

Lamprey River Advisory Committee

Archeological Survey of the General John Sullivan Industrial Complex

Durham, NH

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Introduction

Victoria Bunker, Inc. undertook an industrial archeological site survey, on behalf of the Lamprey River Advisory Committee, to identify, locate and document features and components associated with the General John Sullivan Industrial Complex on the Lamprey River in the Town of Durham, Strafford County, NH.

The project, conducted between April and August, 2016, included: visual inspection, mapping and photography of archeological resources related to the complex; review of background research compiled by the Durham Historic Association; informant interviews; excavation of subsurface tests; and synthesis of information.

The goal of this study was to complete a field recording survey of locations that exhibited archeological sensitivity related to General John Sullivan's industries that once operated here. The study relied on previously completed historic research.

As a result of this survey, features and components of the industrial complex were identified and recorded. Individual elements vary in dimension and intactness yet each offers important information pertinent to Durham's industrial history. Despite effects of flooding, erosion, reforestation and elapsed time, all of the archeological resources associated with the General John Sullivan Industrial Complex are worthy of recognition as physical representations of early American industrial history. It is further recognized that the Lamprey River has a rich and broad industrial history, with numerous additional sites and remains located throughout the drainage.

The Archeology of Mills

In the late 1700's, General John Sullivan carefully selected a location on the Lamprey River for successful siting of several water-powered mills. The location offered a reliable source of water power that could be harnessed and controlled for mill operation. In 1774, the river was touted as a stream that affords plenty of water in the driest seasons.

Prior to development of steam engines and electrical power in the 1800s, mills were built where water power could be harnessed to operate mill machinery. Thus, Sullivan's mills were placed at a natural falls where dams were then built to create ponds or impoundments to ensure a reserve of water and raise the water's depth to provide the "head." The head was necessary to secure sufficient energy to drive the machinery in a mill. Without water power, early mills simply would not have existed.

At the time of mill construction, timber felled during land clearing would have been sawn here to produce beams, boards or other wooden products. Grain, such as corn, wheat, rye or oats, could have been transported by wagon along local roadways, to be ground into flour at the gristmill. As other industries were introduced, these mills became thriving places, tied to local economy and serving important roles in the fast-growing neighborhoods along the river. In addition, the location offered other key variables. A growing community required milling of timber, grain and fiber to create lumber, flour and textiles for daily use. Timber was brought to the sawmill, perhaps sledged from nearby hillsides and stored in a log pond for ultimate sawing. Grain was brought from nearby farms for grinding and cloth was brought for fulling.

A labor force was also critical in the seasonal and day-to-day operation of the mills, as the manufacturing process included many labor-intensive activities. Archival records indicate that Sullivan employed numerous workmen including a farmer, coachman, carpenters, wall-builders and others who worked at his farm and at his mills. Among the individuals connected to Sullivan's mill operation were Daniel Croxford and Eleazer Bennett, who lived along the river.

Components of water-powered mills that are typically encountered at archeological sites include:

- the natural water source
- a dam to impound the water and create head
- a mill pond or impoundment to create a reservoir, provide stored energy potential, and store logs at a sawmill
- a conduit to convey water to the mill (such as a race, penstock or canal)

- a wheel pit and water wheel or turbine to convert the water power to rotational power for operating machines
- a tail race to return the water to the natural stream
- and the mill building itself along with accompanying machinery, work space and associated yards.

While early mills typically utilized natural waterfalls to provide power, dams were also added to impound water and provide energy to the mill. Dams were typically constructed of readily-available materials such as stone and logs, often built in a crib configuration. Most dams had anchor points on shorelines or wings of bermed earth to provide an enlarged impoundment. Dams were built to span the entire width of a river, often a distance of several hundred feet. They also were built with sluices, positioned to control flow into the mill headrace or to permit flowage of excess water

As water was channeled from the dam, it flowed in a canal, trough, flume or penstock to the location of a water wheel. The water wheel was placed in a pit and was located within the mill building. Typically, undershot waterwheels were most commonly used in New England before 1850. These wheels were constructed with boards that served as blades; the impulse of water caused the wheel to turn. The wheel rotated on an axle which was geared to mill machinery.

Mill buildings were generally timber framed and built of wood, with stone footings or foundations. These buildings were placed at one terminus of a dam, where water could be channeled into the building and structures often straddled portions of the dam or power canal. Most mills had supports or pilings either on the river bank, in the stream bed or on top of a dam.

Sawmills were usually left open-sided, serving as only a rough shelter. The open walls did not offer much protection from weather, but facilitated disposal of bark, sawdust and debris. The sawing of lumber was generally accomplished with an up-and-down saw blade. Timber was moved from the mill pond or other storage area into the mill and finished products were removed from the side of the building to be stored in a work yard.

Conversely, gristmills were more substantial structures. These buildings were enclosed from the weather, were usually one or two stories and housed heavy millstones and storage areas. Typically, a gristmill was used to grind grain such as corn, wheat and rye into meal or flour. Gristmill buildings were generally rectangular, though not necessarily so, and usually were two-storied and weather tight. The building needed to be strong to resist the forces of heavy millstones and the stresses of running the machinery. A

bolting mill, located in the same structure, sifted the product of the gristmill into finer flour, improving its quality. Usually, the bolting was accomplished in the gristmill, sometimes with both the milling and bolting machinery operating side by side.

Fulling mills were also substantial structures, built to process newly woven fabric, often of wool, into clean, oil-free, pliable cloth. This was accomplished by utilizing strong V-shaped wooden tubs into which large wooden trip hammers were dropped. The tubs were filled with water into which the freshly woven cloth was placed and then struck from above by the heavy hammers. The hammers were raised by a cam driven by a water wheel. At the end of the cam travel, the hammer was released (tripped) and the heavy hammer fell by force of gravity into the vat of water and cloth. The raising and dropping of the hammer was repeated continuously as a worker manipulated the cloth in the vat of water. A fulling mill needed to be strongly built to resist strong water wheel torque and the forces of the falling hammer.

While a sawmill, gristmill and fulling mill are believed to have been present at Sullivan's complex, it is most likely that each occupied a separate building given their differences in use.

Large mills represent only a fraction of the buildings and activity areas at industrial complexes. Archival sources indicate that Sullivan's mills also included a scythe mill, dye mill and press house. Additional structures and work yards undoubtedly existed, used for storage, processing, refuse disposal, maintenance, animal enclosures, sheds, administration or housing.

A scythe mill would have consisted of a stone grinding wheel for sharpening scythe blades. While the machinery may have been powered by a hand crank or a small water wheel, a scythe mill would not have required the space or head needed to operate larger saw, grist or fulling mills. A sharpening stone could have been located in one corner of the sawmill or in a small workshop; this activity did not necessarily require a separate building.

A dye house is an important component of textile production. At Sullivan's mills, the occurrence of a separate dye house typifies the pre-revolution manufacturing method of utilizing separate and distinct mills for individual manufacturing steps. In this way, the first steps in textile production, such as carding, spinning and weaving, were accomplished elsewhere. The dye house itself would be a place of true technological processing that relied on chemistry, specialized apparatus, and critical timing. A dye house would have included several spaces such as a laboratory (known as a drug room), a dye room, and a drying room. Dye houses

were solid, complex buildings with wash tubs, vats, furnaces and pipes. Often these buildings were substantial structures supplied with plenty of water, but not operated by water power.

Nineteenth century discussions of dye houses, indicate that each step in the dyeing process required a different internal arrangement and apparatus. Within the facility, the Dye-house, Dry-house and Drug-room were all partitioned off. The dyeing apparatus included kettles capable of dyeing several hundred pounds of fabric, along with a scour-kettle and wash-box to rinse the product. As some dyes required boiling, a wood fire was needed; however, boiling heat was not necessary for dyeing silk. Silk required special treatment as a quick drying time was necessary lest the colors be changed. For this process, silk was dried on a moveable pole known as a shaker that was suspended within a heated chamber. The pole was kept in constant motion to enhance evaporation. Kettles used for dyeing were made of tin (for scarlet and delicate colored dyes), brass or copper. The base of each kettle would have been pierced for drainage, with exhausted dyes running into a drain or gutter below the work floor. Floors in dyeing rooms were usually inclined to facilitate drainage.

Dye houses were built close to streams, as water was integral to the dyeing process. However, dyeing did not require a water-powered mill. Dye houses were often arranged so that drying could be conducted along the southern side of a building to benefit from sunshine.

Archeological mill complexes can be elusive, with features rarely intact. At sites, components may range from still-standing structures to stone alignments, to earthen mounds, to subsurface depressions. Wooden elements may have burned while portions of buildings and dams may have washed away. Yet, mill sites are considered valuable because they provide a point of connection among diverse elements, including local topography, water ways, environmental resources, community growth and cultural geography.

Archeological Features at the General John Sullivan Industrial Complex

Field investigations resulted in identification of an array of archeological components at the General John Sullivan Industrial Complex. The remarkable components recorded during this survey are key cultural resources along the Lamprey River. These include the remains of dams and buildings which, taken together, constitute the archeological site. These remains helped shape the local history and provide an important view into the earliest industry along the river.

The General John Sullivan Industrial Complex reflects a continuum of growth and development over the course of some 30 years, between 1770-1771 when Sullivan first purchased land and obtained the mill privilege and 1805-1808 when lands and mills were sold. By 1813, deeds no longer mention the mills, suggesting that they had been destroyed in the years following the sales of 1805 and 1808. The site reveals ownership by a single proprietor and his family, with the location serving multiple purposes.

Numerous archival sources including published histories, deeds, the Sullivan Papers, news reports and advertisements indicate that the General John Sullivan Industrial Complex was bustling and thriving at the turn of the eighteenth and nineteenth century. Among the recorded components of this early American industrial nexus were: a sawmill, gristmill, bolting mill, fulling mill, scythe mill, dye house and press house.

Prior to this archeological investigation, none of Sullivan's mills had been recorded in the field. As a result of this study, a series of archeological components were identified. A description of each follows.

Dams

Two dam locations were identified. Both were recognized first, by drops in the water flow, created by submerged alignments of stone and second, by diagnostic attributes observed on bedrock outcrops seen on river banks.

These two features are located at the upstream (western) and downstream (eastern) ends of a narrow channel within the archeological survey area. Here, the channel is characterized by its rocky stream bed, scoured banks and rapid flow - making it the ideal setting for dam construction.

At one dam, a massive bedrock projection was observed. Several notches and cuts are present on the surface of this outcrop indicating places where the dam was anchored to the shore. This dam created a nearly circular impoundment, which served as a mill pond. This pond would have been the ideal location for storing logs brought to the sawmill from surrounding hillsides.

At the other dam, bedrock and tumbled stones were observed. Many of these stones exhibit cut notches, which likely held wooden timbers representative of timber crib construction, in place. Additionally, a stone alignment is constructed of massive stone blocks, some of which exhibit notching, and likely served as a wing to the dam.

These dams constituted hydraulic management features, providing the requisite water power for operation of Sullivan's mills. As such, these dams set the scene for all other industrial components at the site.

Sawmill

A feature interpreted as representing the location of Sullivan's sawmill was identified. The location, setting and orientation of this feature are diagnostic of a channel placed to divert water and direct flow into the mill structure.

The feature includes stone alignments, running parallel to the river's flow. The feature is partially submerged, rising only slightly above low water level. While only remnants are present, the alignment is clear, consisting of dry-laid stones positioned to form the margins of a water management channel. Immediately below this channel, numerous large boulders and outcrops were also observed. These rocks exhibit cut and notched surfaces which likely served as footings or were used to support beams and timbers associated with the sawmill structure. No evidence for a building foundation was found; it is likely that the mill structure was perched on footings or situated above the water management channel. The presence and orientation of the channel, and associated notched stones, is in keeping with a sawmill location, positioned below a log pond.

Archival sources provide additional detail about Sullivan's sawmill. Sources indicate that the mill was in operation in 1774. Subsequently, great damage was caused to the complex by a flood in 1785 and a fire in 1787. The sawmill was still in operation as of 1790, but by 1796, a year after Sullivan's death, the sawmill is no longer mentioned. This suggests that the sawmill operated for slightly more than 20 years.

Gristmill and Bolting Mill

A feature interpreted as the remains of Sullivan's gristmill and bolting mill was identified. The massive stones observed at this feature are in keeping with its function as a gristmill and bolting mill.

This feature is positioned in direct alignment with a dam. As such, water impounded behind the dam would have been used to power this mill. While only remnants are present, the original building was constructed utilizing a natural slope and relying on bedrock exposures to support the massive building. The visible feature exhibits an "L" shape, with walls that are constructed of massive, dry laid, natural and squared boulders placed directly on bedrock. Notching was observed in stone faces and likely reflects placement of structural elements such as posts, beams, or machinery supports. These stones are loosely aligned and in several locations, there is evidence of wall tumbling and displacement. While only remnants remain visible, the large, massive boulders placed on stable bedrock would have served as a sturdy foundation for a gristmill and bolting mill.

Archival sources provide invaluable detail on Sullivan's gristmill and bolting mill. A portion of the mill privilege was acquired in 1771 from Stephen Pendergast, with the gristmill and bolting mill soon in business. By 1774 the complex included a double gristmill, providing "the best of flour" from winter rye.

On October 23, 1785, a freshet which raised the water level by some 15 feet, carried Sullivan's gristmill off its foundation. The building itself filled with water up to the second floor. Ebenezer Sullivan, son of General John Sullivan, ripped up the floors and removed the boards, weighing the building down with rocks and securing it with chains. Despite his efforts, the mill broke away and traveled downstream about 20 feet. Ebenezer was able to salvage the mill stones and all the iron work, but found that the timber was no longer serviceable.

The mills which were swept away by the 1785 freshet were rebuilt one month later *in situ* as recorded on November 22, 1785 in the *NH Mercury*. Notably, Sullivan offered mill stones and iron work for sale at the same time.

The gristmill was put up for auction in 1796, slightly more than a year after General John Sullivan's death. Deeds indicate that the gristmill was still standing as of 1808, but apparently operation ceased at about the same time as the mill is not mentioned in later deeds or transactions.

Building Foundation

A building foundation feature was identified.

The visible remains of this feature include: dry-laid fieldstone alignments; a notched cornerstone; a large mound composed of brick rubble, marking the position of a former central chimney; and a subterranean cellar.

Notably, a flat stone was identified roughly in the center of one wall. This may have marked the location of a front door step. From this point, a person would have had a clear view of the river.

Artifacts included 8 fragments of brick as well as 2 hand wrought nails, 1 metal spike, 11 ceramic sherds, 1 bottle glass fragment, 1 whetstone, and 1 gunflint.

The gunflint is an intact gray, prismatic chert gun flint of English origin, datable to the eighteenth century. The piece is trimmed with a rounded heel and sides, with evidence of use from striking in a lock dog. This type of gray English flint likely originated from East Anglian mines, with nodules shaped into long prismatic cores for use in guns of various sizes.

The hand wrought nails and iron spike are important materials, indicative of building construction using these iron fasteners. In general, hand made nails typically date prior to the 1790s.

The whetstone is a fragment of a tool used for sharpening knives and other cutting tools. This item is a small, with a rectangular shape and exhibits polishing from use on two surfaces. Perhaps, someone was sharpening a tool when the whetstone snapped and was discarded, entering the archeological record.

The bottle glass fragment is from a free-blown bottle. This technique is indicative of a mouth-blown bottle manufacturing process, predating the process of blowing glass into molds introduced in the nineteenth century. While the fragment is too small to determine exact age and technology, it may be consistent with the age of other artifacts found during sampling.

The ceramics found during subsurface sampling consist of small, highly fragmented sherds. Most of these sherds are unglazed and lead-glazed redware which was ubiquitous at domestic sites throughout New England prior to the mid-nineteenth century. The ware was associated with dairy product processing, such as cheese and butter, as well as

food preparation, cooking and food storage. Because of its longevity of use, and frequent lack of decoration, redware is not generally considered temporally diagnostic. However, archeological investigations at Strawberry Banke Museum indicate that locally-made redware was manufactured in Portsmouth by Samuel Marshall who operated a pottery works circa 1737-1749.

Other ceramics found during sampling include a single sherd of white salt glazed stoneware and a single Staffordshire slip decorated earthenware rim sherd. The stoneware sherd represents a ceramic type that was manufactured between 1720 and 1805 for production of tankards, plates, jars, jugs or bowls. This sherd exhibits a white to buff-colored body paste typical of many British pottery manufacture centers. The Staffordshire sherd is from the rim of a vessel. It is a type manufactured between 1690 and 1800 and exhibits a marbled brown slip. The marbled design, typically glazed on both sides, can be elaborate, often found on bowls and cups.

The artifacts found at the foundation represent a mixture of locally made and English-made pieces. Temporally, all artifacts are consistent with an occupation date during the late 1700s and reflect domestic - rather than industrial - type activities.

The size, orientation and artifact association suggest that the foundation dates to the late 1700s. The foundation footprint is evocative of a one-room-deep hall-and-parlor building, with a central chimney, known as the Cape Cod house. This house form is the most common early period home in New England, built in the late eighteenth century, and known for its symmetry of design.

The building which stood on this foundation may have served multiple purposes, used as a dwelling, office or workshop. It may also have served as an entry to the industrial complex.

Scythe Mill

The location of the Scythe Mill remains vague and unsubstantiated. Archival sources indicate that a scythe mill existed in 1774, where scythe-makers could leave new-made scythes for sharpening. After sharpening, the scythes were to be returned to the makers and a drop location was established in Portsmouth. This hints that new and sharpened scythes may have been transported between Portsmouth and Sullivan's mills by gundalow. Sharpening may have occurred within the sawmill or another building, using a small wheel to accomplish the task. The longevity and success of this business venture is unknown, and this may have been only a short-term, ancillary venture. By the 1780s the scythe mill appears to have ceased operation.

Fulling Mill, Dye House and Press House

The finishing and dyeing of cloth constituted a substantial activity at Sullivan's mills. Archival sources indicate that three facilities were associated with the textile industry including the Fulling Mill, Dye House and Press House. However, it is unclear where these activities took place and archeological evidence remains elusive.

In a 1774 advertisement, the Fulling Mill is described as an operation undertaken by 2 people, one of whom had experience in England, and the other who had trained with a clothier in this country. In addition, the advertisement promotes the facility's ability to dye silk and other types of cloth, to dye yarn in blue and other colors, and to repair or care for fabrics. The advertisement also strongly points to use of boats to transport the yard and dyed cloth, relying on the services of "Mrs. Hight at the Ferry."

Over time, the Fulling Mill, silk dyeing and clothing business are promoted in numerous advertisements. Yet, the fulling mill suffered the flood of 1785 and was carried away. The building was caught in the river and fastened to trees with ropes, then was completely rebuilt to carry on in the best manner.

In addition to dyeing, Sullivan also established a relationship with Gillet de la Vallee and Company for buttons, mohair, silk knee garters, hair buttons for hats, cord, threads, looms and other goods, accepting wool, flax, cotton and raw silk in payment for such articles.

By 1788, the Press House was also in operation. Finished and dyed yardage was kept in this building. A notice of yardage theft provides information on the type and value of the cloth finished at the mill. In this 1788 notice, both thick and thin cloth was inventoried with quantities ranging from 3 to 14 yards. Among the yardage was fabric dyed green, olive, claret-brown, snuff, gray, black, blue, and claret. Presumably, these fabrics were of great value as a reward was offered by General Sullivan.

By 1790, the Fulling Mill and Press House were both offered for sale and by 1798 these facilities were under operation by Daniel Croxford following John Sullivan's death. By the 1820s, the clothier business was owned by Nancy Croxford, the daughter of Daniel Croxford.

The place where these activities occurred at the site remains vague and unresolved, but it is likely that all operated in the same or contiguous buildings within the industrial complex. Fulling and dyeing required abundant water in dye preparation and equipment operation. While dyeing required an abundant water source, the fulling mill required water power to operate machinery. Fulling and dyeing were aspects of the textile finishing process; whole cloth – wool, cotton and silk – was brought to and from Sullivan's mills, perhaps by boats on the river.

Archival evidence indicates that the fulling mill structure floated away with the gristmill in the flood of 1785. However, no evidence for any of these elements was observed during field inspection.

Summary

All of the components associated with Sullivan's mills were constructed soon after the property was purchased in 1771. They continued to operate until the time of their abandonment in the early 1800s, following Sullivan's death and property transfers. As such, there is a well-defined chronology for construction, use and decline of the archeological components at the site.

The effects of water flow, flooding, erosion, fire and disuse have transformed a vibrant industrial complex into an archeological resource where only remnants of past activities are preserved. The most substantial of these components – the dams, building foundation, sawmill feature and gristmill feature – have withstood time; in contrast, the scythe mill and textile components are elusive and could not be defined in this archeological study.

Preservation Recommendations

The Lamprey River Advisory Committee has provided a unique opportunity to investigate the industrial archeological components associated with General John Sullivan's eighteenth century mills.

The features, components, artifacts and elements identified during this survey are considered valuable cultural and heritage resources, worthy of protection and preservation.

Despite their original massive construction and substantial components – built of earth, stone and timber – the individual features are delicate and fragile, subject to continued demise from both nature and man. Thus, we promote a program which would encourage protective measures and respectful treatment of these individual features and their immediate surrounds. While awareness of Durham's past is encouraged, we recommend that any visitors follow a "Leave no Trace" philosophy regarding outdoor ethics for heritage sites with particular attention to historic and archeological resources as follows:

- Leave artifacts in place, as rearranging them limits both their scientific value and the experience of future visitors
- Do not rearrange, remove or walk on stone alignments
- Take photographs or make drawings of any remains
- Do not dig, remove, or collect artifacts
- Do not damage sites with graffiti and do not attempt to remove existing graffiti
- Report vandalism as soon as possible
- Respect the past as historic and archeological sites are fragile, irreplaceable, and special places that tell the story of our past

We strongly recommend that vandalism, including unauthorized digging for artifacts or stone scavenging, be deterred.

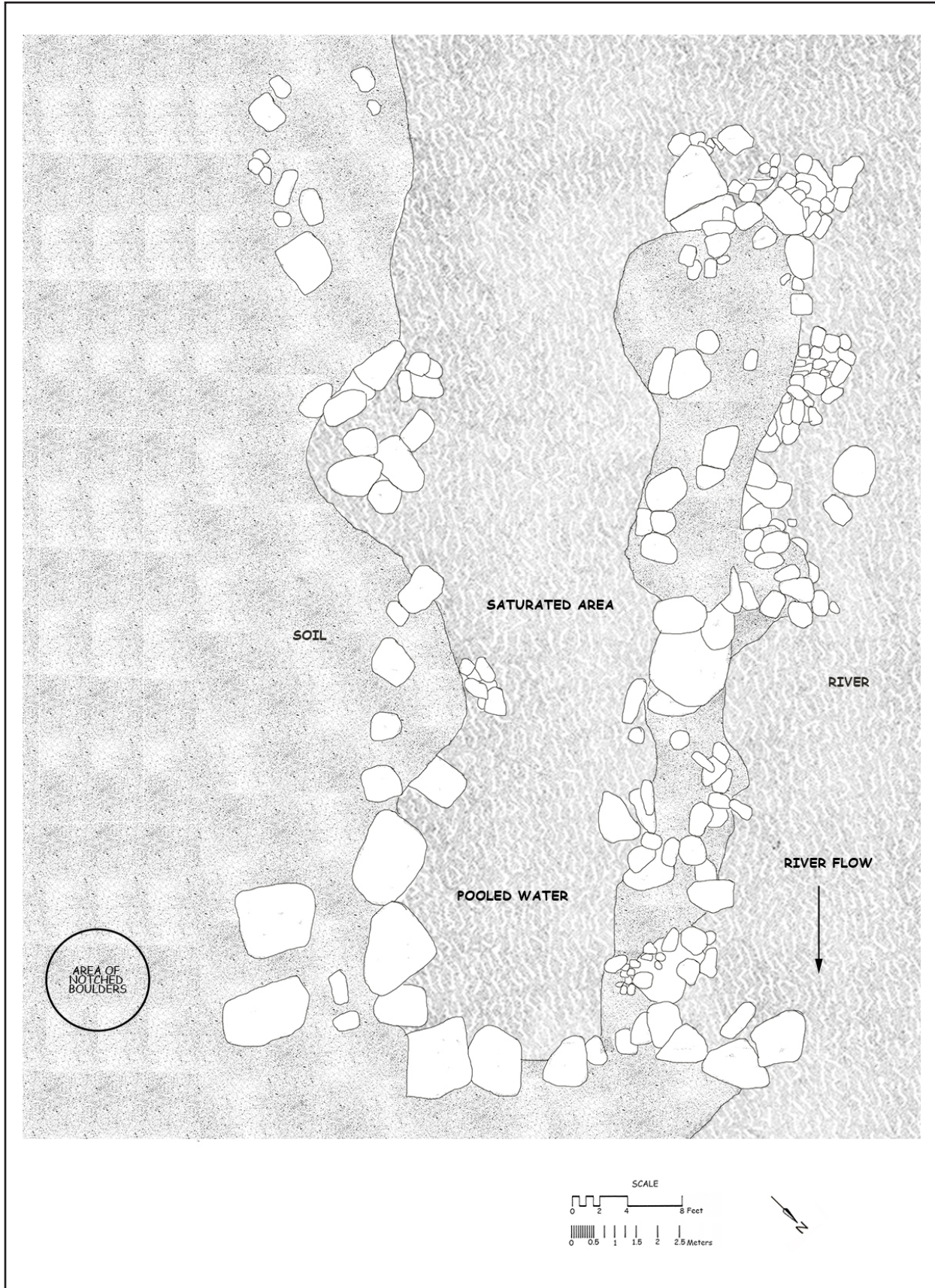
Preservation of this complex will require continued stewardship and sustained cooperation.

The artifacts and features recorded during this survey have special meaning. They are the tangible reminders of the history of New Hampshire's early industry and are associated with a prominent individual who played a leading role in establishing a new country.

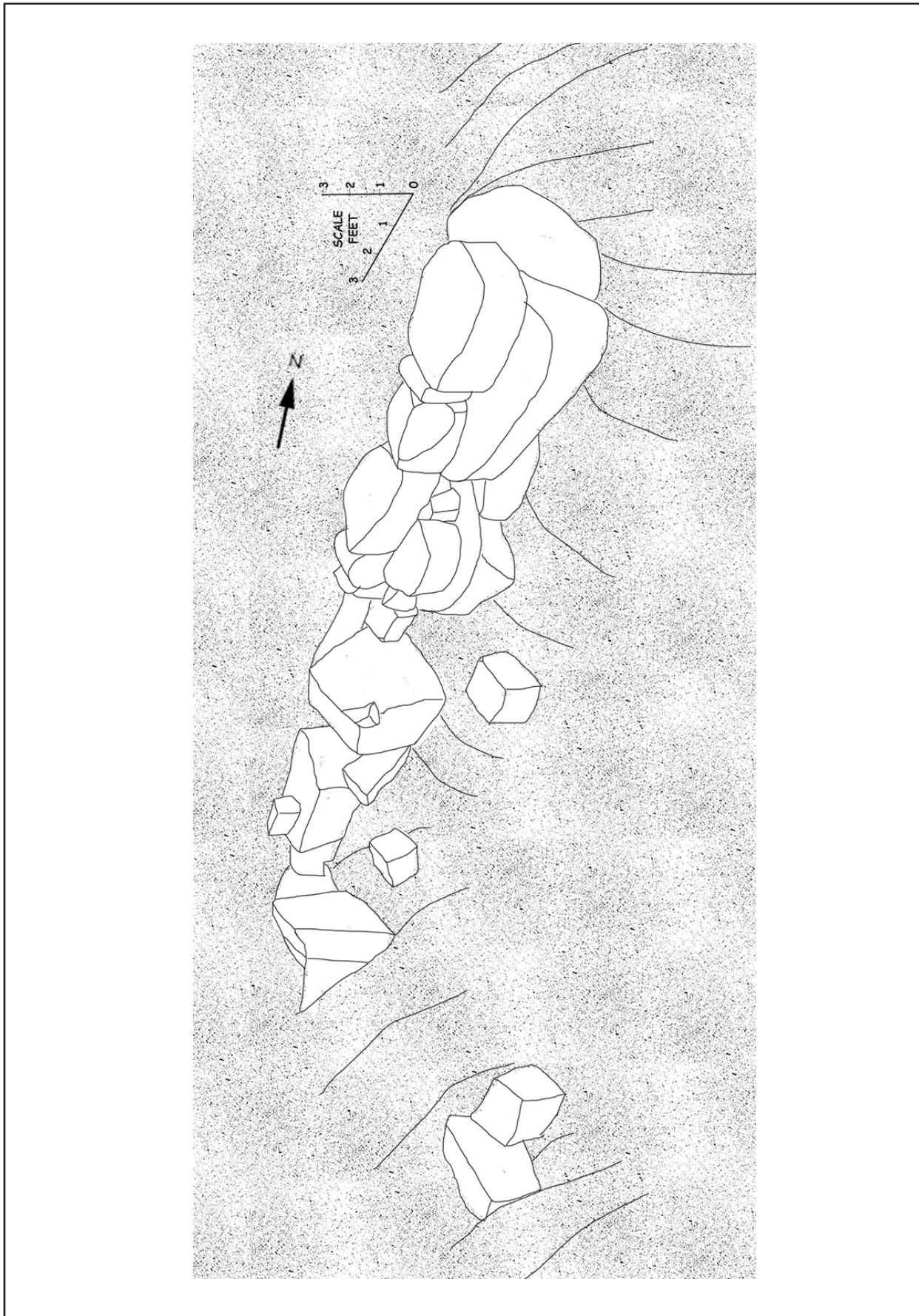
Notes

This report has been extracted from a Technical Report which provides additional details. The Technical Report is available only to authorized archeological researchers, historians and preservation managers.

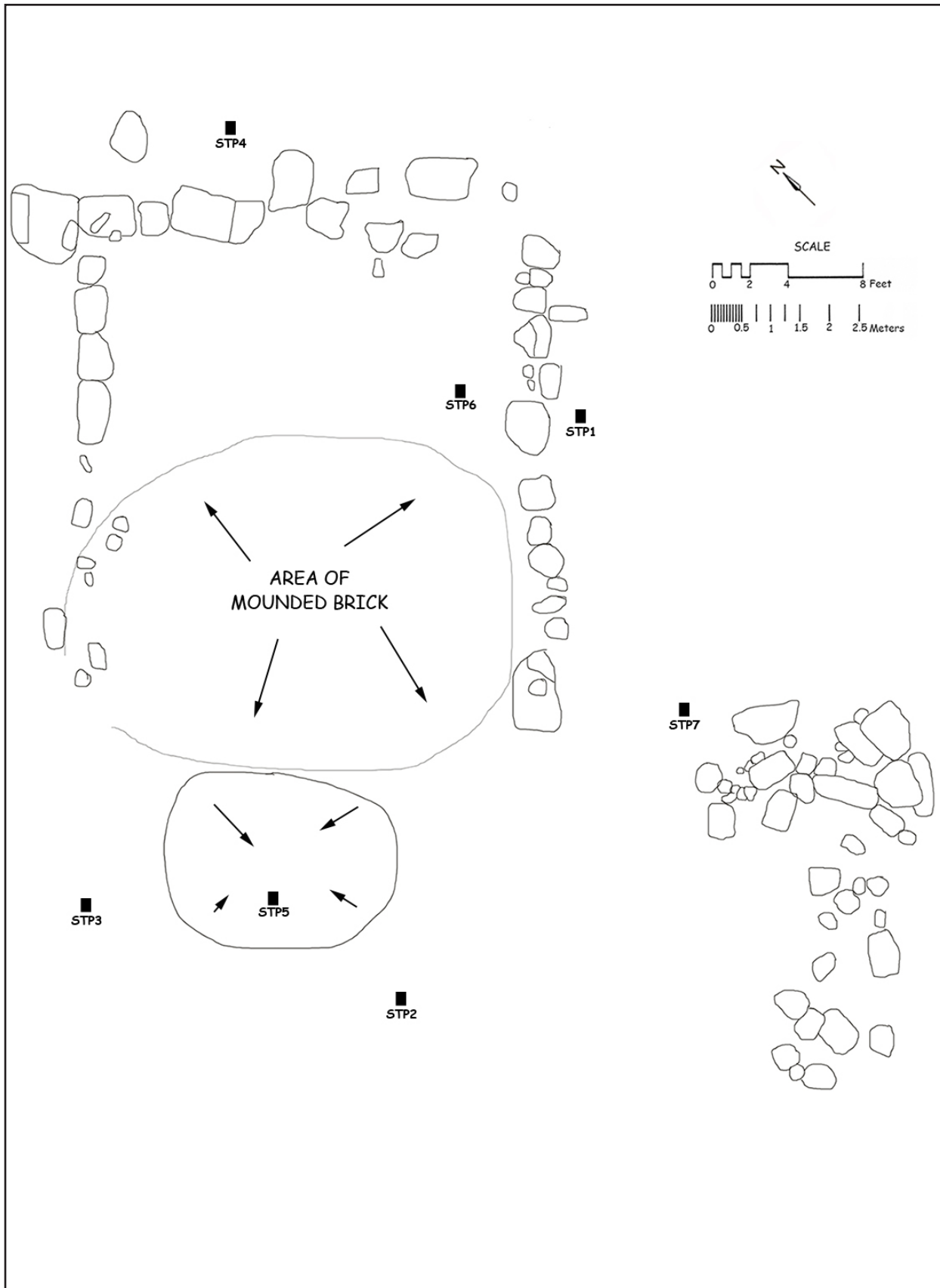
Funds for this project were provided by the LRAC and the National Park Service under CFDA: 15.954 – Lamprey Wild and Scenic River Assistance. The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions or policies of the U.S. Government. Mention of trade names or commercial products does not constitute their endorsement by the U.S. Government.



Scaled Field Sketch of Sawmill Water Management Canal Feature



Isometric Scaled Field Sketch of Gristmill and Bolting Mill Feature



Scaled Field Sketch of Building Foundation Feature