

1970

Archeological Exploration of Land's Ford Canal Chester County, South Carolina

E. Thomas Hemmings

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Archeological Exploration of Land's Ford Canal Chester County, South Carolina

Description

Land's Ford Canal was built on the west bank of the Catawba River in Chester District, South Carolina, between 1820 and 1823. The canal bypassed two miles of shoals, and accomodated a fall of 32 feet by means of two pairs of lifting locks. Archeological exploration of the canal was undertaken in December, 1969, in order to determine the shape and grade of the bed and other construction details. After reconnaissance of the canal course and surface features, eight backhoe trenches were placed across the bed and banks at selected locations. The profiles exposed in these trenches revealed less about canal construction than was desired because of changes in the flood plain of the Catawba River between 1838 and 1925. Overbank flooding primarily affected the lower third of the canal course which was built on alluvium. One relatively well preserved profile indicated a broad canal bed,with sloping walls and berms about 5 feet in height. Another key profile exposed a shallow flat-floored basin open to the canal bed and a berm built over a rammed clay core.

Keywords

Landsford Canal, Catawba River, Chester County, South Carolina, Archeology, Antiquities

Disciplines

Anthropology

Publisher

The South Carolina Institute of Archeology and Anthropology--University of South Carolina

Comments

In USC online Library catalog at: <http://www.sc.edu/library/>

38C55

ARCHEOLOGICAL EXPLORATION
OF LAND'S FORD CANAL
CHESTER COUNTY, SOUTH CAROLINA

by

E. Thomas Hemmings

RMS #2

Prepared by the
INSTITUTE OF ARCHEOLOGY AND ANTHROPOLOGY
UNIVERSITY OF SOUTH CAROLINA
1970



FRONTISPIECE. Masonry bridge at the northern lifting locks, Land's Ford Canal.

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ABSTRACT

Land's Ford Canal was built on the west bank of the Catawba River in Chester District, South Carolina, between 1820 and 1823. The canal bypassed two miles of shoals, and accomodated a fall of 32 feet by means of two pairs of lifting locks. Archeological exploration of the canal was undertaken in December, 1969, in order to determine the shape and grade of the bed and other construction details. After reconnaissance of the canal course and surface features, eight backhoe trenches were placed across the bed and banks at selected locations. The profiles exposed in these trenches revealed less about canal construction than was desired because of changes in the flood plain of the Catawba River between 1838 and 1925. Overbank flooding primarily affected the lower third of the canal course which was built on alluvium. One relatively well preserved profile indicated a broad canal bed with sloping walls and berms about 5 feet in height. Another key profile exposed a shallow flat-floored basin open to the canal bed and a berm built over a rammed clay core.

INTRODUCTION

In 1818 the legislature of South Carolina appropriated one million dollars for internal improvement. A large part of this sum was to be used in construction of canals on the larger rivers of the Piedmont; by means of these canals, and the Santee Canal in Charleston District, cotton and other up-country products could be transported at low cost to the port of Charleston. Land's Ford Canal in Chester District was the northernmost of a chain of four canals designed to open the Catawba-Wateree river system to navigation.

The Wateree River changes its name to Catawba at the Wateree Creek. This river, above Camden to the North Carolina line, is intercepted by four principal falls, around which canals have been cut, except at Rocky Mount, where the work is now going on. The first fall is at the Wateree Canal, which is five miles long, having a fall of 52 feet and six locks. The second is at Rocky Mount, where there is a fall of 121 feet, requiring 15 locks; the canal is cut the greatest part of the distance. The third fall is at the Catawba Canal, where there is a fall of 56 feet in three miles. A canal and seven

locks here are furnished. The fourth fall is at Landsford, where a canal two miles long, with five locks, complete the navigation; above this the river has rapids, but ... small boat navigation can be extended with ease within the Alleghany Mountains (Mills 1825).

CANAL CONSTRUCTION

Construction of Land's Ford Canal was begun in late 1820 by the contractor, Robert Leckie, whose Scotch and Irish workmen were able to complete all the necessary work within three years. This construction included (1) one mile and 76 chains (about 1.97 miles) of canal bed, (2) a rock dam at the intake to provide necessary flow at low water, (3) a masonry guard lock near the intake to protect the canal during high water, (4) two pairs of masonry lifting locks in the southern third of the canal course to provide about 32 feet of fall, (5) six masonry culverts which carried small streams under the canal bed, (6) a masonry bridge and another of masonry and wood crossing the canal, and (7) a masonry lock keeper's house (Mixon 1969). In addition, an existing mill and millrace were incorporated into the canal near its midpoint (Fig. 1). All these structures, which are preserved in varying degrees, are visible on the canal site today.

The Land's Ford Canal bypassed two miles of shoals where Paleozoic gneiss of the Charlotte Belt outcrops in the bed of the Catawba River (Overstreet and Bell 1965). The canal course was essentially north-south and paralleled the west bank of the river at a distance of several hundred feet (Fig. 1). In the northern two-thirds of its course the canal passed through terrain where bedrock lies near the surface and where high ground on the west closely approaches the river. Construction of the canal in this area involved, chiefly, excavation of a trench at the proper grade through weathered bedrock (saprolite) and, occasionally, by blasting through the parent material. In addition, small streams draining eastward into the river were carried under the canal bed by means of culverts. The northern section of canal has not been seriously affected by erosion except where these streams intersect the course. A pair of masonry lifting locks and bridge at the downstream end of the northern section are essentially intact.

In contrast, in the southern third of its course the canal was built on a narrow alluvial floodplain. Here construction of berms, as well as trenching into the unconsolidated alluvium, was required. In this section of the canal overbank flooding by the Catawba River has caused alternate scouring and filling along the bed and partial destruction of the berms, although the canal course is still fairly apparent on the surface. The masonry of the southern pair of lifting locks is relatively intact, but

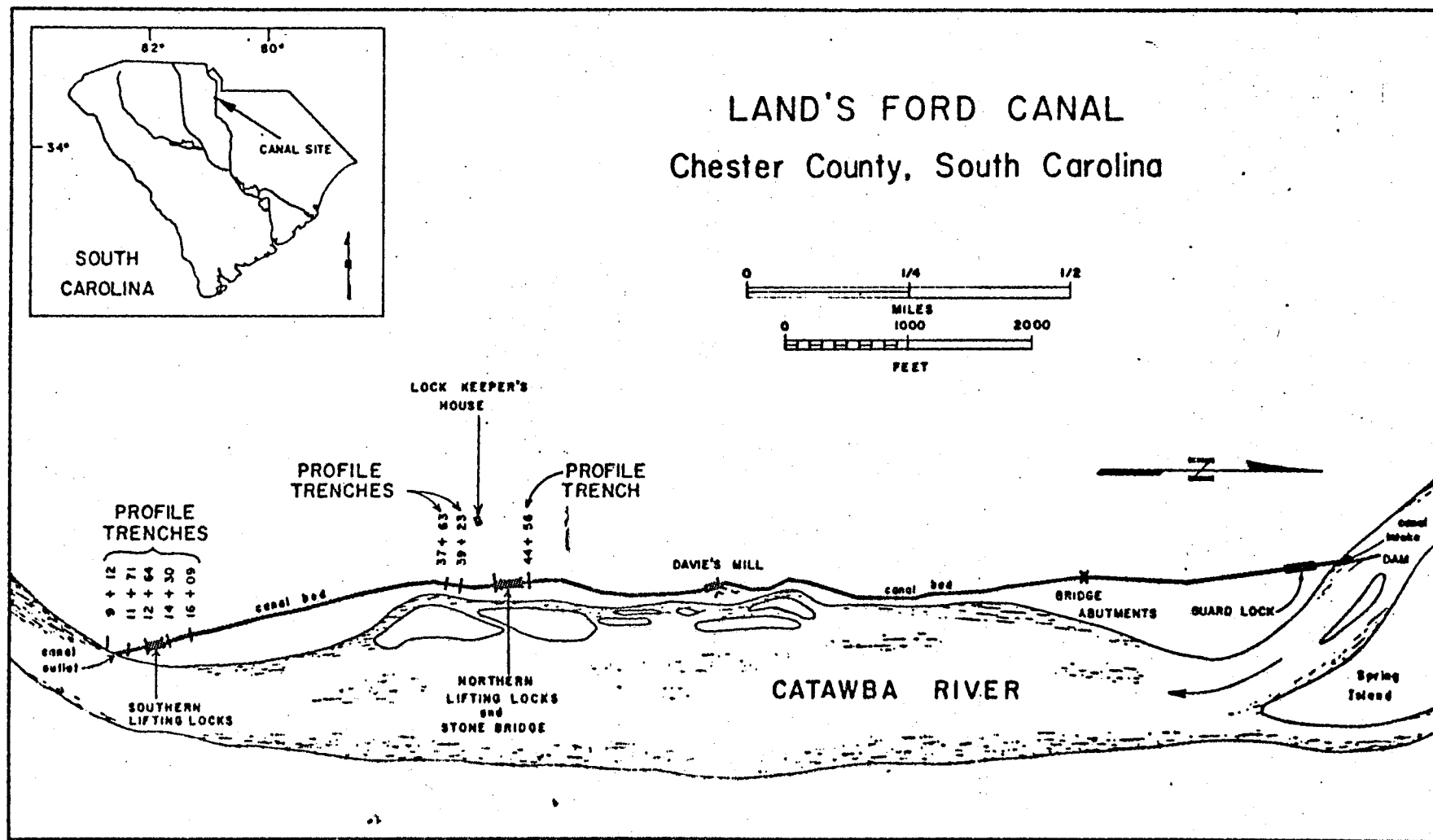


Figure 1. Location of canal features and profile trenches at Land's Ford Canal (adapted from Hager 1969)

partially buried. The southern third of the canal has probably been preserved from complete destruction by the dense hardwood forest occupying this section of floodplain.

ARCHEOLOGICAL WORK

An agreement for preliminary archeological investigation of Land's Ford Canal was reached on May 28, 1969, by the South Carolina Department of Parks, Recreation, and Tourism and the Institute of Archeology and Anthropology, University of South Carolina. Prior to actual excavation at the canal site two necessary aspects of the project had already been completed. Acting for the Institute of Archeology and Anthropology, Mr. Kenneth W. Mixon made a search of historical documents during July and August 1969 for information pertaining to construction and use of the canal; a manuscript report of the results was deposited at the Institute (Mixon 1969). Mr. F. J. Hager, who had been hired by the Department of Parks, Recreation, and Tourism to prepare a topographic map of the canal area at a large scale and suitable contour interval, carried out a survey in the fall of 1969. This useful, detailed map (Hager 1969) was essential to the next phase of work. During the period December 8 to December 20, 1969, the Institute of Archeology and Anthropology placed backhoe trenches at strategic locations along the canal course. These trenches were designed to provide an interpretation of the original canal shape and grade and to

assist in planning further large scale excavations. Eventually, the canal will be restored to working condition and, with its environs, set aside as a South Carolina state park.

METHOD OF INVESTIGATION

Prior to excavation a detailed topographic map of the canal area at a scale of 1:480 and one foot contour interval was prepared for the Department of Parks, Recreation, and Tourism (Hager 1969). The baseline of the survey was carried along the canal midline, which is largely determinable from the surface. Sequentially numbered stations were established at one hundred foot intervals along the baseline from Station 10 near the outlet to Station 110 near the intake. The elevation of these stations and of points of intersection along the baseline was maintained by reference to the nearest U. S. Geological Survey benchmark (Hager 1969).

In the initial phase of archeological work a reconnaissance of the canal course was carried out in order to locate features of interest showing at the surface and to select locations for backhoe trenches. Surface features located with respect to the survey baseline are listed in Table 1.

The backhoe has frequently been employed in archeological excavation, and, occasionally, has been used to investigate prehistoric or historic canal systems (Haury 1965; Cleland and Stone 1967). Backhoe trenching at Land's Ford Canal permitted rapid observation of vertical profiles. These observations were in two dimensions, and cannot be so reliable or complete as those

TABLE 1. Location of surface features at Land's Ford Canal.

| LOCATION ON BASELINE (south to north) | CANAL FEATURE |
|--|--|
| ca. 9 + 60 | canal outlet. |
| ca. 12 + 64 to 14 + 06 | southern pair of masonry lifting locks. |
| 39 + 23 | masonry retaining wall on east side of canal. |
| 40 + 10 | masonry culvert (washed out). |
| 42 + 09 to 44 + 00 | northern pair of masonry lifting locks and stone bridge. |
| 47 + 67 | masonry culvert (washed out). |
| 54 + 40 to 56 + 40 | ditch of unknown use diverges and re-enters on west side of canal. |
| 55 + 05 | masonry culvert (nearly intact). |
| 59 + 60 to 60 + 73 | Davie's mill site masonry and culvert (washed out). |
| 69 + 95 to 86 + ? | ditch or mill race diverges and re-enters on west side of canal. |
| 72 + 86 | masonry culvert (partially washed out). |
| 85 + 50 | masonry retaining wall on west side of canal. |
| 90 + 88 | masonry abutments for wooden bridge over canal. |
| 108 + 27 to 109 + 22 | masonry guard lock. |
| ca. 110 + 90 | canal intake. |

obtained by standard excavation techniques. Nevertheless, well placed, carefully interpreted cuts can quickly reveal the nature of subsurface features and deposits.

Eight backhoe trenches were excavated at right angles to the canal course, six in the southern, less well preserved section and two upstream (Fig. 1). A 24 inch bucket was used for speed of progress, although the resulting trench was somewhat narrow for smoothing and viewing profiles. Trenches were carried through both sides of the canal bed and banks at each location. The maximum depth reached below the modern surface was about 15 feet, and the total length of trenches was 668 feet. Groundwater limited the depth of several excavations, and one trench caved and could not be entered. In the seven remaining trenches the south profile of each was smoothed, and stratigraphic features were recorded with reference to a graduated level line.

CANAL PROFILES

Seven canal profiles are described below in order from south to north. Each is referred to in text and on maps and profile drawings by the position of the south wall of a backhoe trench along the survey baseline. Key profiles for interpretation are reproduced as Figures 2 to 6. Most of the profiles revealed natural stratigraphic units of fluvial origin, laid down prior to and after canal construction (Table 2). These units, as well as the few construction fills encountered, are described in terms of one or more predominant grain sizes on the Wentworth Grade Scale and one or more predominant colors (Compton 1962). In some cases terms for texture or content are appended to the unit descriptions (Table 2). Essentially all of the boundaries between natural stratigraphic units are sharp erosional contacts.

All profiles were characterized by a forest soil at the modern surface (Figs. 2-6). Presumably, this soil developed since 1925 when impoundment of Lake Catawba upstream halted overbank flooding and floodplain erosion or deposition in the canal area (U. S. Geological Survey 1963).

TABLE 2. Summary of stratigraphic units exposed in the Land's Ford Canal excavation.

| UNIT DESIGNATION | DESCRIPTION | MAXIMUM OBSERVED THICKNESS (feet) | RELATIVE AGE |
|---------------------|---|--|----------------------------|
| A ₀ | red sandy clay | 2.0 | post-canal |
| A | tan crossbedded medium to coarse sand | 7.5 | post-canal (ca. 1916) |
| B | red clay and sandy clay | 3.5 | post-canal |
| C ₀ | tan medium sand with ash lenses (borrow pit fill) | 3.5 | post-canal |
| C ₁ | yellow and gray sandy clay and sand | 5.0 | post-canal |
| C ₂ | tan medium sand | 2.5 | post-canal |
| C ₃ | red medium sand | 1.5 | post-canal |
| D | tan medium sand with seepage lines (levee deposit) | 8.0 | post-canal |
| E | gray clay | 8.0 | post-canal (after 1838) |
| Y ₀ | mottled gray and brown sandy clay (berm fill) | 2.5 | canal (ca. 1823) |
| Y ₁ | mottled yellow and brown sandy clay and sand (berm fill) | 2.0 | canal |
| Y ₂ | tan medium sand (berm fill) | 4.0 | canal |

TABLE 2--Continued.

| | | | |
|----------------|--|------|-----------|
| Y ₃ | mottled yellow and brown sandy clay (lockpit fill) | 4.0 | canal |
| Y ₄ | mottled red clay and saprolite (berm fill) | 4.5 | canal |
| Z ₀ | intercallated gray clay and red medium to coarse sand | 2.0 | pre-canal |
| Z ₁ | yellow and brown clayey sand | 3.0 | pre-canal |
| Z ₂ | mottled yellow and brown clay | 6.0 | pre-canal |
| Z ₃ | blocky brown to red clay (weather- ing zone) | 2.0 | pre-canal |
| Z ₄ | saprolite (weathering zone) | 11.0 | pre-canal |

PROFILE 9 + 12

A 72 foot trench was cut about 340 feet south of the southern pair of lifting locks in an area where, from surface indications, the outlet section of canal might have passed (Fig. 1). Almost the entire section exposed consisted of sands and clays which correlate on the basis of lithology and superposition with post-canal units in other trenches. No trace of a canal bed was observed in this trench, which was carried down to maximum practical depth at about 420 feet above mean sea level. Since the elevation of the river adjacent to the excavation is about 415 feet at normal flow, canal evidence could have been preserved below the profile obtained. However, it was clear that extensive cutting and filling had occurred in this area since the time of canal construction. A natural levee deposit sectioned by the trench stands to an elevation of about 436 feet.

It seems likely that the canal outlet section entered the river on a straight line from the southern lifting locks, or 300 feet west-southwest of the locks. In this case, the trench which provided Profile 9 + 12 was well outside the canal course (Fig. 1), and the appearance of the modern surface was not a good indication of the outlet location.

PROFILE 11 + 71

A 55 foot trench was placed about 80 feet south of the southern pair of lifting locks and squarely across the lock midline (Fig. 1). This trench was also carried down to an elevation of 420 feet. A small test pit encountered groundwater at 418 feet above mean sea level. Again the entire section exposed consisted of post-canal sands and clays resulting from extensive cutting and filling during Catawba River flood stages. Some construction debris, such as granite spalls and carbonized wood, derived from upstream sections of the canal, was observed in the profile. On the basis of the next profile upstream the canal walls might be expected to rise up to 425 feet, but no trace remained. Probably the eddying of floodwaters below the lifting locks caused such thorough removal of the canal bed and berms.

PROFILE 12 + 64

A key profile (Fig. 2) was obtained from a 117 foot trench placed so as to expose the completely buried lower section of the southern pair of lifting locks (Fig. 1). Lock masonry had protected the immediate canal area from erosion. Groundwater limited the depth of excavation at 419 feet. The top of the lock walls and of a contemporary horizontal surface behind each wall had been constructed at about

425 feet, or 10 feet lower than the top of the adjacent lifting lock masonry, visible above ground.

The oldest unit exposed by this profile (Unit Y₃, Fig. 2) has the same appearance as the material of the pre-canal flood-plain in this area. However, it abuts the lock masonry with no indication whatever of a wall trench in which the stone was laid. This would seem to indicate that Unit Y₃ was locally excavated and then replaced as fill after the lock masonry had been completed. The extent of this unit in the trench suggests that the lock pit was quite large prior to installment of walls and filling behind them. Leckie had commented that "while employed in digging out the foundations in the locks next the river there was a considerable stratum of clay...." (Mixon 1969: 34). The material removed from the lock pit was re-used where needed. A rotted stump about 10 inches in diameter (Fig. 2) is the remains of a tree which grew on top of Unit Y₃ between the time of construction and abandonment to the ravages of the river (1823 - ca. 1838).

Ten to fifteen feet back from the inner face of the lock walls, berms about 4.5 feet high were built of sand and sandy clay (Units Y₁ and Y₂). These contained concentrations of spalls from the rough trimming of blocks used on the rear (hidden) side of the lock walls (Fig. 2). The trench did not encounter debris from the finely shaped granite facing blocks.

When the southern pair of lifting locks was no longer in use, the lower section became filled with gray clay (Unit E). This clay had accumulated at least to the top of the lock walls (425 feet) in the lower section before it was partially cut out. The upper boundary of Unit E is a channel cut where flood waters continued to occupy the canal course. The clay extends down at least to 417 feet, probably several feet lower. Thus more than eight feet of clay were deposited when, after abandonment, the outlet section of the canal existed as a stagnant slough.

Unit D in Profile 12 + 64 represents natural levees deposited over the east and west berms, which interrupted the velocity of floodwaters (Fig. 2). The west levee indicated over-bank flooding to an elevation of about 438 feet or some 23 feet above the river's present normal flow. The levees appear as discontinuous ridges on the surface, and were intersected by other trenches both upstream and downstream. Presumably, this flooding occurred at some time after abandonment of the canal (ca. 1838), and may represent a single unusual flood. The levee deposits are similar in elevation, stratigraphic position, and lithology where they have been exposed in the profiles. Each consists of homogeneous medium sand marked by "seepage lines" or sinuous, essentially horizontal, thin lenses of clay (Fig. 2). These seepage lines are secondary depositional features which form in a relatively short period of time, probably a few decades (Webb 1939:59; Lathrap 1968:70). They are more numerous and more

closely spaced at greater depth in the levee deposits as a result of the order of formation.

Units B and C (Fig. 2) record further episodes of flood-water cutting and filling subsequent to levee deposition. Unit B reached a thickness of at least four feet before it was removed by channel cutting along the canal midline.

The youngest deposit exposed by Profile 12 + 64 is Unit A, a crossbedded medium to coarse sand (Fig. 2). The maximum thickness of this deposit is about 7.5 feet, and it is uniform in appearance throughout its observed extent. The contents of the deposit included a few Indian artifacts - stone flakes, pottery sherds and a large Gary projectile point (Ford and Webb 1956:52). These objects were naturally transported from one or more eroding Indian sites upstream or from canal construction fill upstream which had been obtained from a site area. The projectile point (Fig. 7a) dates approximately to the time of Christ. In addition to prehistoric artifacts the brass base of a shotgun shell (Fig. 7c) was recovered from Unit A and provides a maximum age for the deposit. The shell was manufactured between 1909 and 1911 by the Robin Hood Ammunition Company, Swanton, Vermont (Gardner 1963:164). Unit A, therefore, was deposited after 1909. Local residents recall an unusual overbank flood in 1916, which may well have been the source of the crossbedded sand. This year is not covered by the records of the nearest gaging stations on the Catawba River (U. S. Geological Survey 1963).

LAND'S FORD CANAL

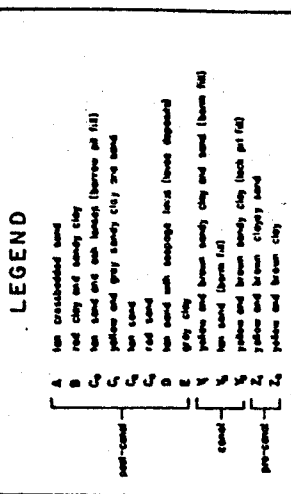
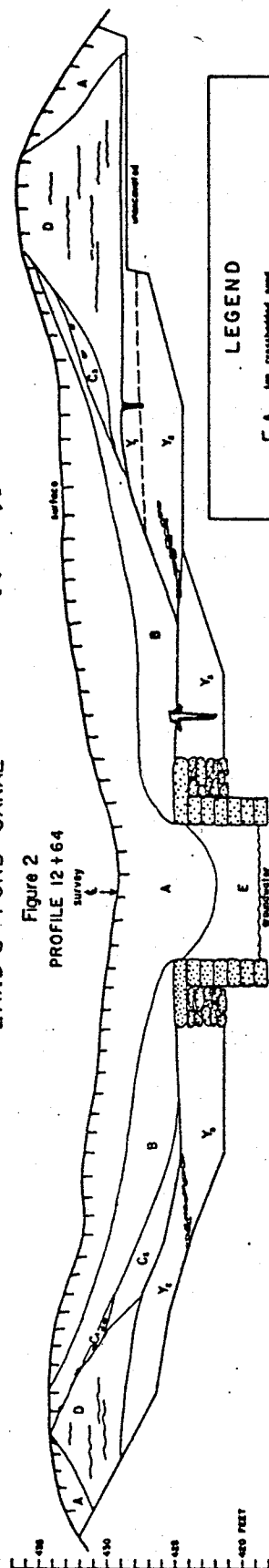
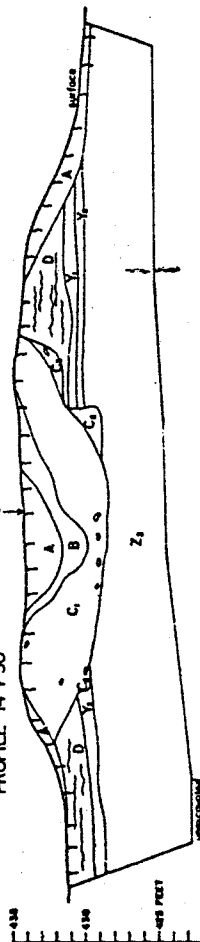
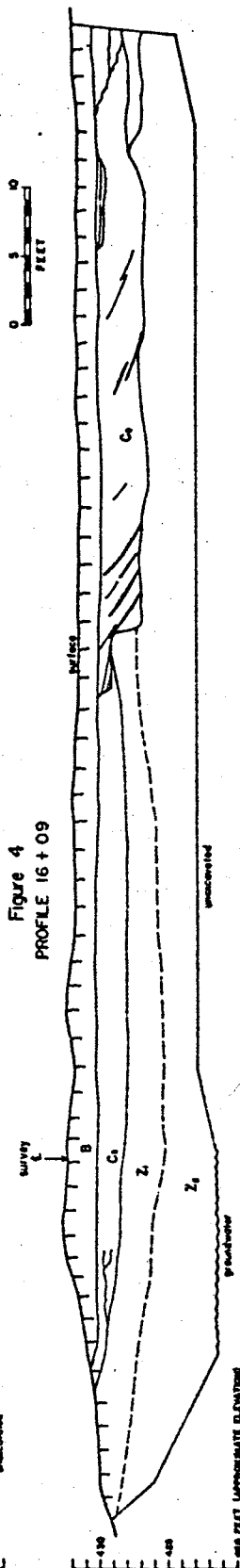
Figure 2
PROFILE 12 + 64

Figure 3

PROFILE 14 + 30

Figure 4
PROFILE 16 + 09

PROFILE 14 + 30

A 62 foot trench was cut 24 feet above the southern pair of lifting locks where the canal bed appeared to be well preserved except for filling (Fig. 1). The trench was carried down to an elevation of 421 feet. Preservation of the canal bed did not prove to be the case. The profile (Fig. 3) records a series of floodwater cuts and fills along the canal midline which have destroyed the original bed and banks. The stratigraphic units exposed in the profile correlate completely with those of Profile 12 + 64 downstream (Fig. 2).

Unit Z_2 is the pre-canal floodplain, in this case in situ and not excavated and re-used as fill. Berms or construction fills (Unit Y) were placed on either side of the canal bed, but appear to have been lowered by erosion prior to deposition of natural levees (Unit D). Units A, B, C_1 , C_2 , and C_3 record channel cutting and filling along the canal midline, which has obliterated the bed, both laterally and below the grade at about 429 feet (Fig. 3). The C units contained considerable construction debris. A crossbedded sand, Unit A, possibly representing the 1916 flood, was again the youngest unit exposed by the profile.

PROFILE 16 + 09

The final trench in the vicinity of the southern pair of lifting locks was placed 203 feet upstream from the masonry (Fig. 1). Groundwater limited the depth of the trench at an elevation of 421 feet. The trench was lengthened to 109 feet when a curious feature was intercepted in the west end (Fig. 4). A pre-canal floodplain deposit (Unit Z) was exposed at the base of the profile. Every trace of the canal bed was removed by a broad erosional cut on top of Unit Z, which was made prior to deposition of Unit C₂. Unit B extended nearly the length of the profile as the youngest deposit exposed (Fig. 4).

The 50 foot long feature exposed in the west end of the trench appears to be a borrow pit and sandy fill (Unit C₀) which later washed into the depression. Probably sand was the material obtained from the pit, as it does not continue down into clay. Since the borrow pit intrudes into a sand deposit, which correlates well with Unit C in downstream profiles, it is most likely younger than canal construction. Traces of a forest road leading to the borrow pit area are observable on the surface.

PROFILE 37 + 63

An 85 foot trench was cut across an apparently well preserved section of canal 446 feet downstream from the northern pair of lifting locks (Fig. 1). The trench caved during excavation and was unsafe to enter. From the surface it appeared that the profile would be similar to Profile 39 + 23 upstream.

PROFILE 39 + 23

After the previous trench failed, the location of the cut was moved to a position 286 feet downstream from the northern pair of lifting locks (Fig. 1). The 81 foot long trench was carried down to an elevation of 427 feet where groundwater was encountered. The resulting profile (Fig. 5) shows the canal bed in section, probably not greatly altered from its condition at the time of construction. Berms or construction fills are present on both sides of the canal, but are not so well preserved. Correlation between the units exposed by Profile 39 + 23 and those exposed in the vicinity of the southern pair of lifting locks is not precise because of differences in lithology and the absence of most floodwater cuts and fills in this section of canal.

Unit Z is the pre-canal floodplain clay which is darker in color than its stratigraphic correlate downstream. The upper surface appears to have had slight relief, and a low area on the west was filled by a stratified sand, Unit Z₀, also of pre-canal age.

The canal excavation is 30 feet across, 5 feet deep, and has gently sloping walls. The elevation of the bed on the midline was about 430.5 feet. It is possible that channel cutting has enlarged the bed laterally and altered the form, but there is no evidence for drastic erosion in the profile. Unit E filled the canal after abandonment and was later partially removed along the midline, presumably by runoff.

The east berm was composed of loads of sand and clay (Unit Y) which were built outward and up from the edge of the canal. The height of the berm was at least 6 feet above the original ground surface. This old surface may have been scraped and leveled prior to berm construction, a procedure which was specified in the canal contract, because it lacks a humus zone (Mixon 1969). A hearth or fireplace was made in the lowest level of the berm fill (Fig. 5). The slope of the berm facing the river was anchored by a rough masonry retaining wall. Because the berm fill is porous and intersects the canal wall, one might expect an impervious canal lining, but no evidence of such a feature remains. There is also no evidence of a 4 foot space between canal bed and banks as specified in the contract. The west berm has less volume, but presently stands a foot higher than the east berm at the profile trench location.

PROFILE 44 + 56

The final trench was located 56 feet upstream from the northern pair of lifting locks, and provided some interesting construction details (Fig. 1). The trench was 87 feet long, passing through an east berm, the canal bed, an apparent basin or enlargement of the canal just above the entrance to the lock, and the foot of the hillslope to the west of the canal (Fig. 6).

The pre-canal surface was formed on a residual clay (Unit Z₃) which grades downward into saprolite (Unit Z₄). The parent granitic gneiss was exposed at one point in the bottom of the trench. (Strictly speaking, Units Z₃ and Z₄ are not stratigraphic units, but weathering zones).

The canal bed and flat-floored basin were excavated into the underlying soft saprolite (Fig. 6). The bottom of the canal was slightly depressed below the basin floor at an elevation of about 443.5 feet. The east-west dimension of the basin in the profile is about 40 feet. The use of this basin is unknown; it could have served as a canal boat parking or passing area or as a silt settling basin.

On the east side of the canal bed the berm, presently standing about 4.5 feet above the old ground surface, was composed of loads of red clay and saprolite (Unit Y₄). It was characterized by a most unusual construction feature. A trench, 1.5 feet wide and 1.5 feet deep, was centered under the berm and filled with stiff, pure, red clay. The clay extended another 1.5 feet above

the trench before grading into the berm fill. Thus, a 3 foot core of clay had been built into the embankment, probably as a waterproofing device. (Similar impervious cores are often built into modern earthen dams). The clay core might have been rammed into place, because it had a massive, jointed appearance unlike other construction fills.

Although the length of this clay-filled trench is not known, probably it extended along the basin where extra protection against loss from seepage was required. The depth of water in the basin was not greater than 4 feet, perhaps closer to 2 feet.

Subsequent to abandonment, some filling took place in the basin (Unit E) followed by erosion and additional filling of the entire depression (Unit B).

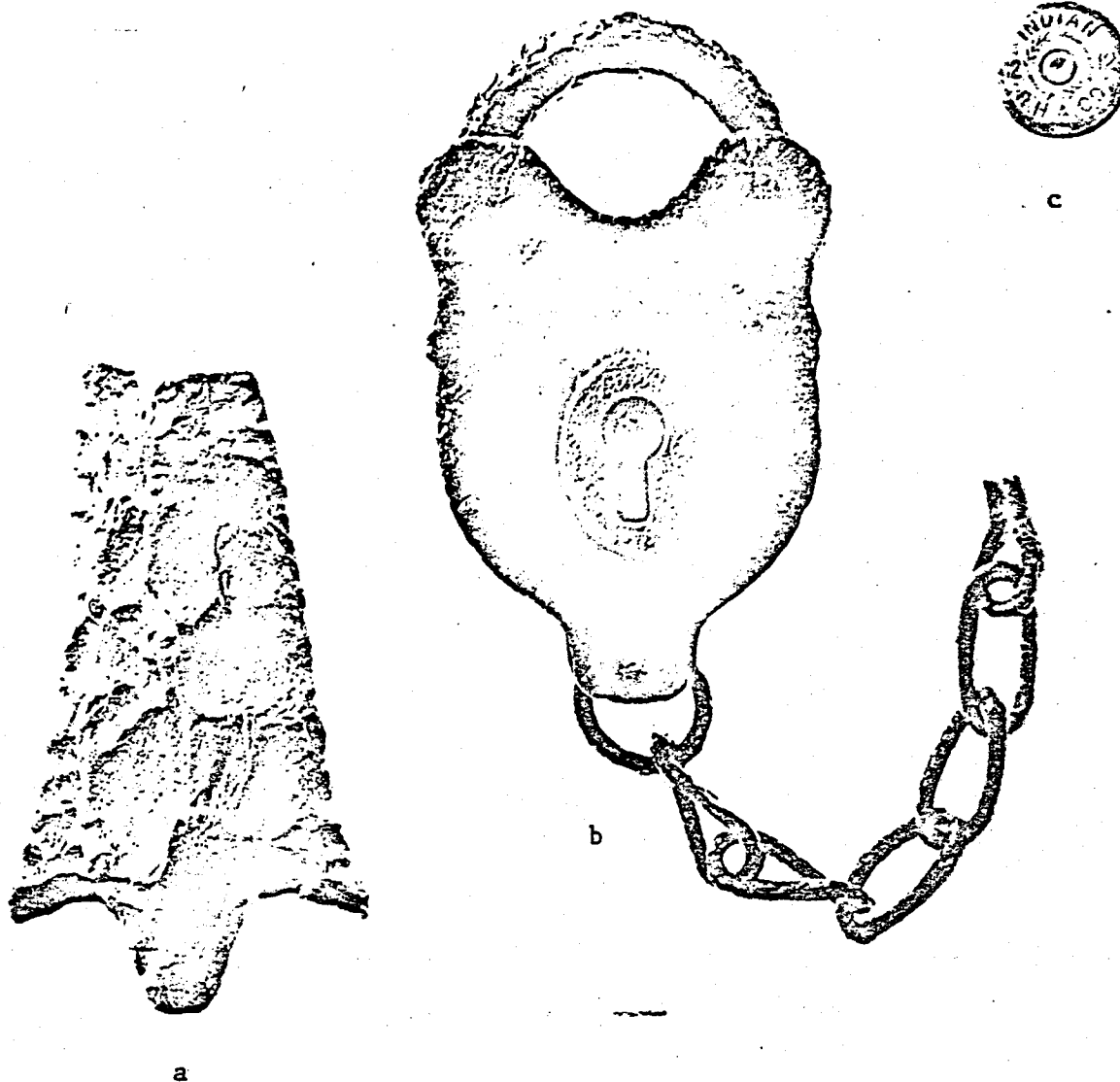


FIGURE 7. Artifacts recovered at Land's Ford Canal. a, Gary projectile point from Unit A, profile trench 12 + 64; b, iron padlock and chain from roadcut in front of lock keeper's house; c, brass shotgun shell base from Unit A, profile trench 12 + 64. Length of a is 110 mm.

CANAL GRADIENT

The Land's Ford Canal was designed to overcome a fall of 32 feet in slightly less than 2 miles (Mixon 1969:3). The manner in which this fall was accommodated by the canal bed and locks can be ascertained within certain limits. Some observations can be made for canal bed elevation at profile locations or where the bed has not been filled, and additional observations could be made by excavating the sills and floors of lock structures. The depth of water can be estimated from berm and lock wall heights, but need not have been constant along the course, especially where Davie's millrace was incorporated into the canal bed.

Figure 8 shows an interpretation of the longitudinal profile of the canal bed. On the average 3 feet of water may have covered the bottom. One of the uncertainties is the elevation of the surface of the Catawba River at canal intake and outlet in 1823. The elevation figures used are estimated from available bed and lock details, and are not very different from flow observed near intake and outlet when topographic survey of the canal area was done (fall 1969).

The essential details of canal gradient, as shown in Figure 8, are as follows. The bed of the northern two-thirds of the course, or intake section, maintained a horizontal grade at about 444 feet. The northern pair of lifting locks provided a fall of 14 feet. The bed of the next section, between lifting locks,

maintained a horizontal grade at about 430 feet. The southern pair of lifting locks provided a fall of 18 feet, and the bed of the outlet section passed out to the river at about 412 feet.

CATAWBA RIVER REGIMEN 1838-1925

One of the byproducts of archeological exploration of Land's Ford Canal was the interesting physical evidence of the activity of the Catawba River between the time the canal was no longer maintained (ca. 1838) and the construction of the Lake Catawba reservoir upstream (1925). During this period of nearly 100 years, a total thickness of at least 28 feet of sediment was deposited by floodwater in the lower canal course, although not at any one point. Several of these deposits appear to represent single unusual floods which scoured the area during rising stages and filled floodwater channels as the water receded. If the canal had continued to operate into the late 19th and early 20th centuries, flooding would have been a vexing problem.

On the average, rivers without flood controls are subject to overbank floods every other year (Leopold 1962). It is not surprising, therefore, that a series of floodwater cuts and fills is present in the lower canal area. The most conspicuous change caused by the river was the addition of natural levee deposits near the southern lifting locks to a height of more than 20 feet above the modern normal flow and lining the canal banks. These levees became anchored by vegetation and were able to resist erosion, including the effect of the 1916 flood, until the present time. Less apparent, until exposed by backhoe

trenching was the extensive cutting by floodwaters of the unconsolidated alluvium and construction fills, which has obliterated the original canal bed and banks in much of the lower section. Because the canal course can still be readily identified on the surface, this degree of destruction was unexpected. Apparently no overbank flooding has occurred since 1925, and no damage of this sort should affect the restored canal.

REQUIREMENT FOR ADDITIONAL ARCHEOLOGICAL WORK

Since no engineering maps or records for Land's Ford Canal remain or have been located, interpretation of the canal's operation must rest largely on archeological investigation. Excavation can be expected to throw considerable light on the design, construction, and use of the canal, as these preliminary results show. Complete investigation of the canal should be accomplished in three stages.

CLEARING THE LOCK STRUCTURE

The interiors of the southern and northern pairs of lifting locks and of the guard lock are filled to various degrees. Removal of the fill to the bed and test excavations to the foundations would permit complete construction plans to be prepared and, probably, recovery of artifacts, such as parts of the lock gate and sluice mechanisms or debris discarded or lost in the canal. Each of the lock structures requires about three weeks of excavation with one archeologist and a crew of 12 laborers. In addition the southern lifting locks require one week of backhoe operation, since they are partially buried and deeply filled.

EXCAVATING THE LOCK KEEPER'S HOUSE

The 30 by 15 foot lock keeper's house near the northern pair of lifting locks exists as a mound of masonry rubble. The floor and lower courses of masonry probably remain intact. Clearing of this rubble and stabilizing the remains would permit the intact portion of the structure to serve as an interesting outdoor exhibit. A search for artifacts in and around the lock keeper's house would probably be rewarding (Fig. 7b). Excavation of this structure would require about three weeks of work with one archeologist and a crew of 12 laborers.

INVESTIGATING DAVIE'S MILL SITE

Excavation and mapping of Davie's mill site would provide a glimpse of early 19th century up-country technology, as well as showing how the mill structure and millrace were incorporated into the canal. Only foundation walls and some unused sections of millrace remain, but mill equipment may be present under the rubble. Three weeks of excavation with an archeologist and a crew of 12 laborers are required to fully interpret the mill site.

CONCLUSIONS

The objective of archeological exploration at Land's Ford Canal was only partially achieved. The degree of recent alteration of the Catawba River floodplain was not entirely expected, since the canal course and lock masonry are apparent and seem well-preserved on the site today. However, each of the profiles recorded from backhoe trenches across the canal course contributed some information about the nature of the canal.

Profile 9 + 12, furthest downstream, contained no evidence of the canal bed. The outlet section of canal is believed to have passed out to the river bank on a straight line from the southern lifting locks, and thus passed northeast of the profile trench. Profile 11 + 71 contained evidence of substantial erosion on the canal course just below the southern lifting locks, perhaps caused by eddying floodwaters. Profile 12 + 64 intercepted the buried portion of the southern lifting locks and exposed details of the lock, lockpit, surface at the time of lock use, berms, and post-canal floodwater cuts and fills. Evidence obtained from this profile was critical for interpreting other canal profiles. Profiles 14 + 30 and 16 + 09, both a short distance upstream from the southern lifting locks, again recorded marked erosion of the canal course where it was constructed on low alluvial floodplain. Near the northern lifting

locks, Profile 39 + 23 showed the canal bed to be a broad shallow trench with sloping walls, bounded by berms up to 6 feet above the ground surface. The final or northernmost trench, just above the northern lifting locks, contained another key profile. Profile 44 + 56 exposed the canal bed, bounded by a berm and a flat-floored basin. The berm had been constructed over a rammed clay core, rendering it watertight. In this part of the canal course, and continuing upstream, the bed passed close to bedrock and had to be blasted out at several locations, but preservation from erosion has been more favorable.

Insofar as it can be ascertained, the gradient of Land's Ford Canal consisted of three near-horizontal stretches of bed separated by two pairs of lifting locks. The northern pair of lifting locks accommodated a fall of about 14 feet and the southern pair a fall of about 18 feet; the total fall was about 32 feet in one mile and 76 chains of canal.

ACKNOWLEDGMENTS

A number of people contributed time and skill to the exploration of Land's Ford Canal. Among these I would particularly like to thank Paul E. Brockington, student field assistant for the project, Janson L. Cox, curator for the Department of Parks, Recreation, and Tourism, and Ransom Lindsay, superintendent of Andrew Jackson State Park. Fred Hambright, representing the Chester County Historical Commission, shared his thorough knowledge of the canal and its history with us. The manuscript was reviewed by Stanley South, archeologist, and Dr. Robert L. Stephenson, Director, The Institute of Archeology and Anthropology, University of South Carolina. Dr. Stephenson, Mr. Cox, and Mr. John D. Combes (Assistant Director of the Institute of Archeology and Anthropology) were responsible for all administrative arrangements for the work here reported. It has been a real pleasure to work closely with these individuals and state agencies.

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