Hampshire expressed these concerns:

“Clear your field as you will in a stony region, some round pebble will rake your scythe from point heel, every swath, and occasionally the point of a fast rock will break such a gap in the edge, as will send you groaning to the grindstone. And as to mowing machines, the effect of contact with stones with one of them is too painful to be more alluded to.”⁴

Increased labor, time and difficulties caused by presence of stones

Fields that had not had their stones removed required more labor and time to plow than one that had been cleared of stones.⁵ The farmer needed to plow slower to avoid hitting visible stones. Sometimes a second oxen or horse team was added to overcome the increased resistance caused by the presence of stones. For example, Mr. French of Exeter, New Hampshire states:

“We use nearly double the team in plowing, and the plow groans and labors constantly, as if passing through a stone heap, and every new breaking up of the sward brings to light a few loads more of the hidden rocks.”⁶

Benjamin Butler of New York used three teams of oxen to break ground in a new field filled with stones.⁷

Cost-Benefit Analysis

Some but not all farmers kept detailed account books and analyzed their operation costs and revenues for the farm many times breaking it down by individual fields. They tracked field clearing, fencing, manuring, plowing, etc. costs along with crop or hay yields, to which they assigned fair market values. Some farmers conducted a cost-benefit analysis before purchasing new lands, abandoned farms, or clearing a new field on their property. They evaluated the initial costs for field clearing, including stone removal, against anticipated financial gains. These financial gains could be calculated several different ways: (1) value of the 1st year's crop, (2) value of crops over a 5 to 10 year period, (3) increased land value of the field, (4) increased overall real estate value of the farm, and (5) value of the stones removed in terms of their usefulness on the farm or as a saleable commodity.⁸

For some farmers the cost benefit analysis was based upon non-financial goals. The *St. Albans Messenger* in Vermont wrote in an annual column devoted to fall work on the farm:

³ French 1855: 463; Anon 1979; Anon 1886; Olive 1899: 4 (reference is to damaged equipment caused by stumps rather than stones but the principle is the same).

⁴ French 1855: 463.

⁵ French 1855: 463; Holbrook 1851: 35; Shull 1870: 747; Butler 1863: 209.

⁶ French 1885: 463.

⁷ Butler 1863: 209.

⁸ Holbrook 1848: 105; Shull 1870: 747; Platt 1873: 125-136; Connecticut State Agricultural Society 1858: 206; Manning 1887: 133; New York Agricultural Society 1854: 288-289; Emery 1855: 113-114; Anon 1886a.

"Sometimes it will cost as much as the land is worth to remove the stone, but after it is done the satisfaction of having accomplished it and got the fields in a condition in which they can be cultivated, and crops harvested easily and cheaply, will repay for the needed outlay."⁹

Chas. Manning of Methuen, Massachusetts wrote an "Essay on Reclaiming Rocky Pastures" in 1887. He noted that cost of clearing rocky pastures so they could be cultivated exceeded the value of the crops grown on it. Many Essex County farmers were reluctant to expend capital on these areas of their farm for this reason. He argues these rocky pastures will prove "to be a much greater damage to the appearance and selling value of the property than what the income of the same land when cleared would seem to justify."¹⁰ Manning found a creative solution to this problem: he sold the field stones suitable for building purposes in a nearby town where there was demand for stones for house cellars, factory foundations, bridges and other construction projects. The sale of the stone offset the costs of removing it from the field. It is unclear at present as to how wide spread the practice of selling field stone was.

At an agricultural meeting in Connecticut in 1873, George Platt did a short presentation on clearing rocky land. This was followed by a lively discussion by audience members for which a transcript was recorded. This discussion covered a range of topics including costs and benefits of clearing rocky lands. Audience members expressed a diversity of opinions on the subject. Mr. Hubbard was opposed to clearing any field of "largely occupied rocks" on the grounds there was a sufficient amount of better quality land to work. Mr. Rockwell testified a $\frac{3}{4}$ acre field he cleared increased in value from \$25 an acre to \$150. (He qualified this by noting he cleared the field for his own purposes rather than for increased market value.) Mr. Gold pointed out the farms in Litchfield could not survive without clearing rocky land; it was a necessity. Mr. Hart argued that the first crop should pay for the expense of clearing the land. Mr. Norris, who lacked the skills to keep detailed farm records, was satisfied if he had sufficient crops to feed his family for the year and sell the surplus to pay his bills. This wide diversity of opinions and practices is reflective of American agriculture in general.

In an 1883 article, Phinneas Whittier conducted a cost-benefit analysis of Maine farms in general:

"In other sections with an equally fertile soil, but so encumbered with rocks that it costs more to prepare it for cultivation than the land is worth after it is prepared, the farmer who is prosperous is the exception. ... On such farms, where improved machinery cannot be well used, the high price of labor bears heavily, and this with decreasing fertility, and the competition of the West growing stronger every year, farming in the old way on such soils [is] a very discouraging business."¹¹

Whittier came to the conclusion the solution was not to pursue clearing of stones but rather to convert those farms to orchards and to graze merino sheep in the orchards. Fruit trees do well in rocky soils, the sheep keep the orchards "mowed" and the wool provides a cash crop in addition to the fruit production.

⁹ Anon 1885.

¹⁰ Manning 1887: 133.

¹¹ Whittier 1883: 260.

Social Expectations

Social conformity and a strong work ethic are major themes associated with New England society. Surprisingly, there is little evidence that these social expectations played a significant role in the decision making process for clearing stones from fields. There are only two references in the literature and both focus on a lack of a proper work ethic. An old farmer from Danvers, Massachusetts wrote "I cannot but think, that *any apology* for not removing them [stones], must be the prompting of a *spirit of laziness*."¹² Mr. Durand of Derby, Connecticut complains:

"In many parts of Connecticut, old rail fences may be seen three or four feet high, while the stones are so thick that you may travel on them from one field to another. I consider it the most miserable and shiftless economy in the way of fences and cultivation that the Connecticut farmer has yet accomplished."¹³

These are the only two sources to address social expectations. Farmers focused on the more practical considerations for stone removal.

What Types of Farm Lands Were Cleared of Stones?

Of the 61 American sources used in this study, 29 (48%) mention the type of farm land being cleared of stones. Although this sampling is small, the results almost exclusively indicate that only crop and hay fields were subjected to stone clearing activities. There were two references to clearing stones from an orchard. (One of those sources, Joshua Hempstead's Diary, noted that the stones were removed for the purpose of stone wall construction rather than for the purpose of clearing.) This is not surprising given the prevailing 19th century opinion that orchards did better on rocky land.¹⁴ There were no references to stone removal on pasturage. This finding is consistent with old photos showing stones in pastures. The reason for not removing stones from pasture is simple; the livestock could graze around the stones. (It should be noted that some pastures were part of field rotation systems where the field was alternately used as hay field and pasturage or even for crops.) The reason for a lack of references to stone clearing in woodlots is self-evident.

Stone removal and disposal activities were labor-intensive and time-consuming. Farmers had very specific reasons for clearing stones from a piece of farm land. These reasons include obstructions to cultivation, equipment (plow and scythe) damage, and increased time and labor when plowing or haying. The majority of reasons were related to plowed fields and hay meadows, which is consistent with the types of land being mentioned in regards to stone removal activities. Hay meadows were generally plowed at least once to break up the ground and seed it with the British grass species that many farmers preferred. Stones in hay field were an obstruction both the plow and scythe.

According to the 1875 Massachusetts agricultural census "land under crops" (i.e. cultivated fields and hay fields) constitute about 26% of agricultural lands. This has important implications. Only ¼ of all farm land was a candidate for stone removal and disposal activities. Both cultivated fields and hay

¹² Anon 1855: 261.

¹³ Durand 1851: 244.

¹⁴ French 1855: 463; Whittier 1883: 261.

fields were plowed one or more times. Plowing creates plow scars and a “plow zone” which can be identified archaeologically. The presence or absence of a plowed field can be scientifically tested.

| Farm Land | # of References |
|-----------|-----------------|
| Crops | 21 |
| Hay | 12 |
| Orchard | 2 |
| Pasturage | 0 |
| Woodlot | 0 |

Table 2. Twenty-nine period sources mention the type of farm land being cleared of stones. This table shows that pasturage and woodlots were not cleared of stones.

Stone Removal and Disposal Process

The clearing of stones from fields was a three step process: (1) removal; (2) transportation; (3) disposal. Occasionally, an intermediate step involving the temporary storage or stockpiling of stones either in the field or at a construction site occurred. The temporary storage of stones in a field occurred when the farmer intended to wait for more favorable field conditions (ex. dry or frozen /snow-covered) before dragging or carting the stones off. Stones were stockpiled at a construction site in anticipation of building a stone wall, cellar, or other project.

The three step process could take place in a single day, or over several days, or be spread out over the course of a year or two. It was common practice to combine stone removal with stone wall building, farm road repairs, subsurface drainage, or other construction projects. Farmers found it was efficient, convenient and cost effective to remove the stones, haul them to the project location and make use of the stones in constructing the wall or drains as part of the same operation. This avoided the time and labor of creating intermediate storage or stockpiles of stones and the inconvenience of having those piles in the field (having to plow or hay around them).

Step 1 – Stone Removal

Farmers used a variety of methods and techniques for removing stones. The method(s) they chose were in part influenced by their personal preferences, what equipment they had, their skills, size of the stones and the number of farm hands they had assisting them. The objective was the removal of all the stones that would be an obstruction to the cultivation or haying of the field.

Stone Size

Farmers seem to have had a generally agreed upon idea of what size stones constituted an obstruction. For example, Mr. Kelsey of Bucks County, Pennsylvania wrote, “[I] say to plowman, take out every stone of sufficient size to disturb the plow.”¹⁵ Unfortunately, since this was a generally well

¹⁵ Kelsey 1860: 123.

known detail, farmers for the most part did not elaborate. References to the actual size (dimensions or weight) of stones being removed, especially the minimal size of stone, are rare in the literature. One of those rare references comes from Mr. Phinney of Lexington, Massachusetts, who removed stones that weighed 10lbs or more.¹⁶ Mr. Hart of Connecticut stated, "The first crop of stone had been taken off, from small stone, suitable for filling up interstices in the walls, up to stone that a single pair of oxen would draw."¹⁷ The size of stones used to fill the "interstices" of a wall varied according to the preferences of the wall builder but was generally less than 12 inches in length. The minimum length is harder to ascertain. Mr. Platt speaking at an agricultural meeting in 1873 made an interesting statement:

"When mowing machines first came into use, our meadows, cultivated land, and pastures were all encumbered with small stones and rocks too large to be removed easily, the intermediate size having been removed by my ancestors. We saw at once that in order to have the mower work well, it must have a smooth, unobstructed surface, and began at once to pick up by hand and cart off the small stones, and to roll out the smaller rocks with oxen, and raise the large ones with a Lyon rock lifter, which was owned in the neighborhood."¹⁸

Mr. Platt noted that prior to the introduction of mechanized farming machinery stones below a certain size which he refers to as "small stones" were left in the fields. The large stones were likewise left probably due to the inability to remove them. This problem was solved when the neighborhood pooled their resources and purchased a Lyons rock lifter.

The literature only offers very limited assistance in determining the size of stones being removed, especially the minimum size. Another approach to evaluating the size of stones removed during field clearing on any given farm would be to measure the size of stones in the stone walls. Numerous period sources talk about disposing of field clearing stones in walls.

Time of Year

The few references in the literature to the time of year emphasize the spring and fall as the primary time for stone removal.¹⁹ Basically, the stone removal occurred before or during preparation for planting in the spring and after harvest in the fall. Joshua Hempstead's diary indicates that stone removal took place at other times during the year. During one particular mild winter, stone removal activity took place in January.

The time of year that stone removal activities took place was dependent upon a number of factors. Some stone removal activities were timed to coincide with building projects like stone walls or subsurface drainage. The availability of labor, tools, and transporting could also affect the timing. Fields actively being cultivated or hayed could only be cleared before the crop was seeded or after harvest or the hay was cut. The condition of the ground affected the ease of digging and pulling stones

¹⁶ Holbrook 1848: 105.

¹⁷ Platt 1873: 128.

¹⁸ Platt 1873: 117.

¹⁹ Holbrook 1858: 105; Russell 1854: 491; Smith 1900: 123; Platt 1873: 119; Anon 1879; Anon 1886, Anon 1886a; Mann 1887: 136.

out of the ground. Some farmers preferred to remove stones when the ground was soft and wet.²⁰ Weather and temperature could also be a factor. Frozen ground and snow prevented stone removal during the cold winter months but was ideal for sledding stones off the field.

Removal Methods

Gathering (Hand Picking) Loose Surface Stones

The simplest approach was to gather all of the loose stones from the surface of the field. It involved hand picking the stones and loading them into a cart or onto a stone boat or placing them in a pile for removal at a later date. The stones could either be lifted by hand into the cart or rolled onto a stone boat.²¹

Plowing up Stones

In New England, the stones occur both on the surface of the soil and intermixed with the soil. It was common practice when breaking new ground to combine it with stone removal. The ground was plowed slowly, generally with two to three teams of draft animals. The stones were plowed to the surface and removed. If the plow hit an unmovable stone it was marked and subsequently dug out with shovels. Because of the freeze/thaw cycle stones continued to work their way to the surface for a number of years after a field was opened up. Stone removal during plowing continued for a number of years after the initial ground breaking process.²²

Digging and prying the Stones Out

Stones partially or completely below the surface of the ground needed to be dug or pried out with shovels, crowbars and pickaxes. The subsurface stones were generally discovered when the plow hit them.²³

Probing

The probing technique involved pushing a crowbar into the ground in search of subsurface stones. A stone was detected by the noise it made when it struck the stone and the jarring of the crowbar. The technique is mentioned in the 1823 edition of the *Encyclopedia Britannica* and as being a "custom of Yorkshire" Scotland. This technique seems to have been rare in the United States. There is only a single reference to it (Massachusetts).²⁴

Splitting Large Stones

Large boulders in the field that were too large to be dug out and drawn off presented a special challenge to farmers. They basically had three options: (1) dig a deep hole next to the boulder and tip into it, (2) split the boulder into smaller pieces, or (3) leave it in the field. All three approaches were used. Given the difficulties of removing these boulders a number of detailed explanations for splitting them were published. One advantage of splitting the boulders was it provided pieces of stones with one

²⁰ Mann 1887: 136.

²¹ Smith 1900: 123; French 1858: 463; Platt 1873: 117; Anon 1881.

²² Holbrook 1848: 107; French 1858: 463; Kelsey 1860:123; Anon 1881; NY State Agricultural Society 1854: 288; Butler 1833: 209; Breck 1845: 19.

²³ Kimball 1857: 105; Anon 1881; Anon 1875; Board of Trustees 1868: 360; Mann 1887: 135; Fohl 2003: 13.

²⁴ Loudon 1825: entry #4167; Sleeper 1860: v.1 p.256.

or more flat faces suitable for building projects. The boulders could be split using the fire method, hammering wedges into existing cracks, quarrying the boulder, or blasting. Blasting by far was the most discussed method in the literature.



Fig. 1 – Field boulder quarried with the plug and feather method (South Hampton, NH).

Fire Methods

Fire was used to split stones as early as the 1600s in New England and continued to be used into the late 1800s. There are a number of different variations on the technique. The basic concept was to heat the stone and either (a) pour cold water on it, (b) hit it with a heavy object (sledgehammer, drop cannon balls, etc.), or (c) allow it to split on its own. The fire was usually placed on top of the boulder along the line of the intended fracture. It could also be built around the base of the boulder but this was not common.²⁵ The amount of time it took varied by the intensity of the fire and type of rock. The boulder could split in as little as 15 minutes or take several hours. S. Edwards Todd wrote in *The Young Farmers' Manual* (1859):

“Now in order to break them in pieces of a desirable size, let little fires be made with hard dry wood across the stone where it is desirable to break it, and in a few minutes a seam will be formed so that a crowbar will easily separate them. We have often broken large flat stone very true and straight with fire, by laying a scantling about four inches wide on the place where it is to be broken, and then shovel dirt on both sides of the scantling about an inch in depth. Take up the scantling and make a fire with short pieces of dry wood, split very fine, the whole length of the stone where it is to be broken. Small hard wood chips are the most convenient article to make a fire with in such a place. The dirt is to prevent the fire from heating the stone on each side of the line where it is desirable to have it broken. If the fire burns uniformly entirely across the stone, it will require but ten or fifteen minutes before it will crack.”²⁶

Quarrying (Plug & Feather Method & Flat Wedge Method)

In 1790 Samuel Deanne wrote:

“Another method of breaking rocks, which ought to be generally known, and which sometimes turns out cheaper, is this : Drill two holes in a stone, ranging with the grain, when that can be discovered by the eye. Then filling each hole with two semi cylindrical pieces of iron, drive a long steel wedge between them. The stone will thus be split open. And, commonly, very regular shaped pieces for building may be thus obtained.”²⁷

²⁵ Gage & Gage 2005: 17-18.

²⁶ Todd 1859: 67-68.

²⁷ Deanne 1790: 268-269.

This is a description of an early version of the plug and feather method. It only used two to three drilled holes along the length of the split whereas the modern version uses holes spaced every 6-7 inches. To distinguish between the two versions, the earlier is referred to as the “farmers” and the later as “commercial”. The commercial version was developed after 1800 and prior to 1824.²⁸ The farmers’ version, based upon known archaeological examples, only saw limited usage. Deanne acknowledged it should be better known. It wasn’t till the development of the commercial version that farmers embraced this method of splitting boulders. Examples of quarried boulders on 19th century farm sites are quite common.

The flat wedge method works upon a similar principle of driving a wedge between two shims in a series of holes cut along the length of the split. The holes are narrow as viewed from the top and trapezoid shaped when viewed from the side. They were cut with a cape chisel. The wedge and shims are thin and flat. The method was developed in the Danvers/Lynnfield area in Massachusetts prior to 1800 and introduced in the Quincy quarries in 1803. The method spread rapidly from there.²⁹



Fig. 2 – Typical remains of a 19th century blast hole after a field boulder was blasted.

pieces of stone for farm-related building projects.³⁰ Other farmers quarried boulders on a seasonal basis and sold them in their local communities or to stone dealers.³¹

²⁸ In our book *The Art of Splitting Stone* we had stated the commercial plug and feather method was developed in 1803. This was based primarily on an 1859 speech by Shaw. New information now suggests Shaw confused or misunderstand what Lt. Governor Robbins had originally explained to him. The method that Robbins was instrumental in introducing in the Quincy quarries in 1803 was the flat wedge method. The commercial plug and feather method (based upon firmly dated buildings) had come into usage in the commercial quarries at Quincy and elsewhere prior to 1824.

²⁹ The earliest dated example of the flat wedge method is the Unitarian Church in Newburyport whose foundation was completed in 1800 (Gage & Gage 2013). For a more detailed description of how the flat wedge works and illustrations of the tools please see Gage & Gage 2005: 41-46. Information on the originals of the methods came from unpublished research of the authors.

³⁰ A good example of this is the farm on Bugsmouth Hill in South Hampton, NH. This site has examples of both versions of the plug and feather method. See Gage & Gage 2005: 32-35.

³¹ A good example of this is a farm now located on the Burns Wildlife Management Area in Newbury, MA. The boulder quarried extends to east, north and west of the maintenance buildings and contains examples of flat wedge method, plug and feather method, and blasting. For more information on stone dealers and selling of stone by farmers please see Gage & Gage 2014.

Blasting

The blasting method was introduced into Great Britain in the 1670s from Germany and made it into the American colonies by the 1730s, if not earlier. The earliest American references to blasting boulders are found in Joshua Hempstead's diary. On August 26, 1730 Joshua wrote, "I Split a Rock with Powder & turned it into mr Coits Stone wall." The earliest dated example of a blast hole is found in the ledge in the cellar of the Nathaniel Hempsted House in New London, CT built in 1759. Samuel Deanne mentions blasting in his *New-England Farmer: Or Georgical Dictionary* (1790) "Stones that are very large, and which cannot with ease be removed whole, may be blown to pieces with gunpowder."³² Blasting is mentioned in a number of 19th century agricultural references but details of the methods are generally not given.³³ It is unclear how much of the blasting was being done by the farmers and how much was being done by skilled workman. It is likely the skills were learned from hands on training rather than from written instructions in a book.

The basic process of blasting was fairly straight forward. If the boulder was partially or completely buried the earth needed to be dug away from it otherwise it would absorb part of the blast reducing its effectiveness. A hole was drilled towards the top center of the boulder with a plug or star drill. The hole was filled between 1/4 and 1/3 of length with black powder. A thin rod was placed in the center of the hole and a tamping material usually sand or clay packed into the hole around the rod. The rod was removed, the resulting channel was filled with powder to form a fuse, and a trail of powder extended from the top of the channel across the boulder. This was ignited.³⁴

Tools for Removing Stones (Stone lifters, cant hooks, and grapple hooks)

Farmers had a number of different tools available to them for pulling boulders out of the ground, and lifting them so they could be placed in a wagon, cart, or stone boat or placed into a stone wall. Knowledge of these tools was sporadic judging by the fact the various publications included detailed descriptions with illustrations of how to make them and the fact that many farmers struggled with the removal of large stones. Some of the tools could be made by the farmer or local blacksmith. Some of the stone lifters were commercial products based upon patents. What follows is a sampling of some of the tools.

Grapple Hook

According to S. Edwards Todd (1859):

"The grapple hook, figure 60 [fig.3], is used for hooking on to large stone with a team, in rolling them over and over, or in lifting one end of a stone, so that a chain can be passed around it, when one end of it is in the ground. ... The grapple hook should be made of about the same curvature of the iron part of the canthook (fig. 59) [fig.4], with a link and ring in one end, as shown in the figure 60, for the purpose of hitching a chain to when in use. It should be made from eighteen to twenty-four inches long, of the best iron, with the point of the hook laid with steel. The hook should be large enough to retain its shape, without bending, even when two

³² Deanne 1790: 268-269.

³³ Holbrook 1848: 105; French 1855: 462; Kimball 1857: 105; Kelsey 1860: 123; Platt 1873: 116, 120-121; Connecticut State Agricultural Society 1858: 206; Anon 1881; Anon 1886a; Anon 1875; Sleeper 1860: 256; Mann 1887 [uses dynamite].

³⁴ One of best descriptions of 18th century blasting techniques can be found in Maxwell 1743: 279. The basic technique remained the same well into the 19th century.

teams may be hitched to it. At the hook end, where it is exposed to the greatest strain, it should be about three-fourths of an inch thick and two inches wide. The other parts need not be half as heavy as this.”³⁵

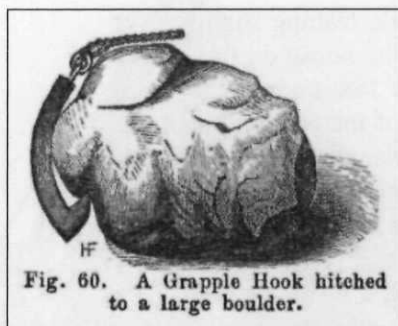


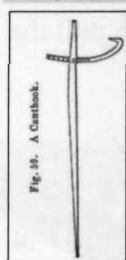
Fig. 3 – Grapple hook (Todd 1859: 65).

Cant Hook

Todd (1859) states:

“With a good canthook one man can roll along a bolder of six or eight hundred pounds with ease, and by using a couple of plank he will be able to load such a stone on a sleigh or stoneboat, in a very few minutes. ... The handle of

the canthook is, almost always, made too large and clumsy. It should be about six feet in length, and of a uniform taper, from the mortise, where the hook enters it, to the end, which end need not be larger than the end of a fork handle. The other end may be tapered off, as shown in the cut. At the mortise it should be about two by three inches square, or even smaller, if the timber be of the best quality, otherwise it must be larger. The hook should be made of the best iron, about inch and a half wide and three-eighths of an inch thick, with half inch holes every

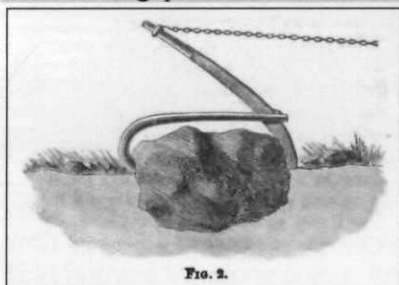


two inches, and from twenty to thirty inches long, according to the size of stone, or logs to be rolled with it. At the hook end it must be made much heavier and stronger than the other part of it. The curvature of the hook is a very important feature of it. If it is curved but little it will hook on a large stone or log, very readily, and will not hook on a small one. But, if the curvature of it will admit of its hooking to a small stone, it will, usually, hook on a larger one, except it is very large. The bolt which holds the hook should work easily, in and out, and be fastened with a leather key.”³⁶

Fig. 4 – Cant hook (Todd 1859: 65).

Mr. Gold of Connecticut describes a larger version of the canthook design to be used with oxen:

“we have another instrument, in the shape of a canthook, that is very efficient for a certain class of rocks. It is a large cant-hook, (fig. 2) [fig.5] that will weigh, with the necessary attachments, two hundred pounds or more. It is worked with two yoke of oxen, and it will take out stones weighing from half a ton to five tons, very rapidly. Two hundred rocks a day is about the working power of that instrument, under favorable circumstances, with one man to dig



around the rocks, one man to drive, and another man to handle the cant-hook. That costs, well made, about twenty dollars. I have found this a very serviceable implement.”³⁷

Fig. 5 – Large cant hook used with oxen (Platt 1873: 120).

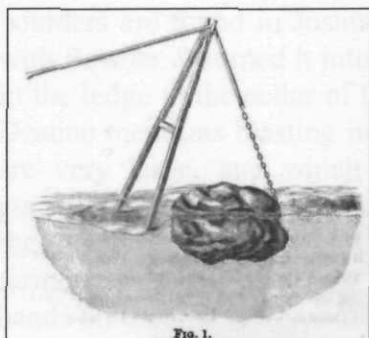
³⁵ Todd 1859:65.

³⁶ Todd 1859: 64-65

³⁷ Platt 1873: 119-120.

A-Frame Puller

George Platt (1873) describes a simple A-frame rock lifter he made himself.



"To operate it place the A near the rock, leaning slightly over it; put the chain around the rock, having the noose on the side of the rock opposite the machine; pass the free end of the chain through the clasp link on the lower end of the rod, and start the team. As the A assumes the perpendicular and leans from the rock, the lifting power is enormous; it not only lifts or rolls the rock but draws it sidewise, taking it one side of the hole. It is generally necessary to back up the team and set the A up again, moving it farther from the rock and giving a second pull in order to get the rock entirely out."³⁸

Fig. 6 – A-frame puller (Platt 1873: 118).

Stone Lifter – Sheer Poles

Sheer poles consist of two stout timbers attached at the top with their legs spread apart (Fig.7). They were held in an upright position with guy ropes. A block and tackle was attached and used to lift a boulder vertical so it could be lowered onto a stone boat, cart or wagon. Oxen were used to pull the lift rope. It was a simple stone lifter that could be easily made on the farm.

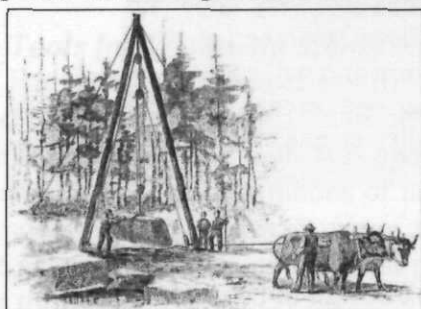


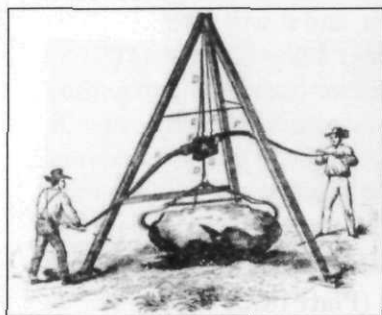
Fig. 7 – Sheer poles.³⁹

Stone Lifter - Tripod

Tripods consist of three stout timbers fastened together at the top. A block and tackle was used to lift the boulders. In the 19th century mechanical lift systems were developed like the one illustrated in figure 8.

Rock Lifter

Figure 9 shows a tripod-like setup with a ratcheted lift system. It was described as:



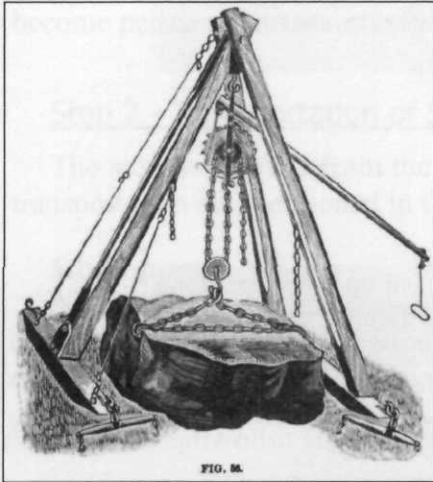
"a rock-lifter, by means of which one or two men 'pumping' on the end of a 10 or 12 foot ash lever, can lift heavy rocks, pull tree-stumps, etc. A stirrup hanging from the end of the lever engages with the teeth of a ratchet wheel on the block axle, so that, with each stroke, the wheel is pulled around two or three teeth, and the sprocket wheel shortens the 'bight' of the chain, thus exerting an accumulated force in lifting. The ratchet wheel is prevented from slipping by means of a pawl or 'detent' on its opposite side."⁴⁰

Fig. 8 – Tripod with mechanical wench.

³⁸ Platt 1873: 118.

³⁹ Teele 1887:390.

⁴⁰ Rogers 1907: 83.

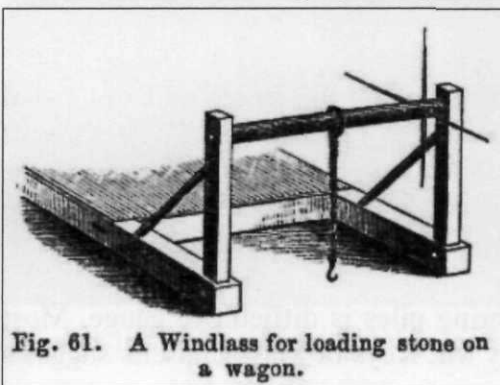


The key feature of this rock lifter was the fact it was built on runners, which allowed it to be dragged around the field to where it was needed.

Fig. 9 – Rock lifter (Rogers 1907: 84).

Stone Lifter – Wagon

Todd (1859) designed a tailgate windlass for loading stones into a wagon. Figure 10



“shows a portion of a platform to a wagon or sleigh, with a windlass attached to the hind end, for the purpose of loading stone, which would weigh from one hundred to three or four hundred pounds. One man can roll a stone which three or four men cannot lift on the wagon, and by having a windlass on the hind end of the wagon, one man can raise a large stone on the wagon in one minute, with ease. In loading a stone, the fore end of the platform should be fastened down, so that it cannot tip up, without raising the forward wheels of the wagon. Hitch the chain around the stone and raise it as high as the top of the platform, and then let a board be slid under the stone, with the two ends resting on the sills of the platform. The stone can then be rolled forward on the platform and another raised in the same manner.”⁴¹

Fig. 10 – Platform and windlass for lifting stones into a wagon (Todd 1859:65).

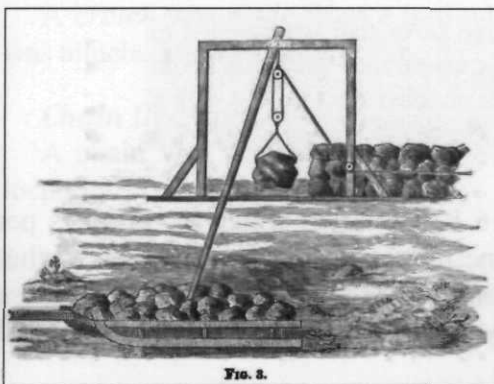


Fig. 11 – Square timber frame rock lifter.

Stone Lifter – Square Timber Frame

“Mr. Lawrence Mitchell, of Newtown, uses a very simple frame to which a pulley is attached, for lifting rocks on to a wall, (fig. 3,) [Fig.11] and moving them in places difficult of access with a team. I have constructed one but have not yet put it in use. It consists of a timber frame twelve feet square, with a sill long enough to receive outside braces. This is set upright by the side of the wall, and held in place by a long pole resting with a notch in its lower side on the top beam, the other end being chained to a sled or wagon, loaded with stone. A pulley with hooks for the stone, is

⁴¹ Todd 1859: 65-66.

attached to the upper end of this pole, and the draft is by a team by the side of the wall. By this arrangement stones weighing several tons may be drawn into place or elevated upon the wall.”⁴²

Step 1A – Temporary Field Clearing Piles

Robert Baldwin in an 1851 article wrote:

“Another farmer, in preparing his field for a crop four years ago, picked up the loose stone and placed them in large piles in the field. Last year he cultivated the field in corn, having previously removed the stone.”⁴³

The *St. Albans Daily Messenger* (Vermont) ran an article in 1879 making the following observation:

“Occasionally [sic] we see stones piled in heaps in a field. It may sometimes be necessary to do this when seeding down to grass, but they should be removed as soon as possible, certainly not be allowed to remain until another year. These heaps take up considerable room and always in the way, interfering with every kind of farming operation.”⁴⁴

Mr. Stephens (1912) states he had “bushes and briars to clear up along the fences and walls, and stone-heaps to draw-off, preparatory to “breaking up” several acres more of greensward.”⁴⁵ All three of these sources clearly indicated some farmers were gathering stones together in multiple temporary stone piles in the field in anticipation of removing them at a later date. The length of time between the creation of the temporary storage piles and their removal could range from months to several years.

How extensive this practice of building temporary field clearing piles is difficult to gauge. Most sources are not as explicit as those quoted above. A statement by Mr. Keys of Massachusetts suggests this practice was occurring but does not explicitly state it:

“Before planting, I removed the rocks from a field of about five acres that was seeded to grass the year before, and also cleared about six acres of rock heaps where they averaged about a heap of four to six bushels of small stones to the square rod. This enabled me to mow with a machine about twenty-five acres.”⁴⁶

Keyes was building one stone pile per square rod (16 ½ x 16 ½ foot area) which is 160 piles per acre. A number of sources mention the removal of existing stone piles in a field but offer no further details as to how long they were in the field or the original intention for their construction.⁴⁷ In those cases it is impossible to determine if the piles were temporary or intended to be the final disposal

⁴² Platt 1873: 121-122.

⁴³ Baldwin 1851: 747.

⁴⁴ Anon 1979.

⁴⁵ Stephens 1912: 297.

⁴⁶ Keyes 1866: 3.

⁴⁷ Holbrook 1848: 107; Yant 1852: 150; Kimball 1857: 105; Adams 1877: 109; Walker 1876: 261; Poore 1885: 7; Agricola 1824: 8; Western Historical Company 1880: 911.

location for the stones. This issue is further clouded by the fact that some temporary piles could become permanent in the event the farmer became ill, disabled, died, or abandoned the farm.

Step 2 - Transportation of Stone to Disposal Location

The stones removed from the field needed to be transported to the disposal location. Five modes of transportation are mentioned in the literature.

Stone-boat

A stone-boat is a heavy duty flat bottom sled or flat bottom sled on two runners designed to be dragged over the ground. Stone-boats without runners generally had the front angled upward to overcome obstacles. A stone-boat could be built on the farm and was common.⁴⁸



Fig. 12 – 1937 photo of farmers in Wisconsin using a stone-boat (FSA, courtesy of the Library of Congress).

Cart

A cart was a two wheeled conveyance with box sides used to transport heavy materials. There are a number of references to them being used for field clearing.⁴⁹

Wagon

A wagon was a four wheeled conveyance with box sides used to transport heavy materials. There are several references to the use of

wagons in connection with field clearing but it is unclear if this was a common practice or not.⁵⁰

Crotch

A *crotch* was made from a tree with two branches that forked apart forming a “Y” shape. A chain was attached to the bottom of the “Y”. Large boulders were rolled on to the crotch and dragged away.⁵¹

Chain Dragging

A chain was wrapped around the boulder and pulled by the oxen or horse team to the disposal location.⁵²

⁴⁸ Holbrook 1848: 105; Platt 1873: 117; Knight 1877: v.3 p.2392; Douglas 1878; Anon 1875; Mann 1887: 137; O.F.G. 1837:8.

⁴⁹ Holbrook 1848: 107; Brown 1861: 335; Platt 1873: 117; Butler 1833: 164; Breck 1845: 19.

⁵⁰ Russell 1854: 492; Todd 1859: 65-66; Mann 1887: 136.

⁵¹ Hempstead 1901: April 30, 1726, January 20, 1737.

⁵² Platt 1873: 131; Fohl 2003: 14.

Step 3 - Stone Disposal

Once the stone was removed from the fields it had to be disposed of. Farmers had three basic options for disposing of stones (a) dump, pile, or bury it someplace (b) utilize the stone for building stone walls, subsurface drains, roads, cellars, filling holes, etc. (c) sell the stone.

Time of Year

The time of year the stones were transported from the field to the disposal location is rarely mentioned in the literature.⁵³ The most likely reason is that in many cases it occurred in conjunction with the stone removal process. Like the stone removal process, it could essentially take place during anytime of the year. In the few cases it is mentioned, the time of year is the fall or winter. For example George Platt of Milford, Connecticut wrote:

"Our practice has been to lift the rocks to the surface and leave them till winter when they are easily drawn off on a stone boat, taking a time when the ground is thinly covered with ice or snow."⁵⁴ Platt was referring to the large heavy boulders. Joshua Hempstead also noted waiting for winter to move some large boulders when the ground was frozen and covered with snow.⁵⁵

Amount of Stone per Acre

The amount of stone being pulled from a given acre varied considerably. Farmers like Joshua Hempstead struggled to find sufficient stone to build the necessary stone walls to fence his orchards and fields. Others had a superabundance of stones. Mr. Phinney of Lexington, Massachusetts reported removing approximately a ton of stone [about 17 cubic feet of loose stones] per 6 x 9 feet square.

Mr. Keyes of Massachusetts reported removing 4 to 6 bushels [59 to 80 cubic feet] of stone per square rod (rod = 16 ½ feet) of land. Chas. Mann of Methuen, Massachusetts reported removing more than 300 perch of stone per acre. George Platt of Milford, Connecticut claims "There are enough rocks and stones on this and the neighboring farms to fence them into three acre fields, making single walls." [1496 linear feet of wall x 4 feet high x 1 foot wide = 9984 cubic feet of stone]⁵⁶

| Farm | Stone removed (Cubic feet) | |
|---------|----------------------------|---------------|
| | Per Square Rod | Per Acre |
| Phinney | 86 | 13760 |
| Keyes | 59 to 80 | 9440 to 12800 |
| Mann | 47 | 7520 |
| Platt | 21 | 3328 |

Table 3. Four 19th century farmers provided information on the amount of stone they removed from a field on their farm. As this table shows the amount of stone removed varied considerably.

⁵³ Holbrook 1848: 105; Russell 1854: 491; Platt 1873: 117.

⁵⁴ Platt 1873: 117.

⁵⁵ Hempstead 1901: December 4, 1742.

⁵⁶ Holbrook 1848: 105; Massachusetts Board of Agriculture 1866: 3; Mann 1887: 136; Platt 1873: 116.

Stone Disposal Methods and Locations

Stone Walls

Stones walls are the most often mentioned means of disposing field clearing stones.⁵⁷ More than one writer spoke of the fact that stone walls were both a means of fencing a field as well as means to get rid of the stones in the field. In describing the farm of Harvey Dodge of Sutton, Massachusetts one writer noted:

“One object of these small divisions was probably to get rid of the stones, which had to be removed from the soil before it could be worked. Some idea of the quantity of stones may be formed from the fact that these walls were made from four to six feet wide and four feet high.”⁵⁸

Fig. 13 – Wide disposal wall in Holden, Massachusetts.



There are several basic different types of stone walls. The single or “thrown” wall is one stone wide and generally 3 to 4 feet high. Although carefully built, these walls tend to have a “thrown” together look and feel. Double walls as the name implies are essentially two walls built against each other. If properly built they had long stones that spanned the width of the double wall every few feet which helped to tie it together. Wide or disposal walls were created by building two walls from 3 to 12 feet apart and dumping field stones between the two walls. The cart or wagon could be backed up to the outside wall the stones dumped over it. Wide disposal walls were

used when the amount of stone being cleared from the field exceeded the volume of stone need for traditional stone walls and other building projects. The sole purpose was to serve as a disposal location. In areas where there was not sufficient stone to build a full height wall, farmers sometimes built “half walls.” These were stone walls 2-3 feet high with wood rails on top.⁵⁹

Dump Walls

“Dump walls” or “stone rows” are low wide linear piles running along the edge of the field like a stone wall. They can be easily mistaken for broken down stone walls. Not much is known about them. A photograph (Fig.14) of one appeared in a 1922 Cornell Extension bulletin.⁶⁰ They appear to be the result of stone being dumped along or dragged to the field edges or fence lines.

⁵⁷ Holbrook 1848: 105; Meigs 1883: 342; Durand 1851: 244-245; Anon 1850: 40; Agricola 1824: 8; Lane 1907: 51; Shaler 1895: 310; Shull 1870: 747; Platt 1873: 116; Anon 1879; Anon 1881; Anon 1886a; Anon 1875; Todd 1859: 57; Flint 1884: vol.1 p.562; O.F.G. 1837: 8; T.S. 1840: 254; Breck 1845: 19.

⁵⁸ Anon 1850: 40-41.

⁵⁹ “half walls” see O.F.G. 1837: 8.

⁶⁰ Myers 1922: 359.



FIG. 139. A STONE ROW THAT FUNCTIONS AS A FENCE ONLY IN WASTING LAND AND IN FORMING A BARRIER TO CULTIVATION
This stone row occupies a strip of land 20 feet wide. Land here is worth \$100 an acre

Fig. 14 – Dump wall along edge of field on New York farm (Myers 1922: 359).

Subsurface Drainage ("Underdraining")

Beginning in the late 1700s, farmers both in Great Britain and the United States started to experiment with subsurface (buried) field drainage systems. The idea was to improve fields which had low crop yields due to excessive water and to reclaim lands too wet to

normally cultivate. Throughout the 1800s subsurface drainage gained in popularity and many farm manuals provided detailed instructions for how to design and construct these drainage systems. There were a number of different designs being used for drains. One of those designs involved digging a ditch and filling it with field stones to within 12 to 18 inches of the surface. The top 12-18 inches of the ditch being filled with soil (plow zone).

Disposing of field stones in subsurface drains was the second most mentioned disposal location in the literature. Field clearing and drain construction was usually done in conjunction with each other. The stones were gathered and transported to the drain and dumped into it.⁶¹ This was the practice on the Seven Hoyt farm in Connecticut: "Clearing rocky lands is usually carried on at the same time with the underdraining."⁶²

Burying Stones

Joshua Hempstead had a 12' long by 7½' wide boulder that he could not drag out of the field. He buried the stone below the plow zone instead.⁶³ The typical approach used for burying stones was to dig a deep hole adjacent to the boulder and then tip it into hole and cover it with soil. Simon Brown, editor of the *New-England Farmer*, recommended the practice of burying field stones a minimum of ten inches below the surface rather than removing them from the field. He argued the stones attract moisture and are a storehouse of heat, both of which promotes better growth of crops and hay. His arguments were based upon years of personal experience in farming. The editor of the *Working Farmer* disagreed with Brown and argued that the stones should be used for subsurface drainage in the field instead.⁶⁴

Filling Holes

The process of removing large boulders from the fields resulted in substantial depressions being left behind. These needed to be filled and leveled. This was a routine and mundane task that was rarely

⁶¹ Holbrook 1848: 105; Holbrook 1851: 36; Anon 1850: 41; Brown 1861: 335; Kimball 1857: 105; Adams 1877: 109; NH Journal of Agriculture 1862: 546; Maine Board of Agriculture 1873: 225; Platt 1873: 125; Connecticut State Agricultural Society 1858: 206; Anon 1879; Anon 1886a.

⁶² Connecticut State Agricultural Society 1858: 206.

⁶³ Hempstead 1901: May 8, 1732.

⁶⁴ Brown 1861: 335-336.

mentioned. Joshua Hempstead notes in his diary that he filled some of these holes partially with field stones and then finished filling them with soil.⁶⁵ He also filled some holes with seaweed and manure.

Filling Low Spots, Ravines & Swales

Ravines, swales, and gullies were a convenient place to dump stones. These locations were generally unfarmable and, therefore, there was no loss of productive land. Charles Flint, author of the *American Farmer* (1884), recommended removing unnecessary stone walls. As a means of disposing of the stones, Flint notes, "Ravines and swales may also be filled with stones"⁶⁶ William Chaplin (1890) writing on removing obstructions from fields mentions this filling option: "If you do not need them for drains or filling up some gully or ravine ..."⁶⁷

Terracing

There is a single reference to using field stone as fill for hillside terracing. Isaac Kimball of Temple, New Hampshire noted, "Some fields have been cleaned of stone, by removing them to the base of a hill-side and erecting a heavy upright wall, removing the soil from the rear and filling with stone; then replacing the soil, making a level surface for cultivation."⁶⁸

Selling

Farmers in New England did on occasion sell field stone usually directly to the contractor or home owner building a cellar or some other type of construction project, like constructing a canal.⁶⁹ There is no historical evidence that farmers stockpiled the stone in anticipation of future sales.⁷⁰ The available evidence indicates that stone was removed and transported to the construction within a matter of days. Because of the limitations of the transportation system, most field stone being used in construction projects was purchased locally generally within a few miles of the construction site. Chas. Mann seems to have had a three mile limit for transporting stone. At three miles he could deliver 3 loads of stone per day making it profitable.⁷¹ Not all field stone was building quality. Mann distinguished between two types of field stones:

"There are two kinds of stone known as field stone, the round cobbles, such as are found in gravelly soil, and have no face, bed, or build to them, and are almost worthless, save for paving gutters and drives, or grading, filling trenches, and the like, and the square-faced, solid, good shaped stone, such as are to be found in a heavy, clayey soil. It is of the latter [building stone] that I have written, and, although in places where ledge stone is easily obtained, there will be encountered a strong prejudice against field stone, growing out of the idea that they are all like those first described, while stone from heavy soil will make as strong and substantial a wall as

⁶⁵ Hempstead 1901: May 24, 1757.

⁶⁶ Flint 1884: v.1 p.562.

⁶⁷ Chaplin 1890: 303.

⁶⁸ Kimball 1857: 105.

⁶⁹ Mann 1887; Emery 1855: 115; Commissioner of Prisons 1887: 163.

⁷⁰ See Gage 2014. Gage found evidence that stone was temporarily "stockpiled" in a field or at the construction site for a specific project but was never stockpiled in anticipation (i.e. speculation) of future sales. (The hypothesis that farmers stockpiled stone for future sale was the subject a 1990 article by Gresham titled "Historic Patterns of Rock Piling and the Rock Pile Problem." Gresham tried to tease out a stockpiling hypothesis for the Georgia flagstone industry but his primary source explicitly states in the opening paragraphs that stockpiling did not occur. Gresham failed to make a case for this hypothesis.)

⁷¹ Mann 1887: 134.

any ledge stone, and can often be split so as to make a good finish for exposed portions, or faced with granite for a finish, either way making the cost much less than by the use of ledge stone, which costs from \$2.25 to \$3 a perch; and beside this strong reason for the use of our field stone, is another, that every perch of stone taken from the field helps to improve the property, and the scenery of the vicinity of its former location, as well as to add to the ease and profit of cultivation, while the use of ledge stone only encourages the digging of an unsightly hole in the ground.”⁷²

A detailed survey of cellars, wells, and root cellars at 33 sites throughout New England⁷³ confirms Mann’s observations. Cobbles were rarely used as building stone the overwhelming preference was for flat faced blocks of stone in Massachusetts and New Hampshire and slab type stones in Connecticut where this type of stone was abundant.

Cellars and Building Foundations

In addition to naturally occurring flat faced blocks and slabs of stones, pieces of blasted stone with flat faces were also suitable for building house cellars, barn foundations, bridge abutments and other construction projects. The use of building quality field stone for these purposes is mentioned in several sources.⁷⁴ Most of these projects were around the farm rather than stone sold for construction projects elsewhere.



Farm Roads, Causeways, and Bridge/Dams

Farm and public roads with wet muddy sections were repaired by filling the top of the roadbed with stones. Roads crossing swamps required a raised causeway to which was sometimes built with stones from cleared fields. Dams, which many times doubled as a raised causeway, were an effective means to dispose of a large volume of field stone.⁷⁵ An Ohio farmer created a pond that he stocked with fish:

Fig. 15 – Stone used to repair road in Canton, Maine.

“I had on my farm a number of heaps of rough stone, not very nice to look at, and not very convenient to get around, nor very profitable. There were also several spring runs with deep gullies, across which it was desirable to have a road, so I hauled the stone into one of the gullies insufficient quantity to make a bridge, dug down the banks, and graveled the upper side and surface of the stone bridge, forming a clear pond of spring water.”⁷⁶

⁷² Ibid.

⁷³ Gage 2014.

⁷⁴ Kelsey 1860: 123; Platt 1873:116; Todd 1859: 66; Flint 1884: v.1 p.562; Mann 1877: 133; Chaplin 1890:110.

⁷⁵ Saunders 1888: 3[Ontario]; Yant 1852: 150; Kimball 1857: 105; Kelsey 1860: 122

⁷⁶ Yant 1852: 150

Stockpiling of Building Quality Stone?

As previously stated, there is no evidence for the stockpiling of stone in anticipation of future sale. With the exception of stone wall building piles (discussed next) and Joshua Hempstead's dairy, none of the sources make explicit reference to setting aside or stockpiling these stones for future farm projects like cellars, foundations, bridges, dams, road repairs, etc. They simply state that these stones were suitable for such projects. Joshua Hempstead stored stones in the corner of the field, along the back side of the field, and at the construction site (*see* case study for further details). Stockpiling of stone for farm-related projects did occur on some occasions. It should be noted in some cases the stones were gathered just before or during the construction project. Mann combined field clearing with transporting the stone to the construction site.

Stone Wall Building Piles

Stones removed from the field were many times transported to where stones walls were going to be built or were in the process of being built. Edward Todd in *The Young Farmers' Manual Detailing the Manipulations of the Farm* (1859) summarizes the details of wall building piles:

"The first thing in building a stone fence, usually is, to haul the stone; and they are, usually, thrown in a long row, exactly where the fence is to stand. This is always wrong. If stones are gathered, from year to year, and hauled to a given place, for the purpose of making a stone fence, the place where it is to stand should be staked off, and no stone should be dropped within four feet of the point where the face of the wall is to be, on both sides of it. If the wall is to be made six or eight feet wide, on the bottom, no stone should be dropped nearer than six feet, especially if they are mostly large ones. It is a great fault with most farmers, who build stone fence, to get their stones too close to the wall. It is but the work of a few moments to tumble a large stone six or eight feet; and it is far better to have a stone one foot too far away, than to have it a foot too close to obstruct the progress of workmen."⁷⁷

Some stone walls were never completed and these long row-like stone piles remain.

Permanent Stone Piles

Some farmers disposed of the stones in permanent stone piles. The question is where did the farmers choose to locate these piles? The literature offers some clues. One writer complained that "unsightly stone piles lie in the centre of fields."⁷⁸ A 1902 map of a New York farm (Fig.16) shows a single central stone pile serving several different fields.⁷⁹ John Gilley of Sutton Island Maine placed his stone piles on "bare ledges." One of them is described as being 24' long x 15' wide x 5' high.⁸⁰ Alfred Lane writing about the geology of Michigan observed that "The cleared fields are, in general, surrounded by piles of stones that have been gathered from their surfaces, and in part built into walls."⁸¹ The *New Hampshire Journal of Agriculture* observed, "We know of scores of acres of wet

⁷⁷ Todd 1859: 57-58.

⁷⁸ James 1893: 163.

⁷⁹ Warren 1918: 378.

⁸⁰ Elliot 1904: 47-48.

⁸¹ Lane 1907: 51.

swampy land, always late because wet, and of endless runs, where huge piles of stone lay in unsightly confusion on the borders and all about".⁸²

Piles were also built in the corners of fields. "Get them out of the way by putting in walls, underdrains or large heaps in some corner of the field."⁸³ William Chaplin of Vermont recommended "select some corner where the big rocks are thickest, and built an everlasting monument to your own industry."⁸⁴ A North Brookfield, Massachusetts farmer states "I have seen farms, where in the corners of the plough-fields there were heaps of from one to two hundred loads [of stone]."⁸⁵ Some farmers chose unfarmable land: "Selecting an untillable spot in a field in which there were one or two natural mound-like hillocks, a large pile of stones was made."⁸⁶ Peter Fay of Southborough, Massachusetts had fields described by the editor of the *New England Farmer* as "beautiful, smooth," which suggests the "numerous monumental stone heaps" were located so they did not obstruct the fields. One pile "measured 16 rods [264 feet] in circumference and 12 feet high-all composed of small stones".⁸⁷ (Pile diameter = 84 feet)

Cornell Agricultural Extension in New York published two photographs of stones piles in 1922. One photo (Fig.17) shows five medium size stone piles widely scattered in a mowed hay field. The second photo (Fig.18) is of a single large stone pile in a wooded area in the corner of a field. The FSA has two photos (Figs.19 & 20) from the 1930s showing a single large pile along the edge of a field outside of the area being cultivated.

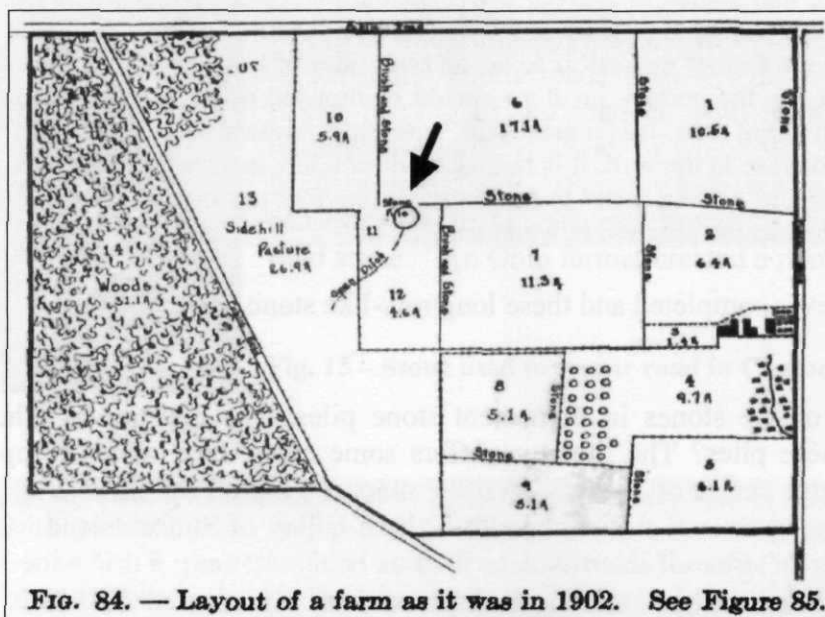


Fig. 16 – Arrow points to single large stone pile in field of New York farm (Warren 1918: 378).

⁸² New Hampshire Journal of Agriculture 1862: 546-547.

⁸³ Anon 1879.

⁸⁴ Chaplin 1890: 303.

⁸⁵ T.S. 1840: 254.

⁸⁶ Flint 1884: v.1 p.562.

⁸⁷ Breck 1845: 19.



FIG. 136. SMALL SCATTERED STONE PILES WHICH WASTE BOTH LAND AND LABOR

Fig. 17 – Five widely scattered stone piles of uniform shape & size in New York farm field (Myers 1922: 358).

Overall, with the exception of Figure 17, the literature and photos have a common theme: permanent stone piles were located outside of the area being cultivated or mowed for hay. These locations included the edges and corners of fields, unfarmable spots, the center of the field, and adjacent wooded areas along the field. This is consistent with the overall rationale and objective of field clearing which was to remove obstructions to the cultivation of the land. It is also consistent with the locations of field clearing piles found in field investigations of abandoned farms by the authors. In addition, these field investigations found that single large stone piles found in the middle of the field were generally located on exposed bedrock or other unfarmable natural feature.



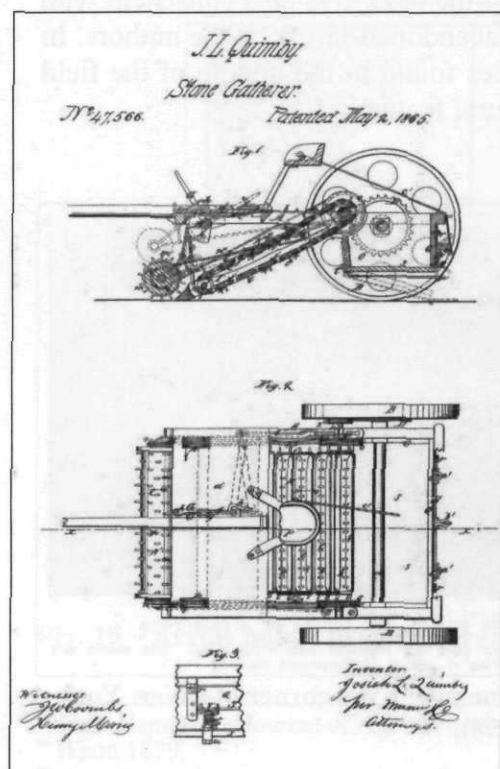
FIG. 137. A LARGE STONE PILE IN THE CORNER OF A CROP FIELD
This stone pile occupies little land and does not interfere with cultivation. The stones are convenient for drawing if needed for improved highway

Fig.18 – Single stone pile in the corner of a New York farm field (Myers 1922: 358).

Fig. 19 – 1941 FSA photo showing a single stone pile along the edge of a Minnesota farm field (courtesy of the Library of Congress).



Fig. 20 – 1941 FSA photo showing a single stone pile along the edge of a different Minnesota farm field (courtesy of the Library of Congress).



Removal of Permanent Stone Piles

Permanent stone piles were sometimes removed as the existing owner made improvements, modernized the farm for mechanized equipment or simply needed the stone for a project. New owners who had ambitions for improving their new property focused amongst other things on removing existing stone piles.⁸⁸ For example, Mr. Phinney of Lexington, Massachusetts had:

“a field of 12 acres, which he took in hand a few years since, an old orchard, which had been in grass for a long time, the soil thin, and the field covered with stone-heaps. These were removed, the field plowed about six inches deep, and the stones brought to the surface in the operation, picked up and carted off.”

Fig.21 -- Patent #47566 (1865) stone gatherer.

⁸⁸ Holbrook 1848: 107; Yant 1852: 150; Kimball 1857: 105; Adams 1877: 109; Walker 1875: 98; Poore 1885: 7; Agricola 1824: 8; New Hampshire Journal of Agriculture 1862: 546; Maine Board of Agriculture 1873: 225;

Impact of Mechanized Farming on Stone Removal Practices

The development and introduction of mechanized farmer equipment like mowing machines, cultivators, and harvesters fundamentally changed the economics of farming in New England. Farms in the Ohio Valley and the Great Plains that had level fields and no stones could be easily converted to mechanized farming, which lowered their operational costs allowed them to compete and even undermine the prices for agricultural goods in the New England markets. In order to survive economically New England farmers also had to adapt to mechanized farming. The main problem was this new equipment required flat to gently rolling fields completely free of obstructions. The mechanized equipment was easily damaged by small stones and could not be easily maneuvered around large boulders and obstructions, which had not been a real issue for older types of farming equipment. Fields had to go through a second phase of stone removal, dismantling of fences to create large fields, leveling and filling, etc.⁸⁹

Mechanized Rock Pickers

Beginning in the 1850s and continuing into the early 1900s, various types of mechanical “rock gatherers” were invented. A search of the patents database found 10 patents for stone gatherers between 1852 and 1919.⁹⁰ In addition, the *American Agriculturist* published a sketch of a stone gatherer that was never patented.⁹¹ It is presently unknown if any of these designs saw commercial production and sale. Patent #45970 (1865) and #47566 (1865) were both illustrated in *Knight's American Mechanical Dictionary* (1877).



Fig. 22 -- Pile of uniform size stones picked by a mechanized “stone gatherer” (Joppa Hill Farm, Amherst NH).

The design of stone gatherers relied upon metal teeth or pins to grab or plow up the stones. The distance between the teeth governed the minimum size of the stones that would be removed. Although the distance between teeth is not given, the close spacing suggests they were intended for small stones. This observation seems to be

confirmed by the fact patent #9069 is described both as a stone gatherer and a potato digger. The overall design of these stone gatherers suggests they were not designed to handle large stones. These stone gatherers likely gathered small stones of similar size. Stone piles created from stone gatherers should exhibit uniform stone size. Joppa Hill Farm in Amherst, New Hampshire has a massive stone pile along one edge of field. About 95% of the stones range in size from 2 to 6 inches. The 10 to 12 foot height of the pile indicates it was dumped via conveyor belt loader, which suggests an early 20th century date for the pile. The limited range of stone size created a uniformity of stone sizes in the pile.

⁸⁹ Platt 1873; Anon 1886.

⁹⁰ Patents 9069, 45970, 47566, 124122, 129767, 1241880, 1253094, 1263658, 1274244, 1304156.

⁹¹ Douglas 1878: 256.

Farming Around Stumps & Stone Piles

The agricultural literature emphasized the complete clearing of fields of brush, stumps, and stones prior to cultivation. This was an ideal model of farming practiced by some but not all. A farmer's limited time and labor resources as well his personal work ethic resulted in fields being cultivated with stumps, stones piles and other obstructions still present. How wide spread practice it was to cultivate crops or cut hay fields only partially cleared of obstructions is unclear but it did occur. Joseph Walker of Concord, New Hampshire (1876) states "Should it be here intimated that half-buried boulders and stumps and rock-heaps often opposed the use of these implements [i.e. hay cutting machinery], it may

very properly be said in answer, that it is part of their mission to bring about the removal of such impediments, and compel us to do things we ought to have done years ago."⁹² Francis Wiggins in his book *The American Farmer's Instructor* (1840) describes a common horse rake that could be lifted over stumps and stone piles.⁹³



Fig. 23 – 1915 photograph of an Alabama cotton field with stumps being plowed (Courtesy of the Wisconsin Historical Society).

Figure 24 shows a 1937 Farm Services Administration photograph of a potato field in Michigan with stones piled around the stumps in the field. Figure 23 is a 1915 photograph showing an Alabama cotton field with stumps being plowed. It is important to note that photographs showing actively farmed fields with stumps or stone piles present are rare. Photographs of fields free of obstructions are the norm.



Fig. 24 – 1937 FSA photo showing a Michigan potato field with stone piled around stumps (Courtesy of the Library of Congress).

Although the practice of not removing stumps and stone piles during initially clearing process saved time and labor, the increased time and labor in trying to plow and cultivate around the obstructions negated any savings in terms of time and labor. It also reduced the amount of land that could be used and increased the risk of damage to

equipment. Mr. Olive of Edna, California summed up the problems with this practice:

⁹² Walker 1876: 261.

⁹³ Wiggins 1840: 450.

"For six years I have farmed among stumps, and I do not agree with G. M. R., who, in a recent issue, favored leaving the stumps in the ground. If I had grubbed out all my stumps, I am satisfied that I should have had better crops. The ground that the stumps occupy is just so much waste. The breakage of tools and implements in working stumpy land is considerable of an item. The stumps on my land have been rotting for ten years, and although the tops are rotted off, under the surface is a hard piece. There is no way to tell just where the subsurface stumps are until you strike them, when you will likely break something. Another objection to stumps is, you must go slow when working among them, and finally the team contracts the habit of such slow walking that you feel as the man who was working with a lazy team felt. He wanted to quit, and was asked his reason. "I get weary holding up my foot while waiting for the horses to step," he replied. It is possible that G. M. R.'s stumps rot more quickly than mine. Mine are oak. The best plan is to bore a hole in the stump and fill it nearly full of saltpeter. In six months you can burn up your stump, even to the smallest roots, and the ashes will make a good fertilizer."⁹⁴

Some farmers grew tired of the added time and effort needed to work partially cleared fields and opted to finish clearing them.

Analysis and Implications

The study of stone removal and disposal practices in agriculture has real world implications for the interpretation of archaeological sites and cultural landscapes. This study has revealed that the stone removal process was far more complex and diversified than previously thought. Farms did not remain static. They were bought, sold, rented, abandoned, divided by wills, combined with other farms. They changed the types of crops grown and livestock pastured to meet changes in the marketplace. They embraced new tools, technologies, and methods which impacted the physical arrangement of fields, location of fences, and placement and removal of stone piles. Farms were a constantly evolving agricultural landscape. As the chart in Fig. 25 illustrates, there were various processes working to create field clearing stone piles but there were an equal number of processes that were removing those piles for various reasons.

The agriculture literature emphasized the disposal of field stones in walls, drains, and other useful projects. This was an ideal model of farming and did not always reflect actual practices. The literature confirms that farmers built single stone piles in the middle of field, multiple stone piles along the edges and corners of their fields, as well as numerous piles scattered throughout the field. These were built as both temporary piles in anticipation of future removal and as permanent disposal locations.

How extensive was this practice of stone piling? The 19th century journal editors seem to be divided on this point. Some claim it was an extensive practice others claim it was only an occasional practice. This may reflect regional differences or simply differences of opinion. It is clear that various processes resulted in the removal of some of these stone piles. The mechanization of farming and the ambitions of farmers who purchased a rundown farm were two of the major forces contributing to the subsequent removal of existing stone piles. This raises some important questions about how extensive the practice of disposing stones in piles in or around fields was, and how many would have survived various subsequent agricultural processes working to remove them?

⁹⁴ Olive 1899: 4.

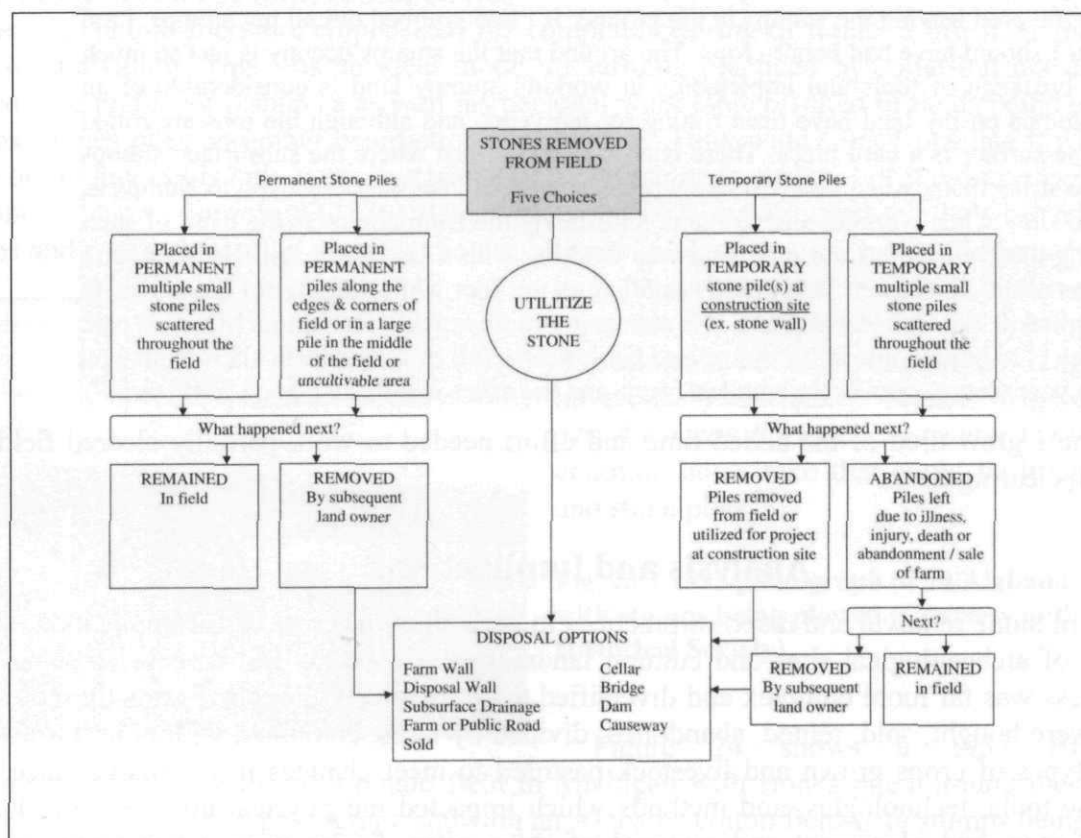


Fig. 25 - Flow chart showing the stone removal and disposal processes.

This study determined that only cultivated fields and hay fields were normally subjected to stone removal activities. Pastures were rarely if ever cleared of stones except when part of a field rotation system. The livestock could easily graze around the stones. Wood lots were never cleared of stone. Stone removal activities only occurred on approximately 26% of agricultural lands. This limits where field clearing piles should be found.

Stone piles along field edges, mounds of stone (without retaining walls) in field corners, or one or two large stone piles in the middle of the field are easily identified as field clearing for the most part. The difficulty comes with groups of stone piles scattered in the middle of the field. Some farmers worked around such piles despite the obvious disadvantages in doing so in terms of time, labor, equipment damage and aggravation. The question is who built these piles scattered throughout the field? Some farmers built temporary piles as an intermediate step during the field clearing process. Illness, death, or abandonment of the farm would result in them remaining in the field. On occasion some were built as permanent disposal piles as illustrated by Cornell Extension Bulletin photo (fig.17). Are there other explanations as well?

The Miner Farm in Hopkinton, RI has been in the hands of only two families. According to the present owner, Bob Miner, his family was told by the previous family when they purchased it many

generations ago that the stone cairns and other unusual stone structures on the farm were present prior to clearing the land for farming. This is not an isolated incident. For example, Captain R.D. Wainwright heard a similar story during his 1915 archaeological field work in Roanoke, Virginia. He states "the oldest inhabitant informed me that these stone piles were there when white man arrived."⁹⁵

In agricultural literature there are various references to farmers removing older stone piles, generally from land or farms they recently purchased. It is not perfectly clear in most accounts as to who built the piles. The fact the land was previously farmed certainly suggests this was the case, but it is ultimately an educated assumption, one which needs to be used cautiously. Some farmers were willing to farm around obstructions like stumps, boulders, and stone piles. The possibility exists they could farm around stone piles that pre-date the clearing of the land for farming. This possibility increases with woodlots and pastures for which there was no benefit to removing pre-existing stone piles. On the Miner Farm, the cows are currently pastured in semi-wood pastures amongst hundreds of stone cairns.

Any discussion of field clearing must enviably weigh in on the historic field clearing pile versus Native American ceremonial structure debate. This study has provided sufficient evidence to establish the fact farmers built stone piles. There is historical and archaeological evidence that has established beyond a reasonable doubt that Native Americans constructed stone cairns and other stone structures in both pre-European contact and post-contact (historical) times.⁹⁶ The challenge is how to distinguish between utilitarian agricultural stone piles and Native American ceremonial stone cairns. The authors have previously worked on this challenging problem in their book *A Handbook of Structures in Northeastern United State*. The reader is referred to that book for more detailed information on identifying Native American structures.

Identification of Stone Removal and Disposal Activity

In many cases, interpreting the remains of stone removal and disposal activities is straight forward. Stone walls, wide disposal walls, subsurface drainage, stone causeways, stones used to repair roads, and various construction projects (cellars, dams, etc.) are readily identifiable and there is a general agreement as to their purpose, cultural affiliation, and approximate time period. The interpretation of stone piles and stone cairns has proven contentious.

Field Clearing Stone Pile Construction Methods (toss, dump, & roll)

There are no 19th century descriptions of the manner in which field clearing piles were constructed. However, the methods and tools used to remove the stones offer some important clues. (a) Stones were gathered into piles. Anyone who has gardened or done landscaping and removed stones knows the common practice is to toss the lighter stones onto the pile and carry the heavier stones and unceremonious drop them on the pile. This results in an oblong or oval shaped mound of stones. The stones are disorganized and are not tightly packed together. There is usually stone scattered around the edges. (b) Stones were loaded onto carts and wagons and then dumped into a pile. When the stones are dumped from the cart they form a loose circular or oval mound. As typical when dumping stones there

⁹⁵ Wainwright 1916: 2.

⁹⁶ Mavor and Dix 1989; Butler 1946; Gage & Gage 2011.

is a scattering of stones around the edges. Multiple dump loads in the same pile will either merge together to form a single larger pile or individual dump loads will be discernible as a series of humps. (c) Stones were dragged or loaded onto a crotch or stone-boat. Stones which were dragged were too heavy to be lifted off the ground except by a stone lifter. These stones would be dragged to the outer edge of the stone pile or the edge or corner of a field. Stones on stone boats and crotches which were rolled off along the edge of the piles resulted in piles with medium to large stones at ground level generally spread out horizontally (rather than mounded). Smaller stones could be tossed or dumped on top of the larger stones. Stone dragged or rolled to field edges and corners resulted in a group of closely spaced large boulders spread out horizontally sometimes with some spacing between the boulders.⁹⁷

These observations based upon analysis of the tools and techniques can be cross-checked against a mid-20th century account of field clearing. Tim Fohl spent two summers (1949-1950) as a farm hand on a Vermont hill farm. Much of his time was spent in stone removal and disposal activities using hand tools, chains, stone-boats, dump carts and horses. Fohl felt the methods he used were likely similar to those used in the 19th century. He offers the following descriptions of resulting field clearing piles:

"These processes resulted in piles with distinct characteristics. When the cart containing the small stones was dumped it made a rather loosely spread pile. Usually several cart loads were dumped in the same place, resulting in piles with hundreds or thousands of stones. ...

When the large stones were disposed of either by being rolled off the boat or by unfastening the drag chain, a relatively open array of stones were created. This was because it was difficult to get the animal team to go through a tightly spaced stone grouping."⁹⁸

Did farmers build carefully built stone piles with vertical exterior walls to contain interior stone fill? It is well documented that farmers built wide disposal walls composed of two vertical stone walls set 3 to 12 feet apart with stone dumped between them. However, there is very little evidence they built stone piles using a similar construction technique. Joseph Walker of Concord, New Hampshire mentions in 1875 "carefully constructed rock heaps" in a generalized statement.⁹⁹ He never explains what he means by "carefully constructed." This is the only American source to make reference to something other than haphazardly constructed piles. There is a good reason for this. Carefully constructed piles took time to build. The same basic skills and care needed for building a stone wall was needed to build such a pile. There is some archaeological evidence for the occasional construction of massive stone piles with vertical retaining walls. In Amherst, New Hampshire on the Joppa Hill Farm there is an elongated stone pile with tall vertical retaining walls along the edge of the field. Its interior is filled with small stones of uniform size gathered by a mechanical rock picker. It likely dates from the early 1900s. At present there is no supporting evidence that this type of construction was

⁹⁷ The characteristics described here can be easily tested and verified by examining modern dumped stone piles and tossed stone piles at the local community garden. One can also experiment with a bucket of stones by dumping the bucket or tossing the stones from the bucket into a pile. These characteristics are consistent with examples of field clearing piles found along the edges or in the center of farm fields.

⁹⁸ Fohl 2003: 14.

⁹⁹ Walker 1875:261.

common. This issue is complicated by the existence of large vertical walled cairns built by Native Americans.¹⁰⁰ More research is needed.

Did farmers build stone piles on top of boulders in the field? Large boulders, especially those partially buried in the ground, seem like a logical place to dispose of field stones. Is this supported by the literature? There are numerous references to the presence of boulders in fields but not a single reference to stones being piled on top of them. (There is a single reference to building stone piles on bare ledge on a Maine Island.)¹⁰¹

Stone Wall Building Piles

An historical description of stone wall building piles was quoted under the *Stone Disposal* section. What was described was a pile dumped parallel with the intended line of the wall. In other words, stones dumped in a long narrow pile. This is consistent with examples found in the field. The field examples were generally not more than 2 feet in height and range from 25 to 50 feet in length. Usually there is a series of piles in a straight line.

Uniformity of Field Clearing Piles

The available historic literature and period photographic evidence suggests there was a strong tendency toward basic uniformity in the overall construction of stone piles, especially when multiple scattered piles were built. Sometimes small or medium size piles were intermixed with large to very large piles but their overall shape and construction was similar. The "toss, dump & roll" construction techniques created only two basic types of pile (1) mounds from tossing and dumping, and (2) low and more spread out piles from dragging and rolling. Uniformity is an important characteristic. Native American stone cairn groups have a high tendency to have a diversity of stone cairn designs (*on ground, on boulder, split stone* and numerous variations within these three major categories).

Volume of Stone

In evaluating many stone pile/stone cairn sites, the authors have observed the volume of stone in cairns seems to be well below the amount of stone one would expect to be removed from a given acre of land based upon the visible surface stones. Does the volume of stone in the piles match the typical yield stone from a single season of plowing? This can be tested. Rough volumes measurements can be made of the piles. Several meter square units excavated 10-12 inches (average plow depth) can be made and the volume of stone removed determined. With some basic math the volume of stone for the area covered by the group of stones can be estimated and compared to the volumes of stone in the piles.

Archaeological Testing of Piles

Excavations of stone piles or cairns have rarely resulted in the recovery of diagnostic artifacts or dateable carbon materials. The potential for a pile to be a ceremonial feature has made the dismantling of them problematic due to cultural sensitivity issues. Alternative scientific testing procedures are needed.

¹⁰⁰ Muller 2003.

¹⁰¹ Eliot 1904: 47-48.

As previously discussed, stone removal activities were confined to cultivated and hay fields. One important characteristic of cultivated and hay fields was they were plowed, whereas pastures usually were not plowed. The presence or absence of a plow zone and the stone pile's stratigraphic relationship to the plow zone could prove useful for testing a field clearing hypothesis. This can be tested for without disturbing the stone pile by placing an excavation unit along the side of the pile to determine the soil stratigraphy and ascertain whether the pile has a plow zone underneath it. The presence of a plow zone is the minimum standard needed to consider a field clearing interpretation; however, it is not conclusive evidence of field clearing. There are other factors which need to be considered.

Field clearing piles placed in the corners of a field, along the edges of it, or in a single pile placed in the center of it generally will be outside the area plowed in the field. The farmers would have likely avoided plowing too close to these piles. Therefore the area immediately surrounding the pile may show no evidence of a plow zone. One or more test pits would need to be excavated in an area of the field suitable for cultivation to determine the presence or absence of a plow zone. The presence of a plow zone would confirm the hypothesis that piles placed in these locations are field clearing. (This scenario assumes there are no groups of piles scattered throughout the field.)

A group of stone piles scattered throughout a field present a more complex challenge for interpreting their relationship to a plow zone. Field clearing piles were either (a) built on top of the plow zone from stones plowed up by the farmer, or (b) built on the existing ground level from stone gathered from the surface by the farmer before the field was plowed for the first time. In both cases there should be the presence of a plow zone. The absence of a plow zone within the group of piles would indicate they are most likely Native American ceremonial structures.

For piles built in the field after the plowing occurred, the pile should be either on top of the plow zone or extend partially into it but should not extend to the bottom or below the plow zone. There is a high probability that piles with a plow zone underneath them are field clearing. (There is a small probability it is a historic Native American structure built after the farm land was abandoned.) It should be noted that if the bottom of the pile is below the plow zone, it would indicate the pile predates the agricultural usage of the land.

For piles built on the surface of the ground in the field before the field was plowed for the first time, there will be no plow zone underneath it. In addition, there may be no plow zone adjacent to the pile due the fact that some farmers (but not all)¹⁰² avoided plowing too close to it. The plowing would have cut 6 to 12 inches below the surface of the soil and therefore below the bottom level of the pile. Logic would suggest that stratigraphically the bottom of a field clearing stone pile should be higher than the bottom of the nearby plow zone. (In addition to a test pit adjacent to the pile, a second test 1 to 2 meters away in the plow zone may be needed for comparison purposes.) If the bottom of the pile is below the plow zone it likely predates the agricultural usage of the land. However, if the bottom of the pile is higher than the bottom of the plow zone it does not automatically mean it is field clearing. The historic record indicates some farmers were willing to farm around obstructions. The possibility of a farmer working around rather than removing stone piles built prior to the land being plowed needs to be given consideration. Further testing may be necessary.

¹⁰² Figs. 23 & 24 show that some farmers did plow very close to obstructions.

There is another potential scientific approach to testing stone piles: soil dating. Loubser and Hudson excavated a stone pile in northwestern Georgia. They obtained an AMS date from charcoal recovered from within the pile and also conducted OCR soil testing of the soil level above and below the base level of pile.¹⁰³ The charcoal was recovered from soil between the two soil levels from which the OCR samples were obtained from. AMS date range after calibration was 1660-1800 (which predates settlement of the area). The upper OCR was 1888-1890 and the lower OCR 1030-1090.¹⁰⁴ The AMS date offers a more precise date range but in the absence of charcoal samples, OCR dating could prove useful for offering a date range for a pile.

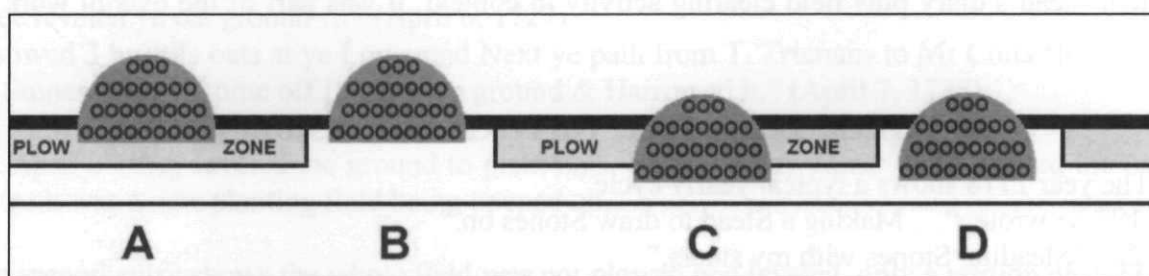


Fig. 26 – The relationship between a stone pile and the plow zone: The bottom of pile A is on top of or near the top of the plow zone, which is a good indicator (in most cases) that it is a field clearing pile. Pile B is stratigraphically higher than the bottom of the plow zone. It could be a field clearing pile or it could be pre-agricultural pile that the farmer plowed around. The bottom of piles C&D extend below the plow zone and therefore predate the agricultural usage of the land. They are most likely Native American ceremonial structures.

Conclusion

The subject of stone removal and disposal practices in agriculture in the Northeastern United States and beyond is a complicated subject. Farmers had a diversity of practices when it came to field clearing in general and stone removal in particular. The decisions farmers made in regards to stone removal were influenced by their personal work ethic, finances, time and labor resources, skills, and their own thinking on farm management. This diversity and complexity complicates the interpretation of these activities on archaeological sites. The existing interpretative model in New England identifies field clearing stone piles solely based upon their presence on or general proximity to agricultural lands (stone walls, foundations, & wells are typical evidence used to identify farm land). This model requires no other analysis or scientific testing. This model is no longer adequate.

Many agricultural lands consist of multiple layers of changing agricultural land use from different periods in the farm's history. In addition to these agricultural layers, one must take into consideration potential pre-contact and historic Native American ceremonial stone structures. Given that 70% of land area (whether cultivated lands or fenced wood lots) was part of a farm, evidence of agricultural activity is likely at the vast majority of Native American ceremonial sites. Agricultural lands need to be treated as complex sites with the potential of multiple cultural layers of land use. In light of these

¹⁰³ OCR – "Oxidizable Carbon Ratio", AMS – "Accelerator Mass Spectrometry".

¹⁰⁴ Loubser & Hudson 2005.

complexities, distinguishing between utilitarian agricultural stone structures like stone piles and Native American ceremonial structures like cairns requires a more in-depth and scientific evaluation.

Case Study of Stone Removal Activities in Joshua Hempstead's Diary

By Mary E. Gage

Joshua Hempstead was a farmer, surveyor, gravestone carver, ship carpenter, wrote legal documents and was a diarist. He wrote prolifically about his farm work. He kept a detailed diary from 1711 to 1758. Hempstead's diary puts field clearing activity in context. It was part of the overall work on his farm.

Typical Year's Cycle (in reference to stone)

The year 1718 shows a typical yearly cycle.

Feb. 19th he wrote, "... Making a Slead to draw Stones on."

Feb. 22th "Sledding Stones with my steers."

March 15th "at home ... digging stones. Wee drew 30 load"

April 23rd "at home al day helping Nathll Holt Make Stone wall between Orchard & ye lot from the Rocks 4 Rod downwards"

April 24th same activity as previous day.

April 26th "at home al day Sowing oats & picking up Stones"

May 6th "Nathll Holt made stonewall finished".

Sept. 8th "I was al day helping Lay out ye Road to Nahantick by Ben Morgans. Wee Set up Meer Stones in Morgans Land & Stidmans"

In these excerpts Hempstead built a stone sled, sometimes called a stone boat. This shows his carpenter skills. It was done in February and followed a few days later by sledding stones. The sledded stones had been previously dug out of the ground. When the ground froze and became covered with snow and ice typically in February he transported them. In March when the ground thawed out he dug stones up and "drew" dragged or carted the stones out of the field during the same session. This shows not all stone was left in the field in the spring. When possible Hempstead removed the stones at the same time he dug them out of the ground. In April with the help of N. Holt he made a stonewall between two lots. They worked on the wall segment two days. That was followed by planting oats and picking up stones presumably in the same field. He makes a distinction between digging up stones and picking up stones. Picking up stones on several occasions is associated with planting, which suggests he picked up stones on the surface of the field. In May he notes N. Holt came back and finished the stonewall. This suggests Holt also had fieldwork of his own and that he had to let the work on the stonewall lapse until it was done. In September Hempstead was hired as a surveyor to lay out a road to Nahantick. Although he does not state it the road appears to have gone through B. Morgan's land and Stidman's land as both warranted boundary markers in the form of Meer Stones. No explanation of a Meer stone has been found but it appears to be a stone of an unknown height and width and shape that was commonly used in Connecticut to mark property boundaries. He did his survey work in the off season.

This was a typical year, which happened to include stone activities, but not all years included stone activities. The years 1713, 1715, 1716 and 1717 had no entries involving stones. So a typical year did not always involve stone activity.

Opening New Field for Planting?

He used three terms that indicate he was referring to opening a new field. The terms are “breaking up”, “cleared lot” and “leveling ground”.

“wee were breaking up in ye foren & drawing Stones” (May 3, 1726)

Breaking ground is not plowing as he distinguishes between the two terms. The two terms were used again with the Gilbert lot (see *New Field & Current Field*).

“wee leveled ye oat ground ...” (April 6, 1727)

“I sowed 3 bushlls oats at ye Lowerend Next ye path from T. Trumans to Mr Coits Hollow. we dug Some Stones & drew some off Leveled ye ground & Harrowed it.” (April 7, 1727)

On April 6th they leveled the ground to plant oats. The next day April 7th he planted the oats. This indicates it was a new planting field being opened up.

The second entry shows the whole field was not plowed and leveled, only a portion of it. For on the second day they continued to remove stones and level more ground that was harrowed (plowed).

The term leveling was used in conjunction with new fields and fields in cultivation (see Cornfields). It can not by itself be used to identify a new field.

(April 1st was entered twice in the diary)

“wee Cleared the lot beat ye dung & drag of Some Small Stones” (April 1, 1730) “...Leveling the ground & Car[t]ing of Stones” (April 1, 1730)

The combination of terms “cleared the lot” and “leveling the ground” indicates this was a new field. Again, it cannot be confirmed; it is implied.

Plowed Fields in Current Use

“Diging Stones ... of ye plowd ground” (March 14, 1747)

“harrowed it & drew Some Stones” (March 16, 1747)

These entries simply state stones were dug up and the field was plowed indicating the fields were in current use.

New Field & Current Field

“Stephen breaking up Gilbert upper lot yesterday & today.” (April 19, 1746)

“att Gilbert Lot Leveling the ground where Danll Ways Hoggs have Rooted in the barely. Joshua and adam plowing there.” (April 24, 1746)

“& to Gilbert Lot picking up Stones. Joshua & adam plowing there.” (April 25, 1746)

“Joshua & adam plowed att the Cornfield Gilbert upper Lot.” (April 26, 1746)

These entries go together as they all reference Gilbert’s lot. In the first entry Stephen was breaking up in the “upper lot” indicating Gilbert’s lot had different sections. Breaking up suggests this is a new planting field. In the second entry he says Way’s hogs had dug in his barley, which he had to level

showing part of Gilbert's lot was in use and a planted field. In the third entry they picked up stones and plowed. In these entries Hempstead distinguishes between plowing and breaking up, showing there was a difference. The fourth entry notes Gilbert's upper lot was plowed and used for a cornfield.

The entries indicate part of Gilbert's lot was under cultivation with barley and that the upper part was not in cultivation as of 1746. In that year his son Stephen breaks up the upper lot to create a new field to plant corn.

Cornfield

"I Leveled the Cornhills in order to D[rage] of[f] Large Stones when the ground is froze & Snow on it." (November 16, 1741)

In this entry Hempstead points out, he built hills to plant his corn. Those hills, although we do not know their height or diameter, were substantial enough to warrant him leveling them in order to drag the large stones out of the field. It is interesting to note that 18th century farmers followed the Native American practice of building hills to plant corn. A recent article in the *Bulletin of the Massachusetts Archaeological Society* "Unpublished Papers on Cape Ann Prehistory" (Vo. 74 (2), 2013) describes the Native American cornhills' make up and how they could identify them by the broken shells.

The corn hills indicate the cornfield was not plowed on an annual basis. It also shows not all the stone was removed in the original opening up of 18th century plowed fields.

Orchard

The orchard is an interesting lot as it had multiple uses regarding stone removal.

Dig Stones & Plant Trees

"I was at home al d.[ay] I diged Some Stones thr [there] & wee drawed th[e]m off. I Transplant Some Appletrees & Mended fence." (April 2, 1714)

"I was at home digging Stones & Seting Trees Most of the day" (April 19, 1726)

In these entries Hempstead dug stones out to plant his orchard. The trees as seen in the next entry were planted in rows.

Sunk a Large Stone into the Ground

"I was at home all day. wee are Sinking a Rock in Smiths Lot that Lyes about the middle of it between the 6 & 7th Rows of Appletrees from the main Street and is about 12 foot Long & 7½ Wide. (May 8, 1732)

"wee finished Sinking the Rock Sunken it about a foot under ground. wee diged till wee came to water." (May 9, 1732)

"I was at home al day. wee finisht Carting away the Dirt that came from the where the Rock was Sunk & began to break up the Lot." (May 10, 1732)

In these entries it shows Hempstead had more than one lot planted with an orchard. This one was called Smith's Lot. He sunk a rock too large to blast or move, underground. It was sunk a foot lower

than the surface so that the land could be broken up by plowing. The next couple of entries talk about the oxen used to break up the lot.

Quarried a Large Stone, Dragged Stone on Crotch, Built a Cartway

"I was at home & out to Crossmans Lot & wee pickt apples & Drew a very Large Stone from the upper End of the Lower Ledge of Rocks the orchard down towards the house to place in the Edge of the Meadow to make a Cart-way in the orchard & also one [stone] more not quite So Large by $\frac{1}{2}$ from the upper Ledge with my Six oxen only, but the first large one over set the crotch [stone was larger than his crotch used to drag the stone. A crotch was a Y shaped Limb or tree.] wee drew it on by Reason of the Steep Side Hill. "(September 17, 1744)

This entry dated 1744 names Crossman's lot as being an orchard. Smith's lot entry dated 1732 was also listed as an orchard. It is unclear if he had two orchard lots at the same time.

What is important about this lot was its versatility. It was described as having an exposed rocky ledge from which large stones could be removed. These large stones had nothing to do with the orchard. They were not in the way and therefore did not have to be removed for the operation of the orchard. They were mined (quarried) for a building project.

The large stones were dragged across a steep hillside via a crotch pulled by oxen. This shows the lot had different areas that were utilized for different purposes. The large stones were taken down to a meadow where they were placed to build a cart way. The cart way indicates the meadow had some wetlands. Stone removal from a lot of land that was under cultivation was not always for making it plow land.

Dragged Stones & Built a Stonewall

"...in the (afternoon I helped & Joshua & adam draw Stones out of the orchard and Laid up Some on the Stone wall by the Brook above the bridge ..." (February 19, 1747)

This last entry shows the stones were removed from the orchard during the winter. He does not state they were dug up only that they were dragged out. This suggests they were large stones that were stored until the ground froze to make it easier to move them. The stones were taken to a stone wall under construction by the brook near the bridge.

The orchard was a resource for apples and stones. It had a variable terrain. Stones were removed for planting purposes and for building purposes. This was typical land usage.

Blasting Stones

Of the entries that mention plowing, harrowing, or breaking up the land none included blasting stone. As all other methods of stone removal showed in this article blasting or blowing up stone is being included here.

"I Split a Rock with Powder & turned it into mr Coits Stone wall" (August 26, 1730)

"wee had Emmanuel to blow 3 Large Stones in the Stony Gutter in Crossman lot" (September 27, 1755)

Hempstead sometimes blasted the stones himself. At other times he hired other men presumably better skilled than himself to blast the stones.

Transporting the Stones

Hempstead had several ways of moving stone.

Sled

"Sleaving Stones to make Wall behind Trumans by the Peartree." (February 16, 1719)

"I shodd ye Slead one Side" (January 17, 1737)

Sleds were used to move stones in the winter when the ground was frozen, and covered with snow and ice. The reference to "shodd" is a term commonly used when shoeing a horse. With the sled it refers to adding metal runners to the wooden runners.

Cart

"...carting Stones & making ye cross Stone-wall" (April 12, 1722)

"I was home al day. Foren finishing Compass Stand & aftern diging & Carting Stones & breaking dung" (March 10, 1731)

"Adam Carted Stones to the fort 11 L[oa]d From Town Wharf" (July 2, 1731)

The cart was a two wheeled vehicle with a box used to transport stones. The second entry shows Hempstead digging stones and carting during the same session. It also shows him making a compass stand (carpentry) for his surveying business. In the same entry he worked at breaking up the dung to spread on his fields as a farmer.

In the third entry Adam carted stones from the town wharf to the fort, which was being constructed of stone. Adam, who worked for Hempstead, transported stone that had been shipped into New London via the water. It was not stone that had been removed from Hempstead's farm or any other local farm.

Truck

"...making Trucks for Stone Cart" (November 19, 1719)

"I finisht My Truck Cart" (March 2, 1756)

The truck appears to refer to a heavy duty box for his cart. It was custom made by Hempstead who was a carpenter. Judging by the two dates thirty seven years apart he made more than one.

Crotch

"...I went to woods to get a Crotch to draw Stones on" (April 30, 1726)

"I hurt my Leg in Cutting of a great Limb from the Pairmain Tree by T. Trumans to make a Crotch to draw Stones." (January 20, 1737)

A crotch was made from a tree or tree limb with a fork. In this case, he chose a specific type of tree called a "Pairmain Tree". It was used to drag large stones with his oxen.

Drag & Chains

"Dragged Stones most of ye Day ... 2 very Large ones" (February 28, 1744)

"Ad[a]m helpt Joshua Wheeler Draw a great Stone for a bridge & broke my Chains 2 of them" (October 11, 1735)

The second entry said the two men "Draw a great Stone". Draw is interpreted as drag due to the fact the men were using chains. In the first entry, the word "Dragged Stones" is spelled out confirming stones were literally dragged.

Scow

"I was at home al day Splitting & hewing pieces for a Stone Scow" (January 19, 1737)

"I finisht ye Stone Scow & went out to my I[s]land and helpt adam Cut a Ld of wood. he brot it home. I Stayed & Cut above a Ld more."

Hempstead owned his family's house, a 200 acre farm and several lots of land including an island. He built a scow, a heavy duty boat to transport logs from the island to the mainland. What is a scow? "A large flat-bottomed boat with square ends, used chiefly for transporting freight" (1985, *The American Heritage Dictionary*, p 1101).

Hand Barrow i.e. Wheelbarrow

"In the foren I was at home made a hand barrow & helpt Cart Stones" (April 27, 1739)

A hand barrow is a wheelbarrow operated by hand to carry small loads. He built one to use in the removal of stones. It is interesting to note he used the term cart in the same entry indicating cart was a general all purpose term not always intended to indicate the use of a cart.

Stones of many different sizes were frequently transported by being dragged and carted on the farm. They needed to be removed from the fields. From there the stones either went directly to the location of a stonewall under construction or were stored in an out of the way place.

Storage

Left in Field & Removed from Field

"Diging up Large Stones & Laying ym on Small ones in order to Draw ym away in ye Winter when the ground is froze & Snow on it. Joshua & adam Drawing & Carting Stones &c." (April 29, 1742)

This entry had two different methods. The large stones were placed on small stones for removal later, during the winter. The method was strictly for the large stones. The smaller stones were removed from the field during the same episode as noted by Joshua & Adam drawing & carting stones on the same day.

Left in Field

"I Raised up Some Large Stones & put Small one under in order to Draw ym away wn the ground is froze." (December 4, 1742) In this entry the large stones are lifted / raised and small stones were placed underneath as a bed. The bed of small stones kept the large stones from freezing to the ground and therefore allowed them to be removed when the ground froze. These were not piles of stones. They were large stones placed on beds of small stones -- a very distinct structure.

Corner of Lot

"in the foren was at home helping Dig & Draw Stones to the upper Cornr of the Lot." March 31, 1740)

He makes no suggestion he piled the stones only that he dragged the stones into a corner that was out of the way of his working area. He was stockpiling without making *built* piles.

Back Side of Lot

"aftern at home Diging Stones back Side ye Lot" (April 3, 1742)

"wee Dug up Some Stones & Drew Some to the back side" (April 8, 1742)

In this entry Hempstead moved the stones to an area where he was storing stones.

Behind the House

"Dragged Some Large Stones into ye Garden behind the back Leantoo in ordr to Replace them whn opportunity p[r]sents" (May 31, 1754)

In this entry Hempstead dragged the stones to the location where he intended to use them at a later date. Storage was therefore at the building site.

Discussion

Storage took on several different forms. If the stones were too large to move across the soft spring ground they were left in the field to be dragged out during the winter months when the ground was frozen. If the stones were movable in the spring they were taken to either a location out of the way to be stored for later use or were brought to the building site.

Stone Removal from Fields – What months did it take place in?

"I was Diging up Stones & dragging ym off the wheat Ground" (August 30, 1736)

Digging up stones could occur any time of year. Digging stones up was frequently done in tandem with dragging the stones off the field. This shows they were not piled up and left in Hempstead's fields.

"farewell January. I never knew one So moderate. No frost in the ground So that many are plowing & Diging Stones & making wall like Spring." (January 31, 1755)

January is not a month associated with digging up stones and plowing but these activities showed up more than once over the years.

Over the course of Hempstead's lifetime there were two months in which he did not have an entry for digging up stones: October and November. These two months did have entries for carting and dragging stones.

Conclusion

Stone removal was synonymous with field clearing; however, it was not relegated to field clearing. In the 1700s these lines were blurred. Field clearing was done to remove stones and other obstacles like stumps from fields that interfered with plowing. Stones removed from field clearing were often used for building stonewalls. When stones were needed for a stonewall but there was no field to be cleared then they had to be dug up some place. The orchard, fully planted with trees, was repeatedly

used to get stones. In some plowed/planted lots there were areas of heavy concentrations of stones which were mined/quarried. One orchard lot contained a rocky ledge used to get large stones and a meadow in addition to the orchard. It shows the diversity of some of these lots. Stone was sometimes removed from a lot that contained plowed/planted field. The fields often had non-plowable areas that contained stones. In other cases, the cornfield had its corn hills leveled to drag out the large stones previously not removed. This could have been done for future plowing, there was plant rotation being done, or to obtain building stones.

Stone removal is a subject which includes field clearing and independent stone procurement from other areas on the farm. Stone removal revolves around two activities: field clearing and building stone walls – the need to remove stone and the need to obtain stone. Sometimes the two activities coincided. At other times they did not coincide. Stone removal and/or obtainment were project based. It did not occur on an annual basis. It was done for specific projects. A project could be field clearing and/or building a structure.

September was not normally a month when stone activity took place. Over the forty-seven year diary, seven single day, single year entries were recorded in September with the exception of the years 1755 and 1758. In 1755 there were entries on 12 days related to stones. Hempstead had a man named James Harris working for him who was building stonewalls. There were entries for digging, moving, and building. Harris was also working for him in 1758, which had 5 days with entries related to stones. This was two years out of forty-seven years that appreciable stone related activity took place in September and in both years it related to specific wall building projects.

Eighteenth and 19th century farmers took advantage of opportunities that presented themselves. No frost in the ground in January, they got a head start on their wall building and plowing activities which often went in tandem with each other. They had no set months to remove stone. Plowing was generally done in the spring but it occurred as weather and ground conditions permitted. Planting was regulated by frosts and lengths of growing season. It was probably the only activity that was consistently done annually in May and June.

Hempstead's diary puts field clearing i.e. stone removal in perspective over the duration of one farmer's lifetime on his farm. Stone removal in general has to be studied within the overall context of farming and not from field clearing alone.

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