The Shape of Time in Buffalo Valley:
Traditional Barn Building in Union County
by
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The most memorable vernacular buildings in Buffalo Valley are the hundreds of nineteenth and early twentieth century barns that occupy its landscape[1]. Large and weather-worn, set into hillsides and oriented to greet the morning sun, these structures present the farm to the passing world. One thing that is apparent from looking at old barns in Buffalo Valley is that they share common traits of form and construction, but with myriad variations. No two are identical, yet as a group they show the influence of a barn building tradition that persisted over many generations, from the period of settlement through the early 20th century. While the practice of farming underwent enormous transformation during this period, many characteristics of the traditional form and construction of barns remained resistant to change, or were able to accommodate and adapt to change in ways that preserved strong continuity with the past.

This article will consider barns in Buffalo Valley as the markers of a gradually evolving building tradition. Why barns? Like houses, they are richly informative artifacts —a primary document of the culture and history of a place. But looking at barns reveals different aspects about the past than looking at houses. Whereas comparison of 19th century Union County houses demonstrates the extent to which families worked to retain ethnic identity in a diverse society, barns speak to the process of assimilation in the economic realm, as distinct communities separated by language, customs and religious faiths merged to form a common society.

Defining the characteristics of a local building tradition requires examination of a broad sample of evidence. Barn builders worked largely without written records, so to study their practice we primarily use the buildings themselves—seeking to understand the ideas which formed them. This article draws on evidence from a survey that I conducted over the course of a summer and fall nearly thirty years ago to record the architectural characteristics of farmhouses, barns and outbuildings in Union County, and in many

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[1] The term 'vernacular' applied to buildings refers to architecture which is indigenous to a place and rooted in tradition.

discussions in the years since with the owners of old barns. By comparing barns we can discern common traits of form and construction and attempt to define a chronology of ideas which guided builders working within the tradition.

There are two immediate challenges with doing this, however. The conception and construction of even a simple barn does not emerge from a single idea, but rather from a complex of intentions about the building location and orientation, size, structure, materials, and internal organization. Each of these intentions is affected by its own set of considerations and potential solutions subject to differing rates of change.[2] Compounding this, the second challenge is that barns are not static structures, but prone to alteration over time. In fact, alteration and addition is a fundamental characteristic of barns—it is in their nature to be adapted as farming practices and the needs of the owners evolve. Therefore, the challenge in studying building traditions is to develop a model for analyzing evidence from buildings which acknowledges the multi-faceted nature and variable pace of change in builder's practices, as well as subsequent alteration to buildings after initial construction.

Common traits of the form of traditional barns are used to define building types, "type" designating a basic plan with a set of consistent characteristics which may be constructed using different materials and techniques. This definition of type based on patterns of shared form is an attempt to approximate the concept in the mind of the builder which guided the planning of the barn as a solution to specific requirements. Profoundly utilitarian structures, barns are essentially tools which reflect the intentions and needs of farmers, organizing space for storing crops and stabling livestock, facilitating the daily work of the farm and processing of the harvest. [3]

Thinking of the barn as a tool shaped in response to a farmer's requirements and circumstances helps us to understand the relationship between building tradition and farming practice. The changing size and configuration of barns in Buffalo Valley records the impact of economic and technological change within the region's evolving farming systems.[4] Barns in use today have been modified multiple times to adapt to shifting

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[2] George Kubler, The Shape of Time: Remarks on the History of Things, Yale University Press, 1962.

[3] John Fraisier Hart, "On the Classification of Barns", Material Culture, Vol. 26 (1994), No. 3

[4] A 'farming system' consists of the natural, economic, cultural, social and political conditions which form the context for agricultural activity. The concept of historic and regional 'farming systems' in Pennsylvania is discussed at length in "Historical Agricultural Resources of Pennsylvania 1700-1960", Pennsylvania Historical and Museum Commission, (http://phmc.info/aghistory)

farming practices, but these shifts have been so extensive in the 20th century that many barns have fallen into disuse and are gradually disappearing from the landscape.

18th Century Barns

The roots of this building tradition are difficult to assess because the built evidence is incomplete. Very few barns survive from Buffalo Valley's early settlement period at the close of the 18th century, and those which have are much altered, so we must look to other types of evidence such as tax records to supplement our understanding of the built environment of that time. John Blair Linn's Annals of Buffalo Valley contains a 1796 enumeration of occupations and improvements of the taxable inhabitants of West Buffalo and White Deer Townships which is helpful in this regard. While the information is limited to very brief descriptions, it provides a glimpse of the condition of farms in the community during the first generation of settlement.

While most of the agricultural land in Buffalo Valley was purchased by 1796 and much of it already under cultivation, the majority of farmers had not yet constructed a barn. The improvements of over three quarters of the assessed occupants include a dwelling, but only about 15% owned a barn and 9% a stable. All of the barns and stables, as well as the great majority of the houses are listed as log construction. Slightly less than half of heads of household indicated their occupation as 'farmer', and of these more than two-thirds did not own a barn, (see Table 1).

Table 1: Agricultural Buildings Listed in 1796 Assessment

	taxables	farmers	barns	stables	Spring houses	still houses	farmers w/o barn
West Buffalo Twp	204	99	28	11	6	2	76
(% of total)		48.5%	13.7%	5.4%			76.8%
White Deer Twp	175	78	30	24	0	11	53
(% of total)		44.6%	17.1%	13.7%			67.9%

Source: Linn, Annals of Buffalo Valley, (Harrisburg, PA, 1877), pp 301 – 308.
In 1796, West Buffalo Township included modern Hartley, Lewis & Limestone Townships. White Deer Township included modern Kelly Township.

a. Single-crib ground barn near White Spring

b. Same barn from west, with added frame bays

c. Double-crib ground barn near White Spring

d. Same barn from east

e. Double-crib bank barn near Mifflinburg

f. Same barn from south east

Figure 1 Log Barns in Limestone and West Buffalo Townships, Union County. The two barns near White Spring, photographed in 1984, have since been demolished.

The 1796 assessments provide evidence of barn construction and form. The West Buffalo assessor included construction material in his description of property improvements, indicating all of the barns listed were constructed of horizontal log. He described 15 barns as 'round log', 8 as 'hewed log', and the remainder as 'chipped log' or 'scutched log', indicating the amount of effort and labor put into transforming the logs from their natural 'round' condition into more refined rectangular hewn form.[5] The West Buffalo assessor uses the term 'cabin barn' in four instances and 'cabin stable' once. The White Deer assessor used three different terms to describe barns on the assessed properties, distinguishing between 12 'barns', 17 'double barns' and one 'bank barn'.

Comparing these assessment lists to contemporary records for Lancaster and Berks Counties we find fewer and smaller agricultural buildings in Buffalo Valley at the close of the 18th century than in the older farming communities of the southeastern counties. The simplest and most expedient of these, a 'cabin barn', was a small log building used for storage of fodder and sheaves of un-threshed grain crops.   The White Deer assessor may have used the term 'barn' (as opposed to 'double barn') to indicate this type of single crib log structure. The assessment evidence records farmsteads of cabins and small barns more closely resembling building types preserved in the southern Appalachian Mountains than the large houses and barns that replaced them in central Pennsylvania during the 19th century.

To interpret the architectural remnants of this early settlement landscape, it is necessary to understand the context of the distinctive settlement period agricultural economy. In 1796, eighteen years after the Great Runaway, Buffalo valley was a young but steadily growing farming community, no longer on the frontier. The overall population density in the region at the close of the eighteenth century was still under twenty persons per square mile, too rural to offer a significant local market for agricultural production, but this was a period of increasing grain exports to Europe which inflated the price of wheat and provided an expanding cash economy for farms with access to transportation. Buffalo Valley farmers benefitted from the proximity of the Susquehanna River, which they

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[5] 'Scutched' was a term from processing flax for the removal of outer plant fiber, so it probably indicated stripping of bark. 'Chipped' indicates the logs were roughly shaped on two sides with an axe. 'Hewed' logs were worked with an axe and adze to produce timbers with straight, smooth surfaces.

navigated on large, flat-bottomed 'arks' during high water in the spring to carry barrels of milled flour, grain and whiskey to Middletown, Columbia and even Baltimore.

Tenant farming was prevalent in the settlement period, as farmers without means to acquire land rented property from speculators and resident land owners. Farm families exchanged goods, services, products and labor within their local communities and sent goods to distant markets, pursuing an extremely varied range of enterprises and creating a diverse exchange network to obtain necessities and amenities. [6]

While warrants and property deeds recorded in Buffalo Valley during the first generation of settlement averaged about 125 acres in size, early tax assessments indicate the amount of land cleared and under cultivation in this period was a fraction of the total holding. Converting woodland to cleared, tillable fields proceeded at a rate of about 30 acres per farm per decade. In addition to growing produce for the homestead and local trade, farmers planted the small fields of the early settlement period with crops that would bring the highest return—primarily small grains. Travelling through the region in 1794, William Davy, an English land speculator, recorded his observations of crops grown on farms:

> I find Wheat is sown here in the Fall (beging. of Septr.) Clover & timothy Grass
> is generally sown with it. The Wheat is cut in June or beginning of July after
> which the Grass grows very rapid & always affords two Crops. Where Grass
> has not been sown they harrow the Ground well where the Wheat is taken off &
> sow Buck Wheat which ripens by the beginning & through September is
> excellent food for Poultry & Cattle & makes good Cakes.[7]

Fall-sown wheat and rye, harvested in July and threshed out in late autumn were the main crops, consumed on the farm, but also exported to market as grain, flour and whiskey. Many farmers also planted spring grains: oats, buckwheat, Indian corn and barley; grasses and legumes for forage and hay; hemp and flax for fiber and oil; orchards for dried fruit and cider; gardens for potatoes, turnips and other vegetables.[8] Tax records

[6] "Historical Agricultural Resources of Pennsylvania 1700-1960", PHMC
[7] Norman B. Wilkinson (ed.), "Mr. Davy's Diary," *Pennsylvania History*, 20 (1953), p.259.
[8] Stevenson Fletcher, Pennsylvania Agriculture and Country Life, 1640-1840, Pennsylvania Historical and Museum Commission, 1971

indicate most farms had only a few horses and cows, seldom more than two. Hogs and cattle initially were allowed to free range, captured in the fall for butchering. Horses were kept in stables rather than in barns, which were used primarily for storing and processing grain. Many farmers did without a barn for several years while clearing land, storing grain within the house.

Buffalo Valley barn builders at the end of the 18th century organized space around the work of storing and processing grain: providing space to dry harvested crops under shelter and a floor for threshing with a flail to separate grain from the straw. In many barns they also provided stable and manger space for livestock below or adjacent to 'mow' spaces for storing fodder. The manner in which these various functional requirements were addressed depended at first on the origin of settlers and the farming practices they brought with them. Scots-Irish farmers who composed a majority of the earliest settlers initially perpetuated a northern Irish pattern of small, single-use structures in separate buildings: cow byre or stable, hay barn, still house. Stone masonry construction typical in northern Ireland was replaced in central Pennsylvania by horizontal log, but cabins and barns retained the narrow gable width and single story form of traditional Ulster farms. These were intended as provisional, temporary structures, often built expediently with unhewn 'round' logs, with minimal or no foundations. Any single-crib log barns that survive from this period have been incorporated into larger structures by subsequent addition and rebuilding. For example, a small single-crib log barn in Limestone Township on Creek Road, (see figure 1a and b), was expanded by later frame additions into a three-bay structure, transforming it into what the White Deer assessor termed a 'double barn'.

Ground Barns

German-speaking immigrants from central Europe made up a smaller portion of the initial settlement of Buffalo Valley than the Ulster Scots, but they remained in the area and acquired farms to such an extent that by the start of the 19th century the rural population in the southern townships of Union County was mostly Pennsylvania German. German speaking farmers introduced two versions of a three-bay barn type, consisting of storage mows flanking a central threshing floor. A 'mow' was a space for storing loosely piled hay for feed and straw for animal bedding, as well as stacked sheaves of wheat, oats, rye or

barley before the grain was threshed out. Threshing with a hand flail required an open space about 16 feet wide with tightly fit wood floor planks--the 'threshing floor'.

The smaller version of the German barn was called a Grundscheier or 'ground barn' because it was built without a basement, with all points of entry at ground level. Ground barns were rectangular in plan with a gable roof. Larger than a cabin barn, with a storage bay to either side of a threshing floor, it was also known as a 'double barn' or 'double crib barn'. The bays flanking the threshing floor were often divided vertically into stable space at ground level with a hay mow above. In the Rhineland Palatinate region that many Pennsylvania Germans originally migrated from this barn type was built of stone or half-timbered construction and was often connected to the dwelling, but in Buffalo Valley it was built of horizontal log or frame as a free-standing structure.

Ground barns have minimal foundations, but the wood plank threshing floor of the center bay was usually raised above the level of the flanking bays, which often had dirt floors. Figure 2 shows plan and sections of the Shively barn, a late 18th century double crib log barn with frame shed extensions, formerly located near White Springs (see photos 1c and 1d). This barn had 22' x 28' log cribs flanking the center floor, divided into two levels with stable space below and hay mows above. A section of the log cribs facing the center floor was cut out for an opening into the hay mow, with a low door below for access to the stable level, which was two feet lower than the threshing floor. Shed roof extensions on the front and back of the barn provided additional space for storing straw and fodder, and a sheltered enclosure at stable level in front of the north crib. Large hinged wagon doors opened to the threshing floor from the back (west) side, while smaller doors on the front open to the barn yard. In overall form and many details the Shively barn resembles log ground barns documented in south-central Pennsylvania. [9] The stall arrangement and gable end location of the stable doors is different, but this could be due to modifications of the original structure. Looking at the log cribs of old barns one inevitably finds cut and patched sections from generations of farmers altering and refining the buildings to fit changing needs.

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[9] Henry Glassie, "The Double Crib Barn in South Central Pennsylvania", Pioneer America, vol 2, no.2 (July 1970), p 24.

a. Longitudinal section   b. Cross section at threshing floor
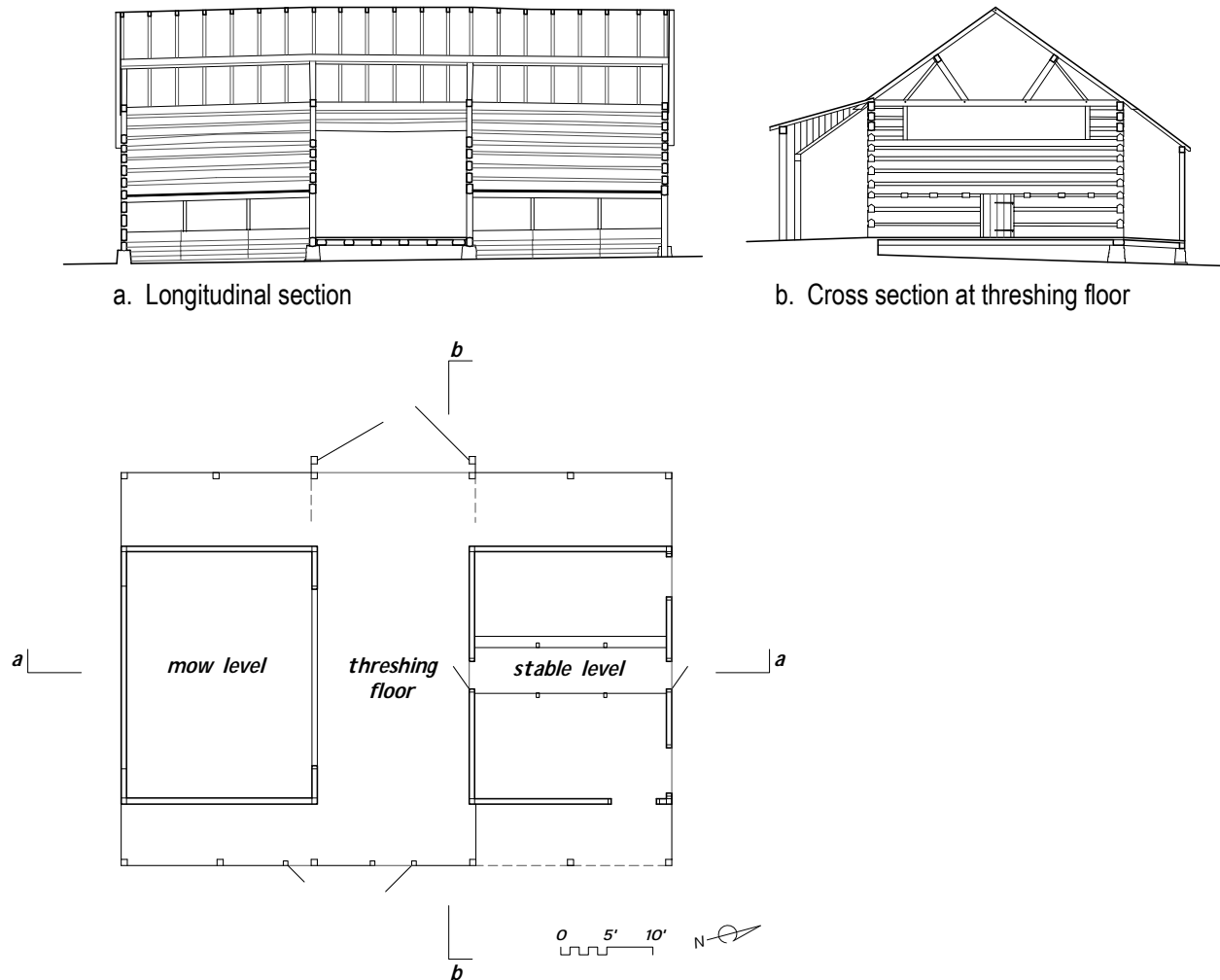
Figure 2 Plan and sections of the Shively barn, a double crib log ground barn in Limestone Township, Union County from photos and measurements taken in 1984. Barn has since been demolished. Plan shows stall level on the right and the mow level above the stalls on the left. The threshing floor in center is raised two feet above the grade level stalls. Shed roof extensions across the front and rear of the barn appear to be early additions.

While all of the barns listed in the 1796 assessment were built of horizontal log, the double crib ground barn type was also built in braced frame construction which first supplemented, then replaced, log construction in the 19th century. Figure 3 shows a small double crib barn of mortise and tennon frame which has been expanded by adding a fourth bay to the west end, containing a mow above and stable below, with a covered extension on the barnyard side, and a more recent in-line shed roof stable addition. The original threshing floor is now used for hay storage since the building has been converted to a horse boarding barn. Change of use over time results in alteration of the barn form, but the original concept of a central threshing floor flanked by mows remains legible. The ground barn type lends itself to expansion by adding bays and sheds, and most ground

barns have been enlarged as farming practices have changed. This openness to change and adaptive re-use through addition and alteration is a fundamental principle of a building tradition in which the form of the barn does not result from a single act of construction, but from a process of continual refinement, repair and rebuilding by a succession of farm owners.
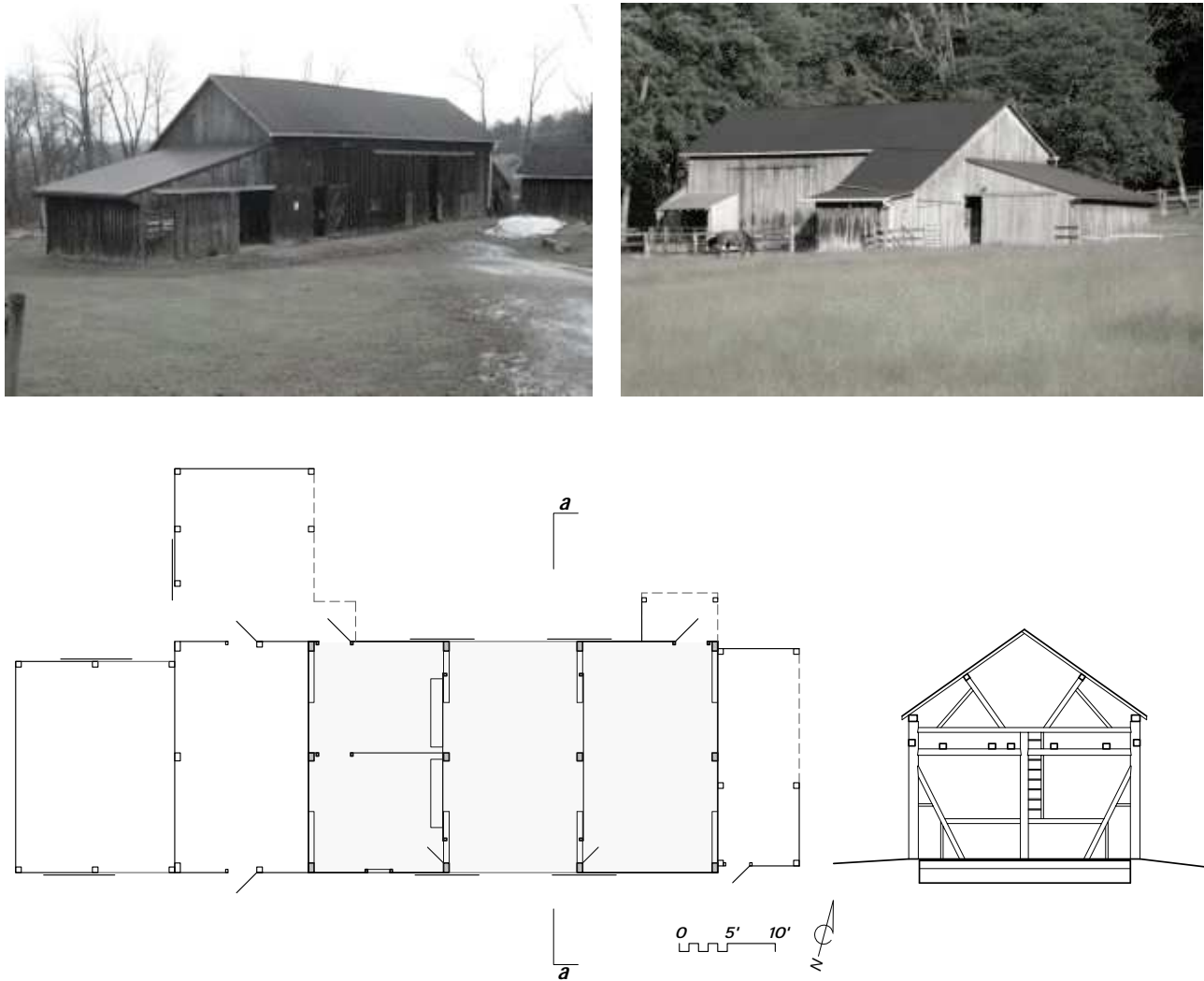
Figure 3 Plan, section and photos of a frame double crib ground barn, Limestone Township, Union County, surveyed in 2012. Shaded portion of the plan indicates the original, early 19th century three bay construction, with subsequent in-line and perpendicular additions. Most of the barn frame is mill sawn, but longer members such as loft beams and roof purlins are hewn.

Variations on the double crib form of the ground barn in Buffalo Valley indicate that the building type was conceptually manipulated to produce a smaller two-bay barn consisting of the threshing floor and a single flanking mow, a two-thirds version of the usual double crib form (see figure 4b and c). Some three bay ground barns in the valley

appear to have been expanded from this two-thirds form. The ground barn building type is therefore a scalable concept, capable of addressing a range of farm size; however there appear to be functional limits on its use as farm operations expanded and became increasingly mechanized. The ground barn type and its two thirds variant continued to be built on smaller farms and at the back of town lots well into the 19th century, but expansion of ground barns beyond the three-bay form is limited. The average size of Buffalo Valley ground barns is 45 feet wide by 30 feet long, and the largest expanded ground barn with bays added on either end is 84 by 34 feet. For larger barns, farmers looked to a different barn type.

a. Double-crib frame ground barn north of Mifflinburg

b. Two-bay frame ground barn in Cowan

c. Two-bay frame ground barn south of Winfield

d. One-bay frame ground barn south of Furnace Road

Figure 4 Variations on the ground barn type. Barn a) extends the three-bay form with in-line shed roof additions for implement storage on the left and additional stable space on right. Barn b) recesses the stable level front doors to create a sheltered forebay. Barns c) is a small two-thirds versions of the double-crib barn, consisting of one stable/hay mow bay next to a threshing floor, with an in line shed roof addition. Barn d) is a single frame bay containing stable space below and mow above, without a threshing floor.

Mapping the locations of surviving ground barns in Buffalo Valley reveals two patterns of distribution, (see figure 5). Ground barns are situated in or near to villages and towns, where their size was well suited to small farms owned by tradesmen and merchants. The rural building survey used to generate this map does not include buildings within the incorporated boundaries of towns, but it does indicate clusters of ground barns at the outskirts of Lewisburg and in the vicinity of Cowan and Mifflinburg. If small barns on the back alleys of Hartleton, Mazzepa and Vicksburg were added to the map, this 'urban' distribution would read more clearly. A second distribution pattern more evident from the map is location on marginal farm land at the edges of the valley. Ground barns remain on the north side of the valley along the skirts of Jones and Buffalo Mountains, on the

Figure 5 Map of ground barns in Buffalo Valley based on survey of surviving pre-20th century rural buildings. Squares indicate double crib barns, triangles indicate 2-bay variant. Open shape indicates log construction; solid fill indicates frame.

(Most of the survey was conducted in the mid-1980s, so some structures have since been demolished. Survey data for White Deer and Gregg Townships is incomplete and not included on the map).

shoulders of Shamokin ridge and at steep slopes on the south side of Dry Valley in Union Township. These edge of valley farms on poor to medium cropland with shale derived soils never experienced the prosperity of the mid valley farms. Discussing the challenge of farming on shallow, shale-based soils, a USDA Soil Survey for Union County concludes "Abandoned fields and farms are numerous".[10]
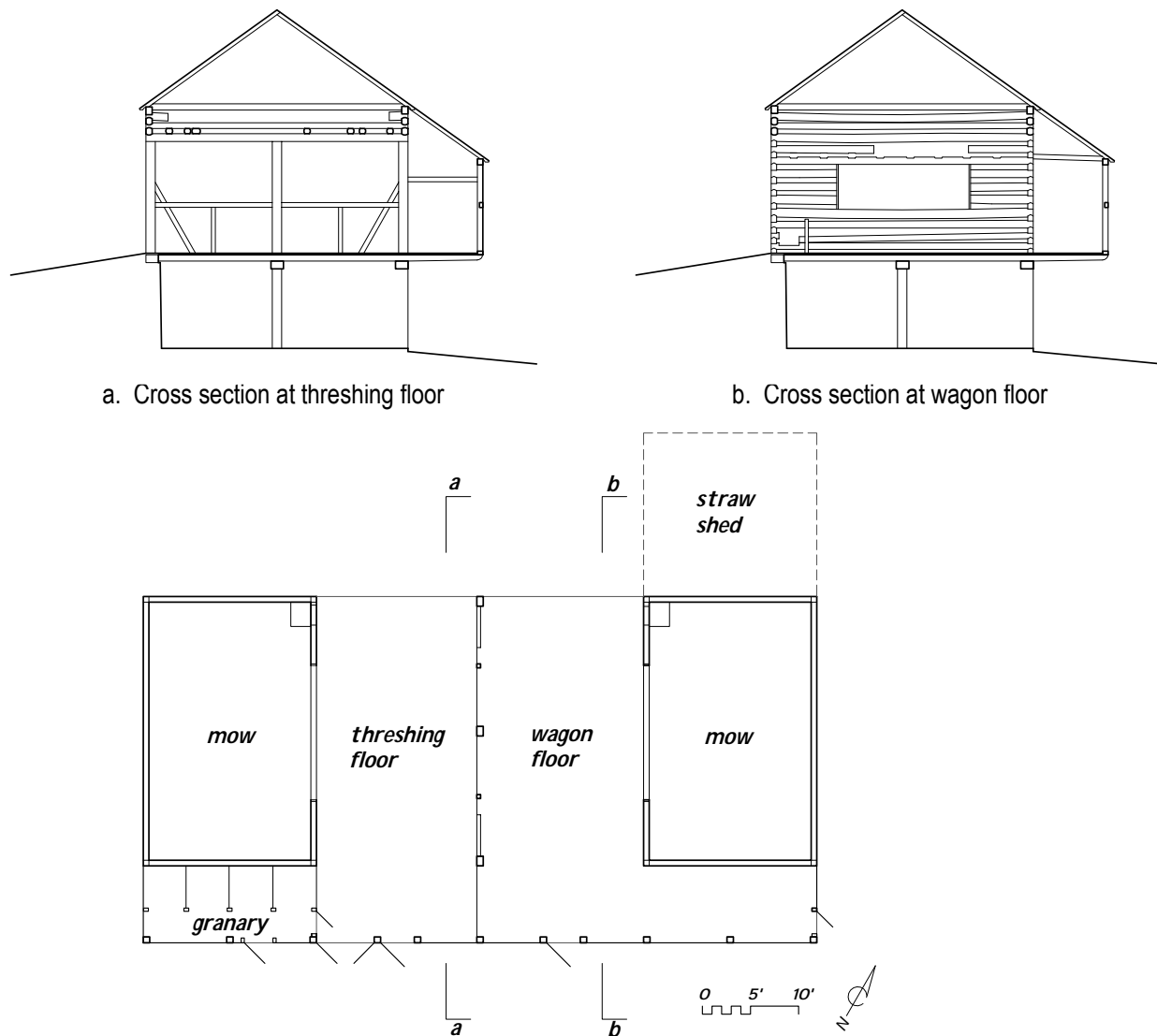
Bank Barns

Among the earliest German speaking families to settle in Pennsylvania were farmers who came from Alpine valleys in what is now Switzerland. They introduced the distinctive two-level 'Sweitzer' barn to south central Pennsylvania by the middle of the 18th century. In plan, the main level of this barn type was similar to the ground barn, with a threshing floor flanked by mows, but the Sweitzer barn was constructed with a full basement level stable, and the threshing floor extends to create a projecting Vorschuss or 'forebay' sheltering the stable doors. Sweitzer barns were built into a hillside or provided with a ramp to allow wagon access to the upper level floor and mows, and were therefore referred to as 'bank barns'. The 1796 assessment mentions only one bank barn, so the barn type may not have been used extensively by the first generation of Buffalo Valley farmers, but by 1820 it was the predominant barn form in the valley.

Two examples of early log bank barns illustrate several important changes from the ground barn type, (see figures 6 and 7). Bank barns took more time and effort to build, requiring extensive masonry work to prepare basement foundations, but this investment provided an entire lower level for livestock, and an entire upper level for storing and processing crops. Whereas the ground barn type in Buffalo Valley exhibits limited potential for expansion from its three-bay plan and smaller two/thirds version, the bank barn type developed three, four, five and a few six-bay versions to produce much larger barns in the initial phase of construction, with the same potential for later expansion by added bays, sheds and entire wings. Like the ground barn, the bank barn was a scalable concept, but one oriented to growth by addition of bays. The most common bank barn plan in Buffalo Valley is the four bay, mow-floor-floor-mow version. In the four bay barns, one of the two middle bays is the threshing floor, its sides lined with boards to contain
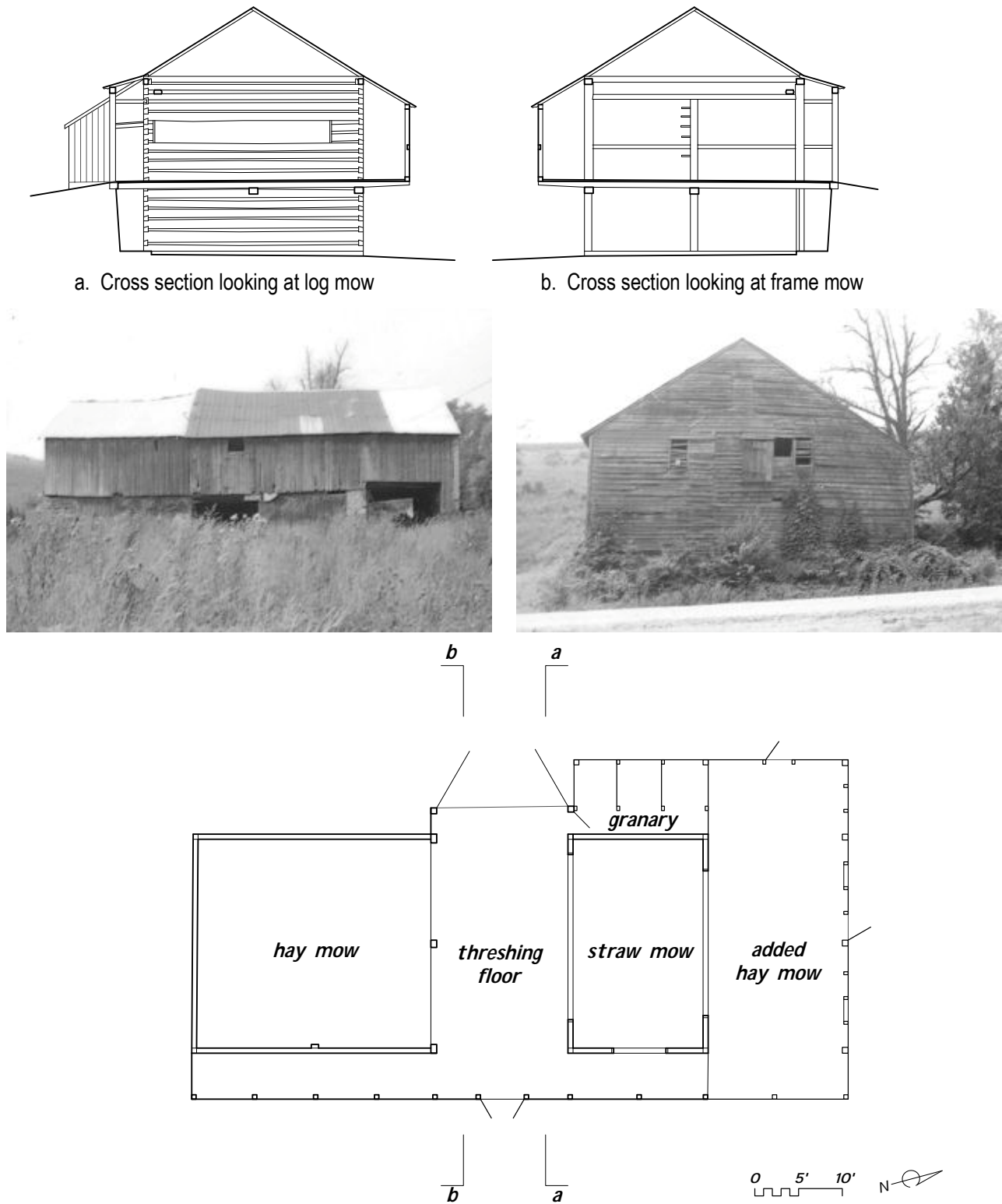
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[10] David Taylor, Alfred Boileau and Gerald Yoder, Soil Survey of Union County, Pennsylvania, (USDA series 1940, No.2, 1946), p99.

threshing activity, while the other is used for unloading wagons and storing implements. The second most common bank barn plan is the five bay, mow-floor-floor-floor-mow version, (see figures 9 and 10) in which the center bay is usually the threshing floor, with wagon floors to either side. In both of these plan types additional temporary mow space was created by the farmer when needed by inserting beams and planks to span across the framed bays about twelve feet above the barn floor, providing overhead mows while keeping the barn floor level open for work and storage of implements and rolling stock.[11]

a. Cross section at threshing floor   b. Cross section at wagon floor

Figure 6 Upper level plan and sections of the Shoemaker barn, a double crib log bank barn in West Buffalo Township, from photos and measurements taken in 2013. See figure 1e and f for photos. The central floor of this barn is two bays in width, divided by a frame 'bent'. Section a shows the framing bent configuration. The granary is located in the west end of the forebay, adjacent to the threshing floor. The barn used to have a frame straw shed addition on the back side of the east mow.

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[11] For more information on the development of the Pennsylvania bank barn, see Robert Ensminger, The Pennsylvania Barn, Its Origin, Evolution and Distribution in North America, Baltimore (John Hopkins University) 1992.

a. Cross section looking at log mow

b. Cross section looking at frame mow

b   a

granary

| hay mow | threshing floor | straw mow | added hay mow |

0   5'   10'   N

b   a

Figure 7 Upper level plan, cross sections and photos of a double crib log bank barn south of Forrest Hill in West Buffalo Township, surveyed in 1984. This barn had an unusually large 25' x 28' log crib hay mow in which the wall facing the threshing floor was a hewn timber frame. Section b shows the frame wall configuration. The granary was located in a shed addition on the back side of the straw mow. In the late 19th century an additional frame bay containing mow space above and implement storage below was added to the north side of the barn. In poor condition when it was surveyed, this barn has since been demolished.

Built primarily by southeastern Pennsylvania German farmers in the 18th century, by the time that construction of bank barns spread to the valleys of central Pennsylvania in the early 19th century the barn type was coming into general use across ethnic boundaries, by farmers of English and Scots-Irish ancestry. The widespread adoption of the large, multi-level barn type in Buffalo Valley reflects the growth of farms, many now in the second or third generation of ownership, and the development of an economic network of farmers increasingly oriented to producing a 'marketable surplus'. In 1820, this marketable surplus accounted for about 20% of farm products in the north-east, but this ratio varied depending on farm productivity and the cost of transporting goods to market.[12] Susquehanna River transport which benefitted early settlement grew into a major thoroughfare for agricultural shipping, as great quantities of grain were floated downstream in arks and flatboats to Middletown (just south of Harrisburg), and then conveyed overland by wagon on the Lancaster Turnpike to Philadelphia. Extension of the West Branch canal to Lewisburg in 1833 further reduced transportation costs, prompting mid-century investment in larger barns.

Buffalo Valley farmers selected their products, other than for home use, primarily for ease of transportation to these distant markets. In 1825, the New Berlin Union Times reported "Union County sends annually to market a surplus of about 150,000 bushels of wheat, 2,800 barrels of whiskey, 6,000 bushels of clover seed, 200 tons of pork."[13] In this farming system fed by the most portable and durable commodities, wheat continued to dominate through mid-century, supplemented and gradually supplanted by livestock. The expandable bank barn, accommodating increasing harvests of grain and fodder for a growing number of livestock suited this system perfectly.

The two-level design of bank barns introduced critical adjacencies between quarters for livestock, crop and fodder storage and the workspaces of the farm laborers in a manner that exploited gravity, sunlight and air movement to assist the enormous amount of human toil that went into operating the farm. The lower level of the barn was ingeniously planned to allow people to work safely among and control large and sometimes unpredictable animals, (figures 8a and b). Cow and horse stalls and gated doors to the

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[12] Clarence Danhof, Change in Agriculture in the Northern United States, 1820-1870, Cambridge (Harvard University Press) 1969, p4-6.
[13] Fletcher, p 291.

barnyard were interspersed with aisles for people to traverse while feeding, milking and mucking out manure. Ramped wagon access to hay mows located above the livestock stalls enabled farmers to drop fodder and bedding to the stable level through chutes and floor openings. Orienting the front of the barn to face south-east provided morning sunlight and warmth at the stable level, while the overhanging forebay provided weather protection and shade from intense mid-day summer sun. The sheltered forebay overhang also kept the ground in front of the stable entrance from being churned into a muddy wallow by the passage of livestock out to the barn yard.

a. South-facing forebay   b. Feeding aisle and horse stalls   c. Tri-level door at threshing floor

Figure 8 Barn building strategies for controlling the natural world include solar orientation and shelter of outdoor work areas, separation of human and animal circulation in the lower level, and devices to promote and manipulate natural ventilation. Forebay a) is at the Maize/Renninger barn east of New Berlin. Preserved lower level stalls b) are at the Barber/Rippon barn in White Springs. Three-level threshing floor door and ventilators c) are on the Baker/Snyder barn in Cowan.

Airflow through the upper level of the barn could be controlled and tuned by opening the large wagon doors on the shaded back of the barn in combination with the tall, narrow ventilation doors on the sun warmed front of the barn to induce breeze. This natural ventilation system was used to promote drying of hay and harvested grain crops, and during the threshing and winnowing process to separate light chaff from heavier grain. Many bank barns have two- or three-section doors on the barnyard side of the threshing floor for variable control of cross ventilation, (figure 8c). When mechanized threshing replaced hand flails in the mid 19th century, the threshing machine was still pulled onto the

mow   wagon floor   threshing floor   wagon floor   mow

granary   granary

horse stalls   cow stalls

0   5'   10'

N
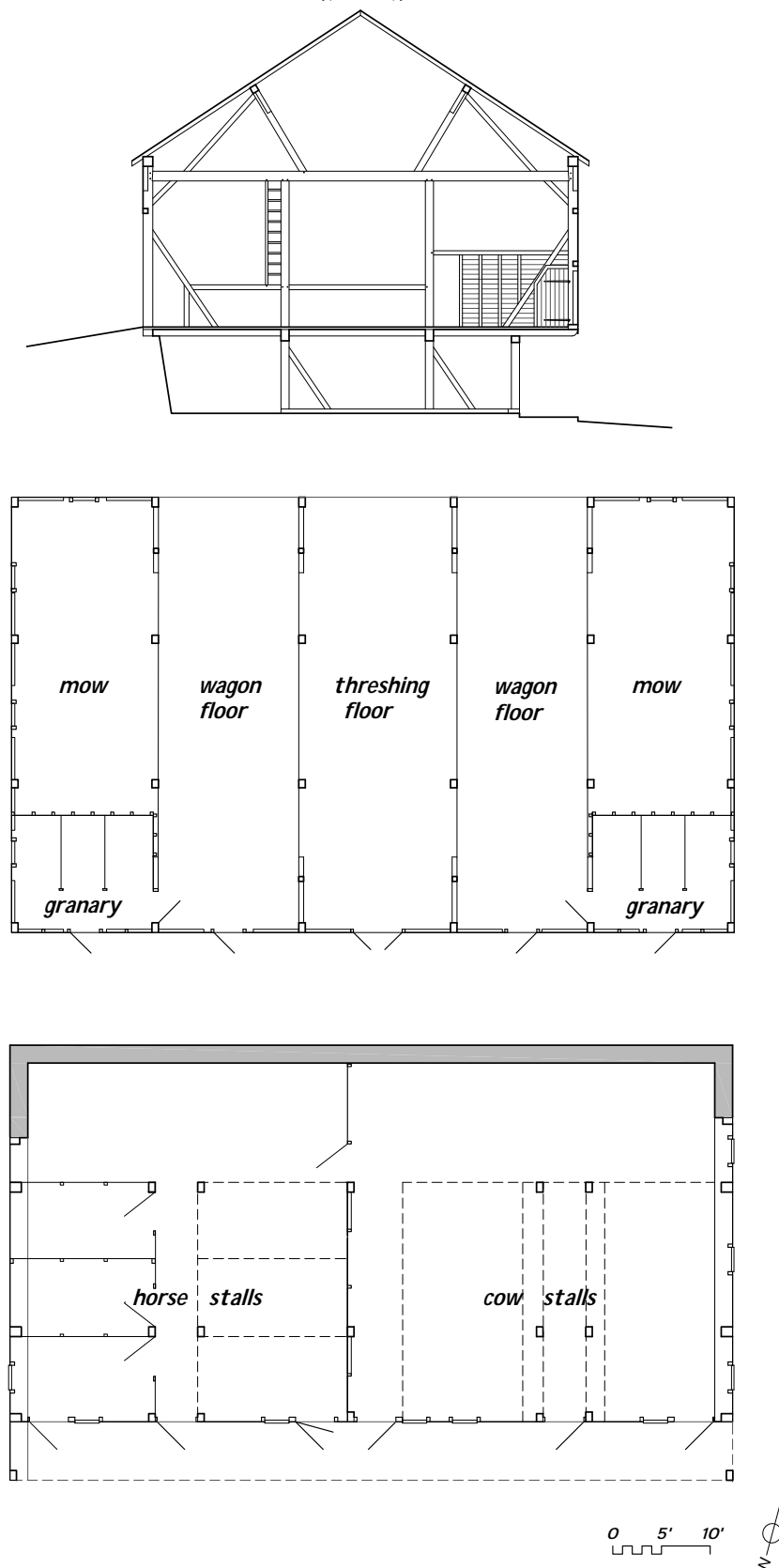
Figure 9a Upper and lower level plans and cross section of the Byler/Showalter bank barn near Cowan, Buffalo Township, surveyed in 1985. Lower level contained horse stalls on left and cow stalls on the right. Upper level had granaries at both ends of the forebay.
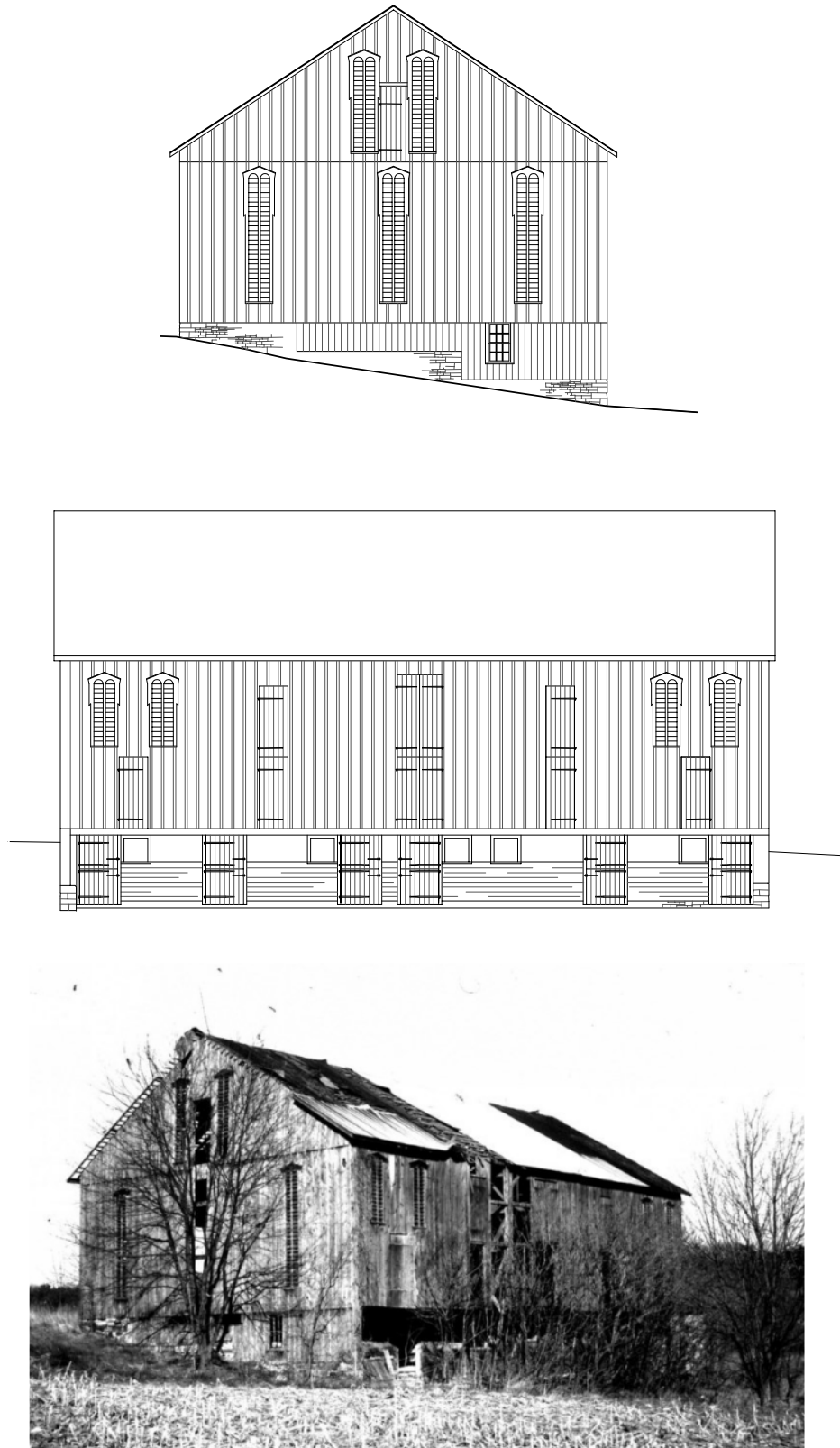
Figure 9b Front and west gable end elevations and photo of Byler/Showalter bank barn near Cowan, Buffalo Township. The cladding and louvers of the barn probably date from the 1870s or later, but the barn frame appears to be older. This barn has since been demolished.
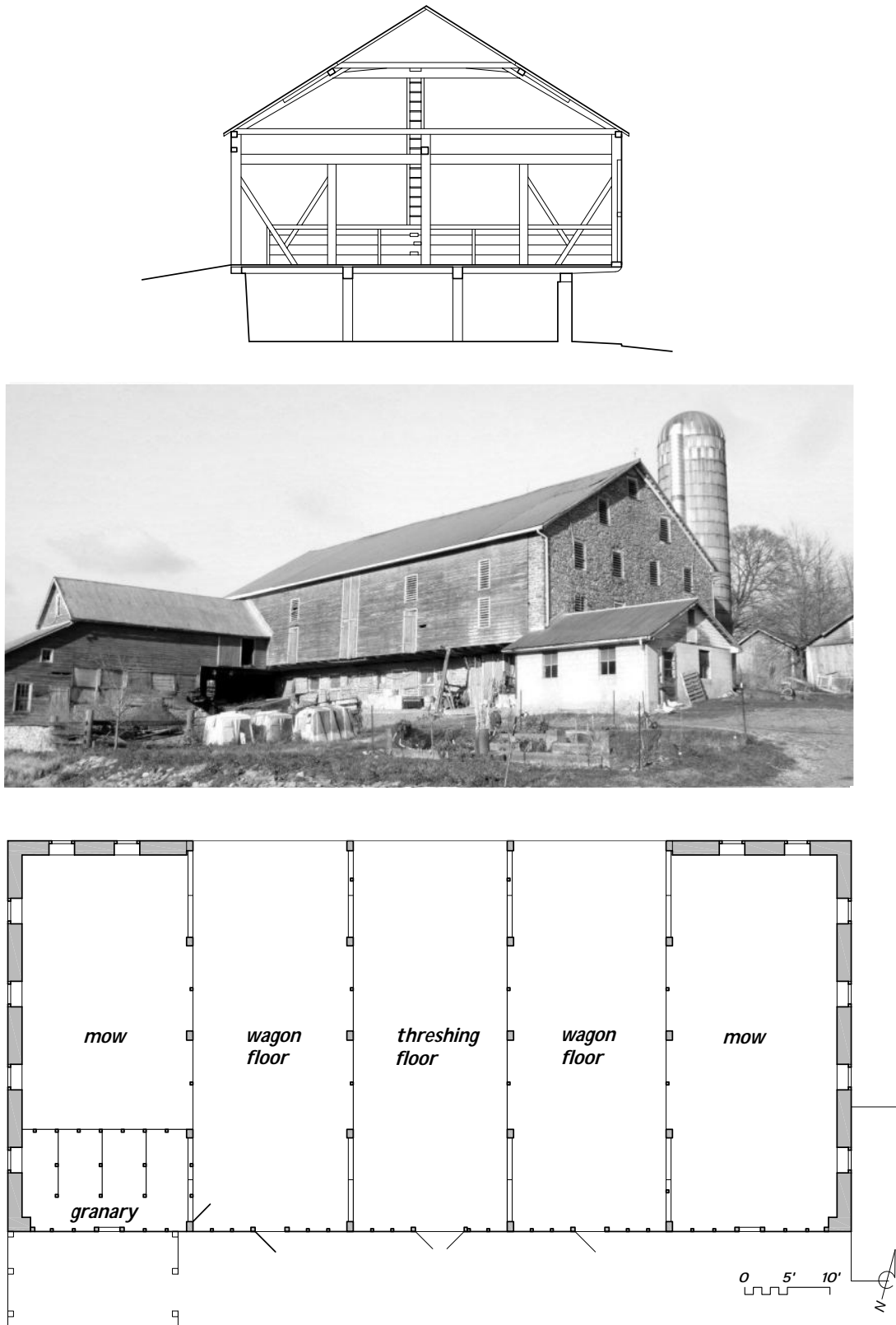
Figure 10 Upper level plan, cross section and photo of the 5-bay stone end Abraham Maize barn in Union Township, built 1819. The eight remaining stone barns in Buffalo Valley are the pinnacle of the barn building tradition. This one, two miles east of New Berlin, is well preserved.

barn floor so that it could be fed with sheaves from the mow and discharge straw and chaff out to the barnyard. The granary for storing threshed wheat and oats was located away from the damp in the dry and sun-warmed forebay, enclosed with tightly sheathed boards and sometimes lined with tin in attempt to exclude mice.

The technique of log construction used for the early barns was imported from forested areas of central and northern Europe, and proliferated in Pennsylvania forests into several regionally distinct styles, based on the shape of the interlocking corner notches

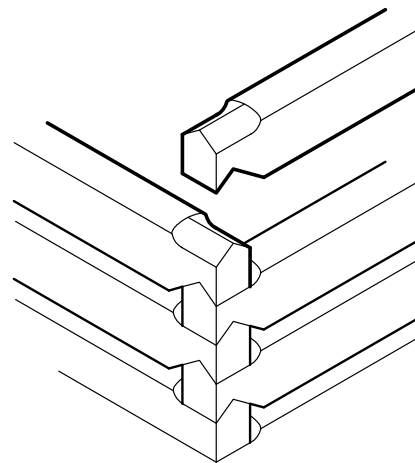a. Half dovetail, Emmental, Switzerland   b. Half dovetail, West Buffalo Twp.   c. V-notch, Limestone Twp.
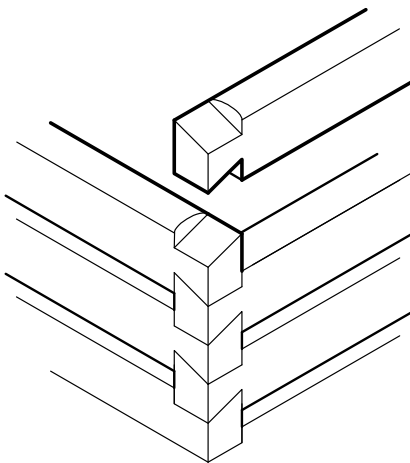
d. Diagram of half-dovetail corner timbering   e. Diagram of V-notch corner timbering

Figure 11 Log corner timbering (notching) techniques brought to Pennsylvania from central Europe include half dovetail notching used for some houses and barns in central Pennsylvania, such as the West Buffalo bank barn shown in figure 7. However V-notching, a North American development, is the predominant method used in Union County log buildings.   The v-notch example shown in c) is from the Shively barn.

of the stacked timbers. Half dovetail notching from the West Buffalo Township bank barn shown in figure 7 is similar in workmanship to notching in Swiss barns (see figure 11a and b). V-notch corner timbering, a new world technique, is the most prevalent practice in central Pennsylvania. The logs in Pennsylvania barns were less extensively worked than in Swiss practice, hewn only on two faces rather than all four sides, and in general the traditional European building methods were pared down in Pennsylvania to be less labor intensive.   Following Swiss precedent, log Sweitzer barns have an asymmetrical gable profile from centering the roof ridge on the log mow and extending the front slope of the roof down over the projecting forebay, (figure 12a). This distinctive profile is a visual clue to log construction, which may otherwise be concealed by siding.

With the size of barns increasing and the clearing of forest land around farms, the construction of barns in Buffalo Valley shifted from log to frame. The transition occurred in the early 1800s, several decades before the end of log construction for houses. Buffalo Valley carpenters practiced systems of frame construction in parallel with log building, so structural framing coexists with log on bank barns, used for roof structure and intermediate support between log cribs. At about the same time that construction method changed to wood frame, Pennsylvania barn builders began to center the roof structure of bank barns over the full depth of the barn to produce a symmetrical gable profile, (figure 12b and c), creating a balanced form that became known as the 'Pennsylvania Barn'. [14]

a. Shoemaker barn, West Buffalo Twp   b. Mensch barn, Limestone Twp   c. Barber/Rippon barn, Limestone Twp

Figure 12 Changing treatment of the forebay of bank barns. The cantilevered forebay of early log barns produced an asymmetrical gable elevation, (a). Later frame bank barns re-center the ridge to create a symmetrical gable, in which the forebay cantilever is expressed (b) or concealed by end walls (c). The change of this treatment over time indicates the aesthetic desire for a completely symmetrical gable elevation.

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[14] Ensminger, The Pennsylvania Barn, Its Origin, Evolution and Distribution in North America, p67.

The framing of Pennsylvania barns consists of a sequence of 'bents', the configuration of posts, connecting girders and diagonal braces which form the support separating the structural bays on the barn's main floor. Bents (also called 'spans' by some builders) are a key detail to the study of frame barns because they are a localized aspect of material culture. Bent patterns vary widely throughout the Pennsylvania bank-barn region, but tend to be relatively consistent within a given community, where knowledge of how to plan and lay out a specific arrangement of framing members to form a strong bent was part of the barn carpenter's craft, passed down from master carpenter to apprentice. Once established within a community, a particular bent pattern may remain characteristic of barn construction over several generations.

Barn bent patterns in Buffalo Valley vary due to building size, available material and the specific barn carpenter's preferences, but there are several fundamental characteristics of barn frames in the valley which indicate the shared local building tradition, (see figures 14 and 15). The large diagonal down-brace at exterior posts and the diagonal support of the roof purlins are consistent for most of the 19th and early 20th century frame barns in the valley.   This type of bent pattern is also found in the barns of western Berks and northern Lancaster Counties, important source areas for settlement in

a. Log and frame construction, Shoemaker barn   b. Early hewn frame, Kelly Twp.   c. Mill sawn frame, Buffalo Twp.

Figure 13 Development of barn frame construction in Buffalo Valley. a) four-bay barn which combines log crib hay mows with a frame bent between the two center bays. Note large opening in the log wall for loading hay into the mow, and overhead moveable beams for additional mow space. b) early four-bay frame barn with all hewn members. Note use of vertical studs at the exterior wall, indicating that the original barn cladding was split horizontal clapboards, later replaced with sawn vertical board siding. c) mid-19th century five-bay frame barn with mostly mill-sawn frame members. Note horizontal rails at the exterior wall for sawn vertical board siding. All three barns have the large diagonal down-brace typical of framing bents in Buffalo Valley.
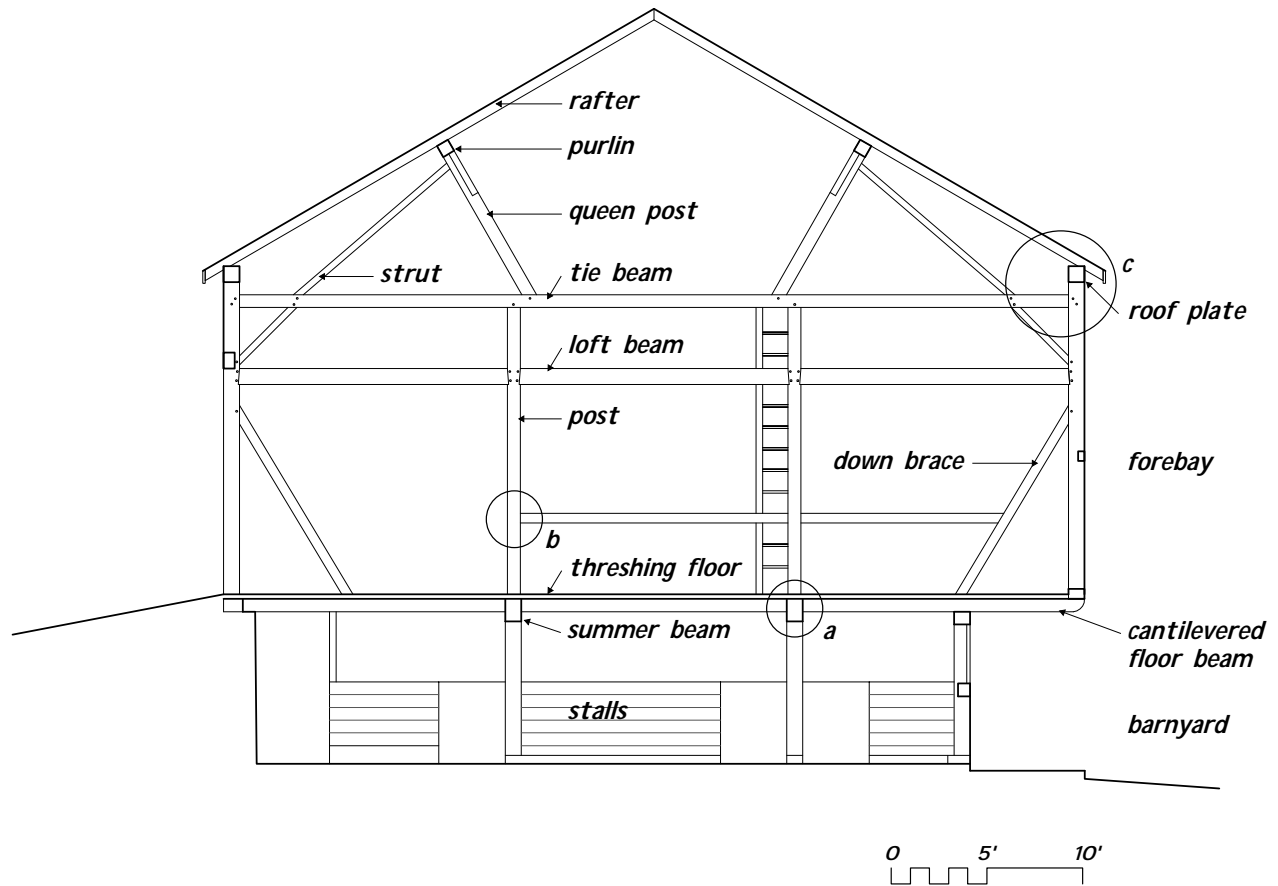
a. Scarf joint at summer beam   b. Mortise joint at post   c. Mortise joint at tie beam

Figure 14 Terminology of barn frame construction in Buffalo Valley. Diagram above is a cross section at the threshing floor of the Barber/Rippon barn in White Springs, Limestone Township, showing the framing bent configuration. Locations of framing joinery examples below are keyed on the diagram above. Scarf joint (a) is used to lock together end-to-end beams. Pinned mortise and tennon joint (b) with tennon removed on one side of post to show mortise pocket. Tension joint at tie beam (c) requires a long tennon and staggered trenails to resist the outward thrust of roof rafters.
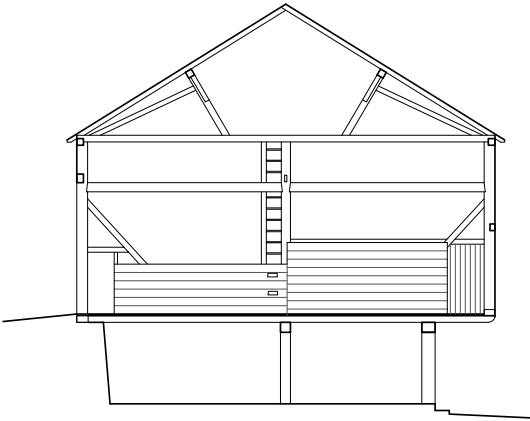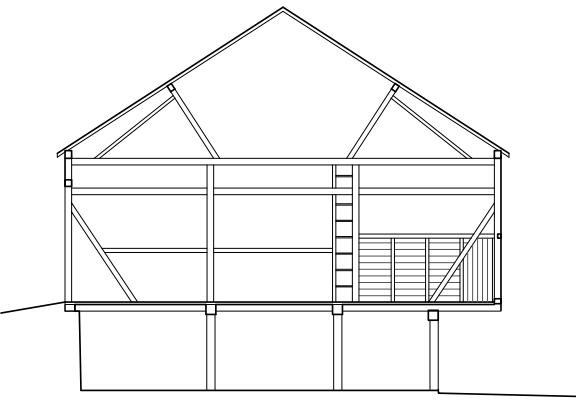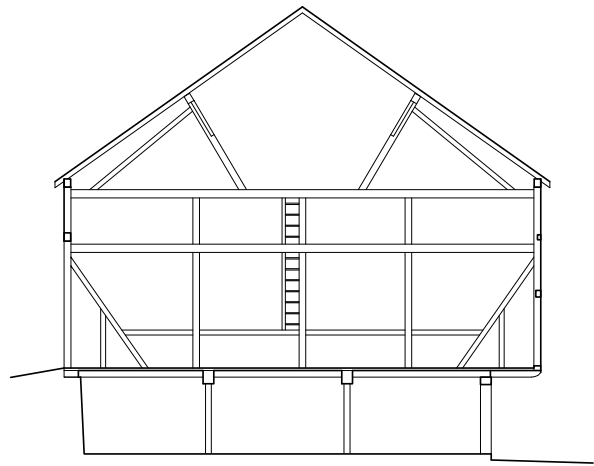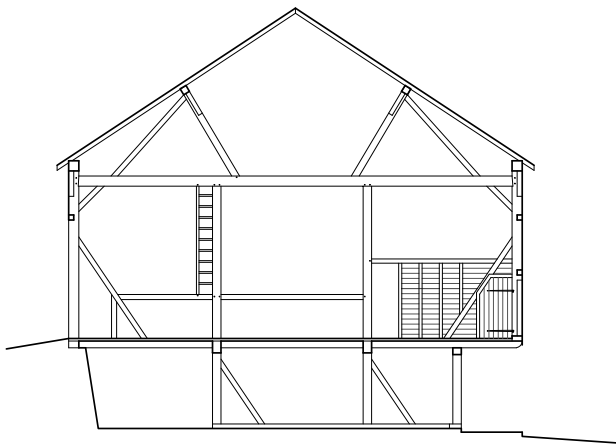
a. Four-bay barn, hewn frame, Kelly Twp.
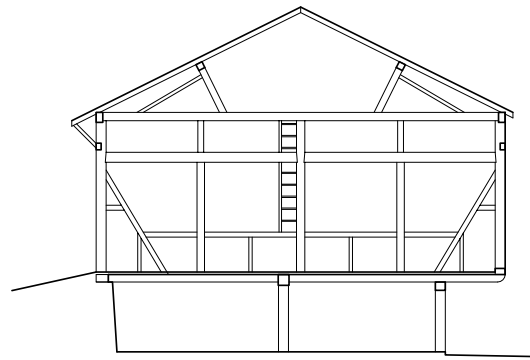
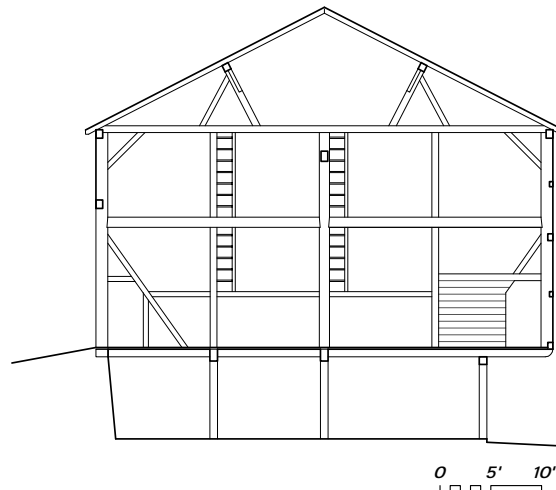b. Four-bay barn, sawn frame, Union Twp.

c. Five-bay barn, sawn frame, Hartley Twp.

d. Five-bay barn, sawn frame, Buffalo Twp.

e. Five-bay barn, sawn frame, Buffalo Twp.

f. Five-bay barn, sawn frame, Kelly Twp.

0   5'   10'

Figure 15 Barn framing patterns from 19th and early 20th centuries.   In the course of a single day barn raising, precut posts, beams and braces were assembled into cross-section frame 'bents' on the barn floor, tilted upright and locked into position by additional braces and longitudinal framing. While the bent patterns vary by size and builder preference, common features tie them to the Buffalo Valley barn building tradition.

Buffalo Valley, and is similar to Barn bents in Brush Valley to the west. Figure 15 illustrates both the range of variation and the shared characteristics of barn bents throughout Union county.

Nineteenth century barn builders used oak and chestnut for posts, braces and main beams, and white pine for the long tie beams across the top of the framing bent that countered the outward thrust of the roof rafters. Pegs, or 'trenails' used to lock mortise and tennon joints together were hickory or oak. The main level floor structure with cantilevered beams that supported the forebay and thick plank flooring for the massive loads of harvested crops, wagons and equipment were oak. Barn siding was usually white pine or hemlock. While the 1796 assessment mentions a thatched-roof barn, roofs were typically covered with split hemlock shingles through the late 19th century, replaced with tin or galvanized steel roofing in the 20th century.

Barn foundations were built of sandstone or limestone masonry, depending upon the native stone in the vicinity of the farm, replaced by concrete and concrete block in the early 20th century. A few 19th-century bank barns are constructed with stone masonry gable end walls (see figure 10), but these are rare exceptions in Buffalo Valley, entailing great expense and time to construct. Apart from the material and thickness of their end walls, these stone barns conform to the same plan layout as similarly sized frame bank barns, and the interior structure between the stone end walls is wood frame.

Building a Barn

The process of building a barn took place in two phases. The first stage was a period of weeks or months when the farm owner retained a crew of masons to prepare foundations and a barn carpenter to select, haul and cut the wood structural components to length. The carpenter measured and cut the precisely sawn corner notches for horizontal log construction, and the mortise and tennon joints for frames. Frame bent assemblies were test-fitted on the ground without installing the pegs during this stage to ensure a properly snug fit.

The second stage was a community event, the barn-raising, for which dozens of neighbors and relatives assembled to erect the structure and roof framing in a single day, under the supervision of the barn carpenter. Two entries in the journal of Flavel Roan from 1809 record the stages of this activity for a log barn in Buffalo Valley:

17 May   Jimmy Thompson building a barn on the Haffer place, for Clingan.

7 June   Raising at Hafer's; sixty-eight feet by thirty feet wide, forty-two rounds high. There were seventy people there. Finished before night and then had a sumptuous entertainment.[15]

This manner of working persisted through the nineteenth century, spanning the transition from horizontal log to timber frame construction. A record of barn construction at mid-century is found in the Diary of Conrad Sheckler, a surveyor and justice of the peace who owned a farm north of Mifflinburg. He notes helping to lay the foundations for three barns and, in the summer and fall of 1857, building a barn on his farm:

| Monday,	May 25	to McCalls white deer creek about lumber
Saturday,	June 6	tore down stable
Thursday,	Aug 20	began getting out timber for barn
Thursday,	Sept 17	raised barn
Friday,	Sept 25	to McCalls for boards
Monday,	Oct 5	began boarding up barn
Monday,	Oct 12 & 19	roofed [16]

One of the major reasons that Buffalo Valley farmers developed and retained a strong shared barn-building tradition over several generations is the interaction between individual families and the community played out in the barn raising. Barn raisings required coordinated efforts of scores of people executing simultaneous and complex operations to assemble and safely erect the heavy frames. Raisings perpetuated relationships of mutual dependency among members of the community that were essential in the early years of settlement, and remained meaningful in later, more prosperous times. Radical innovation in the construction of barns, in this context, was not only risky, but eroded an important symbol of individual and community identity. The voluntary labor of so many neighbors--men and boys to raise the frame; women and children to prepare food

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[15] John Blair Linn, <u>Annals of Buffalo Valley</u>, Lane Hart, printer, 1877, p381. The 'rounds' refer to the stacked timbers of horizontal log construction.
[16] "Diary of Conrad Sheckler", http://scheckler.bouwman.com/Diary/Index

for the communal meals—enabled the assembly of huge barn frames in astonishingly short amount of time. Barn raisings within Amish and Mennonite communities today continue this once widespread social pattern, though the materials and carpentry techniques used for modern barn construction have departed widely from old traditional practices.

Traditional carpenters mostly worked without measured plans or formal structural calculations, but with a remarkable grasp of construction process acquired through
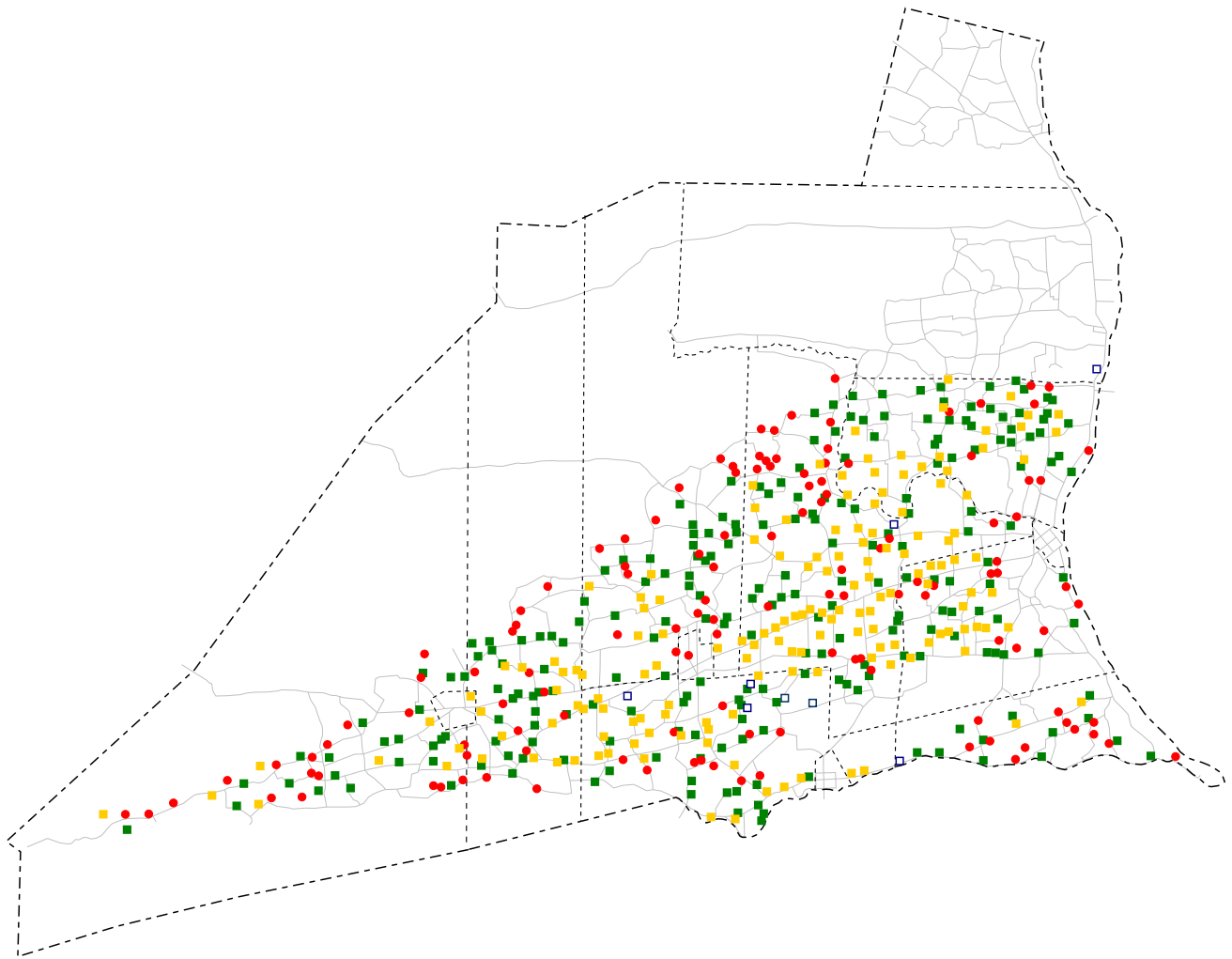
Figure 16 Map of bank barns in Buffalo Valley based on survey of surviving pre-20th century rural buildings. Red dots indicate three-bay barns; green squares indicate four-bay barns; yellow squares indicate five-bay barns. Open blue squares indicate stone end wall barns. While there are exceptions, a clear distribution pattern is evident, with the largest five-bay barns concentrated on prosperous mid-valley farms on the most fertile soil, and notably along the Lewisburg to Mifflinburg turnpike. Small three-bay bank barns are more prevalent at the edges of the valley. Four-bay barns occupy farmland between these two extremes.

(Most of the survey was conducted in the mid-1980s, so some structures have since been demolished. Survey data for White Deer and Gregg Townships is incomplete and not included on the map).

apprenticeship and long experience. Carpenters who possessed the skill and command necessary to plan and fabricate the structural components and then direct a successful barn raising were vital resources for the community, master builders who refined construction details and assembly processes into an efficient and elegant art form. A few of these master barn carpenters are known by name, such as Jacob Strickler of West Buffalo Township, who built barns in the vicinity of Mifflinburg identifiable by their distinctive trim. Most builders are no longer remembered, but their handiwork endures.

Hundreds of bank barns were raised in Union County during the 19th and early 20th centuries, over 600 of which still remain, although their numbers have diminished significantly in the last 20 years. Mapping the locations of the most prevalent three-bay, four-bay and five-bay plan types shows the economic relationship between barn size and fertile, mid-valley farm land, (figure 16).   While hardly surprising, the correlation is nonetheless striking.   The concentration of stone end wall barns (blue outline squares on the map) in Limestone Township is intriguing, and worth further study.

The second half of the 19th Century was the golden age of barn decoration in Pennsylvania. During that period the impulse to decorate barns was widespread throughout the state, but took different forms in different areas. 'Hex signs' were painted on Lebanon Valley barns, patterned brickwork enlivened the gables of York County barns, wood lattice fretwork stars were applied to barns in the Juniata Valley, and fancy ventilator trim to those in Buffalo Valley.[17]

Barn decoration served several functions. For the farmer, it enhanced the barn as a status symbol. Occasionally not just the barn alone, but entire suites of outbuildings, sheds and stables were decorated in the same style. The comprehensively planned estates of progressive farmers illustrated in county atlases and farmer's magazines published in the latter half of the century depict a mixture of folk and popular building styles unified by stylish trim. For the barn carpenter, distinctive decoration could function as a trademark.

Louvered ventilators on Buffalo Valley barns serve both functional and aesthetic ends. The construction of large, tightly sheathed frame barns required louvered openings to ventilate moisture from the large volume of drying hay and grain crops. When first introduced, the ventilated openings were treated like windows in size, proportions and

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[17] Various barn decorating genres are described in Alfred Shoemaker, editor, The Pennsylvania Barn, Kutztown (Pennsylvania Folklife Society) 1959.

trim. There is a similarity between the fenestration of mid-century grain barns such as the Maize barn and the windows of contemporary flour mills, as if to signify participation of the farm in the larger economic structure of commerce. After the 1870s barn ventilators evolved into tall, narrow affairs decorated with carpenter gothic trim. Barn builders developed their own trim signatures for the heads of ventilators, using simple motifs laid out with compass and set-square, and this practice of decorated barn trim flourished in Union and Northumberland Counties.
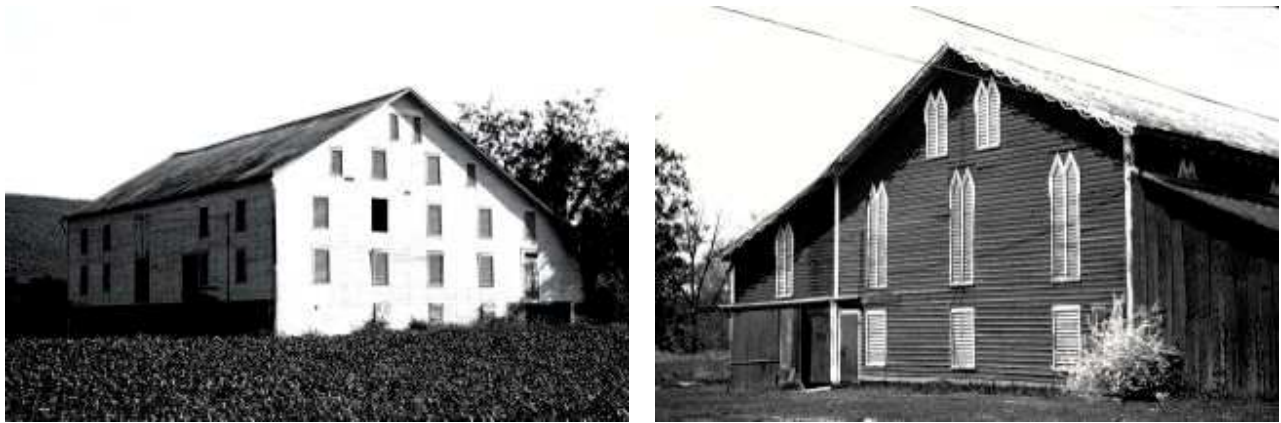
Figure 17 Louvers were introduced to tightly sheathed barns in the mid-19th century. Initially they mimicked window proportions and fenestration patterns, but by the 1870s they became the subject of elaborate 'Carpenter Gothic' decorative treatment. Barn builders developed distinct signature styles to mark their work.

There is something poignant about the decorated louvers of late 19th century Buffalo Valley barns. Underlying explanations of a barn builder's personal style or a barn owner's proud display, barn decoration is fundamentally a process of communication through the manipulation of symbols. Theories of change in the decorative style of artifacts suggest that the elaboration of decorations acts out a symbolic response to conditions over which the maker has no more direct means of control.[18] The decoration of barns flourished precisely at the time when economic depression and inter-regional competition began to threaten farm communities and the status of farmers. It is possible that Pennsylvania farmers responded to the stress of economic uncertainty by reinforcing the visual symbol of the farm as an independent enterprise. Even as they shifted strategies in response to competition and outside market forces, farmers created visual statements of stability, prosperity and control.

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[18] Peter Wells, "Material Symbols and the Interpretation of Cultural Change", <u>Oxford Journal of Archeology</u>, vol 4, number 1 (1985), pp 9-16.

The Waning Tradition

The bank barn remained the predominant barn type constructed in Buffalo Valley well into the 20th Century, accounting for hundreds of structures in Union County that span a period of sweeping changes in farming practice. Horse powered mechanization of farms around the time of the Civil War increased productivity significantly, yielding greater harvests to fill expanded barns. Improved transportation encouraged commercial agriculture, but it also brought Buffalo Valley farmers into direct competition with farmers in other states, altering their economic situation profoundly. By 1870, the grain belt had leapfrogged over the Alleghenies to Ohio and the mid-West. Increasingly enmeshed in the market economy and unable to compete profitably with large mechanized grain farms in the western states, farmers in central Pennsylvania were forced to adjust or even abandon traditional farming strategies. In the second half of the 19th Century, "general farming" replaced grain farming as the preferred strategy. Corn and oats joined wheat as major field crops, consumed primarily on the farm by expanding herds of livestock. The acreage devoted to hay increased substantially. Pork and beef production grew at mid-century, to be gradually replaced by dairy and poultry as the center of meat raising also moved west.[19] Changing practices from grain to 'general farming' in which income came from no single source, later to stock and, by the mid-20th Century, to dairy farming produced a sequence of additions, alterations and renovations to Buffalo Valley barns but did not result in a fundamental departure from use of the bank barn type until the 1940s. Horsepower and implement sheds, hay sheds, silos, milking parlors and covered barn yards each in turn were added to bank barns. Like the additions and alterations to the barns themselves, the changing farm strategies were cumulative and additive, always searching for continuity with previous experience.

The decline of traditional and shared barn building practice in Buffalo Valley was gradual. A loosening of community bonds restricting the inventiveness of individual farmers is evident when one looks at the construction of hay-shed additions to barns, especially later additions raised at the turn of the century--large structures which in some cases more than double the storage capacity of the original barn. The added hay sheds

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[19] "Historical Agricultural Resources of Pennsylvania 1700-1960", PHMC. Inter-regional competition and the adoption of commercial farming strategies is discussed in Danhof, Change in Agriculture.

often take the form of a gable or gambrel roofed 'L' or 'T' addition of two or three bays extending from the barnyard end of the threshing floor, but this outward similarity masks great diversity of individual solutions to the problems of construction. The bents of hay sheds range from improvised affairs to sturdy and well-planned frames, but they do not converge on a common technique to compare with the consensus suggested by barn bents. The construction of hay sheds and other later modifications to barns reflect individual responses to economic change, and individual decisions to set aside 'old-fashioned' traditional practices in favor of market-oriented agriculture and progressive farm management.

Ties to the past linger in the memories of families which have worked the same farm over multiple life-spans, but the old gives way to the new in every generation. The end of local vernacular barn building traditions throughout Pennsylvania in the 20th century was gradual, but cumulative and irrevocable. In many parts of the state, decline of family farming in general and the encroachment of suburban or exurban development are rapidly erasing the evidence of local barn traditions. This isn't the case in Union County which is fortunate to retain thriving farms and a rural agricultural landscape in which hundreds of old barns survive and continue to be used, adapted and preserved.

Figure 18 Covered barn yards and expanded hay sheds adapted bank barns to beef and dairy farming with greatly enlarged herds. They also constitute the final era of barn building as a folk tradition, as modern innovations and mass-market consumer culture increasingly replaced local practices and old time ways.

⚒ **ACCOUNTS** ⚒