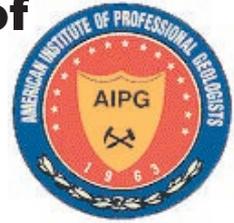


**42nd Annual Meeting of
the American Institute of
Professional Geologists
“Geologic Information: Racing
into the Digital Age”**



**Geology and the Civil War in
Central Kentucky: Camp Nelson**

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Hosted by
Kentucky Section of the American Institute of
Professional Geologists

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Geology and the Civil War in Central Kentucky: Camp Nelson

William M. Andrews Jr.

Abstract

This half-day trip will examine the links between geology and key Civil War events in the Bluegrass of central Kentucky. Our first stop will be a classic geological exposure of the Lexington Fault System and the Ordovician High Bridge Group, the oldest rocks exposed at the surface in Kentucky. The Kentucky River has eroded a narrow gorge, called the Palisades, through these rocks; our second stop will afford a good view of the Palisades and an opportunity to discuss geomorphology and the effects of the gorge on transportation history in the area. Our third stop will consider the karst geology of the region, and discuss the resulting impact on a major Civil War depot at Camp Nelson. Our fourth and final stop will look at the fortifications and defenses of Camp Nelson, and discuss the role Camp Nelson played as the largest Kentucky recruiting center and training camp for African-American soldiers during the Civil War. This trip will be held on the 142nd anniversary of the Battle of Perryville, the largest and most decisive Civil War battle in Kentucky. Although this trip will not directly visit the nearby Perryville battlefield, we will provide abundant logistical, historical, and geological information for those wishing to attend the Perryville reenactment on their own the next day (October 9).

Bibliographic Note

Contents of this field guide have been summarized from Andrews and others (2002b) and Andrews (2004).

Introduction

Geology is everywhere. Geology is often most clearly apparent in its influence on the culture, history, and economics of an area or region, and central Kentucky is a superb location in which to observe this kind of influence. Whether or not those involved were aware of it, Kentucky's development has hinged at every turn of events on its geological foundations, and commonly those events were focused at strategic places because of the geology. On this

field trip, we will examine the geology of Camp Nelson and its influence on the history and development of this unique location.

Camp Nelson

What made Camp Nelson strategic from the 1700's, when settlers first entered the area, until today is the fact that the area provides an important north-south transportation route across the barrier created by the Kentucky River gorge. In contrast to the relatively flat-lying to gently rolling terrain that characterizes the surrounding Inner Bluegrass Region, the valleys of the Kentucky River and its tributaries are steep-walled or entrenched, a situation that creates a natural obstacle to transportation and communication. In the Camp Nelson area, however, Hickman Creek, which follows the Lexington Fault System (former West Hickman Creek-Bryant Station Fault Zone), empties into the Kentucky River, generating a natural ford across the river. This ford became the site for a small community on the Nicholasville-Danville Pike following the Revolutionary War. During the 19th century, the ford was a crossroads for those carrying their goods overland along the north-south roads and those carrying their goods east-west along the river. In 1838, a 240-foot-long, covered, wooden wagon bridge, called Hickman Bridge (or the Wernwag Bridge), was built at the site. The bridge was built without metal and was considered an engineering triumph at the time, but has since been succeeded by two concrete and steel structures, both of which are still extant near the site.

The superposition of Hickman Creek on the Lexington Fault Zone provided the break in the river gorge and the natural ford that would become the north-south transportation corridor known as U.S. 27 today. Construction of the highway, moreover, has also provided access to the rocks of the High Bridge Group and Lexington Limestone and their interesting juxtaposition along the fault zone. Consequently, Camp Nelson is one of the best areas in which to observe the nature of the Lexington and nearby Kentucky River Fault Zones, and it has been the site of several geologic field trips (e.g., Nosow and McFarlan, 1960; Black and Haney, 1975; Kuhnenn and others, 1981; MacQuown and others, 1984; Kuhnenn and Haney, 1986; Ettensohn, 1992; Greb and others, 1997; Andrews, 2001; Andrews and others, 2002a, b). Because of the quality of exposures, accessibility, and the importance of the site in research and geologic education, the Kentucky Society of Professional Geologists has named the Camp Nelson area as Distinguished Geologic Site 2.

(Pound Gap was designated Distinguished Geologic Site 1 in 1998. Middlesboro and the Cumberland Gap area were designated Distinguished Geologic Site 3 in 2003.) The first part of this field trip will examine the bedrock geology, geomorphology, and human history of the Camp Nelson area, and consider the interrelationships between them.

Perryville

Geology also played a key role in the location and outcome of the Battle of Perryville, the bloodiest Civil War engagement in Kentucky. In October 1862, topography and a search for water supplies funneled Union and Confederate armies toward the small agricultural community of Perryville, nestled along the banks of the Chaplin River. The karst topography, aside from providing the strategic water supplies, also controlled the visibility and mobility of the troops, leading to concentrated areas of intense fighting and bloodshed. Many of Perryville's veterans – who also fought at Shiloh, Murfreesboro, and Chickamauga – remembered it as one of the hardest-fought battles of the war for the numbers engaged. We will discuss the geology of Perryville at the end of this trip, and provide information for those choosing to visit the Perryville battlefield on their own. We hope this overview will serve as a foundation for much-needed future work.

Physiographic Setting

Most of central Kentucky is within the Bluegrass Section of the Interior Low Plateaus Province (Fenneman, 1938). The Bluegrass Section is underlain by Ordovician limestone and shale, and is bordered on the east and south by the rugged Knobs Region (Fig. 1). Depending on the proportion of limestone versus shale, the Bluegrass landscape varies from a gently rolling upland plain to an intensely dissected plateau with steep hills and narrow ridges. The origin of the name comes from a grass (*Poa pratensis*) imported by the earliest European explorers, which sometimes appears bluish-green when lit by the sun.

The Bluegrass Section can be divided into three primary regions: Inner Bluegrass, Bluegrass Hills, and Outer Bluegrass. The Inner Bluegrass consists of gently rolling hills underlain by the Middle to Upper Ordovician Lexington Limestone (Fenneman, 1938; McFarlan, 1943). Karst development is locally extensive, especially in areas with minimal shale in the underlying bedrock. The gently

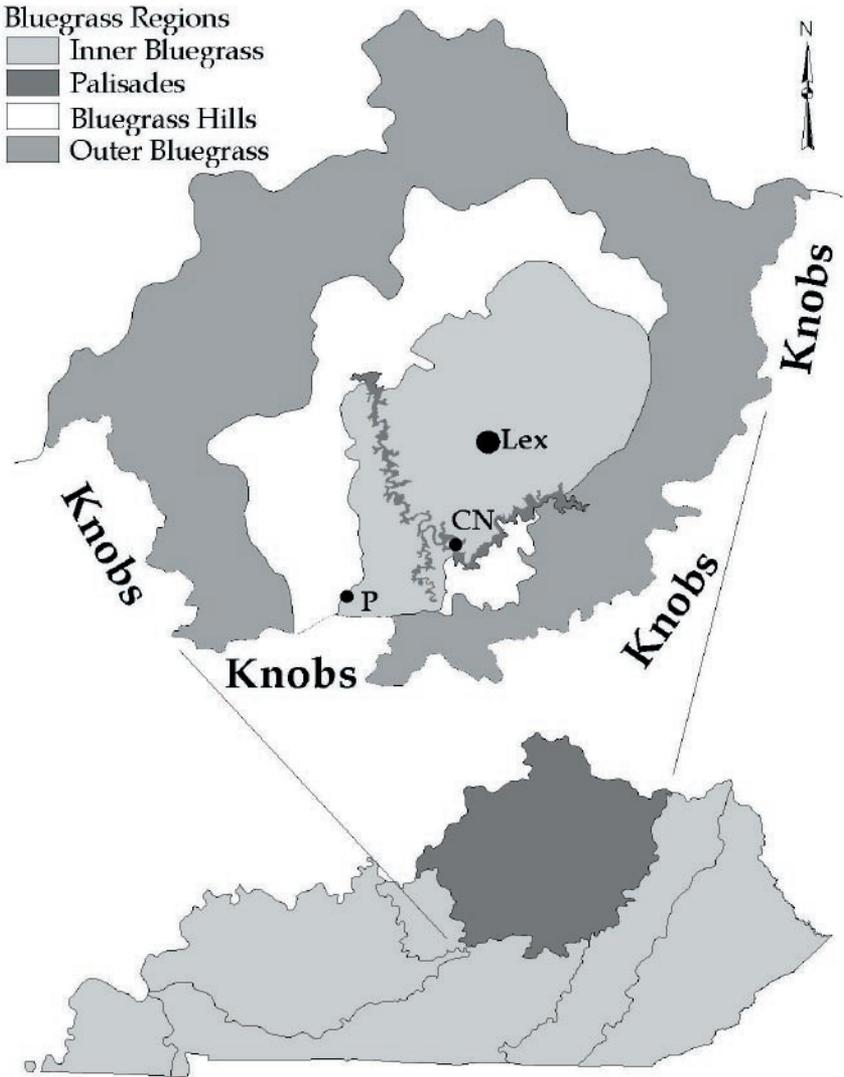


Figure 1. Subdivisions of the Bluegrass Section in Kentucky. CN= Camp Nelson, P= Perryville Battlefield.

rolling landscape of the Inner Bluegrass drew the attention of early explorers and settlers because of its legendary beauty and fertile soil. This region is home to several of Kentucky's more famous industries: burley tobacco production, bourbon whiskey distilleries, and thoroughbred horse farms. The horse farms of Kentucky's famous thoroughbred industry are almost exclusively found on the

gentle hills around Lexington, and the state's renowned bourbon whiskey industry had its beginnings using karst springs in the Inner Bluegrass. The Kentucky River has carved a steep gorge known as the Palisades across the Inner Bluegrass. Massive limestone and dolostone beds of the Middle Ordovician High Bridge Group are exposed in the cliffs of the Palisades (Fig. 2). The Kentucky River Palisades stood as a barrier to north-south communication and transportation for early settlers, while the river itself provided a seasonal trade route for moving timber, coal, and other products from otherwise isolated eastern Kentucky communities to downstream commercial markets.

Between the Inner and Outer Bluegrass is the Bluegrass Hills Region, formerly known as the Eden Shale Belt. The area is underlain dominantly by shale and limestone of the Clays Ferry and Kope Formations (Upper Ordovician). Some valley bottoms on the inner margins are eroded into the Lexington Limestone (Middle to Upper Ordovician). The topography is relatively steep in comparison with the gently rolling hills of the Inner and Outer Bluegrass. The Outer



Figure 2. The Kentucky River Palisades near Camp Nelson (near stop 2 of this trip), showing the massive limestone and dolostone cliffs of the river valley walls.

Bluegrass consists of gently rolling to moderately steep hills underlain by Upper Ordovician to Middle Devonian shale, limestone, and dolostone, contrasting sharply with the taller, steeper hills of the adjacent Knobs Region. Karst development is locally significant in the Outer Bluegrass, but much less than in the Inner Bluegrass; it is inhibited here by the significant quantities of shale in the Upper Ordovician bedrock. The Knobs Region forms a horseshoe-shaped belt beyond the outer edge of the Bluegrass Section. The Knobs are erosional remnants and outliers of the Mississippian plateaus of the Highland Rim Section, and are typically conical hills or narrow ridges of Devonian black shale and Lower Mississippian shale and siltstone, which in some places are capped by resistant Middle and Upper Mississippian limestones.

Camp Nelson lies along the margin of the Palisades in the Inner Bluegrass Region. The steep cliffs along the Kentucky River gorge protected three sides of the Civil War encampment and depot there. The Lexington Fault System separates the Inner Bluegrass Region on the north and west from Bluegrass Hills topography to the southeast. The Perryville Battlefield is on the southwestern transition of the Inner Bluegrass Region with the Bluegrass Hills.

Kentucky River Geomorphology (summarized from Andrews, 2004)

The Kentucky River Basin lies completely within the state of Kentucky (Fig. 3). The main stem of the Kentucky River stretches approximately 255 miles from the confluence of the Three Forks (North, Middle, and South) of the Kentucky River near Beattyville to the mouth of the main stream at the Ohio River near Carrollton. From Beattyville, the stream flows generally northwest out of the Eastern Kentucky Coal Field through the Knobs Region into the Bluegrass Section of central Kentucky. In the vicinity of Boonesborough, the stream makes an abrupt turn to the southwest, flowing as far as the Camp Nelson area before again turning abruptly to the north-northwest. The river follows this general course until returning to a northwest trend just upstream from Lock and Dam 2. The Kentucky River and its tributaries drain a total area of 6,966 square miles (Bower and Jackson, 1981). The basin receives an average of 46 inches of precipitation each year, approximately 18 of which, on average, contributes to surface water (Kentucky River Authority, 1997).

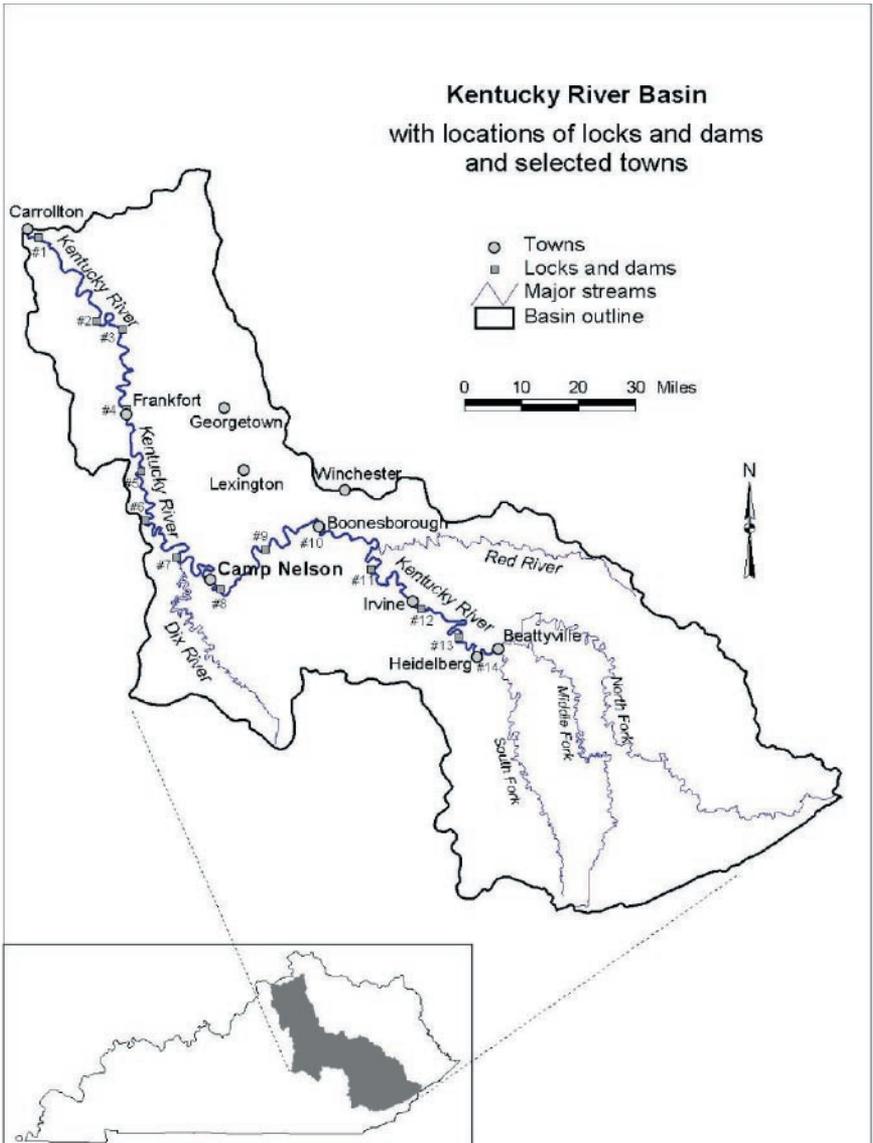


Figure 3. The location of the 14 locks and dams in the Kentucky River Basin, and key geographic sites mentioned in the text.

The Kentucky River has incised more than 300 feet into the Bluegrass plateau across which it flows. Geologic mapping by earlier workers had identified at least three levels of the river near its present course. The modern floodplain has been modified by recent human engineering of river pools. Low-level gravel deposits and

terraces preserve a relatively young stage of the river deep within its current valley. High-level deposits record an early (sub-upland) stage of the river before incision into the plateau, known as the Old Kentucky River. Radiometric dating of sediments at the Kentucky River headwaters and in the Green River Valley suggest an age of approximately 1.5 million years for this stage of the river. Based on sedimentological evidence, some previous workers had hypothesized that ancient river courses (pre-Old Kentucky River, supra-upland) across the Bluegrass plateau connected the upper parts of the Kentucky River Valley with the South Fork of the Licking River or North Elkhorn Creek. Subsequent work show these hypotheses to be untestable (Andrews, 2004).

Bedrock and Structural Setting

The bedrock geology of the Kentucky River Basin is highly variable along the course of the river (Noger, 1988). At Beattyville, the river flows on Pennsylvanian shale and sandstone of the lower Breathitt Group. The thick Lower Pennsylvanian quartz sandstones that are prominent elsewhere along the western margin of the Eastern Kentucky Coal Field are not significantly exposed along the main stem of the Kentucky River. Near Heidelberg, the river cuts down onto Mississippian limestones, and then into thick Lower Mississippian shale and siltstone of the Borden Formation. Near Irvine, the river has progressively downcut through Upper Devonian black shale and Middle Devonian dolostone into Silurian shale and dolostone and Upper Ordovician shale and limestone. Near Boonesborough, the river crosses the Kentucky River Fault Zone and makes a sharp turn to the southwest. From here, the river meanders back and forth across the fault zone as far as Camp Nelson, flowing across the Middle Ordovician High Bridge Group north of the faults, and on the Lexington Limestone south of the faults. Once the river turns northwest again, it flows on the High Bridge Group as far as Frankfort, then flows on the Lexington Limestone to the vicinity of Lock and Dam 2. From there to the mouth of the river, the bedrock valley is cut into shale and limestone of the Kope Formation.

Tertiary and Quaternary Deposits and Features

Previously published geologic maps, most recently those of the cooperative U.S. Geological Survey–Kentucky Geological Survey geologic mapping program, have illustrated the distribution

of geologic deposits associated with the Kentucky River system. Recent field studies (Andrews, 2004) have confirmed the previous work and added new locations. The deposits of the Kentucky River can be subdivided into lowland, sub-upland, and supra-upland settings (Fig. 4).

Lowland

The Kentucky River has incised as much as 120 meters into the adjacent plateau. The floodplain of the river is well delineated on most geologic quadrangle maps that include the Kentucky River. The bedrock valley of the Kentucky River is buried by up to 80 feet of fluvial and lacustrine deposits near the river's mouth. The lacustrine deposits have been related to impoundment of the Kentucky River Valley by the passage of a large outwash valley train down the Ohio River Valley during Wisconsin time. Along the course of the river, several low-level fluvial terraces and abandoned meanders have been noted on geologic quadrangle maps. Other than incidental investigation in a series of master's theses by Eastern Kentucky University graduate students investigating the neotectonic history of the river in Madison and Clark Counties (VanArsdale, 1986) and local geotechnical investigations associated with major engineering projects, the lowland deposits have not been intensively studied in a comprehensive way.

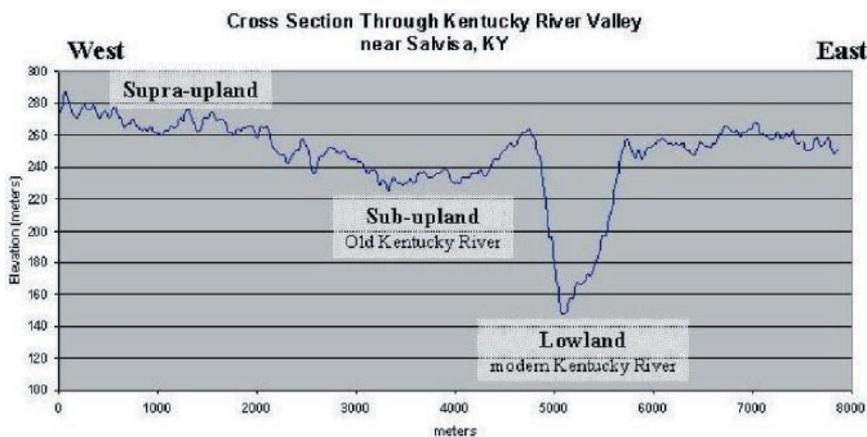


Figure 4. Topographic profile across the Kentucky River Valley near Salvisa, showing the geomorphic setting of ancient river courses.

Sub-upland

The sub-upland stage of the Kentucky River has attracted the attention of numerous researchers. Broadly meandering paleovalleys incised up to 30 meters into the upland and containing scattered deposits of sand and gravel delineate ancient courses of the Old Kentucky River. Two separate and distinct sub-upland levels of the river have been mapped in the Camp Nelson area (see description of stop 3). These distinct paleovalleys do not seem to correlate to particular straths of the river, but appear to be local cut-off paleomeanders (Andrews, 2004). Miller (1895) first recognized and described the presence of fluvial deposits well above the modern level of the Kentucky River. Campbell (1898) assigned the sand and gravel deposits in this geomorphic setting east of Richmond, Kentucky, to the Irvine Formation. Jillson (1943–1948) produced a series of publications on the abandoned sub-upland paleovalleys and their fluvial deposits. Subsequent workers have interpreted the Old Kentucky River as a major north-flowing tributary to the ancient pre-glacial Teays River System, which flowed across what is now West Virginia, Ohio, Indiana, and Illinois (Fig. 5). This system and related deposits have been considered by numerous workers (Tight, 1903; Leverett, 1929; McFarlan, 1943; Wayne, 1952; Durrell, 1961; Ray, 1974; Ettensohn, 1974; Swadley, 1971; Teller, 1973; Teller and Goldthwait, 1991; Andrews, 2004). This stage of the river's development has been related to geologic development of the Old Licking River (Luft, 1986), which has also been inferred to be a tributary of the Teays System (Teller and Goldthwait, 1991).

Close association between upland pre-Illinoian glacial deposits and Old Kentucky River deposits have led several workers to suggest that the north-flowing Old Kentucky River between Carrollton and the Cincinnati area was rerouted down the present course of the Ohio River as a result of glacial damming (Swadley, 1971; Andrews, 2004). Teller and Goldthwait (1991) noted the lack of extensive lacustrine deposits in the sub-upland Old Kentucky River valleys, contrasting with the well-developed Claryville Clay sub-upland lacustrine deposits in the Old Licking River system (Ettensohn, 1974; Luft, 1980, 1986). Teller and Goldthwait (1991) suggested that the Kentucky River may have been captured by the southwest-flowing Ohio River prior to the arrival of a pre-Illinoian glacier in the area.

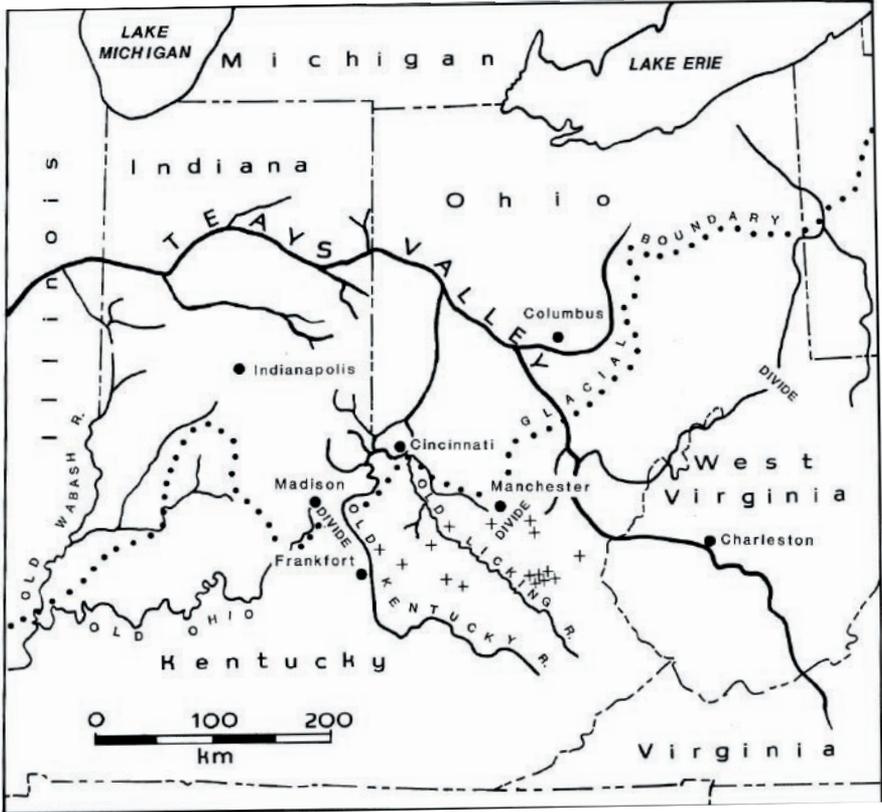


Figure 5. Generalized diagram of the Pliocene Teays River System, showing the Old Kentucky River and other major tributaries.

Supra-upland

In some areas of central Kentucky, deposits of apparently fluvial origin have been mapped on the Bluegrass plateau with no obvious corresponding paleovalley. Jillson (1963) mapped a series of sand and gravel deposits that were not locally derived across Clark, Fayette, and Scott Counties. These deposits may represent a pre-Old Kentucky River stream system across the study area, but Andrews (2004) found the hypothesis to be untestable. Jillson (1963) provided the only systematic examination and consideration of these deposits. He inferred development of the Old Kentucky River system from the supra-upland precursor resulting from structural movement along faults near Boonesborough.

Geochronology

Very few attempts have been made to date relatively young geologic features in Kentucky. Granger and Smith (1998, 2000, and personal communication) examined cosmogenic isotopes in sub-upland fluvial deposits of the Irvine Formation in Estill County and sub-upland sand and gravel in Carroll County. By modeling production rates of Be^{10} in quartz-rich sand, they produced a model age of 1.5 to 1.75 million years for the Estill County deposit. They used Al^{26} and Be^{10} to determine a burial age of quartz pebbles and sand in Carroll County of 1.2 to 1.45 million years. These studies suggest an approximate age of 1.2 to 1.75 million years for the sub-upland Old Kentucky River. Subsequent incision of the Kentucky River to form the Palisades would therefore be entirely Pleistocene in age.

Formation of the Palisades

Between 1.5 and 1.0 million years ago, an early pre-Illinoian glaciation invaded the Teays valley, impounding tributary rivers, including the Old Kentucky River. Lakes formed in the tributary valleys and soon spilled into adjacent valleys across low cols in the basin divides. These spillways and adjacent tributaries coalesced to form the young Ohio River. The newly organized Ohio River provided a much shorter route to regional base level, and rapid incision began in the former tributaries of the Teays River, including the Kentucky River. As the river incised, the shape of the resulting valley was controlled by the bedrock geology into which the river was eroding. Softer, more shale-rich lithologies produced a wide, symmetrical valley, while the massive thick-bedded limestone near Camp Nelson resulted in the steep narrow gorge of the Kentucky River Palisades (Andrews, 2004).

Human Impacts

Human beings have occupied the Kentucky River Valley for at least 12,000 years. The interaction of humans with the landscape has affected the lowland river channel, although the most dramatic changes are related to major land-use changes and engineering efforts initiated after European colonists settled the area in the late 18th century.

Use of the river as a major commercial transportation artery in the early 19th century led to efforts to create a slack-water navigation system along the stream. In 1838, construction began on a

series of locks and dams on the lower Kentucky River. By the early 20th century, 14 locks and dams had been installed, impounding the entire length of the main stem of the Kentucky River (Fig. 6). Widespread logging and forest-clearing throughout the area in the 19th and early 20th centuries led to extensive erosion within the watershed, and significant siltation of the river channel. Surface mining in eastern Kentucky during the last half of the 20th century has also contributed to the sedimentation problem. Other flood-control and erosion-control projects, such as floodwalls and stream-bank armoring, have locally affected the dynamics of the stream channel. Verhoeff (1911, 1917) examined the history of the river as it related to commerce and economics in eastern Kentucky, and Johnson and Parrish (1999) provided a detailed history of engineering efforts along the Kentucky River.

Historic Background

Early Settlement, Industries, and Transportation (abridged from Harrison and Klotter, 1997)

Kentucky's human inhabitation began at least 10,500 years ago, as Paleo-Indian tribes migrated into the area following the retreat

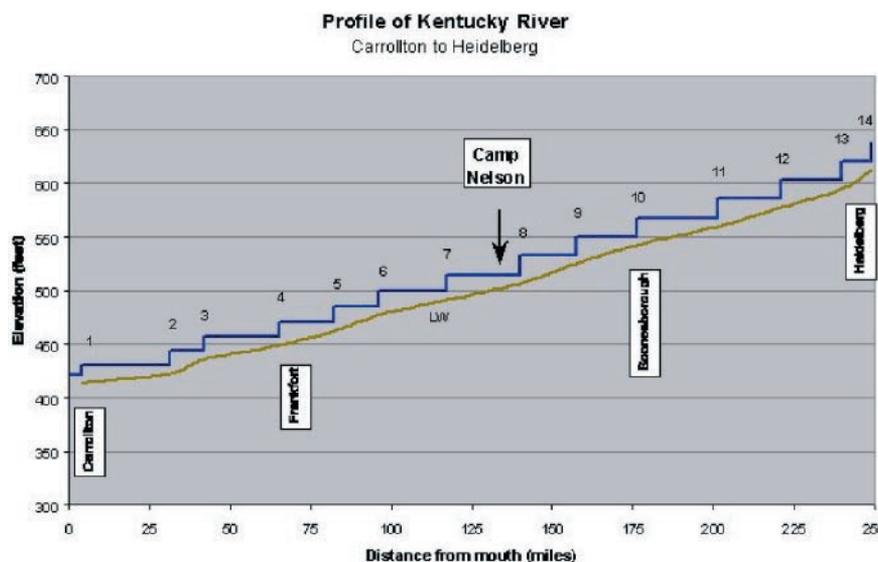


Figure 6. Longitudinal profile of the Kentucky River from its mouth at Carrollton to Dam 14 at Heidelberg. LW=pre-engineering low-water profile.

of Ice Age glaciers. Native peoples lived in Kentucky until as late as 1750, when disease, intertribal conflicts, and growing pressures from European settlers and explorers led to the abandonment of the last native villages within the area of modern Kentucky.

Spanish and French explorers and traders travelling along the Mississippi and Ohio Rivers during the late 17th century were probably the first Europeans to view the western parts of Virginia, which was later to become Kentucky. The first documented travels through the interior of the state were in 1673, when a young English colonist, Gabriel Arthur, accompanied a native war party across the state. Intensive exploration of the state began in the 1750's with Dr. Thomas Walker's and Christopher Gist's expeditions through the state, at the request of speculative land companies. Walker and Gist reported abundant coal deposits in eastern Kentucky, as well as salt springs, salt licks, and fertile savannas and cane breaks in the central Bluegrass. Long hunters were trekking through the area during this time, and the tales they took back east with them encouraged the first settlers to take a chance in this transmontane wilderness. The first permanent settlements were established in 1775, but the outbreak of the American Revolution (1776-1783) slowed the early flow of settlers. During the Revolution, British agents supported and encouraged attacks against the Kentucky settlements by the Shawnee and other tribes. As the war came to a close, many who had suffered through the partisan strife in the east moved west to find a quieter life, and the flow of settlers into Kentucky dramatically increased.

The rapidly increasing population, the great distance across the mountains from the state capital in Richmond, and continued problems with hostile natives led to an effort to gain independence from Virginia. Some Kentuckians favored a complete split from the fledgling United States, seeking instead an alliance with France or Spain to secure a trade route down the Mississippi River. After 10 constitutional conventions held in Danville, however, Kentucky was admitted to the Union as the 15th state in 1792. Kentucky had grown from an uninhabited native hunting ground to a thriving Commonwealth in 17 short years.

Through the early 19th century, Kentucky rose to prominence as an agricultural, commercial, political, and educational center for the expanding American West, in large part because of the state's rich soils and convenient location along major rivers. The rivers were key transportation corridors for early Kentucky commerce.

Coal and timber were shipped down the Kentucky River from Beattyville as early as 1790. In the early 19th century, Kentucky's livestock, crops, and bourbon whiskey were sold primarily down the Mississippi River through New Orleans, and rapidly gained a reputation for high quality. River transportation was unreliable, however, being dependent on adequate flow of the rivers across the numerous shallows and riffles. Early Kentuckians began to exploit the Commonwealth's varied mineral reserves; coal, iron, salt, saltpeter from cave deposits, and timber were key exports. The limiting factor in the industrial development of the Commonwealth was that many of the resources lay in remote areas not yet served by reliable transportation routes.

Kentucky also played a major role in the political life of the young nation during this time: Henry Clay and others served in key roles in Washington, D.C. The earliest schools west of the Appalachian Mountains were established here, and several, including Transylvania University, Berea College, and Centre College, continue to carry a very high reputation for their quality of education.

Civil War

Sectional tensions rose by the mid-19th century, and Kentucky found herself a border state between the seceded southern slave states and the Unionist northern free states. The leaders of the two sides of the Civil War, Abraham Lincoln and Jefferson Davis, were both born in Kentucky, and Kentuckians brokered many compromises that delayed the onset of war. Kentucky occupied a precarious position, with strong industrial and manufacturing ties to the North, but equally strong agricultural and trade ties with the South. Kentucky chose a stance of neutrality through the early months of the conflict, but eventually sided predominantly with the Union. Over 100,000 Kentuckians served in the Union armies, and over 35,000 Confederate soldiers called Kentucky home.

Richard Robinson, a staunch Garrard County Unionist, offered his farm for use as a Federal training camp and recruiting center, and Camp Dick Robinson was established in August 1861. Several Federal regiments from central and eastern Kentucky, as well as eastern Tennessee, were organized there. Confederates viewed the camp as a hostile violation of Kentucky's declared neutrality, which led to the Confederate occupation of far-western Kentucky in September 1861, and the subsequent establishment of a Confederate defensive line through southern Kentucky. Through late 1861

and early 1862, several small skirmishes and battles were fought across Kentucky as Federal forces sought to unhinge the tenuous Confederate line. The Federal army used Camp Dick Robinson as a supply depot for the Camp Wildcat (October 1861), Mill Springs (January 1862), and Cumberland Gap (May–June 1862) campaigns (Hughes, 1992), which ultimately pushed the war into central and western Tennessee.

The late summer of 1862 brought a large-scale Confederate invasion of Kentucky, which was part of a larger effort to move the war into northern territory and out of the South, to enable southern farmers time to gather their harvests for the war effort. The battles of Antietam (Maryland), Corinth (Mississippi), and Perryville (Kentucky) ended this offensive. The Battle of Perryville was the largest Civil War battle fought on Kentucky soil, and effectively ended Confederate hopes of occupying the state. On October 8, 1862, approximately 16,000 Confederate soldiers attacked parts of a 60,000-man Union army on the outer margin of the Inner Bluegrass near Perryville, driving parts of the Union army back nearly a mile. Troops on both sides suffered tremendously from thirst before and during the battle because of a severe drought in the region. Confederate troops initially camped at Perryville to secure a water supply from the springs in the area, and attempted to refuse the Union troops access to the precious pools. The fighting here was some of the fiercest of the Civil War for the numbers engaged: over 7,600 men were killed, wounded, or captured in a half-day battle. At day's end, however, the Confederates realized they were greatly outnumbered and retreated from the field, and ultimately from the state (Noe, 2001).

Because of the poor defensibility of the camp on the gentle Inner Bluegrass hills, Confederate forces easily captured the supplies at Camp Dick Robinson during the Perryville campaign. Upon regaining control of central Kentucky after the Battle of Perryville, Union forces moved the depot a few miles to a more defensible location on the north side of the Kentucky River. The new depot, named Camp Nelson, occupied a naturally fortified position atop the Palisades of the Kentucky River between deeply entrenched tributaries. Steep limestone cliffs prevented attack of the depot from three sides; only a narrow neck of land on the north side of the facility required fortification against overland approach. The warehouses for the depot were constructed in a blind karst valley nestled within the central part of the facility, which hid the warehouses from outside viewers

and potential artillery attacks. Despite numerous forays into the state by General John Hunt Morgan and his Confederate raiders, the depot was never attacked, in large part because of the natural strength of the position (Sears, 1992, 2002).

From early 1863 until the close of the war, Camp Nelson served as a major supply depot for the Union war effort in central Kentucky. Aside from several Caucasian Kentucky and Tennessee units, over 20,000 former slaves and free blacks were recruited and trained as United States Colored Troops here. Camp Nelson was the third largest USCT training facility in the country. Many of the USCT recruits brought their families with them to the camp to protect them from Confederate or racist reprisals (Fig. 7). At one point, many of these nonmilitary refugees were driven out of the camp by the military authorities. After many of them died of exposure, disease, and starvation, the survivors were allowed to return. The refugee community that was subsequently established remains today as the



Figure 7. Students and teachers at the African American school founded at Camp Nelson for the families of U.S. Colored Troop recruits.

community of Hall. In 1867, many Union dead buried throughout central Kentucky were moved to Camp Nelson when Camp Nelson National Cemetery was established (Sears, 1992, 2002).

The remainder of the war in Kentucky consisted mostly of cavalry raids and guerrilla attacks. Harsh treatment of slave-holding Kentuckians by occupying northern armies led to a gradual erosion of Unionist support from the state, until the end of the war, when sympathies for the defeated Confederates became more prevalent. Many famous feuds, especially in eastern Kentucky, had their roots in animosities developed during the Civil War.

Postwar Years

Following the Civil War, Kentucky did not regain her prominent position as a national economic and political leader. The unsettled years of conflict and discord had discouraged additional development of industry in the state, and the geographic isolation of the state became more acute as railroads took precedence over steamboats as the primary mode of transportation. Completion of railroads in the late 19th and early 20th century finally allowed extensive development of Kentucky's eastern coal field, and construction of the Federal Interstate Highway system in the mid-20th century facilitated industrial development across much of the state by providing inexpensive and reliable transportation corridors. Many of Kentucky's communities are now experiencing an unprecedented period of growth, expansion, and development as a result.

Field Trip Overview

The field trip will depart downtown Lexington, and will visit four stops near U.S. 27 in the vicinity of Camp Nelson, Ky. (Fig. 8).

Stop 1: Lexington Fault System and High Bridge Group

This roadcut is a classic exposure in central Kentucky. Many undergraduate classes use this as a natural laboratory for sedimentology, stratigraphy, and structural geology. The large boxcut exposes a bounding fault of the Lexington Fault System, offsetting the thin-bedded, fossiliferous Lexington Limestone on the southeast from the thick-bedded, micritic, and burrowed Camp Nelson Limestone on the northwest. The structural movement is multi-phase and complex, with elements of normal and strike-slip (left-lateral?) displacement. A large kink fold dominates the roadcut (Fig. 9), and has resulted from geometric irregularities along the fault system.

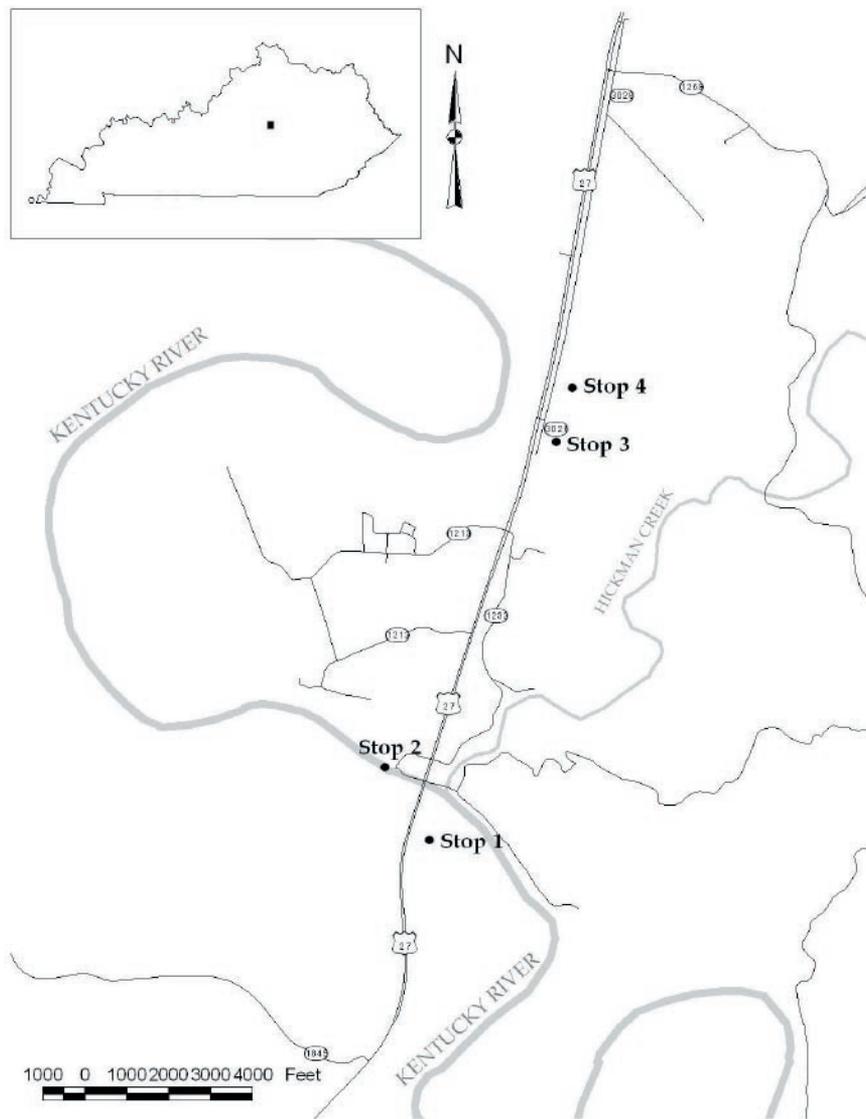


Figure 8. Locations of field trip stops in the Camp Nelson area.

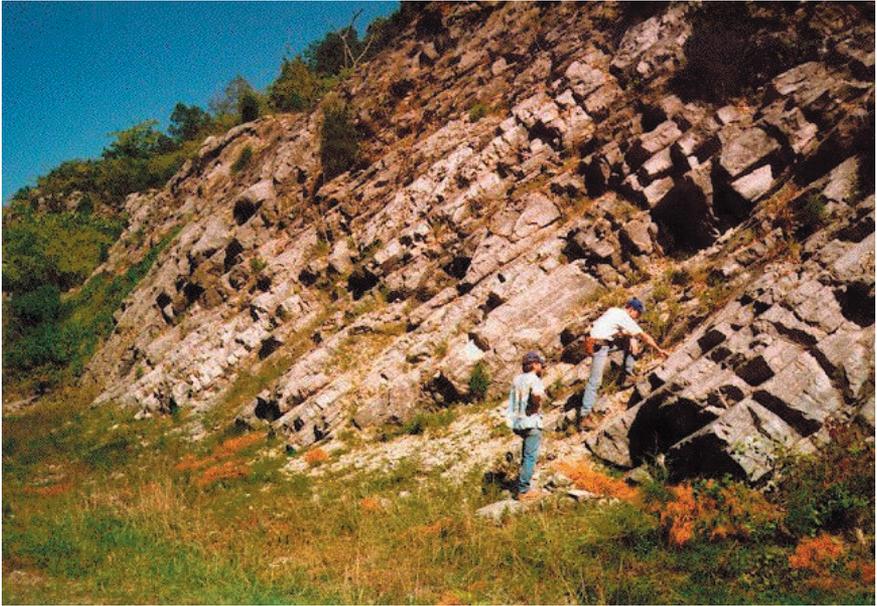


Figure 9. Large kink fold exposed at stop 1.

Veins of calcite, sphalerite, and other Pb-Zn minerals are found near the fault.

Stop 2: View of Kentucky River Palisades and Discussion of Transportation History

The geomorphology of the Kentucky River Palisades and four generations of river crossings are visible from stop 2. The steep cliffs bounding the narrow gorge are composed predominantly of the Camp Nelson Limestone of the High Bridge Group. A short distance upstream, a ford and ferry at the mouth of Hickman Creek offered the earliest assisted crossing of the Kentucky River here. In 1838, a single-span wooden structure, called the Wernwag Bridge (Fig. 10), was constructed to allow road traffic over the river without disrupting down-river shipments of supplies; the stone abutments of this bridge are still visible. The iron bridge we will visit during this stop was built when the Wernwag bridge deteriorated in the early 20th century. It was abandoned in the 1990's when the modern highway bridge was completed.

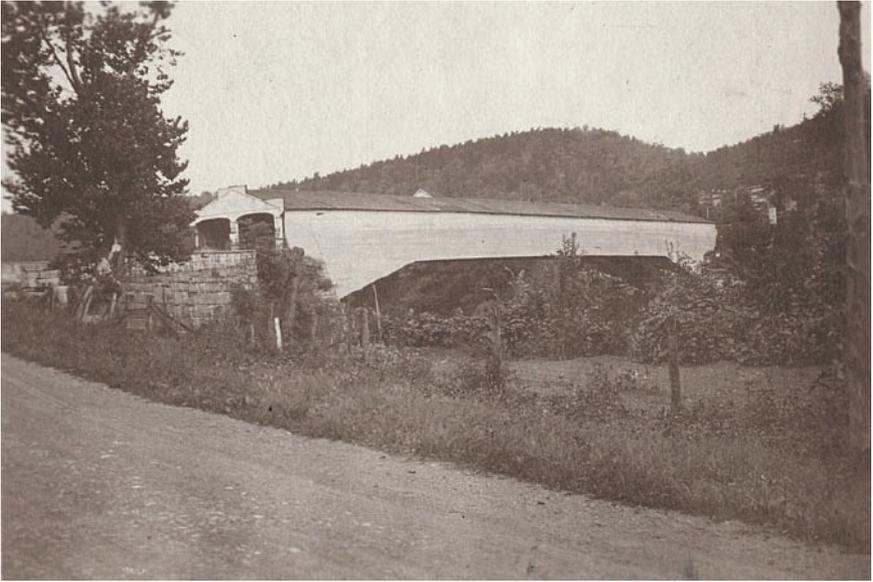


Figure 10. Wernwag Bridge across the Kentucky River at Camp Nelson (1838–1933).

Stop 3: Karst Geology and Impact on Camp Nelson

The valley to the east of stop 3 is a large coalesced sinkhole. The limestone bedrock underlying this landscape is highly soluble, and a series of springs and sinkholes are found throughout the area. Streams from high-level springs, perched above a thin volcanic clay layer in the bedrock, flow down into the bottom of this valley and sink in a master swallet near the large pond in the center of the valley. During the Civil War, the Union Army built an extensive supply depot in this valley, using the topography to hide the warehouses and shops from enemy fire.

Stop 4: Fortifications and Defenses of Camp Nelson

The steep Palisades cliffs along a loop of the Kentucky River and Hickman Creek provided formidable protection to the Union Army camp on three sides. Only the north end of the river-bounded peninsula required extensive fortification to protect the supplies and recruitment center at Camp Nelson. These fortifications stretched across roughly a mile of rolling country, protecting the north side of the camp from enemy attack. At stop 4, we'll be able to view the fortifications and some of the landmarks of the original Civil War camp. Handouts and other information will be made

available for those planning to attend the Perryville reenactment on the following day.

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