9.0 ROOT RIVER TEST LOCALE

9.1 INTRODUCTION AND BACKGROUND

The Root River test locale is situated on a broad, relatively complex, moderately fine-grained portion of the Root River floodplain near the village of Houston, Houston County (Figures 3.3.2-2 and 9.1-1). The Root River valley is within the Driftless Area of southeastern Minnesota. Typically, rivers in this region have a well-integrated channel system with side-valleys cut into the Paleozoic bedrock. Initial incision of the valleys in the Driftless Area apparently occurred during the early Pleistocene (Knox 1985a). Since incision, the Root River valley has had a varied and complex history of aggradation and degradation related to changes in the base levels in the Mississippi River valley and meltwater flows when glaciers occupied their headwaters. The Late Wisconsinan and Holocene history of Driftless Area rivers in Iowa, Wisconsin, and Minnesota has been extensively studied (e.g., Beach 1994; Bettis and Hallberg 1985; Hobbs and Goebel 1985; Knox 1985a, 1985b, 1999, 2001; Knox et al. 1979).

The modern channel of the Root River near the testing locale has a meandering pattern and is located a few hundred meters north of the sampling grid, which measured 40 m × 100 m (131 ft × 328 ft) and was oriented with its long-axis roughly north-south (Figures 3.3.2-2 and 9.1-1). The Root River valley bottoms are characterized by numerous abandoned channel scars in various states of infilling, attesting to the lateral mobility of the channel. Small alluvial fans are present at the mouths of small side valleys south of the test locale. Within and near the locale, the soils are generally fine-grained and occur on a gently undulating floodplain with relative highs at the northwest and southeast parts of the survey grid. These are separated by a southwest to northeast trending swale or probable flood chute that bisects the test locale (Figure 3.3.2-2). The relative topographic difference between these highs and low is less than 2 m (6.6 ft). The LfSAs mapped the ridges as terraces of two different ages, with the southeastern ridge the oldest.

While the geophysics focused on identifying potential archaeological features, coring and trenching within the test locale focused first on determining the presence or absence of archaeological deposits and secondly on determining the sedimentology and stratigraphic relationships of the deposits that form the two relatively minor alluvial levee-like ridges. Surface conditions during the geophysical survey at the test locale were satisfactory, and the test grid had been recently cleared of corn and disked to remove stubble. The disking, however, did leave large clods of dirt that may have affected geophysical survey results (particularly related to GPR and magnetics). The soil was generally dry, although it was somewhat wetter in the northeast-southwest trending swale area that separated the two levee-like ridges. Twenty cores were drilled at the Root River test locale, and augering was performed at 13 locations. Subsequently, five backhoe trenches that extended up to 3 m to 4 m (9.8 ft to 13.1 ft) deep were excavated.

Four previously recorded archaeological sites are located within one-half mile of the Root River test locale. As discussed in Chapter 3.0, these four sites include cultural components that are buried more than 50 cm (20 in) below the current ground surface. The evidence suggests that the likelihood is high that Woodland and perhaps Upper Mississippian and/or Archaic occupations exist buried below the surface at the Root River test locale. This potential is borne out by the

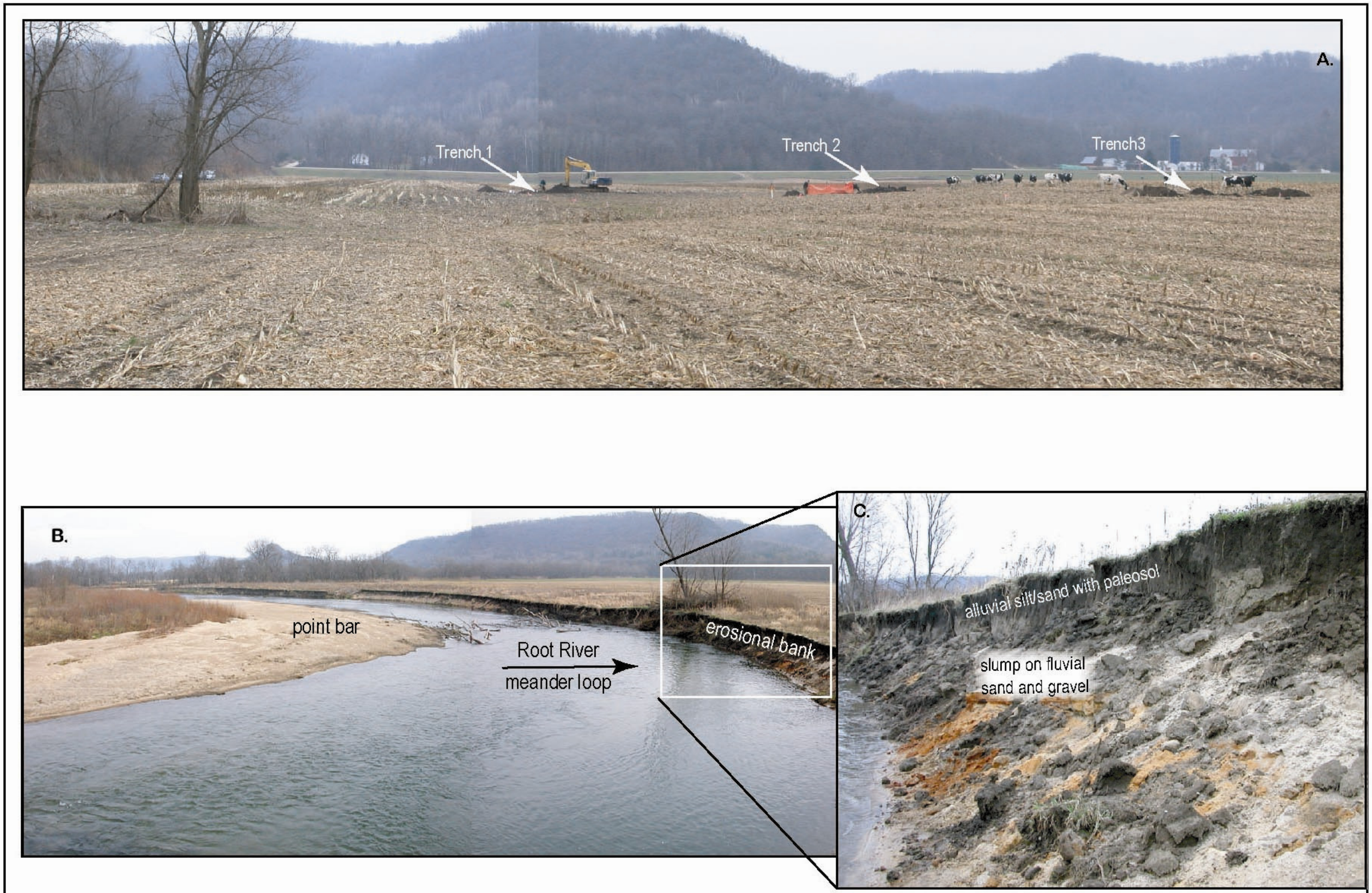


Figure 9.1-1. Root River Test Locale Overviews: (A) Testing Grid; (B) Root River; (C) Active Erosion of Riverbank

LSR rating for the test locale, which indicates a moderate (northern portion) to high (southern portion) potential for preservation of buried deposits.

9.2 RESULTS OF GEOPHYSICS SURVEY

9.2.1 Magnetics

Of all the test locales surveyed, the Root River test locale is the quietest magnetically. No cultural features are detected, though a few spike anomalies typical of those seen on surveys of other modern agricultural fields are present. Distinct linear features appear from drainage cuts of recent origin, which are ca. 1.5 m (4.9 ft) wide and ca. 0.3 m (1.0 ft) deep (Figure 9.2.1-1). The geophysical response is much like those identified in other contexts as plow furrows, but on a slightly larger scale. Otherwise, the magnetics show no clear indication of any features or other disturbances.

9.2.2 Resistivity

The resistivity surveys at this test locale depict the local geomorphology remarkably well. Coincident with the slightly elevated ground to the northwest is an area of high resistivity, probably the result of better-drained soils (Figure 9.2.1-1). Progressing through the deeper data levels, this area becomes smaller, while a slightly deeper area of similar resistivity becomes apparent. This appears to reflect a high terrace remnant to the north and a lower one to the south, with a drainage channel separating them (Figure 9.2.1-1). With depth, resistivity actually increases within the southern terrace and, to a lesser extent, northern terrace remnants. This suggests that the deeper sediments may be coarse-grained (i.e., sand and gravel) fluvial deposits. A major break in sediments and depositional dynamics thus exists within the Root River survey grid. Lateral accretion processes (i.e., bar/channel migration) dominated during deposition of deeper sediments, while vertical accretion (i.e., overbanking) may have been responsible for deposition of the finer grained, upper part of the sequence. The archaeological significance of this observation, if correct, is that occupation is unlikely to have been preserved deeper in the sequence, but is more likely in the upper part.

9.2.3 Ground Penetrating Radar

The results of the GPR survey show few good reflectors in the survey area (Figure 9.2.3-1). No separate units could be reliably defined. Many weak, vertical but thin, light patches occur and small crenulations are noted at several places in a poorly defined reflector. These appear mainly at the easternmost 10 m (33 ft) of the test locale. Minor V-shaped patterns of unknown origin also occur. These are confined mainly to the western part of the survey grid. On two-dimensional maps (Figure 9.2.3-1), a 2-m (6.6-ft) diameter circular feature occurs at 80N/30E. A number of shallow, possibly metal, hot spots occur in the southern part of the survey grid. A clear circular feature also occurs at 5N/30E. An apparent northwest to southeast diagonal grain, probably geologic (i.e., sedimentary) in origin, appears on the 1.0 m to 1.5 m (3.3 ft to 4.9 ft) slice. Subtle features whose origin is unknown also occur at 3N/16E on that level.

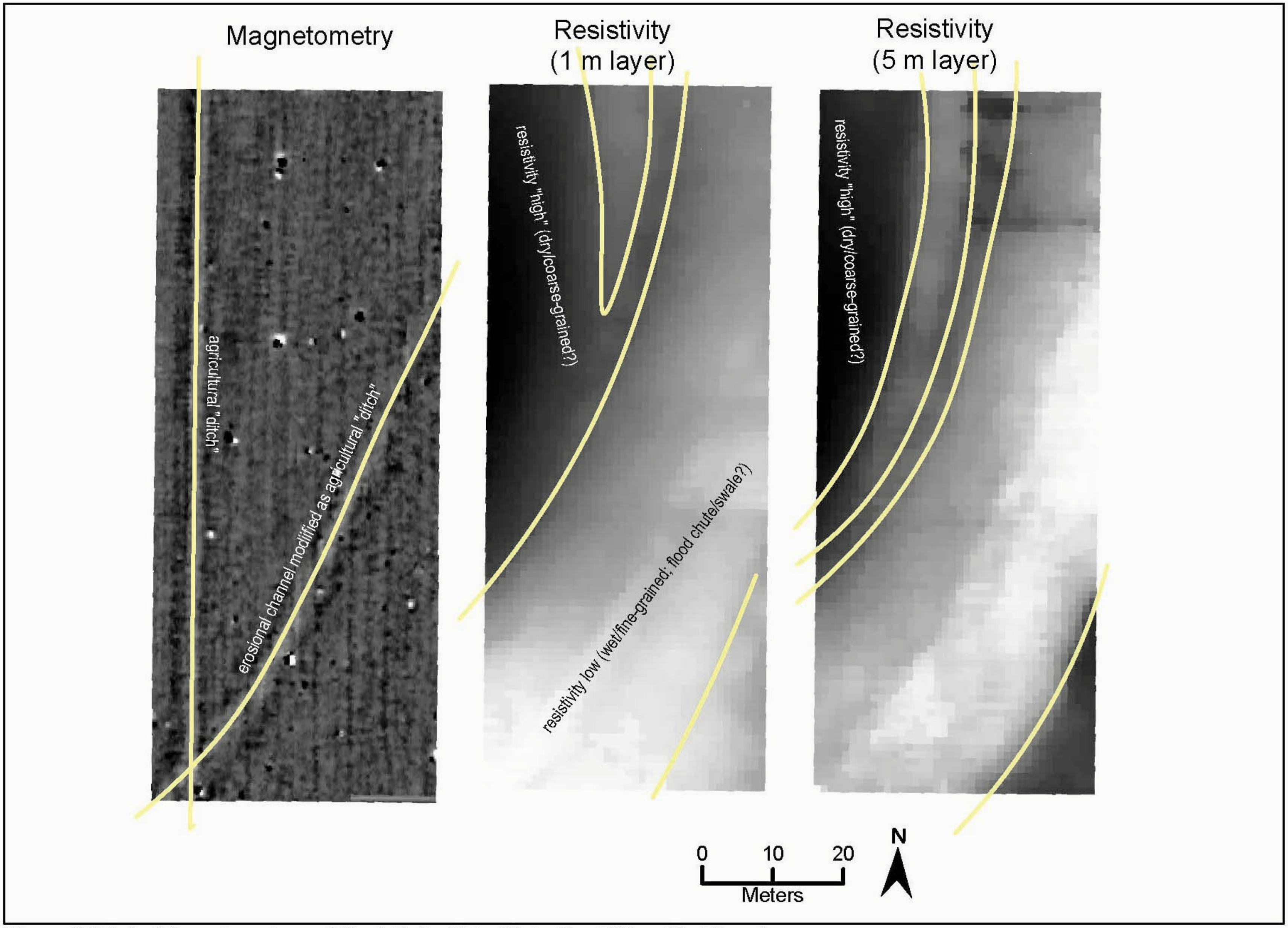
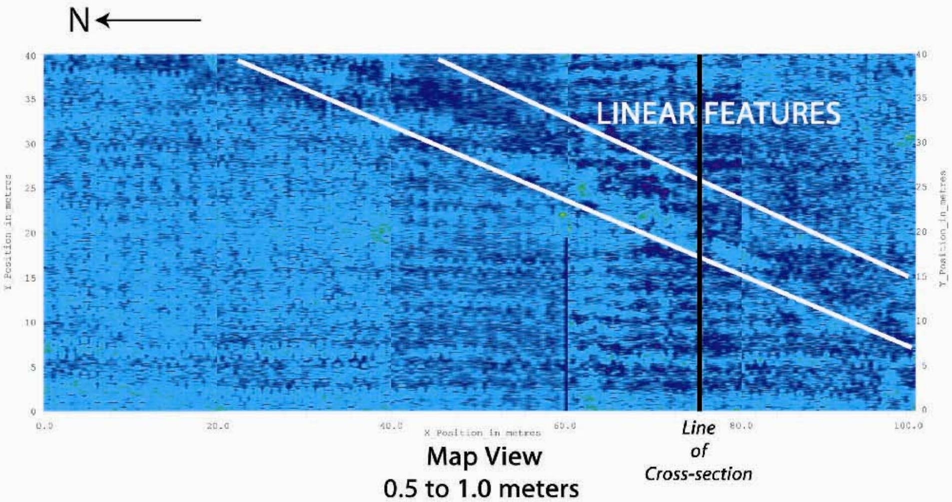
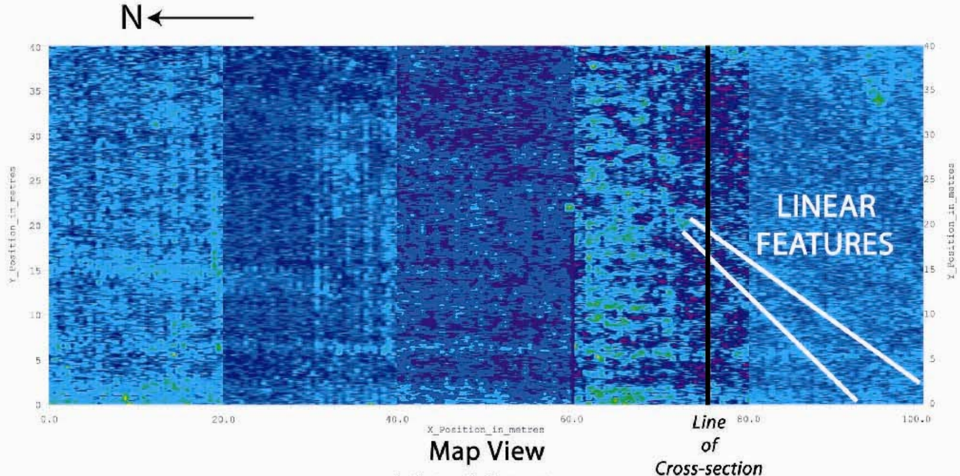


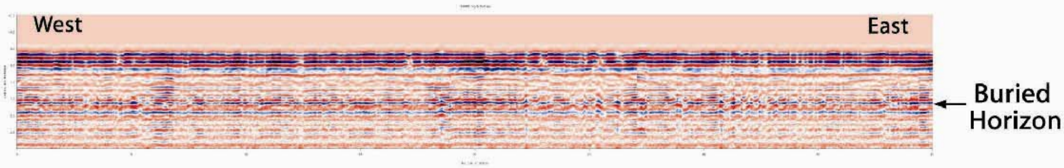
Figure 9.2.1-1. Magnetometry and Resistivity Data Plots, Root River Test Locale



Map View
0.5 to 1.0 meters



Map View
1.0 to 1.5 meters



Cross-sectional View

Figure 9.2.3-1. GPR Data Plots, Root River Test Locale

9.2.4 Discussion of Geoarchaeological Significance of the Geophysical Survey

Like the Clement test locale (Chapter 8.0), the geophysical survey results from the Root River test locale are generally more informative about the geological and sedimentological environments than the possible presence of buried archaeological materials. The GPR shows few good reflectors, although weak reflectors are present and probably related to sedimentary structures within the subsurface sediments. Similarly, even though the resistivity survey data show clear patterning, they merely reflect the obvious geomorphology of the test locale and indicate that a low southwest-northeast trending flood chute channel separates relatively high terrace remnants in the northern and southern part of the survey grid. The resistivity data, however, may show that archaeological deposits are not likely to be preserved deep in the sequence. The magnetic data reveal little beyond the presence of distinct linear features that probably relate to recent attempts to improve drainage and that a few metal or brick artifacts are scattered near the surface throughout the site.

9.3 RESULTS OF CORING SURVEY

9.3.1 Deposits and Soils

Strata in the cores are divided into coarse-grained bottom stratum deposits and fine-grained top stratum deposits. Bottom stratum deposits are sandy and gravelly and consist of the soil textural classes of sand, loamy sand, sandy loam, loam, and sandy clay loam (Appendix B). The bottom stratum deposits are considered bed load and transitional deposits (Friend 1983). These represent the channel and near channel sedimentary environments such as channel lag, benches, scroll bars, and the proximal part of crevasse splays. The point bar platform is constructed of bottom stratum deposits.

Bottom stratum deposits in the cores consist of fine to very coarse sand with small percentages of silt and clay. They are often thin bedded and graded (coarsen downward). Gravel content varies from none to approximately five percent and does not occur in beds but is scattered throughout the deposit. In the eastern two-thirds of the grid, the bottom stratum deposits have hydric colors.

Top stratum deposits consist of silty and clayey sediment that falls into the silt, silt loam, silty clay loam, silty clay, and clay textural classes. They are deposited away from the active channel over the point bar platform ridge and swale topography and in abandoned channels. Sedimentary environments include flood basins, point bars, and abandoned channels. Top stratum deposits at the Root River test locale have a variable stratigraphic pattern.

9.3.2 Stratigraphy

Three mini-LfSAs are defined based on topography, soils, and stratigraphic sequence (Figure 9.3.2-1). The stratigraphy consists of bottom stratum deposits overlain by top stratum deposits over the entire sampling grid with three different sequences in the top stratum deposits that, in part, differentiate the LfSAs (Appendix B). The bottom stratum deposits grade from sand and gravelly sand to sandy loams, clay loam, and loams. The upper contact is always abrupt, probably erosional, and occurs at different elevations (Figures 9.3.2-2, 9.3.2-3, and 9.3.2-4).

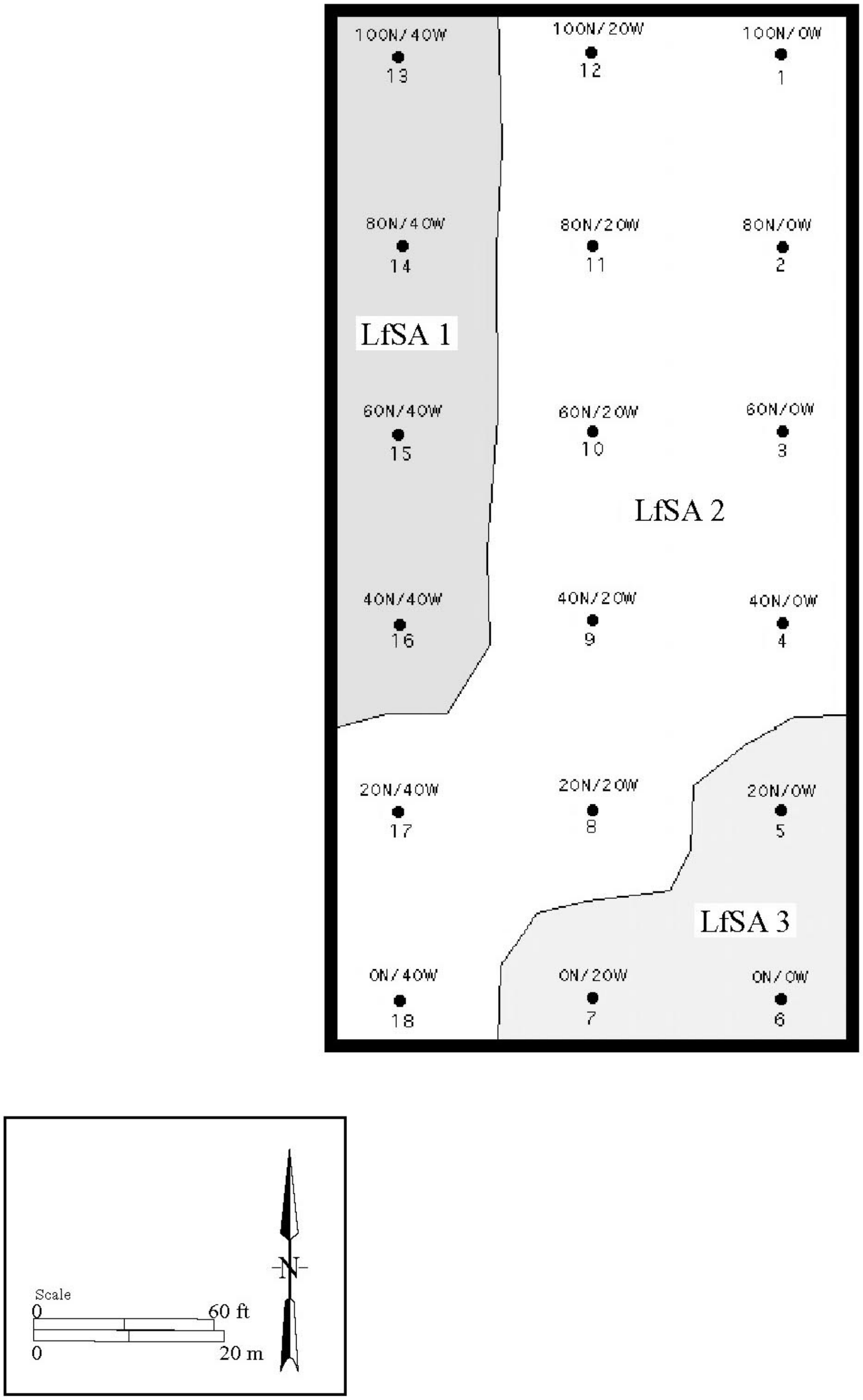


Figure 9.3.2-1. Root River Test Locale, Core Locations, and LfSAs

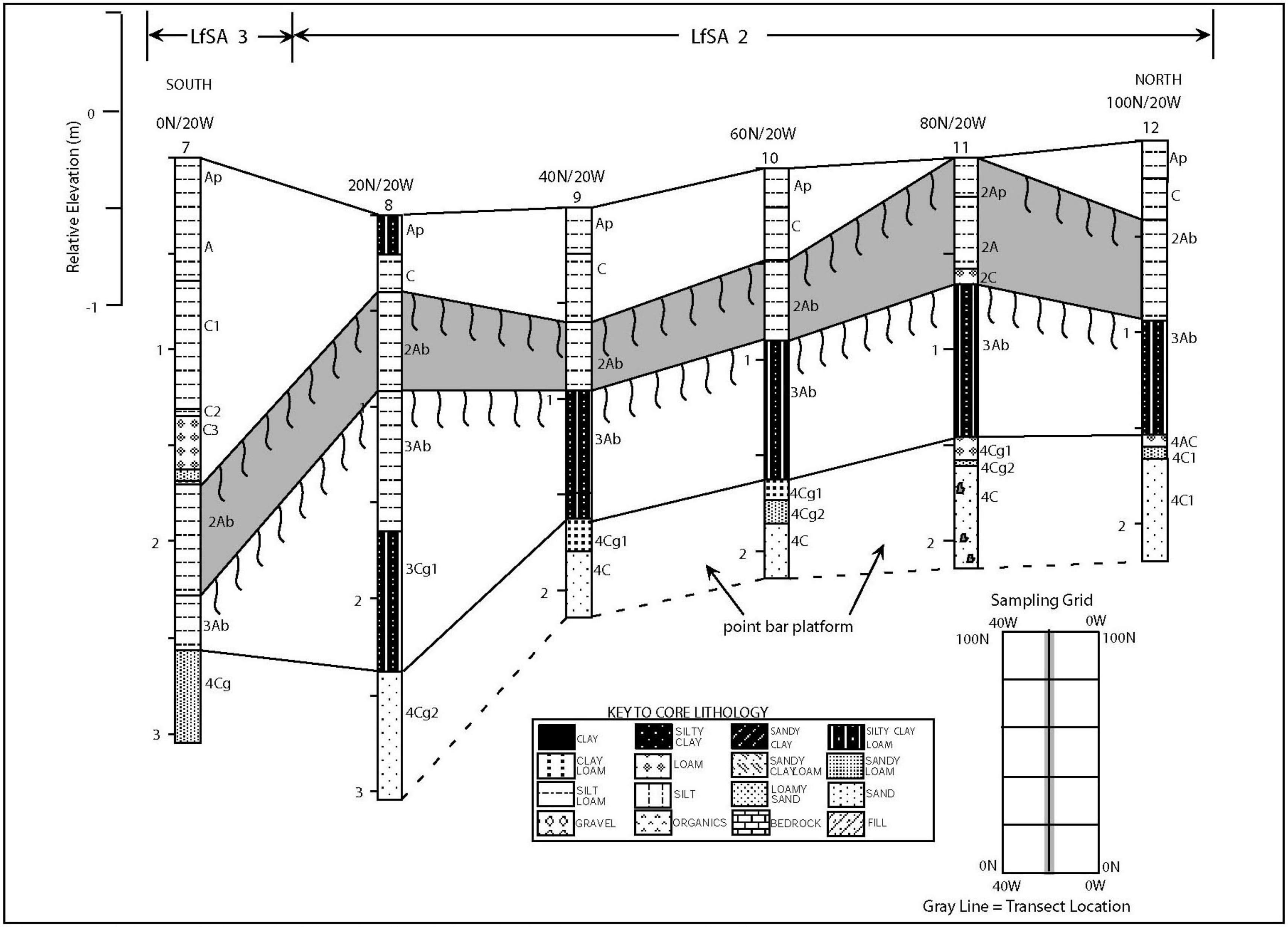


Figure 9.3.2-2. Root River Test Locale, North-South Stratigraphic Cross-Section

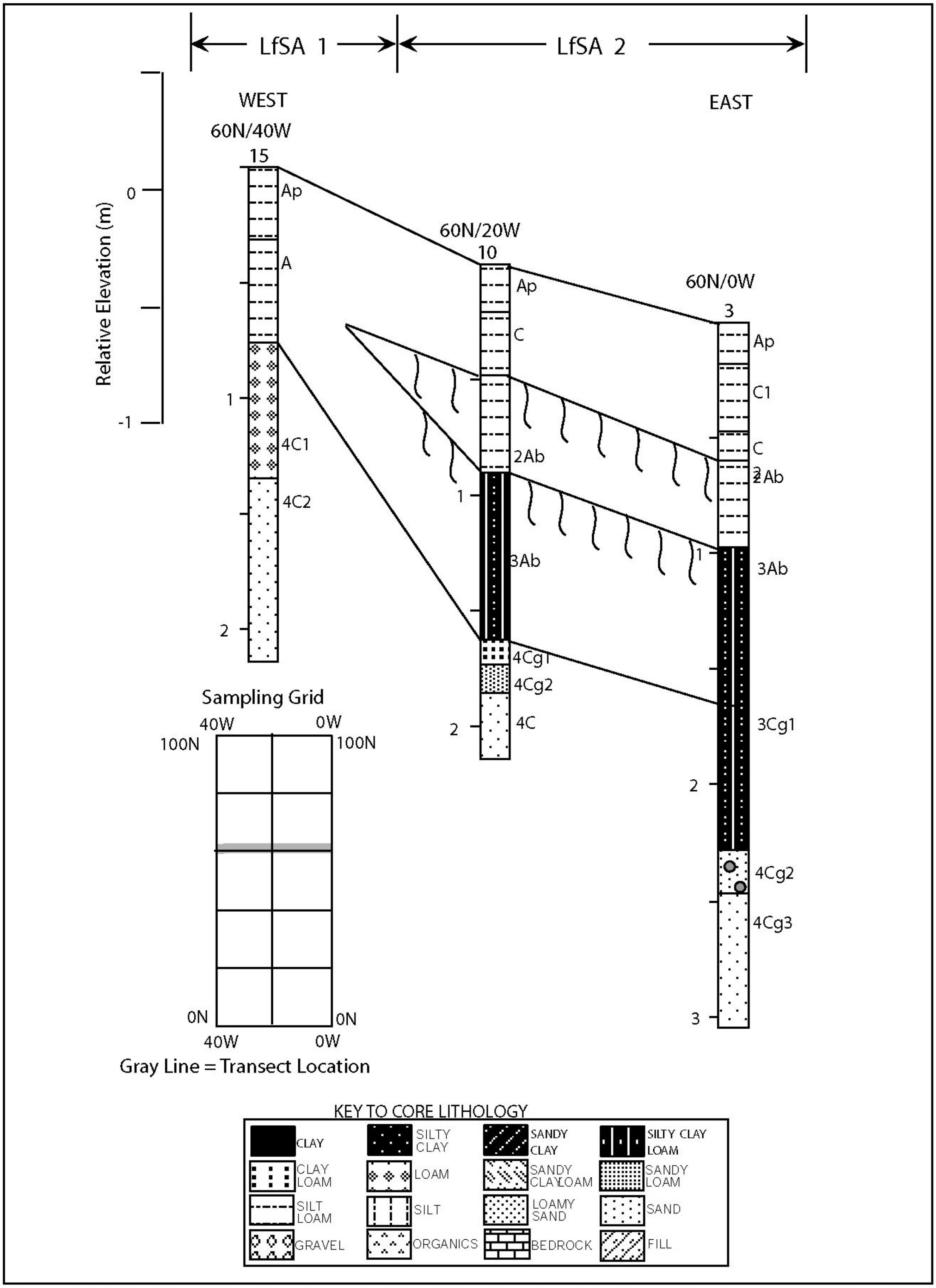


Figure 9.3.2-3. Root River Test Locale, East-West Stratigraphic Cross-Section 60N/40W to 60N/0W

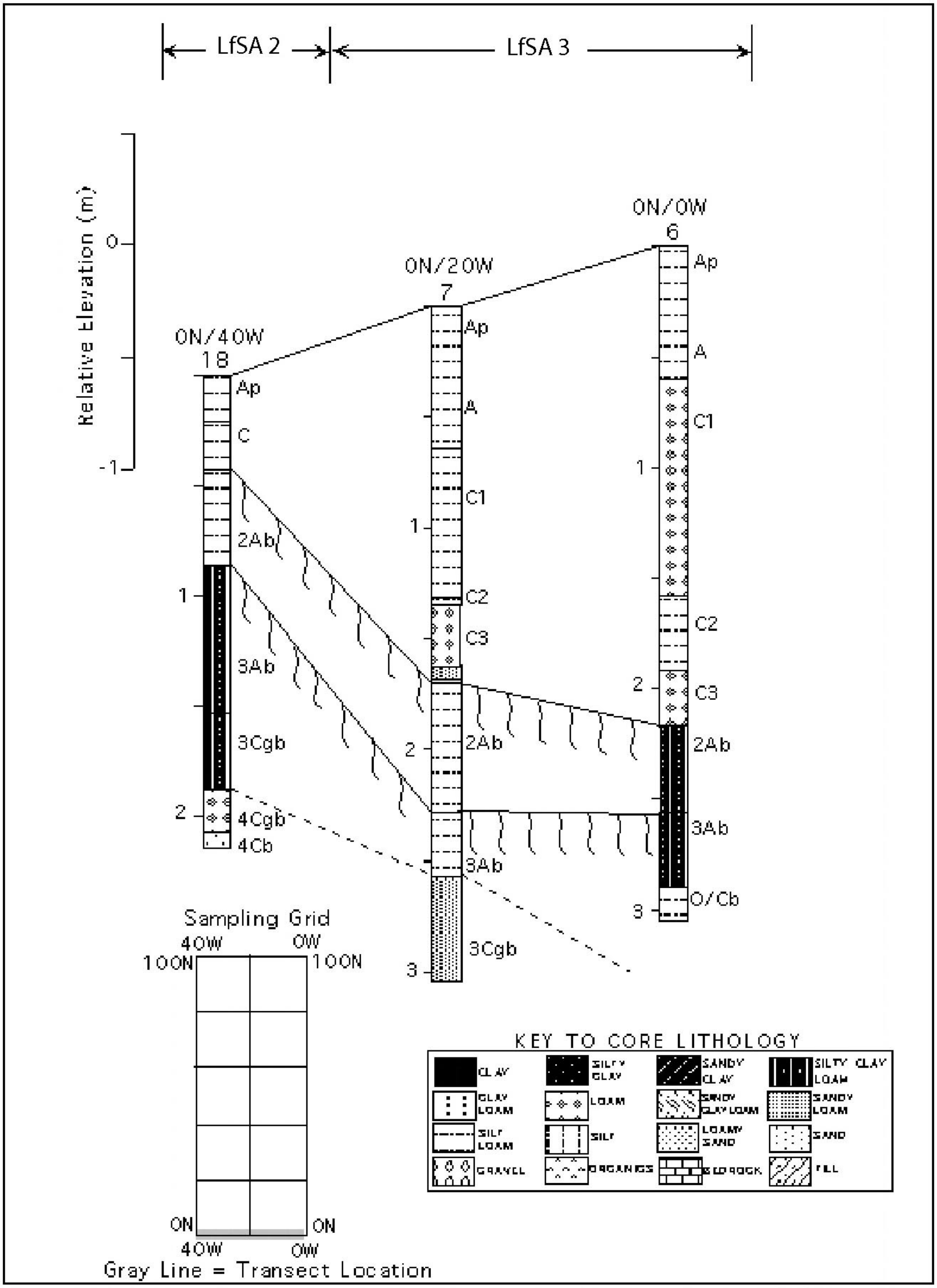


Figure 9.3.2-4. Root River Test Locale, East-West Stratigraphic Cross-Section 0N/40W to 0N/0W

Different elevations are due to the morphology of the point bar platform, which includes ridges, swales, and/or channels. Within the sampling grid the sand bottom stratum deposits occur at the highest elevations along the 40W line from 40N to 100N (LfSA 1) and slope down to the east and south with the lowest elevation in the southwest corner of the grid (Figures 9.3.2-1). This sloping surface is covered by the top stratum deposits whose sequence varies depending, in part, on the elevation of the top of the point bar platform.

LfSA 1 is located within the west and northwest portions of the test locale (Figure 9.3.2-1), which is the highest part of the grid. Stratigraphy below the LfSA surface consists of a surface cumlic A horizon that is occasionally over a Cb horizon formed in silt loam and heavy silt loam. It has moderate pedogenic structure, a few shell fragments, and is unleached (Figure 9.3.2-3; Appendix B). No buried soils were encountered.

LfSA 2 occupies most of the sampling grid and forms a rough diagonal crossing the grid from northeast to southwest (Figure 9.3.2-1). This is the lowest part of the grid. Stratigraphy consists of three top stratum sedimentary units marked by the surface soil and two buried soils. The upper unit (Stratum 1) forms the LfSA surface and consists of a thin (< 60 cm [23.6]) package of silt loam and loam with an Ap-C soil horizon sequence (Figures 9.3.2-2, 9.3.2-3, and 9.3.2-4). The C horizon is often laminated (Appendix B). The middle unit (Stratum 2) lies conformably below Stratum 1 and is a cumlic Ab horizon formed in silt loam. A thin C horizon is occasionally present. Stratum 2 deposits are unleached (Appendix B).

The lowest unit (Stratum 3) is immediately above the bottom stratum deposits. It consists of a 3Ab-3Cg horizon sequence formed in silty clay loam that tends to get sandier with depth. The 3Ab horizon is very dark gray with moderate to strong structure, has occasional shell fragments, is calcareous, and contains more clay than the overlying 2Ab horizon. In some places the 3Ab horizon has sandy beds or very thin laminations. The 3Cg horizon is very dark gray (5Y or 2.5Y hues), contains plant fragments/roots, shell fragments, very small whole snail shells, and is calcareous (Appendix B).

LfSA 3 is located in the southeast corner of the grid (Figure 9.3.2-1). Stratigraphy consists of an Ap-A-C horizon sequence formed in a thick unit of silt loam and loam (Stratum 1), over a 2Ab horizon formed in silt loam, over the 3Ab-3Cgb horizon sequence formed in silt loam and silty clay loam (Figure 9.3.2-4). Stratum 1 is interpreted as a distal alluvial fan deposit that filled the upper portion of the abandoned channel. All of the cores in LfSA 3 (Figure 9.3.2-1: Cores 5, 6, and 7) have a sandy stratum separating the fine-grained Stratum 2 deposits from the fine-grained Stratum 1 deposits (Figure 9.3.2-4). This sand stratum does not occur in the same stratigraphic position in the other LfSA stratigraphies. A flood that did not carry sandy sediment onto the slightly higher point bar landscapes to the north and west deposited the sandy stratum, indicating the flow came from the tributary valley to the south. The sandy strata and, in part, the overlying Stratum 1 deposits, are alluvial fan channel and channel fill deposits that accumulated at the toe of the alluvial fan. The weak soil development, loamy near-surface horizon (lack of a fine grained cumlic surface soil), and position on the landscape indicate the deposit is historic or late prehistoric in age. Buried soils formed in Strata 2 and 3 are hydric, as indicated by the presence of shells, plant fragments, and hydric soil colors.

9.3.3 Discussion of Geoarchaeological Significance from Coring

Sedimentation and pedogenesis have combined to form different stratigraphic sequences across the area of the test locale. LfSA 1 is the highest part of the grid and has a cumlic A horizon (Stratum 1) formed in the top stratum sediments over bottom stratum deposit of the point bar platform. No buried soils are present. The cumlic A horizon indicates small increments of sediment accumulated on the landform surface during late prehistoric time and could have buried short-lived, occupational horizons, if they had existed, below the plow zone. For this reason the entire upper solum (A-Ab horizon) below the plow zone was targeted for auguring.

LfSA 2 stratigraphy consists of a sequence of stacked paleosols formed in top stratum deposits in an abandoned channel. The top of the point bar platform marked by the top of the bottom stratum deposits slopes down to the east and southeast. The surface soil is likely historic or possibly late prehistoric in age. The 2Ab horizon (Stratum 2) is cumlic and has potential for buried archaeological deposits. Its age is unknown. Stratum 3 soil consists of a 3Ab-3Cgb horizon sequence and the 3Ab is also cumlic. This soil also has the potential to contain buried archaeological deposits. There is a litho- and pedo-facies change from LfSA 1 to LfSA 2 with a simple cumlic soil on the higher part of the point bar platform and a complex series of stacked paleosols in the lower channel setting. This is the result of higher sedimentation rates in the abandoned channel than on the point bar platform, even though today there is no more than a 30 cm (12 in) elevation difference. High-frequency low-magnitude flood waters enter the abandoned channel but do not overtop the higher part of the point bar platform or, if a flood does cover the higher part of the point bar platform, as the flood wanes it ponds in the swale allowing extra time for sedimentation to occur. The expression or morphology of the buried soils is due to the interaction and evolution of the pedogenic environment and variable sedimentation rates. The buried soils have potential for buried archaeological deposits to exist throughout the entire thickness of the Ab horizons. For this reason the buried soils beneath the LfSA 2 surface were targeted for auguring.

The stratigraphic order beneath the LfSA 3 surface is the same as in LfSA 2, but the buried soils are low in elevation and exhibit hydric features higher in the profile. This indicates the abandoned channel becomes deeper to the southeast. Thus, given their hydric nature, the buried soils beneath the LfSA 3 surface have only a low potential for buried archaeological deposits and were not sampled with the augers.

No archaeological material was found on the surface or in the auger tests at the Root River test locale. Possible geomorphic reasons for the lack of artifacts may be (1) the relatively young landscape, (2) the hydric nature of some of the buried soils, and (3) the overall low landscape setting (floodplain) of the test locale.

9.4 RESULTS OF TRENCHING SURVEY

9.4.1 Stratigraphy of Soils and Sediments

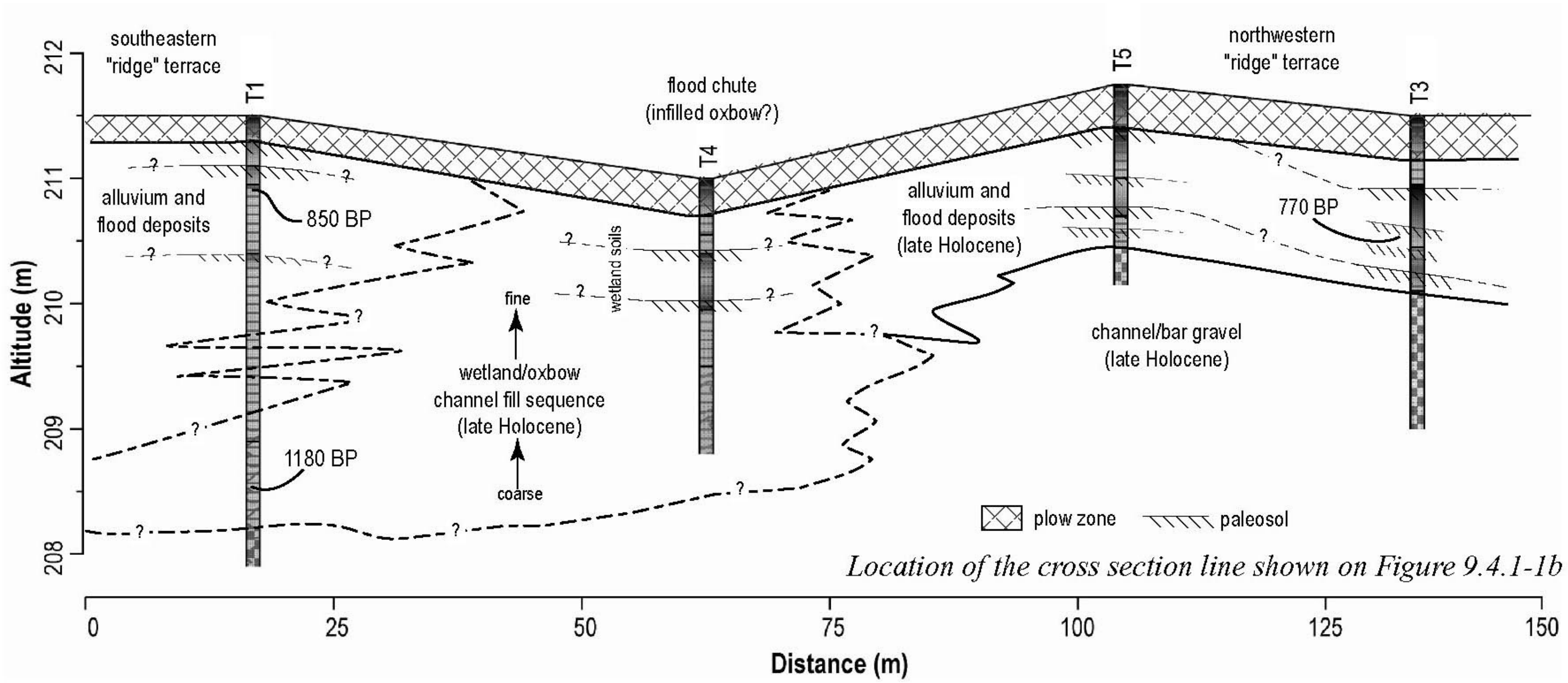
The results of the trenching survey reveal that a relatively thin sequence of Holocene alluvium, which directly overlies fluvial channel or bar deposits, characterizes the floodplain at the Root

River test locale. Similar to the Clement test locale (Chapter 8.0), trenching focused on the two ridges, as well as the topographically lower swale or flood chute that bisects the test locale (Figures 9.4.1-1 and 9.4.1-2). These data reveal only minor differences, either in process or time, for the depositional sequences of the test locale and suggest that the entire area may be part of the same broad depositional system. For example, in Trench 1, located in the southeastern corner of the test locale, the basal deposits consist of an approximately 2.5-m (8.2-ft) thick, probable wetland/infill sequence (Figures 9.4.1-2 and 9.4.1-3; Appendix C). The base of this sequence is marked by thin, discontinuous interbeds of bedded coarse sand and very fine gravel that grades upward into thicker tabular beds of medium to coarse sand. These deposits include abundant shell and one piece of unburned detrital wood. The wood yielded a ^{14}C age of 1180±60 BP (Beta-200806; calibrated cal yrs A.D. 690 to A.D. 990; Appendix D). The inter-bedded sand, in turn, grades upwards into tan to brown/mottled gray/reddish brown, inter-bedded sand, silt, and clayey silt that also includes a few discontinuous strata of organic-rich silt. These deposits grade up into thicker tabular beds of clayey silty sand, which then grade into massive silty sand near the top of the sequence. Shell is common throughout the sequence, while occasional fine pieces of disseminated charcoal occur in the upper 30 cm (11.8 in). The top of this sequence is marked by an ephemeral, darker, more organic-rich horizon that probably formed as a relatively short-lived buried surface (ACb) soil horizon. This soil probably formed within a wetland or at least seasonally wet environment.

Taken as a whole, the succession of deposits described above is indicative of an infilled, abandoned channel sequence that probably developed in an oxbow-like depression that formed within an abandoned channel of the Root River. As such, the basal gravel probably represents the upper part of fluvial channel deposits that were cut into the valley floor by the Root River. This channel cut, which must have been abandoned during a subsequent migration of the Root River, was then infilled with a sequence of organic-rich, accretionary wetland deposits. Similar infilling wetland sequences were also noted in Trenches 4 and 2, located within or adjacent to, respectively, the swale (Figures 9.4.1-1, 9.4.1-2, and 9.4.1-3; Appendix C). The similarity of sequences in Trenches 1, 2, and 4 suggest that expression of the swale noted on the surface of the test locale probably marks the approximate position and configuration of the buried oxbow-like abandoned channel. Based on the ^{14}C age of 1180±60 BP (Beta-200806) on wood, the channel was apparently cut, meandered away, and began infilling just prior to 1000 BP (Figure 9.4.1-2).

The infilled channel sequence in Trench 1 is overlain by a series of vertical accretionary alluvial deposits (Figure 9.4.1-3). These deposits consist of tan/mottled orange/brown, bedded, medium to coarse sand that generally coarsens upwards and includes occasional discontinuous interbeds of fine gravel (more common in the lower part) and silty fine sand (more common in the upper part). The top of the sand is marked by a ca. 50-cm (19.7-in) thick brown (lower part) and black to brown (upper part) massive, medium to coarse sand and silty fine sand. These apparently mark a poorly developed buried and accretionary paleosol. The brown, lower part represents the base of a cumulative surface horizon (A2) while the upper part (A1) is better developed and clearly truncated by and incorporated into the modern plow zone (Ap), which is a black to dark brown, massive silty fine sand. A few broken shells and occasional pieces of fine disseminated charcoal occur throughout the paleosol sequence. A piece of charcoal, found within the lower part of the sequence, yielded a ^{14}C age of 850±40 BP (Beta-200808; calibrated cal yrs A.D. 1050

Figure 9.4.1-1. Trench Locations at the Root River Test Locale



Location of the cross section line shown on Figure 9.4.1-1b

Figure 9.4.1-2. Cross Section through the Root River Test Locale

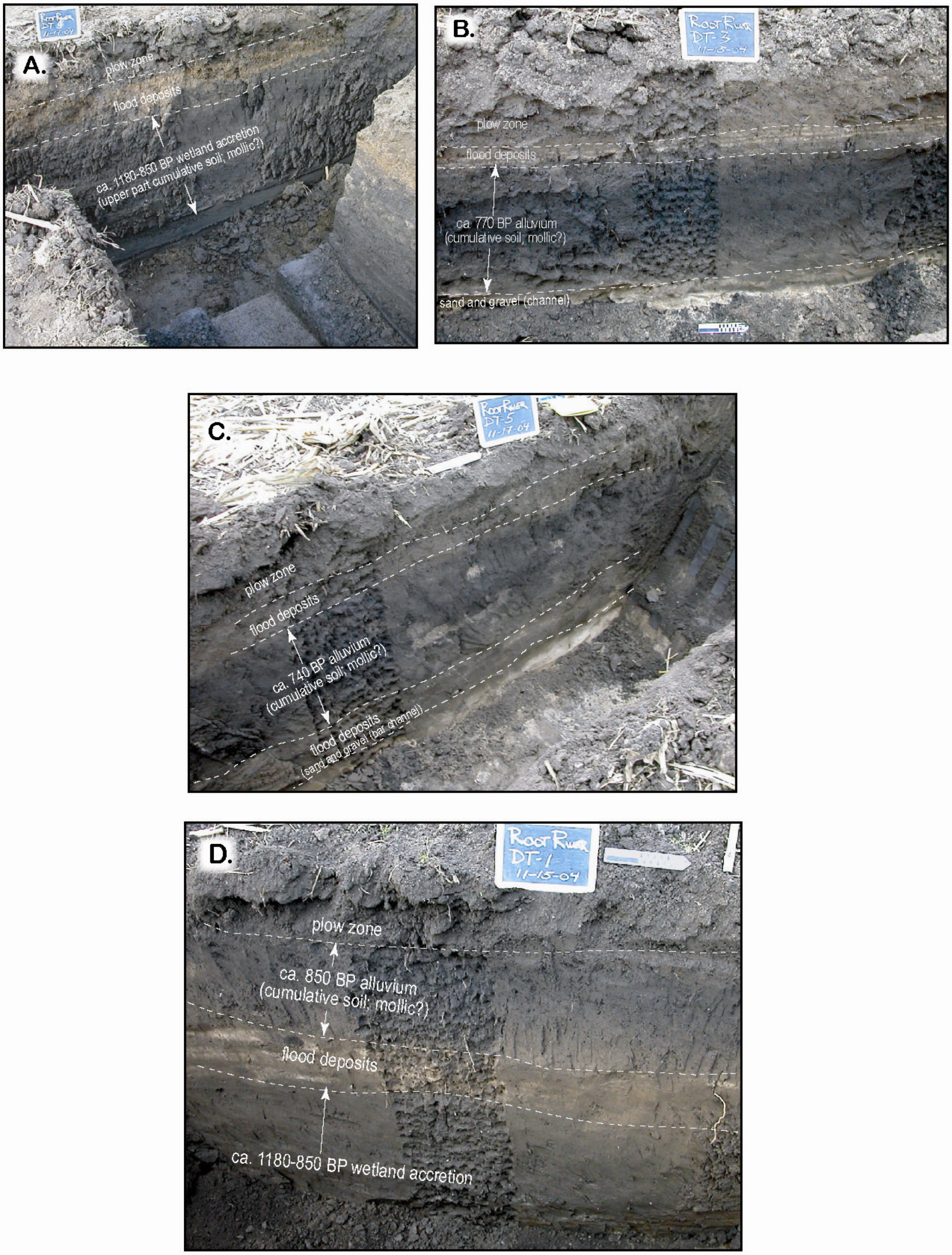


Figure 9.4.1-3. Root River Test Locale Trench Profiles: (A) Trench 1; (B) Trench 3; (C) Trench 5; (D) Trench 4

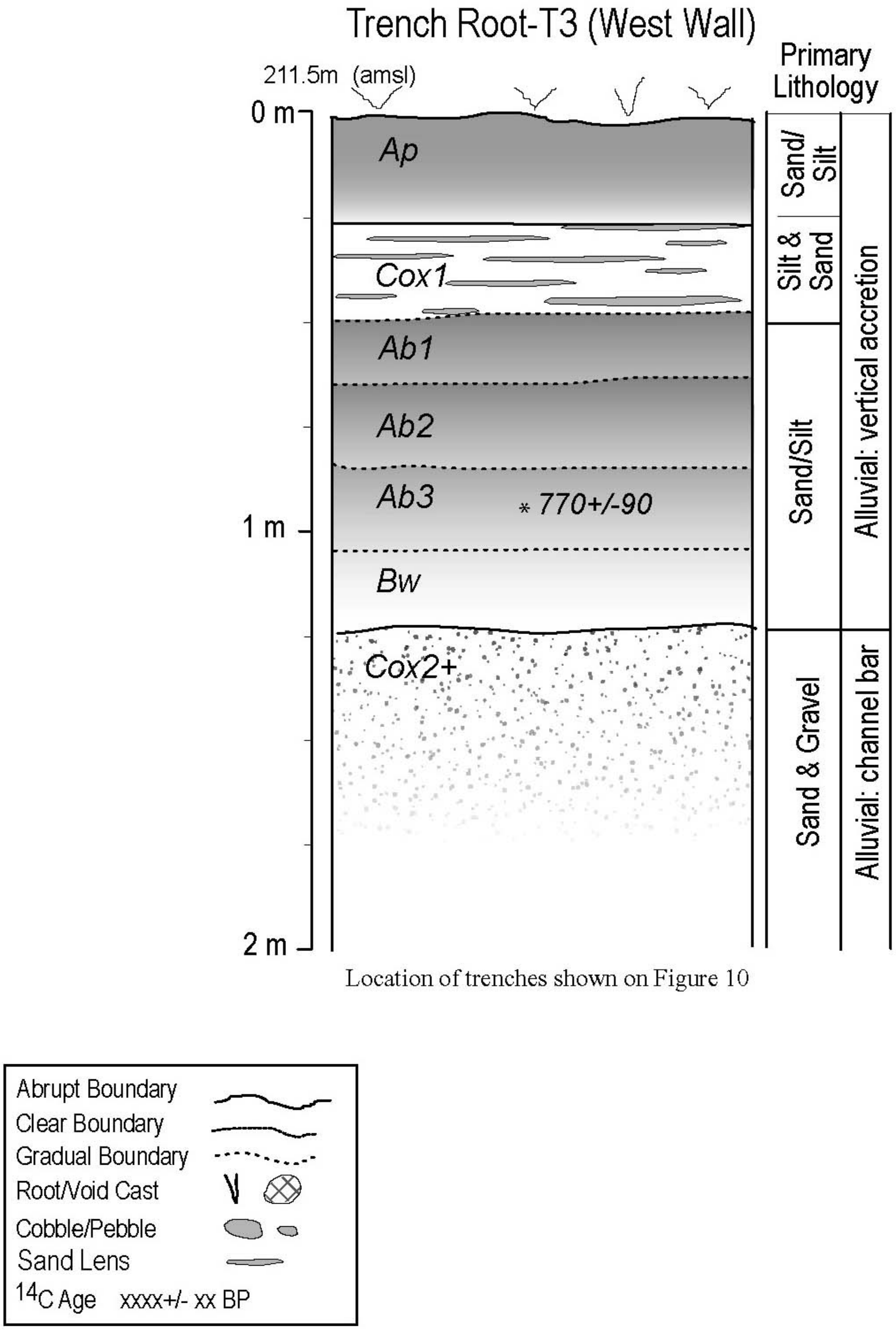
to A.D. 1100 and A.D. 1140 to A.D. 1270; Appendix D; Figure 9.4.1-1). This age and the 1180 BP date collected from the base of the infilled sequence suggest that oxbow filling, along with much of the alluvial deposits that formed the southeastern terrace, occurred within a few hundred years during the late Holocene, just prior to European contact.

Radiocarbon ages from the northwestern terrace indicate that it was formed at nearly the same time as the southeastern. This area, however, lacks the basal wetland fill sequence noted in the swale and southeastern terrace and, instead, is marked by probable gravel point-bar deposits. In Trench 3 (Figures 9.4.1-1 and 9.4.1-2), for example, the base of the sequence is represented by the upper meter of minimally weathered, tan to brown mottled reddish/orange, sand and gravel (Figure 9.4.1-4; Appendix C). The lower part of the unit consists of poorly sorted, cross- to crudely bedded sand and gravel that also includes large cobbles and pebbles within the crudely bedded gravely layers. These deposits grade upwards into better sorted, cross-bedded, medium to coarse sand that occasionally includes interbeds of medium grained sand and fine gravel and a few discontinuous, relatively thin silty sand interbeds, particularly near the top.

These sands and gravels were likely deposited in association with point- or side-bars of the Root River. Their formation is also probably related in time and process to the channel cutting and migration episodes suggested for basal deposits in Trench 1 (Figure 9.1-2).

The upper ca. 150 cm (4.9 ft) of sediments within the northern part of the test locale consists mainly of vertical accretion alluvium (Figures 9.4.1-2, 9.4.1-3, and 9.4.1-4; Appendix C). Similar to the upper part of the Clement test locale sequence (Figures 8.4.1-2, 8.4.1-3, and 8.4.1-4), this alluvium includes several ephemeral paleosols marking episodic local stabilization of the floodplain between flood events. In Trench 3, for example, the basal sand and gravel unit grades upwards into ca. 30 cm to 40 cm (11.8 in to 15.7 in) of tan, mottled gray/light brown, faintly bedded alluvium and flood deposits. This unit includes several discontinuous alternating interbeds of medium to fine sand, silt, and silty fine sand that probably represent occasional floods of the Root River. A series of short-term (or accretionary) ephemeral and discontinuous surface/subsurface (A/C) soil horizons, formed within these flood deposits, suggest the flooding was episodic and probably alternated with short-lived stable episodes as the floodplain accreted (Figures 9.4.1-2 and 9.4.1-3). These flood deposits grade upwards into dark gray to brown, massive to very faintly bedded, silty fine sand that is composed of an accretionary buried surface (Ab) soil horizon. This horizon may reflect an origin as part of mollic epipedon. As was true for the lower alluvium, these sediments also probably accumulated as a series of alternating flood deposits that were apparently of lower magnitude, less frequent, or have been more thoroughly mixed by pedogenesis. Interestingly, pieces of charcoal occur within the sequence and also form a lineation near the base that may mark an erosional surface within the accretionary sequence. One of these pieces of charcoal yielded a ^{14}C age of 770±90 BP (Beta-200807; calibrated cal yrs A.D. 1040 to A.D. 1400; Appendix D), which statistically overlaps with the 850 BP age for alluvial accretion in the southern terrace. It is also only a few hundred years younger than the beginning of the channel infilling within the swale area and attests to the young age and rapidity of deposition (Figures 9.4.1-1 and 9.4.1-2).

The alluvial and paleosol sequence in Trench 3 is overlain by an approximately 30-cm to 40-cm (11.8-in to 15.7-in) thick sequence of post 700 BP-800 BP alluvium and flood deposits. These



Location of trenches shown on Figure 10

Figure 9.4.1-4. Soils and Sediments in Trench 3, Root River Test Locale consist mainly of brown/mottled gray, alternating discontinuous interbeds of medium to fine sand, silt, and silty fine sand. The interbeds are relatively thin (5 mm to 2 cm [0.2 in to 0.8 in] thick), and the finer grained beds are generally gray and include occasional shell fragments in the matrix and bedding planes. These deposits mark a renewed series of floods of the Root River more recent than 770 BP and also include a series of short-term (or accretionary) minimally to unweathered surfaces formed between the floods. The plow zone truncated the upper part of the post-700 BP to 800 BP flood deposits.

9.4.2 Discussion of Geoarchaeological Significance of Trenching

The depositional sequence within the Root River test locale, considered as a whole, suggests this segment of floodplain probably formed during a channel migration episode that occurred between 1180 BP and 770 BP (Figure 9.4.1-2). Sometime prior to 1180 BP, a channel was cut and abandoned as the Root River migrated northward, leaving an oxbow-like depression in the floodplain surface. The oxbow apparently covered at least most of the southern half of the test locale, but its edge was marked by abandoned paleo-point bars on the north (Figures 9.1-1 and 9.4.1-2). The channel depression apparently formed a wetland that began to infill with organic-rich accretionary deposits after 1180 BP. Standing water may have predominated during deposition of the lower part of this sequence, but, as attested to by the presence of paleosols, more seasonally wet back-swamp or marsh conditions probably characterized the upper part of the sequence. The infilling was mostly completed by about 770 BP-850 BP (Beta-200808), when vertical accretion of episodic flood deposits began to dominate deposition on the floodplain. Apparently, the floodplain stabilized and flooding became less intense for an interval after 770 BP to allow for the comparatively strong development of the upper paleosol sequence (Trench 2) (Figures 9.4.1-2 and 9.4.1-3). More intensive flooding, however, was reinitiated just prior to or soon after Euro-American settlement. The lack of plow disturbance in the upper part of the alluvial sequence or lower part of the late flood episode indicates that it must have occurred before the area was plowed and possibly even prior to Euro-American settlement of the Root River valley.

9.5 RESULTS OF ARCHAEOLOGICAL TESTING

9.5.1 Previous Investigations

As a tributary of the Mississippi River draining the Driftless Area of southeastern Minnesota, the Root River valley has a rich and extensive record of prehistoric and historic Native American and Euro-American archaeological resources. While numerous archaeological sites are recorded in the Minnesota State Archaeological Site Files for the Root River valley (MNDNR 1997:382), the actual extent, nature, and distribution of archaeological resources within the valley and the adjacent upland region are imperfectly known. Recent archaeological investigations in the region have been reported as part of the Minnesota SAS, as well as through Section 106 review projects. Through these studies, several archaeological sites have been located within 1.0 mi (1.6 km) of the Root River test locale (Figure 9.4.1-1). More detail of these sites and their importance to the geoarchaeological understanding of the Root River and broader Mississippi valley are given in Chapter 3.0. Of particular interest is the fact that four nearby sites include buried archaeological deposits (MNDNR 1997). The presence of such sites in proximity to the

Root River test locale suggests that the area is archaeologically sensitive for buried archaeological deposits.

9.5.2 Current Investigations

Based on the above review of archaeological data, the field team was aware of the high potential for buried archaeological materials to occur at the Root River test locale. While no archaeological materials were identified in the cores or trench walls, several target horizons/strata that had the potential to contain archaeological deposits were identified during both the coring and trenching surveys. Augering was performed at 13 loci that were deemed to have one or more target horizons (Figures 9.5.2-1a and 9.5.2-1b). In addition, test units were excavated adjacent to each of the five trenches. In Test Unit 1, Trench 1 Stratum II (ca. 35 cm-80 cm [14 in-32 in]) and Stratum V (160 cm-180 cm [63 in-71 in]) were sampled. In Test Unit 2, Trench 2 Stratum III (ca. 35 cm-65 cm [14 in-26 in]) and Stratum V (105 cm-125 cm [41 in-49 in]), the latter identified as a hydric soil, were sampled. Trench 3 Stratum IV (ca 65 cm-105 cm [26 in-41 in]) was sampled by Test Unit 3 and Trench 4 Stratum III (68 cm-80 cm [27 in-32 in]) was sampled by Test Unit 4. Finally, in Test Unit 5, Trench 5 Stratum III (ca 65 cm-80 cm [26 in-32 in]) was sampled (Figures 9.5.2-1a and 9.5.2-1b).

Four small pieces of animal bone were recovered including one each from Auger 4 at N80/E20 and Test Unit 4, and two from Test Unit 3. Given the lack of other artifacts and any other indications of human activity, the field team concluded that they were incidental inclusions.

9.5.3 Discussion of Archaeological Significance

Based on geomorphological data obtained from the coring and trenching, the sediments at Root River test locale are associated with an episode of channel migration and the potential occupation surfaces were inundated and /or poorly drained between about 1180 BP and 770 BP. Subsequently the floodplain stabilized and flooding became less intense, and the development of the upper paleosol sequence suggests that the test locale could have been a more desirable location for human occupation for a period of time. More intensive flooding, however, resumed prior to or soon after Euro-American settlement. Standing in contrast to this situation is that identified at the Belongie site, located only about 0.5 mi (0.8 km) downstream from the Root River test locale. Here a significantly deeper and older stratigraphic sequence of buried cultural deposits, extending back to the Early Woodland period and possibly into the Archaic period, was identified. The fine texture of the sediments at this site and the gradational nature of the soil horizon boundaries suggest that the occupation surface gradually accreted over some 3,000 or more years. Such a long-lived stable surface with only occasional periods of flooding may have been a more attractive location to the human populations who settled there.

9.6 SYNTHESIS AND INTEGRATION

As noted, the resistivity survey and, to a somewhat lesser extent, the GPR survey closely track the obvious geomorphology, including the high terrace remnants in the northern and southern part of the survey grid separated by a low southwest-northeast trending flood chute channel. In addition, the resistivity images closely resemble the LfSA model developed through the coring

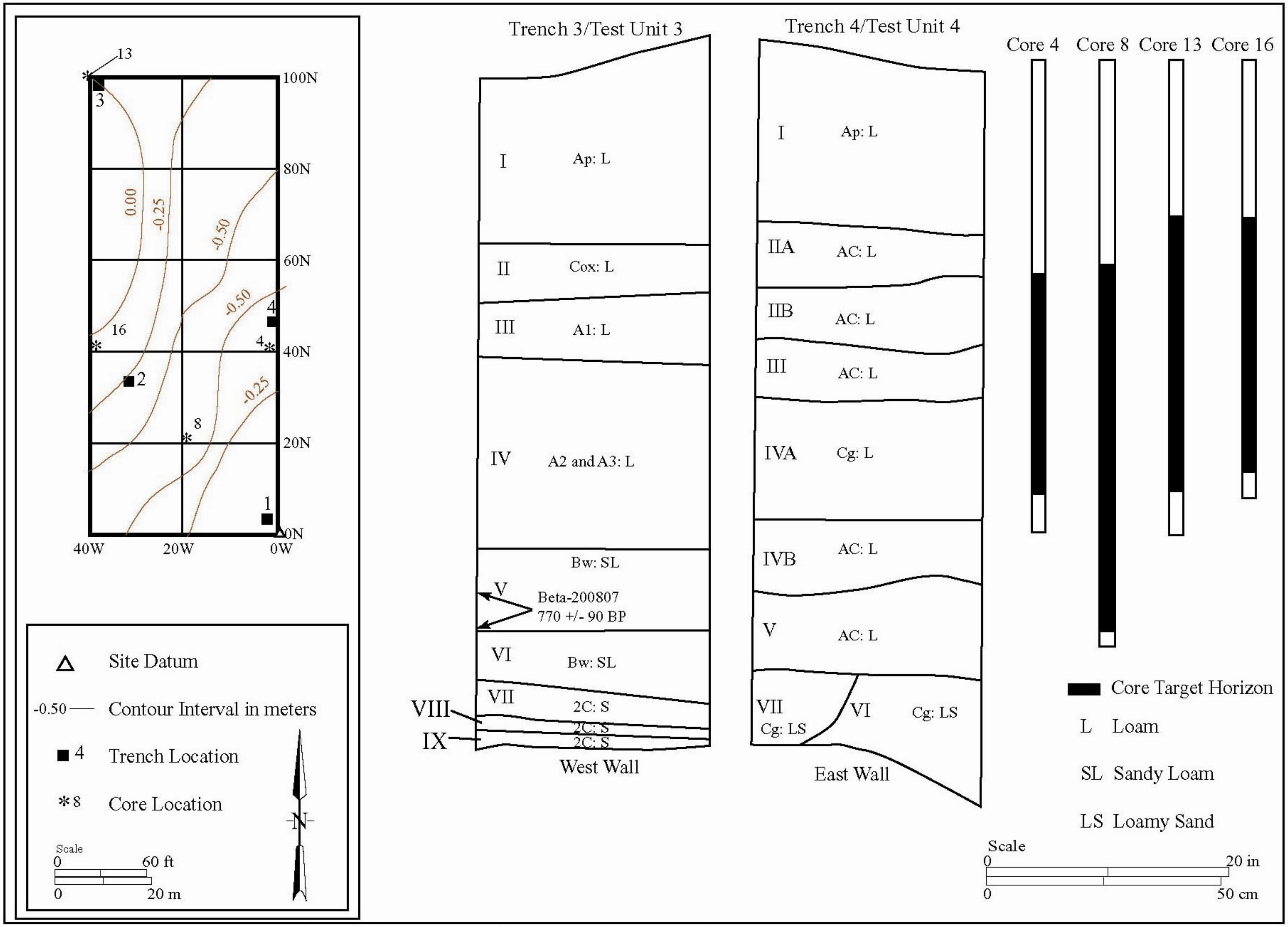


Figure 9.5.2-1a. Comparative Trench/Test Unit Profiles, Root River Test Locale

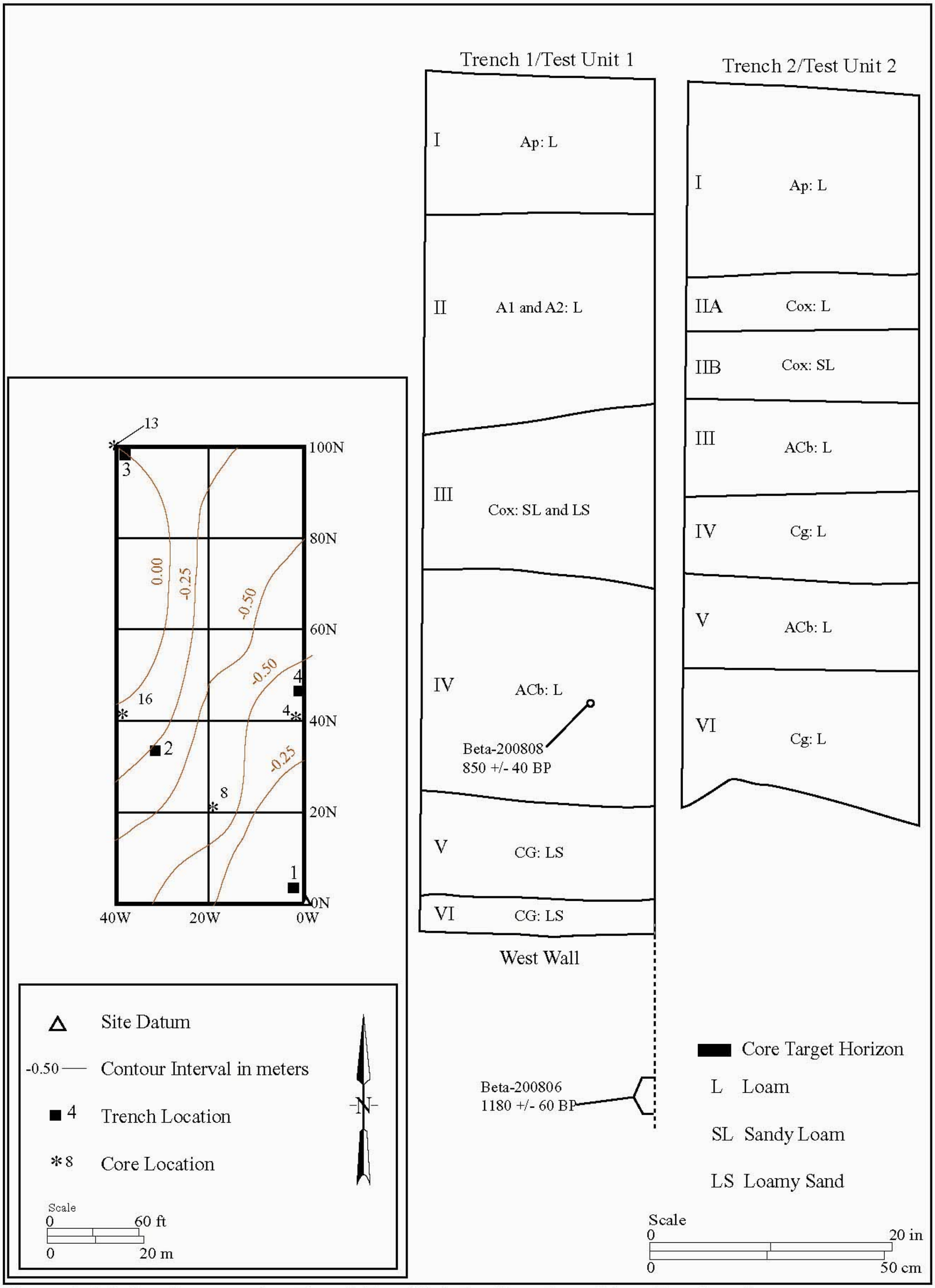


Figure 9.5.2-1b. Comparative Trench/Test Unit Profiles, Root River Test Locale

results. The magnetic survey captured none of the geomorphology as interpreted from the trenching and coring studies. The fairly shallow (~1 m [~3.3 ft]) sand stratum in the west may explain the resistivity high in that area, especially if groundwater was low. The stratum of silty clay loam 1 m to 3 m (3.3 ft to 9.8 ft) below surface present in Core 3 is probably the source of the low resistivity band running between the terrace remnants.

Compared to some of the other sites, the quality of the geophysical data in this survey is quite good. Survey conditions, such as the well disked surface at Root River, were not identical at all sites and may explain some of the variability in the resistivity and GPR results from site to site. That the geomorphology was so well modeled by the resistivity survey results suggests that similar fine-grained meander belt floodplains with well prepared surfaces are ideal candidates for multi-depth resistivity survey.

Of all the test locales, the deep test methods employed at Root River generally were more informative about the geological and sedimentological environments than about any possible presence of buried archaeological materials. As noted for the Clement test locale (Chapter 8.0), events responsible for accelerated channel migration and levee formation, or subsequent intervals of stability, are often episodic and reflect alterations in regional climate patterns. For example, we suggested that the Middle Woodland-associated levee formation at the Clement test locale may be related to increased flooding during a cooler, wetter interval just after 2000 BP (Monaghan and Lovis 2005).

Similarly, another interval of increased flooding and sediment accretion occurred post-800 BP and has been associated with the cooler, wetter Little Ice Age interval (Figure 2.1.2-2; Hayes and Monaghan 1998, 1999, 2000; Monaghan and Hayes 1998, 2001; Raber and Vento 1990). The channel migration, oxbow infilling, and floodplain accretion that occurred between 770 BP and 1180 BP at the Root River test locale may coincide with the beginning of the Little Ice Age and may be causally connected. It may reflect, on the other hand, a regular episode of channel migration characteristic of shallow bedrock-floored channel systems similar to that in this reach of the Root River. The post-770 BP sediment that caps the sequence, however, is probably related to pre-Euroamerican settlement reactivation of flooding during the later parts of the Little Ice Age. Alternatively, re-initiation of active sedimentation along the Root River may indicate deposition of post-settlement alluvium resulting from increased erosion corresponding to Euro-American land clearing for agriculture and lumber industries. Given the relatively late Euro-American settlement of the area (i.e., nineteenth and twentieth century), this explanation seems less likely.

While both the Root River and Clement test locales share commonalities from a sedimentological standpoint, they are archaeologically different. Buried archaeological materials were discovered at Clement but not at the Root River, which, of course, begs the question of why. The ephemeral nature of the Clement test locale archaeological deposits revealed the need to employ site discovery methods that are sensitive enough to detect low-density occupations. Root River, on the other hand, provides a concrete example of why maintaining a landform reconstruction approach to buried site discovery, even when archaeological resources are not discovered, is critical to a deep test protocol. It is not enough for deep testing to merely record the presence or absence of buried cultural materials. As part of a good faith effort and to justify our conclusions regarding the absence of a buried archaeological site, we also should evaluate why archaeological deposits are absent in the area tested and assess the probability that they may occur elsewhere in the study vicinity.

At the Root River locale, for example, a relatively well-developed and thick buried paleosol occurs within what at first blush appears to be a well-drained, vertical-accretion alluvial sequence (Figures 9.4.1-3 and 9.4.1-4). Based on usual geoarchaeological and pedological criteria, there are no *a priori* reasons to assume that an archaeological site could not be buried within this sequence. In fact, this type of landform is an ideal environmental and sedimentological context for depositional processes to bury and preserve archaeological deposits. The absence of archaeological deposits is troubling given that nearby sites include buried components (Figure 9.4.1-1). By placing the test locale within a landform developmental and chronological framework, however, not only does the reason for the lack of archaeological resources at the Root River test locale become clear, but we can also begin to isolate just where, spatially and stratigraphically, such deposits might be more likely to exist within the project vicinity.

The ^{14}C chronology at the Root River test locale indicates that the sediments are simply too young to likely include prehistoric deposits. Certainly, a surface of any age or duration may include archaeological remains, however, the more limited the time interval, the lower the probability that a buried surface will contain human occupation. During the Late Woodland period, the test locale shifted from being a river channel, to a small pond, and ultimately into a broad wetland, which actually may explain the specific location of sites with Late Woodland components adjacent to the test locale. Further, the trenching data indicate that prehistoric resources are unlikely to occur north of testing grid (i.e., between it and the river), but may occur south of the site. The closer to the valley margin one gets, the less likely the alluvium has been reworked and the more likely buried archaeological material may be preserved. This is certainly attested to by the presence of the Belongie (21HU0167), Skree I (21HU0168), and Skree II (21HU0170) sites southeast of the test locale (Figure 9.4.1-1).

Importantly, without the application of ^{14}C age dating to this stratigraphic sequence, such conclusions could not be drawn. The question of whether buried resources are present but were missed due to sampling error or other methodological reasons would remain unanswered, leaving management decisions regarding archaeological resources open to question. Moreover, data sets that explain both why archaeological sites are present at some locales and absent at others can be used to refine existing landscape suitability models, such as those developed for Mn/Model. From a management perspective, this ultimately will result in more effective planning, as well as more efficient deep testing.