Research Design and Methodology for A Phase I Cultural Resources Survey of the Missouri Segment of the Proposed Keystone Pipeline Project Corridor, Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, Audrain, Montgomery, Lincoln, and St. Charles Counties, Missouri

Prepared for
ENSR International
Fort Collins, Colorado

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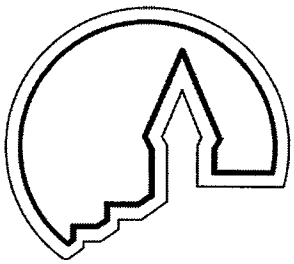

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Introduction

This document is a response by American Resources Group, Ltd., Carbondale, Illinois, to a request by ENSR International, Fort Collins, Colorado, for a research design for conducting a Phase I cultural resources survey of the Missouri Segment of the Keystone Pipeline Project corridor. The proposed pipeline-construction corridor passes through 10 counties in its nearly 273-mile (439-km) transect of northern Missouri (Figure 1). The results of previous surveys across the glaciated uplands of northern Missouri indicate that prehistoric site density is low in this part of the state and that the prehistoric sites that do occur are concentrated in the valleys and adjacent uplands of the larger drainages. In view of this pattern, it appears that the most effective strategy for identifying sites during the proposed survey of the pipeline corridor will be to focus survey efforts on those portions of the pipeline corridor most likely to contain prehistoric sites, supplementing these efforts with limited upland survey targeting previously recorded sites and potential historic sites.

The sampling strategy proposed in this research design constitutes a probabilistic survey of an essentially random transect of the glaciated uplands of northern Missouri. After characterizing the environmental setting of the project corridor, the site-distribution pattern documented by previous research in the region is summarized, the results of the records check and literature review are presented, and the areas within the project corridor selected for archaeological survey and geomorphological investigation are identified. The areas within the project corridor selected for field investigation are tabulated by mile-post number and displayed in the accompanying USGS topographic maps. The survey methodology that will be employed is described in the concluding section of the document.

Project Description

The Keystone Pipeline Project is a proposed 1,870-mile-long crude oil pipeline extending from Hardisty, Alberta, to Patoka, Illinois (Figure 1). The Missouri Segment of the Keystone Pipeline Project passes through the northern Missouri counties of Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, Audrain, Montgomery, Lincoln, and St. Charles (Figure 1). The Keystone Pipeline Project corridor enters the state of Missouri at Mile Post 743.4 and ends at Mile Post 1016.55, a distance of 273.15 miles (439.6 km). Virtually the entire length of the 273-mile-long, 200-foot-wide Keystone corridor in Missouri parallels existing pipeline and utility corridors, thus minimizing the amount of new land that will be affected by the pipeline construction.

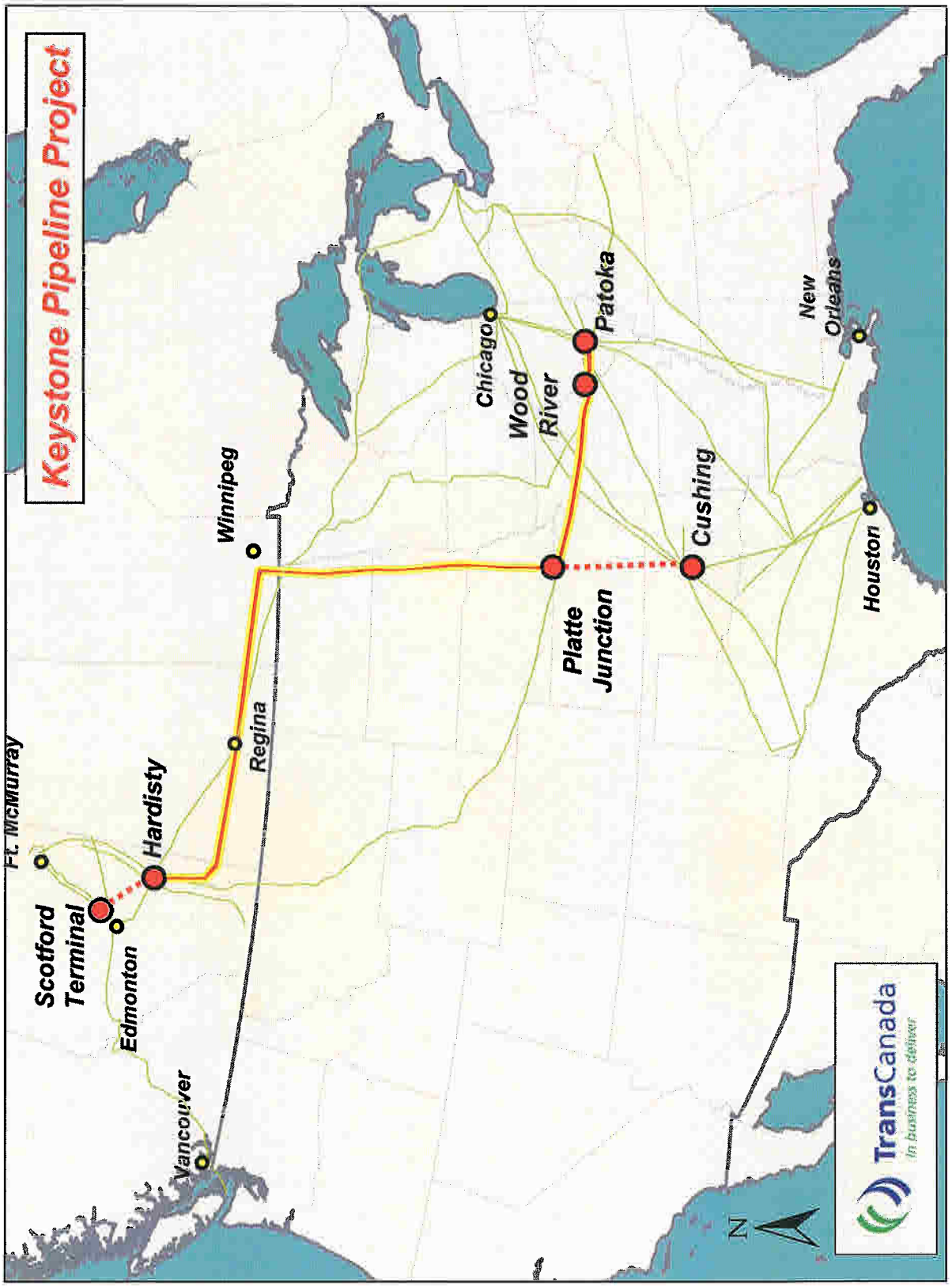

Figure 1. General location of the Keystone Pipeline Project.

The Keystone Pipeline will transport 400,000 barrels of heavy crude oil per day from Alberta, Canada, to Illinois. The pipeline will be a critical aid to the anticipated growth in Canada's crude oil production over the next decade. The project sponsor is TransCanada Corporation. The U.S. Department of State will oversee the project and, as lead agency, coordinate the participation of the many other state and federal agencies that must also review relevant parts of the project.

Environmental Setting

The proposed Keystone Pipeline Project corridor traverses a region included in the Central Lowland physiographic division of the United States (Chapman 1975; Fenneman 1938) and the Dissected Till Plains region of Missouri (Rafferty 1982) (Figure 2). The Central Lowland is characterized by low relief and a glacial till mantle, and the region is underlain by broadly warped sedimentary rock formations. The landscape of the Dissected Till Plains province is characterized by broad, smooth, gently rolling hills in the north, while the southern half of the region consists of a nearly level to gently sloping loess mantled till plain (Benn 1993).

The project corridor cross-cuts the West Missouri, Platte, Grand, Chariton, Salt, Cuivre, and Upper Mississippi Principal Drainage Basins (Figure 3). The Platte, Grand, Chariton, and Salt Principal Drainage Basins are long, linear study units that extend from the northern boundary of the state south to the Missouri River. Each of these study units, except Cuivre, is composed of two or more watersheds. The rivers draining the region, listed from west to east, are the Missouri, Platte, Little Platte, Grand, Mussel Fork, Chariton, Middle Fork Little Chariton, East Fork Little Chariton, South Fork Salt, West Fork Cuivre, Cuivre, Mississippi, and Missouri rivers.

The project area is part of a major ecotone zone which is transitional to the deciduous forests of the east and the temperate grasslands of the Great Plains (Shelford1963). This forest-prairie zone fluctuates with climatic variations of significant duration. This vegetation region is commonly referred to as a "mosaic" of oak-hickory and tall grass prairie (Kuchler 1964). Generally, the oak-hickory association occurs on slopes and in ravines, while the tall grass prairies occur on the level to gently rolling uplands (Figure 4).

Historic accounts of the area describe the region as a melange of expansive grasslands with forested areas occupying the slopes of the escarpments and the courses of streams and rivers. The Mississippi and Missouri River floodplain in Lincoln and St. Charles counties consisted of a mixture of floodplain prairie, wetlands, and forested areas. Prior to intensive nineteenth-century settlement, prairie areas were limited to the uplands with forested areas being more prevalent than today. However, in pre-settlement times forests were probably kept from entering the upland prairies by uncontrolled prairie fires of various origins. Also, species that distinguished the Oak-Hickory forest probably did not enter the lowlands because the majority of these species would not withstand periodic flooding.

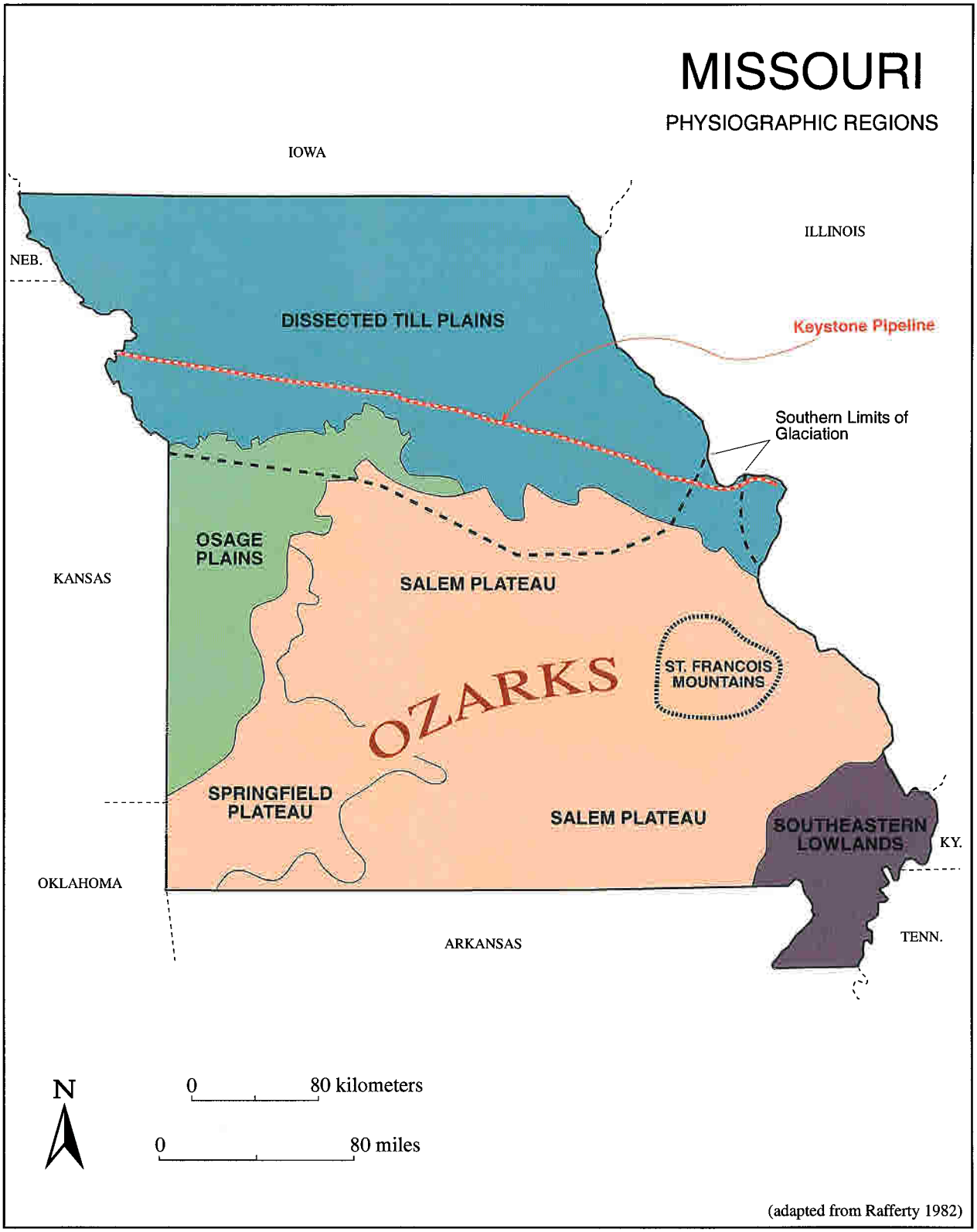

Figure 2. Location of the Keystone Pipeline Project corridor in relation to the physiographic regions of Missouri.

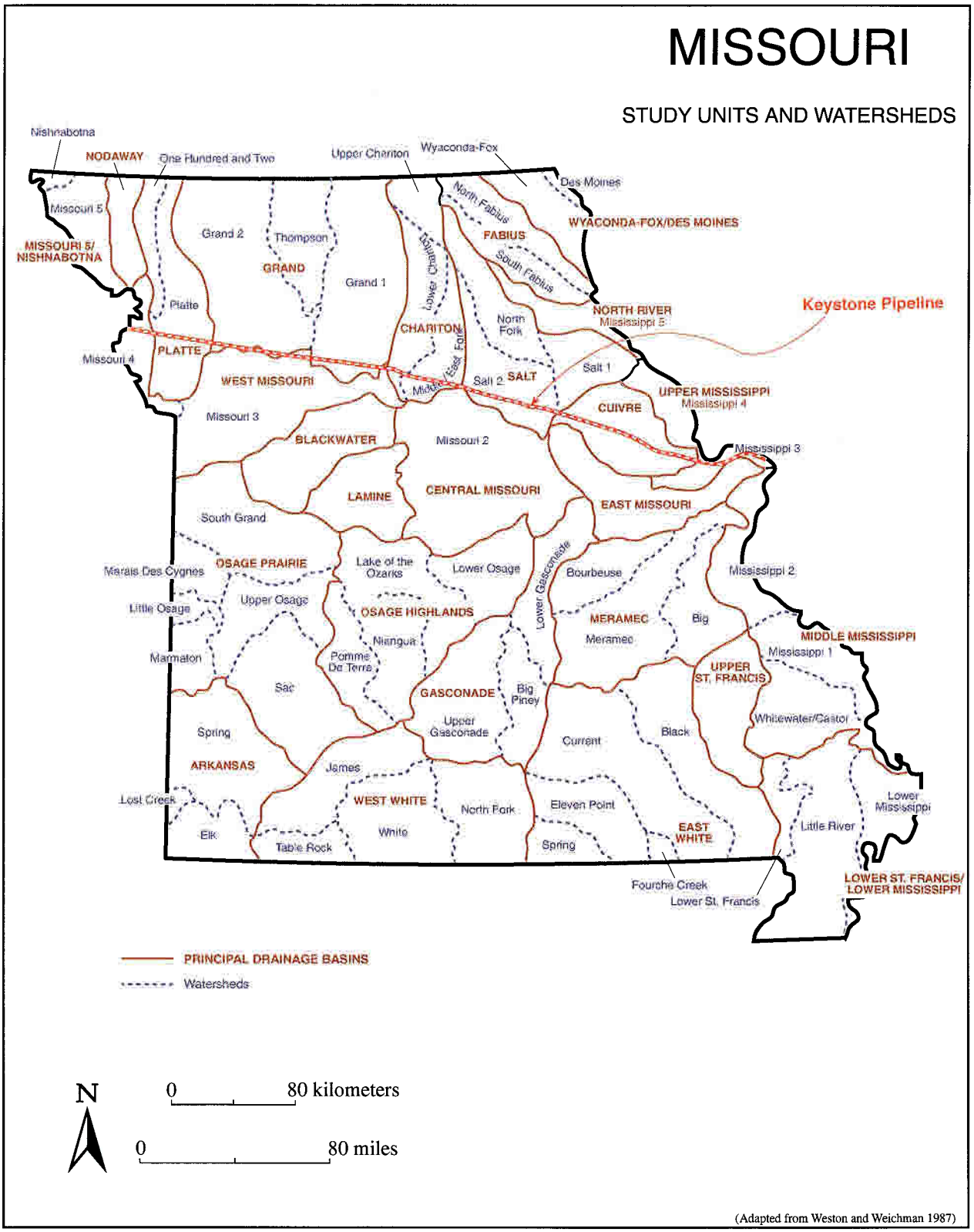

Figure 3. Location of the Keystone Pipeline Project corridor in relation to the archaeological study units and principal drainage basins of Missouri.

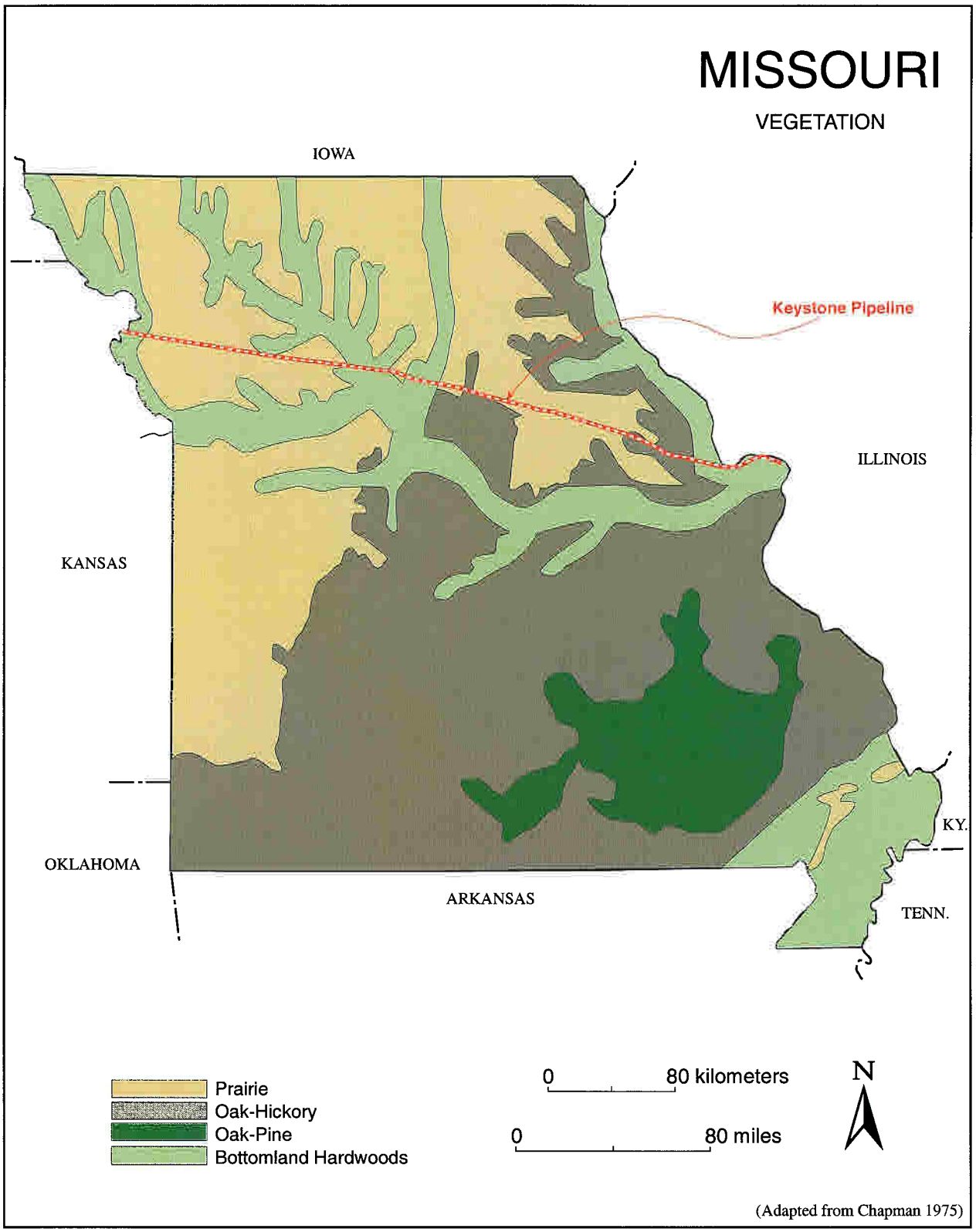

Figure 4. Location of the Keystone Pipeline Project corridor in relation to the natural vegetation of Missouri.

The Oak-Hickory Forest occurs along slopes that lie between upland prairies and river floodplains. This zone is dominated by only a few large trees of white oak, red oak, black oak, bitternut hickory, and shagbark hickory mixed with smaller specimens of ash, maple, red cedar, and wild cherry, while understory species include buckeye, paw paw, redbud, and hawthorne.

Herbaceous flora is slightly impoverished in this zone when compared to similar forests to the east. This is due primarily to decreased moisture availability which has prevented the migration of certain western species into the area. Representative species include specimens of brushy growth such as sumac, goldenrod, artichoke, and goosefoot. These species are more apparent in the suture zone which occurs between the Oak-Hickory Forest and the upland prairie. Here, the prairie is invaded by the forest during periods of higher moisture and retreats during dry periods.

Tall grass prairie (Bluestem Prairie), in the vicinity of the project corridor, occurs away from the escarpments where flooding is infrequent enough to allow its development. This prairie is a warm season grassland and most of its grasses mature in late summer. In recent years these prairies have been encroached upon by the Oak-Hickory Forest, primarily due to man's activities in the area since the 19th century which has limited the effect of periodic prairie fires. Now many areas that once existed as prairies are in various stages of woodland development, hence the designation Bluestem Prairie/Oak-Hickory Forest.

Plant species that are common to the Bluestem Prairie include big bluestem, little bluestem, Indian grass, switchgrass, brome grass, and forms like lead plant, butterfly milkweed, purple prairie clover, and various sedges.

Narrow bands of gallery forests also grow along streams crossed by the project corridor. Species common to this category include cottonwoods, hackberry, willow, and elm. In addition, poorly drained soils and shallow depression found in the project area are excellent sites for wetland communities which include species of chenopods, smartweeds, and prairie cordgrass.

The Oak-Hickory Forest and upland prairie are hosts to a large variety of fish, fowl, and mammal species. Archaeological sites near the project corridor have yielded the remains of riverine species which were available to the prehistoric inhabitants of the area. Specimens include catfish, flathead, gar, buffalo, white heel-splitter mussel, pink heel-splitter mussel, flat mucket mussel, and maple-leaf mussel (Bell 1976; Oman 1978).

Mammalian species include wapiti, striped skunk, raccoon, beaver, western fox squirrel, southern grey squirrel, antelope, blacktail deer, whitetail deer, bobcat, coyote, badger, jackrabbit, and bison (Johnson 1975; Brown and Baumler 1976; Bell 1976). Species of fowl include turkey, quail, prairie chicken, ruffed grouse, mourning dove, passenger pigeon, and several species of duck (Oman 1978). Mammals with restricted distribution that occur in this region include the blacktailed jack rabbit, thirteen-lined ground squirrel, woodchuck, Franklin's ground squirrel, western harvest mouse, plains pocket gopher, common cotton rat, meadow jumping mouse, eastern wood rat, and southern

lemming mouse. The black bear at one time inhabited the wooded areas of the region, and the pronghorn and the nine-banded armadillo also lived in the area.

The prehistoric inhabitants of the Dissected Till Plains region were undoubtedly exploiting resources from a variety of environmental niches. In early historic times both forest and prairie areas overlapped in northern Missouri, and the flora and fauna present in the region were typical of the animals and plants found elsewhere in the region. Prehistorically, most of the plants and animals listed above would probably have been available for human exploitation within the region at one time or another.

Previous Archaeological Investigations in the Region

The results of previous archaeological investigations in the Dissected Till Plains of northern Missouri indicate that prehistoric sites occurring in this part of the state are concentrated in the valleys and upland-valley margins of the larger streams draining the region. A similar site-distribution pattern has been documented for the glacial drift plains of neighboring states, suggesting the environmental characteristics these regions have in common account for the largely negative results of surveys in the prairie uplands in these areas. In extreme eastern Missouri, prehistoric site density in the uplands appears to increase as proximity to the Missouri and Mississippi rivers increases; as a consequence, archaeological surveys have typically resulted in a larger number of sites being recorded in these areas than in the uplands to the west.

Logan et al. (1979) conducted a feasibility study designed to determine the nature of archaeological resources that would be affected by the proposed expansion of the Kansas City International Airport (KCIA). The locality studied encompassed about 150 square miles in the uplands of central Platte County, Missouri, along the high divide separating the drainages of tributaries of the Little Platte River, the Platte River, and the Missouri River. Using information derived from a review of previously conducted surveys in the region, a predictive model of prehistoric settlement-subsistence patterning was constructed for the area from which working hypotheses concerning the distribution of prehistoric sites were subsequently derived (Logan et al. 1979:1). These hypotheses were then tested by limited reconnaissance survey and a review of sites identified in the sample area by land-owners and local collectors.

The results of the KCIA study indicate that prehistoric populations were indeed utilizing the uplands of this portion of the Dissected Till Plains, and this finding reinforces the authors' conclusion that recording archaeological evidence of this activity has the potential for solving problems concerning the settlement-subsistence behavior of prehistoric groups of the region (Logan et al. 1979:96). Logan et al. admit, however, that "it soon became obvious that the nature of the prehistoric cultural resources of the uplands was diffuse and a majority of the sites actually consisted of what some archaeologists have called 'nonsites' (Thomas 1975)" (1979:37). In view of the fact that the field survey conducted for this study was restricted to areas exhibiting fair to excellent ground surface visibility (Logan et al. 1979:107), the question of whether such sites regularly fall

below the threshold of archaeological visibility when shovel testing vegetation-covered uplands becomes a matter of some concern.

McNerney et al. (1993) included a model for predicting prehistoric sensitivity zones within the Kansas City area in their Archaeology Master Plan for Kansas City and Liberty, Missouri. An analysis of the distribution pattern of nearly 250 previously recorded sites in the Kansas City and Liberty formed the basis for defining the prehistoric sensitivity zones. With the exception of the Missouri River—a special case in view of its expansive floodplain and bluff-edge areas—distance to water was the environmental variable given greatest weight in ranking the landforms bordering the secondary rivers and smaller, upland stream drainages in the study area by their potential for containing prehistoric sites. For these smaller drainage basins, the high site sensitivity zone was defined as ranging from 0 to 200 meters from the current or former water source, the medium site sensitivity zone was defined as ranging from 201 to 400 meters from the water source, and the low site sensitivity zone was defined as ranging from 401 meters up to the point where another water source begins its influence (McNerney et al. 1993:93). Among the other variables considered relevant to predicting the locations of prehistoric sites along smaller streams and rivers, although of secondary importance to the variable of distance to water, were degree of slope, relative elevation, and type of soil (McNerney et al. 1993:93).

Sturdevant (1995) surveyed a 20-foot-wide, 60-mile-long telephone cable corridor in Carroll, Chariton, Linn, and Macon counties, Missouri (Figure 1). The proposed cable alignment traverses both valley and upland settings within the central portion of the Dissected Till Plains, crossing the valleys of the Chariton, Grand, and Mussel Fork rivers, the valleys of a number of their larger tributaries, and extensive portions of the adjacent uplands. Eight prehistoric sites were recorded during the survey, each defined as a low density lithic scatter. While approximately 60 percent of the survey corridor was located in areas supporting prairie vegetation prior to historic settlement, all but one of the eight prehistoric sites recorded were located in woodland settings, within or at the margins of the larger stream valleys crossed by the proposed alignment (Sturdevant 1995:30). All of the sites were evaluated as not eligible for listing to the National Register of Historic Places (NRHP).

McNerney et al. (1994) surveyed 67 proposed floodwater control structures within the East Fork Grand River watershed in Worth and Harrison counties, Missouri, and Union and Ringgold counties, Iowa (Figure 1). The drift plain region containing this project area is known as the Dissected Till Plains in Missouri, and the Southern Iowa Drift Plain in Iowa. The 67 structures examined during this survey represented a 30 percent stratified random sample of 217 proposed structures. A 10-acre area was surveyed at each of the 67 structures investigated, thus constituting a survey area approximately 670 acres in extent. The survey was carried out through pedestrian survey, selected shovel testing, and cutbank inspection. No archaeological sites were recorded during the survey (McNerney et al. 1994).

Titus et al. (1991) surveyed a 100-foot-wide, 64-mile-long natural gas pipeline corridor from Harper, Iowa, to the Mississippi River, 12 miles north of Burlington. The proposed pipeline route

passed through portions of Keokuk, Washington, Henry Louisa, and Des Moines, Iowa (Figure 1). The proposed pipeline corridor crossed two landform regions, the Southern Iowa Drift Plain and the Mississippi Alluvial Plain , in its transect of southeastern Iowa. The landscape along the proposed pipeline route is characterized predominantly by upland topography, but floodplain and terraces are present in the valleys of the Mississippi River and several of the larger second-order streams. Thirty prehistoric sites and 13 prehistoric find spots were recorded within the project corridor during the survey, including 22 sites and 12 find spots within the Southern Iowa Drift Plain, and eight sites and one find spot within the Mississippi Alluvial Plain (Titus et al. 1991:197). Prehistoric site density within the project corridor was 7.17 sites per km^2 surveyed within the Southern Iowa Drift Plain, and 38.10 sites per km^2 surveyed within the Mississippi Alluvial Plain. The pattern of variation in prehistoric site density within the proposed pipeline corridor suggested that site density within the Southern Iowa Drift Plain is highest along the eastern margins of the region and steadily declines as distance from the valleys of the Iowa and Mississippi rivers increases. Moreover, the extent of the area of highest prehistoric site density was interpreted as being delimited by the upper reaches of the Iowa and Mississippi river drainages, and, therefore, appeared to constitute a narrow band along the upland-valley margin that ranges from 4 to 6 miles in width (Titus et al. 1991:204–205).

Mandel et al. (1991) conducted a combined geomorphological and archaeological field study of the Upper Delaware River watershed in Nemaha, Brown, Jackson, and Atchison counties, Kansas. These counties are located in the Glaciated Region of Kansas, a dissected drift plain in extreme northeastern Kansas bordered on the south by the Kansas River valley and on the west by the Flint Hills. The primary goals of the investigation were "to generate a model of landscape evolution in order to better identify the context and content of the local archaeological record, to help archaeologists develop more effective means of predicting the potential distribution of prehistoric sites on and below the present landforms in different drainage elements of the watershed, and to assist the Soil Conservation Service in formulating cultural resource management strategies for the project area and northeast Kansas" (Mandel et al. 1991:ii). The goals of the investigation did not include intensive survey of proposed flood protection structures or clearance of areas from further assessment.

The geomorphological study undertaken by Mandel et al. (1991) focused on selected study areas, in both small and large stream valleys, representative of flood protection structure sites in the upper, middle, and lower parts the Upper Delaware River drainage basin. The geomorphological field investigation included an examination of stream cutbanks in an attempt to identify buried archaeological sites and/or deeply stratified fill sequences suitable for dating. The field investigation also included coring with a hydraulic soil probe at several locations in order "to determine the character, depth, and lateral extent of deposits that underlie the various landforms in the study area" (Mandel et al. 1991:14). An archaeological sampling strategy involving selection of 30 sections within the Delaware River/Cedar Creek drainage was implemented. Within the sections selected for survey, the archaeological investigation was conducted following a methodology described as "a stratified, opportunistic, and intuitive survey" (Mandel et al. 1991:16). In practice, this involved walking four transects in each section: one on either side of the largest stream in the section to examine cutbanks for buried cultural deposits and inspect the adjacent terraces; and, another transect

on either side of the stream to examine areas beyond the immediate vicinity of the major stream, cutbanks of smaller streams, and the locations of historic structures depicted on historic atlases. No shovel testing or soil coring was attempted.

Mandel et al. investigated 29 prehistoric sites in the course of their Upper Delaware River study, including five that had been previously recorded (1991:114–115). Four of the prehistoric sites are buried sites that were identified in cutbanks of the Delaware River, three of them a relatively short distance upstream of the point where the Keystone Pipeline Project corridor crosses this drainage. The distribution of prehistoric sites identified during this investigation suggested that the extreme upper reaches of the drainage never provided a sufficiently reliable source of water to support any but the most ephemeral prehistoric occupations. The results of the survey also suggested that prehistoric sites could be expected to occur on all landforms along larger streams, although all those identified during the field investigation occurred on high terraces and in the uplands bordering the stream valleys. While each of the buried sites identified during the investigation were discovered in the cutbanks of larger streams, the potential for site burial also exists along smaller streams in the upper portion of the drainage (Mandel et al. 1991:115).

The archaeological survey of the Upper Delaware River watershed is also notable for its use of late nineteenth- and early twentieth-century atlases to identify the locations of potential historic sites. A total of 122 historic farmsteads was recorded during the survey through the review of the early atlases and subsequent survey. While the results of the historic map review argue for making this practice a standard part of survey procedure, it is acknowledged that historic sites pre-dating the earliest maps can be found only through intensive archaeological survey (Mandel et al. 1991:114).

In eastern Missouri, a cultural resources survey focusing on the identification of prehistoric sites was conducted within portions of the Cuivre River Drainage Basin in Lincoln and St. Charles counties (Harl et al. 1988). The Cuivre River drains portions of six eastern Missouri counties before emptying into the Mississippi River just north of its confluence with the Illinois River. At the time of American settlement, Lincoln and St. Charles counties consisted of an assortment of prairie, forest and floodplain locales. Prior to the study conducted by Harl et al. (1988), few professional archaeological investigations had been carried out in the Cuivre River Drainage Basin. The paucity of data concerning the prehistoric utilization of this area had led to speculation that prehistoric groups visited this area only marginally. The results of the Cuivre River drainage survey, however, combined with those obtained during earlier surveys of portions of the Peruque Creek (Hamilton and Nixon 1984) and Mississippi River (Harl et al. 1986) floodplains substantially altered this interpretation. A total of 4,032 acres was surveyed in the Cuivre River drainage, resulting in the identification of 91 sites (Harl et al. 1988). The investigators found that prehistoric site density and site type diversity within the Cuivre River valley was highest on terraces and along bluff margins. Prehistoric occupation of the interior portions of the uplands was generally sparse, and, where sites did occur, generally consisted of small, special function camps.

The Peruque Creek drainage survey entailed the investigation of 1,070 acres in the Missouri River floodplain of St. Charles County, an area bordering Peruque Creek and including adjacent

upland locations. The survey identified 41 new sites and investigated 11 previously recorded sites. Forty-six of these sites were prehistoric and six were historic. The results of this survey indicated "the overall density of prehistoric use of all environmental zones was heavier than anticipated." (Hamilton and Nixon 1984:8).

The Portage Des Sioux bottom in St. Charles County consists primarily of a floodplain prairie environment. Prior to American settlement, the area known as Portage Des Sioux bottom—which consists of the strip of land between the Mississippi and Missouri rivers—was covered with prairie grasses and complemented by forested areas on the islands, sloughs and tributary banks. A reconnaissance survey of 2,184 acres of selected bottomland resulted in the identification of 27 sites—10 of which were nineteenth-century historic sites (Harl et al. 1991). This resulted in a site density of 1.2 sites per 100 acres. The low prehistoric site density in this area was attributed to either erosion or site burial by alluvial deposits.

Results of Records Check and Literature Review

A site file search was conducted by LuElla Parks of the Archaeological Survey of Missouri (ASM), Columbia, Missouri, on January 5 and 10, and February 21 and 22, 2006, and a literature review was conducted by Colleen Vollman between January 9 and January 20, 2006. The purpose of the records search and literature review were to determine the nature and extent of archaeological investigations conducted to date in the portions of northern Missouri that the proposed Keystone Pipeline Project corridor traverses and to identify the number and nature of previously recorded sites located within approximately a one-mile radius of the proposed pipeline. Due to the paucity of sites within one-mile of the corridor in Lincoln and St. Charles counties, only sites within roughly one-quarter mile (400 m) are depicted on accompanying maps and are discussed below. Historic maps and atlases were also consulted in order to identify potential historic sites within the Keystone Pipeline Project corridor.

Previously Recorded Sites and Surveys

The results of the background study indicate that 17 previously recorded sites are located within the proposed Keystone Pipeline Project corridor. Two tables have been constructed in order to document sites within the western (Table 1) and eastern (Table 2) portions of the proposed Keystone Pipeline Project corridor.

The age and cultural affiliations of the majority of the 29 previously recorded sites located within, or in the vicinity of, the western portion of the project corridor (comprising Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, and Audrain counties) are unknown. Nine of the sites (31 percent) contain components dating to the Woodland period, however, and the Archaic and Paleoindian periods are each represented by two sites. Most of the historic sites are not precisely dated, and the descriptions of the sites are vague; none of the site forms offer any age ranges for the 10 historic components listed in Table 1. Sites within the eastern portion of the Keystone Pipeline

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