Reconnaissance Survey of Lewis and Clark

on the

Missouri National Recreational River,

Nebraska and South Dakota

December 1999

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by

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December 1999

Contract No. 1443-CX-1505-9-0011
Research Passage of Lewis and Clark

Acknowledgments

The authors are grateful for the assistance of Duane R. Molman, Conservation and Survey Division, University of Nebraska-Lincoln; Laura Banker, Omaha District Office, U.S. Army Corps of Engineers; Norman D. Smith, Department of Geosciences, University of Nebraska-Lincoln; and James M. Peterson, Vermillion, SD.

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Part I:

Lewis and Clark on the Middle Missouri

by

Gary E. Moulton

Lewis and Clark on the Middle Missouri

by Gary E. Moulton

The flag was unpacked from its box and unfurled in the afternoon light. On a high hill overlooking the Missouri River the party assembled in military fashion to await the ceremony. This was no routine formation, nor was it a gathering for the usual purpose of honoring Indian dignitaries. This was a solemn occasion of the saddest kind. One of the members of the Corps of Discovery had died. Every member of the party must have wondered if this would be the only loss on the expedition and what fate lay ahead. Less than one hundred days into the expedition an honored comrade had departed. Only a few days earlier a loss of another sort had occurred when two members of the party had deserted. One had been captured, but the other had made good his escape. Was this to be the fate of the Corps: desertion, death, and perhaps ultimate defeat? But if these thoughts ran through the minds of the men, no one recorded such despair. Indeed, it was the party's casualty himself who had earlier penned what may have been the general sentiment about the deserters, that they had abandoned the enterprise "without aney Jest Case." And death was an ever-present occupational hazard to frontier soldiers and French boatmen who formed the Corps. So, the party returned to the boats and moved on. It was a beautiful night.

Charles Floyd was only twenty-two years old at the time of his death, but Captain Meriwether Lewis considered him "a young man of much merit" and had appointed him as one of the sergeants in April 1804 while the party was still at Camp Dubois in Illinois, waiting their start up the Missouri. Floyd was from that select group of initial recruits that William

Clark had gathered near Louisville, Kentucky, a group that would become known as the "nine young men from Kentucky." Lewis had instructed Clark to pick rugged backwoodsmen, skilled hunters who were accustomed to hardship and the outdoor life; no gentlemen soldiers would fill the ranks of the Corps of Discovery. Floyd was one of these able men, but his contributions to the Corps were cut short by his death. He was also one of the expedition's journalists, as all sergeants were supposed to be. Although the journal is brief and in the rough style of a frontier soldier, the sergeant showed insights into daily events. The record of the expedition is poorer for his passing.

Without time to fulfill his service to the Corps and achieve some fame for deeds, Floyd is remembered today as the only member of the party to die during the trip. His death on August 20, 1804, near Sioux City, Iowa, was probably caused by a ruptured appendix. The captains did what they could for him, but their standard remedies were of little help and may have hastened his demise. It is not clear whether the captains resorted to their usual practices of bleeding and purging, but those acts would have hurried the inevitable. Floyd would have received the same treatment from any physician of the time and would have died under the best medical care of the time. Operations to relieve him lay in the distant future. The men bathed and comforted him as best they could, and he died with a great deal of composure. Clark wrote a letter to the sergeant's loved ones before he died. The captain suffered near exhaustion from lack of sleep while caring for Floyd, and his slave York seems to have been especially attentive to the sergeant during his final days. Lewis performed the funeral service later in the day and recalled that the sergeant had "at All times given us proofs of his impatiality Sincurity to ourselves and good will to Serve his Countrey." After the service the

party moved a short distance ahead and camped just above the mouth of a stream they called Floyd River.

Private Moses B. Reed also holds a singular place in the annals of the Corps: he would be the only regularly-enlisted member of the party to attempt desertion. Nothing is known about Reed before the expedition, neither his date nor place of birth, nor the time or place when he joined the Corps. Up to the time of his desertion, he seems to have participated in the activities of the party without any reluctance. Hunting and cutting wood were his typical activities, but he was also trusted enough to be sent on special assignments. Like so many of his fellows who tired of garrison life at Camp Dubois, he was cited for disciplinary infractions while the party was there, but it was of little consequence. Soldiers getting drunk, as Reed did, was not uncommon. But now Reed had broken ranks in a very serious way. Reed was a member of the permanent party, that is, he was not a temporary hand hired to go only as far as the first winter encampment. He was recruited for the entire trip and thus enjoyed a bit of status. His reasons for deserting are totally unknown. Floyd, at least, thought he had no just cause for the action. On August 4 Reed went back to the previous day's camp under the guise of retrieving a knife he had left behind. By the next day Clark was already suspecting that he had deserted—an indication that things were not right with Reed. Within a couple of days the captains detailed a party to find Reed and bring him back, "Dead or alive." Reed's act was a real threat to military order and had to be dealt with seriously. If Reed made good his escape, it could signal lax discipline, and dissension might spread through the ranks. The leaders had to act decisively.

It would be nearly two weeks after his desertion before Reed was finally caught and

returned to the party. The incidents of his arrest were not recorded, nor is it known whether he resisted. At his trial on August 18 Reed confessed to stealing a rifle, shot pouch, gunpowder, and ammunition, and to deserting his post. The private pled for leniency. Desertion was a serious offense, punishable by death, so in a sense the captains showed forbearance when they sentenced him to run the gauntlet four times and then expelled him from the permanent party. Reed would remain with the expedition through the winter's encampment at Fort Mandan, denied of routine privileges and relegated to hard labor. After that, he was sent downriver with a return crew aboard the keelboat. He is never heard of again.

If Private Moses B. Reed remains an elusive figure, his double in desertion, the French boatman La Liberté, is obscure in the extreme. Like so many of the French *engagés*, boatmen hired to haul the keelboat and heavy pirogues up the Missouri to the winter camp, he is almost totally unknown. Even his real name is unsure; La Liberté may have been a nickname. A common name among Mississippi Valley Frenchmen, it perhaps signified a respect for the ideals of the French Revolution. On July 29 he was sent ahead to find some Indians and invite them to the party's next encampment. In the days ahead the captains gave slight attention to his absence, only noting that they thought him lost. When they sent men after Reed, their orders included finding La Liberté but without the reference to returning him dead or alive. In fact, they were merely to make inquiries about him at Indian villages. La Liberté was apprehended about the same time as Reed, but true to his name he claimed his freedom and was not recaptured. Because he was a civilian employee and not an enlisted soldier, his offense was not so serious as was Reed's. In a precise legal sense he may not have "deserted"

the party at all but only quit his job, although he did take one of the party's horses. It may be fortunate that he made good his escape and relieved the captains of the decision of how to deal with him. They did not send a second party to try to recapture him. Like Reed, he is lost in obscurity.

What brought these men of the Lewis and Clark expedition to this moment in the summer of 1804 and to this place near modern Sioux City, Iowa? It was the orders of a president, the pressures of geopolitics, and the desires of a young nation to expand its boundaries and increase its wealth. Thomas Jefferson had dreamed of western exploration for two decades, and now with his ascension to the presidency in 1801 he had the means to realize his ambitions. He was spurred to action after reading the account of Canadian explorer Alexander Mackenzie, who had crossed the continent and laid claim to western lands for British interests. At the same time, France was ready to abandon its North American empire and relinquish its holdings to the United States. Even before the sale of Louisiana was consummated, Jefferson had set his young protégé, Captain Meriwether Lewis, on a course for western exploration. Carrying letters of credit signed by the president, outfitted from Army supply stations with up-to-the-minute arms and provisions, and equipped with the latest scientific instruments and trained in their use at Philadelphia, Lewis set out from Pittsburgh in the late summer of 1803. He was joined by his good friend and former comrade-in-arms William Clark near Louisville, Kentucky. Together they guided the expedition's keelboat down the Ohio River and up the Mississippi to a spot across from the mouth of the Missouri River on American soil in Illinois. Here they learned of the Louisiana Purchase and prepared to explore new American territory and the lands beyond. Here, too, they trained and

disciplined a disparate group of recruits and formed them into the Corps of Discovery. At this point the Corps was not the band of brothers it would become and it would be many months before the men formed bonds that would see them across rivers, plains, and mountains.

Jefferson had tangible and immediate goals for his explorers, and these he laid out in a careful set of instructions before Lewis's departure. Geographic discovery formed an essential part of his plan and would be a key element of the men's efforts. Wisdom of the time suggested the existence of a relatively easy passage across the Rocky Mountains from the headwaters of the Missouri River to a stream flowing into the Columbia River. Lewis and Clark proved that such a pathway did not exist and that crossing the mountains was a difficult task. They dashed all hopes for the long-sought Northwest Passage. However, in their scientific work of taking observations of longitude and latitude, noting significant geographic features, and making detailed route maps, they made important contributions to knowledge of the West. While Lewis performed most of the astronomical duties, Clark charted the course and drafted expedition maps, eventually crafting a magnificent map of the entire West.

Lewis and Clark also carried out ethnological and linguistic studies. Jefferson's lengthiest and most careful instructions to Lewis concerned the party's relations with Native Americans and emphasized the importance of establishing good connections with the Indians. In councils under brush arbors and around campfires where the pipe of peace was passed, the captains worked to carry out Jefferson's directive. They brought back the first detailed reports of three major Indian groups: the village Indians of the upper Missouri River; the intermountain tribes of the Rocky Mountains; and the riverine peoples of the Columbia valley and Northwest Coast. Handicapped as they were by the preconceptions and prejudices of

their day, the men nonetheless displayed a degree of detachment unusual for the time. Working among a diversity of tribes, linguistic groups, and cultural settings, the captains struggled in their efforts to catalog, study, and understand this multitude of humanity. If they could not penetrate deeply into the culture of these people, hampered as they were by language and lack of time, they did rise above the cultural relativism of their age and presented a view of Native Americans that has been praised for its objectivity.

Diplomatic activities and commercial interests also played an important role in expedition efforts. Lewis and Clark were interested in the natives for more than ethnographic research; they wanted to open the door to diplomatic relations and gain access to trading rights. The men were to apprize the natives of the new sovereignty of the United States under the Louisiana Purchase and develop relations with those beyond American borders. In making these contacts, they hoped to shift trade away from English, Spanish, French, and Russian competitors and toward American interests in St. Louis, Boston, and elsewhere. It is doubtful that the Indians grasped the idea of diplomacy outside of trade; the explorers carried gifts, not goods. Lewis and Clark looked to trade in the long run; the Indians wanted an immediate exchange of merchandise. Lewis and Clark wanted to expand United States commercial influence as far as possible to compete with other nations; the Indians wanted the best items at the lowest price from the most dependable supplier. At the time Lewis and Clark could not provide the necessary guarantees.

Investigations in ecology constituted another part of the explorers' work. Lewis and Clark took careful notice of the land's prospects for future agricultural use, while also studying plant and animal life, noting mineral deposits, and recording the country's climate.

Their accomplishments in the biological sciences are particularly noteworthy. They were the first to describe in detail a host of plant and animal species new to science, and they provided better understanding of the range, habits, and physical characteristics of many known species. They wrote at length of the seasonal changes and range of plant life, of the extent and habits of animals, and of the migrations of birds and mammals.

During the party's passage on the middle Missouri, from Sioux City, Iowa, to Pickstown, South Dakota, in late August and early September 1804, the captains carried out the president's directives. In addition to more visionary goals, the leaders were responsible for the routine duties of military command, and principal among these was the care of the party under their watch. These young men were liable to all the accidents that humans encounter, plus the added dangers that come with exhausting physical labor, constant exposure to the elements, and the lack of an adequate diet. They were plagued by boils, diarrhea, colds, frostbite, and heat; they suffered bruises, cuts, and scrapes; they faced mosquitoes, snakes, and grizzlies; and they endured raging rapids, high mountains, and desolate plains. At times, these circumstances taxed the morale of the party, but a constant refrain in expedition diaries is to the men's high spirits. The leaders did the best they could in ministering to the mens' health and looking out for their safety. Indeed, the captains' strong concern for the welfare of the party went far to compensate for their limited medical knowledge. Jefferson later observed that Lewis was as "careful as a father of those committed to his charge." At the end of the trip Lewis could happily report that all members of the party had returned in good health.

With Floyd's death the men had to fill an empty position in their ranks. In a vote on

August 22 near Elk Point, South Dakota, the men chose Patrick Gass as the new sergeant, over William Bratton and George Gibson, so the captains appointed him to the vacancy. Much has been made of this election, with references to it being a dramatic demonstration of democracy. Perhaps it was. But just as likely it was a demonstration of the captains' confidence in the men and in their capacity to choose the best person to lead them. The election also demonstrates the leadership skills of Lewis and Clark; they knew when to give orders and when to gain consensus. Sharing in the decision-making gave the soldiers a sense of ownership in the enterprise. They would have to live with the results. It was several days before the captains finalized the decision and entered the appointment in the official record. Perhaps they wanted a little time to confirm the wisdom of the choice. Gass proved himself, capably fulfilling the duties of his new office. Born in Pennsylvania, he joined the Corps from the First Infantry Regiment stationed at Fort Kaskaskia, Illinois. His skills as a carpenter were particularly valuable on the expedition. Gass is also distinguished at the first to publish and the last to die. His journal was published in 1807, seven years before that of the captains, and he died in 1870, in his ninety-ninth year.

While the captains busied themselves with scientific work and routine command responsibilities, the soldiers and *engagés* worked to get the keelboat and pirogues upriver. A major endeavor besides moving boats and baling was in provisioning the party. Hunters were regularly sent out, and the captains quickly ascertained who was best at providing the party with daily rations. George Drouillard, generally called "Drewyer" by the captains, was one of the Corps' best hunters. A son of the frontier, he was of mixed-parentage, with a French-Canadian father and a Shawnee mother. Lewis hired him at Fort Massac to serve as the

expedition's interpreter because he was adept at Indian sign language. Even more prized were his wilderness skills and hunting abilities. In the most difficult times, Drouillard could be counted on to find a deer or an elk and ease the party's hunger. But on the middle Missouri they found themselves in a land of plenty, so his hunting skills were needed less. Here most of the men got relief from poling and pulling boats and were given a chance to hunt. The captains also looked for opportunities to get away from the boats and do some hiking and riverside exploring.

On August 23 Clark got out for hunting and congratulated himself on getting "a fine Buck." It was a good day for hunting: John Collins got a doe, Reubin Field two deer, John Shields an elk, and Lewis a goose, but, despite the volley of shots aimed at two elk crossing the Missouri, none hit its mark at what should have been easy targets. Joseph Field's hunting success for the day was the most interesting. Joseph, and his brother Reubin, two more members of the "nine young men from Kentucky" and a part of the permanent party, were born in Virginia, and came to Kentucky at an early age. They were early recruits for the Corps. Not only were they among the best shots and most capable hunters in the party, they were also the ones most often singled out for difficult tasks and special assignments. Both were with Lewis (as was Drouillard) in the fight with Blackfeet Indians in Montana in July 1806. And now Joseph had the honor of killing the party's first buffalo. In time the animal would be as common as the grass on the plains, and the captains would tire of trying to count heads on herds of enormous size. Lewis took a dozen men with him to bring the shaggy beast down to the river, dress it, and load it on the boat.

Clark was out hunting again the next day and had his black slave York with him. The

captain killed a deer, and York was detailed to pack it back to the boat and return. The captain was less successful later in the day and blamed his inability to bring down two deer on the small size of his ammunition. York was luckier or better equipped—he killed an elk. Here is the first indication that York carried a rifle, signaling that on the expedition he was to be more than a body servant to Clark. Such an arrangement would have been an unacceptable luxury.

York and Clark were about the same age and may have been boyhood companions. Little is known of York before he joined the Corps except that Clark inherited him from his father a few years before the expedition. York seems to have been a large man of some strength, and he was a source of fascination for the Native Americans who had never seen a black man before. Lewis and Clark capitalized on this, exploiting York to some extent. York seems to have been a willing participant and enjoyed impressing the natives. On one occasion Clark confessed that York "made him Self more turrible in their view that I wished him to." The status that York enjoyed with the Corps was lost after the expedition, however, and once they were back in St. Louis Clark treated him with callous disregard before finally freeing him. After difficult times between the two men, York gained his freedom about 1811, at which time he went into the freighting business. That enterprise failed after a time, and York died of cholera sometime before 1832.

Hunting of an entirely different kind captured the attention of the party in late August, in a situation that caused grave concern for everyone. The youngest member of the corps, George Shannon, an inexperienced hunter and usually listed as one of the "nine young men from Kentucky," was lost. Shannon was born in Pennsylvania in 1785 and moved to Ohio

before arriving in Kentucky, where he joined Lewis in 1803. He remained with the captains after the party's return to St. Louis. In 1807 Lewis sent him with a party to return the Mandan Indian chief Sheheke to his home, an ill-fated trip during which Shannon received a wound that ultimately resulted in the loss of a leg. The accident ended his exploring adventures, and he took up other pursuits that led to his gaining prominence after the expedition, one of the few members of the Corps to do so. Although Shannon was not one of the journalists, he served as a resource person for Nicholas Biddle's official account of the exploration, and received praise from Biddle for his intelligence and knowledge of the trip. He attended Transylvania University in Lexington, Kentucky, between 1808 and 1810, and even though he completed work for a degree, he apparently did not receive it. He went on to practice law in Lexington, serve terms in the Kentucky legislature, and preside as a circuit judge. Perhaps looking for a higher political future, Shannon moved to Missouri in 1828 and, in time, served in the Missouri legislature. He died in Missouri at the age of forty-nine.

On August 26 as the party was preparing to set out from camp near Vermillion, South Dakota, Shannon and Drouillard were left behind to hunt for two lost horses. Clark directed the men to keep track of the main party from the highlands and catch up later. After Drouillard returned the next day without Shannon or horses, George Shields and Joseph Field were detailed to the search with instructions to rejoin the party upriver. They, too, returned empty-handed, concluding that Shannon was ahead of the main party. At this point John Colter, one of the best trackers, was sent after Shannon but after ten days in pursuit, was unable to overtake him. Worry deepened. Clark knew that Shannon was not a first-rate hunter and would soon run out of ammunition. Finally, on September 11, after seventeen

days, an exhausted and hungry Shannon rejoined the party. Believing that the party was ahead of him, he had pushed on, trying to catch up. His ammunition gone, he had eaten only berries except for a single rabbit he managed to kill by substituting a hard stick for lead balls in his rifle. Shannon had found the two missing horses, but at some point one of them gave out and had to be abandoned; the other he kept to eat as a last resort. Clark wrote of Shannon's misadventures that "a man had like to have Starved to death in a land of Plenty for the want of Bulletes or Something to kill his meat."

Shannon will forever be marked as the member of the party who was always getting lost. This is an unjust assessment. Other members of the party were also separated or lost at times. The only similar incident for Shannon was when he was separated from the party for a few days on the headwaters of the Missouri in August 1805 which was hardly his fault. In fact, he found he way back to the party on his own on both occasions. On the second occasion, Clark even remarked that he had "lived very plentifully," and he brought back useful geographical information to the captains. Certainly, the captains did not consider him untrustworthy or irresponsible and they assigned him to many important missions and hunting excursions during the expedition. In recommending Shannon to Biddle, Clark displayed his positive opinion of him when he wrote, "this young gentleman possesses a sincere and undisguised heart." This is a fitting memorial to the Corps' youngest member.

While Lewis and Clark were away from the boat during the afternoon of August 24, the main party passed a small river coming in from the north which they called the White Stone River; it is today's Vermillion River, flowing into the Missouri in Clay County, southeast of the town of Vermillion. The present name alludes to a reddish color on the water

and along its banks, while the party's name refers to the white earth that paints the river valley. Local Indians used both substances for decoration. In the distance, the men noticed a high hill and learned that nearby natives believed little devils or evil spirits inhabited the elevation and would kill whoever came near. Despite the legends, the captains determined to climb Spirit Mound the next day.

In the morning of August 25 Lewis and Clark and eleven members of the party accompanied by Lewis's Newfoundland dog Seaman set out for the mound—a walk of approximately nine miles. The walk proved to be too much for Seaman and he had to be taken back before reaching the hill. Clark estimated Spirit Mound's height to be about seventy feet above the surrounding plain. The captain also reached the correct conclusion that the mound was of natural origin and not some edifice raised for human purpose. Spirit Mound is a remnant bedrock knob that was shaped but not leveled as glaciers advanced and retreated from the area. From the hill the men viewed immense plains all about them, devoid of timber except for scattered trees along the river courses. Equally impressive in their view were the large herds of buffalo and elk. The great confluence of birds atop Spirit Mound was an indication to natives that spirits resided there. Clark found a more prosaic reason: winds blew insects up the slopes and birds arrived to feed on them. York returned from the trip exhausted by the heat and the fast pace that Clark set. Lewis also was affected by the temperature and may have still been suffering from his exposure to some unknown geologic substances a few days earlier. Although it was not especially hot, the men were apparently not accustomed to the heat and humidity of Great Plains weather. Clark recorded the temperature as 86° in the afternoon.

This temperature reading is something of a puzzle. It was the first such reading since the party departed Camp Dubois on May 14, and no recording of regular weather information would be made again until September 19. Keeping a systematic account of weather observations had been a practice of the captains during the winter in Illinois. Started in January 1804, the observations were kept independent of the regular journals and were arranged in tabular form in special notebooks for that purpose alone. These tables included twice-daily thermometer readings, abbreviated references to general weather conditions, and measurements of the river. A final column of "remarks" carried an assortment of natural history notes, including information on the flowering and fading of plants and the activities of animals, in addition to comments on significant weather phenomena. All this work came under the requirements Jefferson had established for the party's scientific studies. The question remains: why only this reading, and why here and now? There seems to be no plausible explanation. One conjecture was that the captains had misplaced the thermometers up to this point, but that seems unlikely. They had three thermometers with them, so it does not appear reasonable to think they had mislaid all of them. And, if so, why not continue with the readings after this thermometer was found instead of stopping and then picking the practice up again in September? We'll probably never know the answer.

There is less mystery in the difficulties with another piece of modern technology that Lewis had with him. The day before the temperature reading, on August 24, Lewis reported that his chronometer had stopped again. It had quit on him a couple of times at Camp Dubois, but he had been able to reset it and get it running accurately. It had also stopped on July 15 and now it malfunctioned again just after Lewis had wound it. He could not account for the

cause of the breakdown and began to worry that it might be a defect beyond his ability to repair. It must have been a faulty mechanism or a part that could not stand up to field conditions even at this early date. The chronometer was a key piece of Lewis's scientific equipment and a necessary tool in establishing longitude. Lewis had purchased an Arnold's chronometer of "the most improved construction" from Philadelphia watchmaker Thomas Parker for about $250 while in the east, and scientists in that city had tested it before he left. After some adjustments it seemed to work perfectly. Now it was failing him in the field.

Establishing the party's latitude was not difficult, but getting a longitudinal fix was a daunting task that required precise instruments and higher mathematics. Lewis had received training in taking astronomical observations and in the use of the technical instruments from Andrew Ellicott, an experienced field specialist of Lancaster, Pennsylvania, and from Robert Patterson, professor mathematics at the University of Pennsylvania in Philadelphia. The captain's scientific instruments included artificial horizons, octants, quadrants, sextants, and compasses—the most modern astronomical, navigational, and surveying instruments available. He also carried books and tables to assist him in the work. Lewis was to accumulate data in the field and leave the final calculations and evaluations to experts like Patterson after his return. The plan failed. Lewis was hampered by inexperience, difficult field conditions, and malfunctioning equipment. It did not help that the captain also occasionally neglected to wind his timepiece. But it is equally doubtful that even an field expert like Ellicott could have carried off the operation under the conditions the party met. Lewis faithfully recorded his work, but his observations of longitude proved useless.

Not so the latitude readings, where the captain was not dependent on a faulty

chronometer. To determine latitude one needed only to measure the height of the sun or any bright star from the horizon and make a quick calculation based on printed tables. Lewis carried the requisite instruments and tables and possessed the ability to do the field work without any difficulty. On the middle Missouri Lewis took two such readings, one on August 21 and another on August 27. Lewis's latitude reading of August 21 was taken from a sandbar about four miles above the mouth of the Big Sioux River, and he gave his location as 42° 28′ 29″ North. The location, as well as can be determined given the vagueness of his point of observation, would be near the Dixon-Dakota county line on the Nebraska side and near 42° 30′ North today. Lewis's reading on August 27 was opposite from and near the lower end of a line of bluffs which the party called the "White Chalk Bluffs," near the community of St. Helena, Cedar County, Nebraska. Here the reading was recorded as 42° 53′ 13″ North. St. Helena is approximately 42° 48′ 40″ North, but Lewis may have been north of that point on the other side of the river. Nonetheless, considering the circumstances of the time, he was quite close. Given the vagaries of the Missouri, it's ever-changing course until recent times, and the difficulty of establishing Lewis's exact point of reference, the readings are astonishingly accurate. The difficulty in being more precise about the location of the actual site of the observations lies in assigning modern designations to his position. Considering the multiple ambiguities possible in labeling any particular spot as an expedition site, it is an inexact procedure at best.

The purpose for Lewis's ambitious scientific work was to enable scientists to convert his figures to accurate readings and then utilize the results to make a grand map of the West. Although he did not mention the making of maps, Jefferson's careful instructions about taking

observations of longitude and latitude presuppose a mapping strategy. Jefferson's great interest in maps of the West was well known to Lewis, and the attention given to securing the most accurate maps of the region before the his departure fixes cartography as a principal purpose of the expedition. During the expedition Clark became the principal mapmaker; he is the author of all but a few of the nearly 200 maps from the expedition. Clark's maps are masterfully executed and models of field cartography. Working with crude and unreliable instruments and with no apparent training, Clark did an exceptional job, and his drafting abilities have been universally admired. Clark's mapping accomplished two major objectives: he plotted the route of the Corps on a series of trail maps and he provided a view of peripheral areas based on the best native information available. Clark's great map of the West, published with the first account of the expedition in 1814, alone justified his efforts. It was the beginning of a new generation of accurate maps of the American West—maps that were based on actual field sightings and acute topographic inference. It has been called "a cartographic achievement" and "one of the most influential ever drawn."

With the defects in Lewis's observations, it fell to Clark to use his route maps and preliminary maps of the West to create his post-expeditionary piece. Professional cartographers prepared the final version that eventually appeared in print. It is unclear what techniques Clark used in drafting his trail maps during the expedition. He was basically concerned with "courses and distances." Clark plotted the direction of travel from point to point (traverse notes), estimated the number of miles covered between the points, and calculated the daily mileage accumulation. For the portion of the middle Missouri from Sioux City to Pickstown, Clark estimated a distance of about one hundred and ninety miles. By the

1890s a more accurate survey measured the same area at about one hundred and seventy-five miles, but on a river that had changed its route and reach many times since Clark's day.

The party carried a great number of surveying instruments for determining their location and direction of travel. Some of these scientific instruments may have been used in establishing distances between widely separated points, but for routine measuring it seems likely that the explorers used estimates or the time-honored method of dead reckoning. For "courses" Clark relied mainly on his compass readings, and occasionally, perhaps, he again trusted dead reckoning. Clark set down the party's course of travel on the route maps on the basis of his compass traverse notes, which he placed at nearly every journal entry. He apparently employed the route traverse method, taking bearings at each turn of the trail or bend in the river and plotting those shifts or waypoints on his maps. The background grids on many maps were a useful guide in such plotting.

Clark's original large-scale route maps for the middle Missouri are lost. What remains to depict the region are high quality copies of the missing maps that were made for Prince Maximilian of today's Germany who was going upriver from St. Louis in the 1830s. Four maps from this set cover the middle Missouri from Sioux City to Pickstown and on one there is a glaring error in the course of the river. Just above the mouth of Floyd River in Sioux City, Iowa, the map shows an extreme curve in the Missouri that would take it to the northeast and in the direction of Minnesota. This error does not appear on Clark's post-expeditionary maps so he must have realized the problem and corrected it. It also could be that the copyist for Maximilian made the mistake and the fault was not with Clark's original route map. Nevertheless, these maps are an essential aid to studying the expedition during

this period and an indispensable resource for understanding the Missouri River of 1804. In addition to laying down the windings of the river and the route and campsites of the party, Clark added an incredible array of auxiliary information on the maps. He shows the entrance of all the major, and many minor, affluents of the Missouri; indicates the valley's bluff line and striking geologic outcroppings; locates Euro-American trading posts; denotes Indian villages, hunting camps, and abandoned sites; notes sandbars, islands, and obstructions in the river; and marks prominent springs, hills, and plains near the river's edge. It is easy to see why Clark has received such praise for his cartographic work.

While Clark made his maps, Lewis took occasional astronomical observations but most of the time he was engaged in naturalist activities. Jefferson had carefully tutored him in these pursuits, but Lewis needed little encouragement since he had been interested in nature since his youth. Both Lewis and Jefferson knew that the captain needed additional instruction in the sciences, so besides studying stargazing in Philadelphia he took a crash course in botany, extended his vocabulary of botanical Latin, and gained some training in pressing plants. Benjamin Smith Barton, a professor of botany at the University of Pennsylvania, was his teacher. Jefferson wrote Barton a critical assessment of Lewis's botanical abilities and provided an insight into his judgement of the captain: "Altho' no regular botanist he possesses a remarkable store of accurate observation on all the subjects of the three kingdoms, & will therefore readily single out whatever presents itself new to him in either." Jefferson's letter to Barton also describes a collecting plan that Lewis would utilize. He was not to concern himself with plants that were familiar to scientists in the East but was to describe and collect species that were entirely new.

Beyond describing and collecting plants that were novel or unfamiliar, it is not clear what criteria Lewis employed in his collecting strategy, but the plants he noticed and gathered along the middle Missouri provide a window to his procedures. Some of the plants he selected for describing and collecting had potential horticultural or agricultural value; others were used by the Native Americans in a variety of ways. Here he was following Jefferson's instructions to take special note of utilitarian plants. On August 21 and 24 Clark noticed a shrub with an excellent red fruit that grew profusely on the hillsides. Lewis collected a specimen of this fruit, the buffaloberry, *Shepherdia argentea,* on September 4 while the party was at the mouth of the Niobrara River. Missouri Indians prized the buffaloberry and utilized it in a number of ways. Of course, the berries were eaten right off the vine, especially after first frost when they were at their sweetest, but they were also dried and boiled and used to make juice. On his collecting tag Lewis indicated that the berry tasted like the cranberry. The berries were often pulverized and added to pemmican (dried buffalo meat) for flavor, giving a reason for the French boatmen's term for the plant, *graisse de boeuf,* "buffalo grease."

Clark gave only passing mention to another plant of even more utilitarian value. On August 31 he recorded that the Sioux substituted a plains potato for bread. Indian breadroot, *Pediomelum esculentum* (previously, *Psoralea esculenta*), is known by a number of common names, but all reflect Clark's observation, as did the French *engagés'* name for the plant, *pomme de terre,* "ground apple" or simply "potato." This root, probably the most important wild food gathered by Plains Indians, was a staple of their diet. The captains would encounter it often as they crossed the plains. Lewis wrote lengthy descriptions of its ethnobotanical uses, and at some unknown time and place along the Missouri he collected and preserved a

specimen of it.

Many of the species that Lewis collected on the expedition had showy flowers or other outstanding visual display. Perhaps these were the qualities that attracted him to the Rocky Mountain bee plant, *Cleome serrulata,* which was also used extensively by Plains Indians. They ate the tender shoots and leaves, and they boiled and dried the stems for later use. The plant also had medicinal and ceremonial value to river tribes. As the name implies, bees are drawn to its showy pink flowers. It may have been the plant's attractive display and the buzzing activity around it that caught Lewis's attention and caused him to collect a specimen on August 25 above the mouth of the Vermillion River.

As the party passed the Niobrara River in northeast Nebraska, they were entering a distinct floral and environmental zone and began to observe plants entirely new to them. Above the Niobrara Lewis would be able to fulfill Jefferson goals in his collecting strategy and find specimens entirely new to science. From this point onward the party saw subtle changes in the landscape. The number of trees decreased, except for the ubiquitous cottonwoods and willows along river edges and scattered sandbars, and the hills appeared more barren and bald. Gone was the familiar eastern deciduous forest. They had moved into mixed-grass country, leaving behind the tall-grass prairies of the lower Missouri. An unbroken and featureless landscape loomed before them and mineral salt deposits were seen more often at the surface level. Short grasses and drought-tolerate species began to predominate as rainfall diminished. Crossing the 98th meridian, they entered the High Plains portion of the Great Plains of North America. The explorers would not emerge from this treeless grassland until August 1805 when they ascended the Rocky Mountains. The pasture sagewort, *Artemisia frigida,* that

Lewis collected on September 2 above Gavins Point Dam, probably on the Nebraska side of the Missouri, is a representive plant of this area. On his collecting tag Lewis noted that it was a "growth of the open high situations." Today this aromatic herb is first found on the Missouri not far below the mouth of the Niobrara and probably in the area where Lewis collected it. As Lewis noted, it is generally found on dry hills and open plains and thrives in the dry, often harsh climate of the northern plains.

In the area of the Niobrara and above it, the party also began to encounter distinctive animals of the Great Plains. In August Joseph Field had killed the first buffalo, *Bison bison,* the quintessential mammal of the plains and one of its most numerous inhabitants. From the top of Spirit Mound Clark saw upwards of eight hundred buffalo and elk feeding on the plains, but this was a small herd compared to later sightings. On returning to the middle Missouri in August 1806 Clark wrote in wonder: "I ascended to the high Country and from an eminance I had a view of a greater number of buffalow than I had ever seen before at one time. I must have seen near 20,000 of those animals feeding on this plain." By Lewis and Clark's time the geographic range of the buffalo had already been reduced, and the animal had been driven out of the eastern United States by the end of the eighteenth century. Now bison thrived on the great grasslands of the trans-Missouri West with estimates of their numbers ranging from thirty to seventy million. The bison became the mainstay of Plains Indians life, and the animal's destruction accompanied the end of their nomadic, buffalo-hunting existence. From their high numbers in Lewis and Clark's time, the bison diminished rapidly after the Civil War until by the mid-1880s there were only a few hundred in captivity and less than one hundred in the wild.

On September 3 a few miles below the Niobrara Clark noticed "several wild Goats." This was the party's first encounter with pronghorn, *Antilocapra americana,* more frequently called antelopes, or simply goats, as with Lewis and Clark. Although pronghorns had been seen by Spanish explorers in the Southwest in the sixteenth century, Lewis and Clark are credited with the scientific discovery of the animal because of their detailed descriptions. During the expedition's time pronghorns may have been as numerous as buffalo, perhaps numbering thirty or forty million; today there are about one million. Lewis was astonished at the animal's speed and later commented: "when I beheld the rapidity of their flight along the ridge before me it appeared reather the rappid flight of birds than the motion of quadrupeds. I think I can safely venture the asscertion that the speed of this anamal is equal if not superior to that of the finest blooded courser." Pronghorns are native only to North America and are considered the fastest land animal on the continent. They have been clocked at sixty-one miles per hour; only the cheetah of Africa is faster, while an American quarter horse is considerably slower.

Two days after sighting their first pronghorn, the captains saw several others and "Deer with black tales." Up to the Niobrara the party had been seeing the familiar white-tailed deer; after that point they also encountered the characteristic deer of the West. Lewis and Clark were the first to give the mule deer, *Odocoileus heminonus,* its most common name; they also called it the black-tailed deer after another distinctive feature. The captains are also acknowledged to have written the first accurate descriptions of the mule deer; thus they are counted as the animal's scientific discoverers.

Sighting a hill nearly seventy feet in height on September 7, Lewis and Clark took a

walk to it, probably hoping to find a vantage point from which to view the valley and the river's course. The hill in eastern Boyd County, Nebraska, is known today as Old Baldy. From its top one can get the view that the captains anticipated, and from there one sees modern Fort Randall Dam a few miles to the northwest. But what caught the captains' attention was the discovery of a little animal new to them and to American science. They had mentioned the prairie dog, *Cynomys ludovicianus,* earlier, but here at the base of Old Baldy they found an entire village of them. The men spent a great deal of time trying to collect a specimen, which the captains called "barking squirrels," and which the Frenchmen called *petite chien,* "little dog." They dug six feet into the hard clay soil without luck and then carried several gallons of water from the Missouri before they finally flushed a little critter from its hole. Clark wrote a brief description of it this day and Lewis gave longer reports in May 1805 and July 1806. Lewis was the first to comment on the animal's ability to go without water, which like other arid-land rodents it did by obtaining sufficient water in its food and retaining it efficiently. Adaptation to aridity was not left only to High Plains flora. The following spring the captains sent a live prairie dog to Jefferson from Fort Mandan. It is not known if it was the prairie dog that bubbled up here.

Canadian fur traders reported on the grizzly bear before Lewis and Clark wrote their extensive comments on the animal. Their reports, however, do not detract from the contributions that the captains made to understanding the range, habits, and physical characteristics of the grizzly. George Ord, who supplied the scientific name for the species in 1815, relied mainly on the notes of Lewis and Clark for his description. The expedition's first notice of the grizzly was made on September 1 near Gavins Point Dam, but a close encounter

did not occur until October 20. The captains could not decide on a single name for the animal, especially since they were not sure if they were always seeing the same species, so they variously called it the white, yellow, brown, gray, and grizzly bear. After discussions with Native Americans they came to realize that these were all color variations of one species, the grizzly bear, *Ursus horribilis* (now commonly grouped under *U. arctos*).

They saw no more grizzlies in 1804 after the October encounter, perhaps because the bears had gone into winter caves for hibernation. The men discounted Indian stories they heard during the winter about the ferocity of the bears. Out on the plains again in the spring of 1805 Lewis wrote: "The men as well as ourselves are anxious to meet one of these bear." They did not have to wait long. A limited encounter came on April 29, near the Yellowstone River, when Lewis and a companion met two grizzlies, both of which the men wounded. One bear pursued the captain but was so badly hurt that Lewis was able to reload and kill him. The confident captain wrote: "the Indians may well fear this anamal . . . but in the hands of a skillfull riflemen they are by no means as formidable or dangerous as they have been represented." Lewis would soon be less assured.

A bear killed on May 5, 1805, near the Milk River gave some pause. Lewis observed that it was extremely difficult to kill. Although it had taken ten shots, five of them to the lungs, it was able to swim to a sandbar in the middle of the river and live for another twenty minutes. The next day when the party saw a grizzly, Lewis commented that "the curiossity of our party is pretty well satisfyed with rispect to this anamal . . . [it] has staggered the resolution of several of them, others however seem keen for action with the bear." The chance for the men of action came on May 14 when six hunters went after a single bear. A

volley of four balls ripped into the animal, but it simply charged ahead, took two more rounds from a second volley, and kept coming. One of the balls broke the animal's shoulder, slowing it slightly, but even so it was on them quicker than they could believe. The terrified men ran pell-mell toward the river. Two made it to a canoe while the others took cover, hastily reloaded, and fired again. When the bear turned on them, they flung aside their rifles and plunged down an embankment, the grizzly tumbling after them into the water. Finally a rifleman on shore put a round through its brain, killing it instantly. They found eight balls in its carcass.

Lewis had his own skirmish a month later at the Missouri's Great Falls. Against good judgement he was out hunting alone when he noticed a large grizzly approaching. Raising his gun to shoot, he realized he had not reloaded his rifle after killing a buffalo. With the bear at his heels he took off across the plains, plunged into the river, and turned to face the bear with his espontoon (an officer's lance), but to his surprise and relief the bear lumbered away. Lewis quickly reloaded his gun and promised himself never to delay reloading again. He concluded: "I must confess that I do not like the gentlemen and had reather fight two Indians than one bear."

Scientific examinations of the earth were less thrilling but included their own sorts of hazards. While carrying out geologic investigations in Jackson County, Nebraska, on August 22 Lewis became nauseated by fumes from some unknown substance. As one writer has noted, the captains not only observed nature but also touched, tasted, and smelled. Lewis may have experienced more than he intended. In the bluffs where he was working he found alum, copperas, and pyrite, but none of these substances would have caused the malady. It

remains a mystery, but the captain recovered soon enough. Although Jefferson gave little attention to geologic matters himself, it was an area of interest to Lewis and in addition to his written descriptions he also collected specimens from the earth. Clark was also on the look out for interesting phenomena, so it was that on August 24 he called attention to some fire-damaged bluffs, still hot to the touch. What Clark noticed at this point was a bluff that later became known as Ionia Volcano, near the now defunct town of Ionia, Dixon County, Nebraska. Before 1900 some scientists believed that the bluff was a true volcano, caused to erupt when the flooding Missouri River poured water over molten rock below the surface. Later investigations proved that the eruptions were due to heat when damp pyritiferous and carbonaceous shale oxidized on fresh exposure as the river bluffs eroded and fell away.

Even more curious were a series of formations that the party noticed on September 2 in Bon Homme County, South Dakota. Clark conducted an elaborate survey of the natural wind-blown formations near the party's camp for the night. The captain also wrote an extensive description of the phenomena and drew detailed maps of the structures which he called the "Antient Fortification." He believed the formations to be constructed artifacts similar to ones left by the Mound Builders in the Ohio valley. Given his military background and knowing the warring conditions of the Missouri valley, Clark thought he saw defensive earthworks and his words matched his view. Where others might see mundane exposures of wind-born sand ridges, Clark saw ravelins, sallyports, gouges, and hornworks—military terms describing defensive fortifications and earthwork ramparts.

With less imagination than Clark and better knowledge of geologic phenomena, the features are now explained as scroll bars that form along the inside of river meanders during

flooding. When the meandering Missouri changed its channel, heaps of sand and gravel were left behind to form low mounds on a rectangular plan similar to those built up for a fort. Here along the Missouri River Clark found immense formations. One of the largest measured nearly sixteen feet high and sixteen feet across at the top, standing on a base over one hundred feet wide. The French *engagés* told him that there were similar phenomena on the Osage, Kansas, and Platte rivers. Controls on modern rivers have diminished the size and occurrence of such features and they have disappeared from this area entirely.

If Jefferson's instructions to Lewis pointed to the importance of Native Americans in the exploration, the captains were having little luck in locating natives with whom to carry out the president's directives. From St. Louis to the middle Missouri there had been only one occasion to meet Indians and try out their diplomatic skills. North of modern Omaha, Nebraska, the party had established a camp which they called Council Bluff (not to be confused with Council Bluffs, Iowa). Here the captains met and negotiated with Oto and Missouria Indians and established a pattern for diplomacy with Indian dignitaries that would be repeated across the continent. Now on the middle Missouri they had a second chance at negotiating and an opportunity to sort out the complex relationships of Siouan people.

As the party passed the James River on August 27 an Indian boy gained the men's attention and was quickly joined by two others as the explorers pulled their boats ashore. The young men told Lewis and Clark that there was a Yankton Sioux camp nearby. The captains dispatched Pierre Dorion, Sr., and Sergeant Nathaniel Pryor to the village where they were enthusiastically received while the main party moved on to a rendezvous spot. The captains had met Dorion in central Missouri. Learning that he had lived and traded with the Yanktons

since the 1780s, they convinced him to join them with the idea that he would lead some Yankton chiefs back to Washington for conferences with the president. He would also be useful as an mediator and interpreter with the tribe and could provide information about the region generally. On August 28 the party arrived at Calumet Bluff in Cedar County, Nebraska, just below Gavins Point Dam, and set up camp for a round of Indian negotiations. The Corps would remain at this camp until September 1, then leave Dorion behind after meeting with the Yanktons.

While the party waited for the Yanktons at Calumet Bluff, the enlisted men busied themselves making tow ropes and Clark prepared a speech for the Indians. At 4:00 p.m. on August 29 Pryor and Dorion arrived with about 70 Yanktons who set up camp across the river. Among the Indians were three chiefs, so the captains sent over meat, corn, and tobacco, and prepared for a council the following day. Pryor had been welcomed by the Sioux and offered dog to eat as a token of respect. The sergeant informed Clark about the nature of the Sioux camps. He found their tipis quite handsome, being made of buffalo skins and decoratively painted, orderly arranged, and holding ten to fifteen persons each. That he said nothing about the number of warriors at the village or the tribe's armaments, says much about the explorers' attitudes towards these people.

The next morning the Yankton chiefs were brought over to Calumet Bluff and the captains delivered their standard Indian speech. Although not recorded on this occasion, the speech probably announced American sovereignty over the new lands, then pled for peace among the Indian tribes, promised increased trade, explained the purposes of the expedition, and requested Indian leaders to journey to the capital. Dorion would stay behind to convince

the chiefs to accede to the realities of the new American presence. Afterwards the captains handed out gifts and gave special attention to high-ranking individuals by giving them commissions and flags. Not having finished the negotiations, the council was carried over to August 31. That day continued as before with exchanges of gifts and delivery of speeches. Among the Yankton chiefs to speak, both Shaking Hand and Half Man spoke of the tribe's need for reliable trade and of the most-desired goods, arms and ammunition headed their lists. They were probably hoping that the captains would open the stores of the keelboat that day and bring out the desired merchandise. The Yanktons did not understand the nature of the expedition; the captains came as emissaries with future promises, not traders with ready goods.

Clark took a Sioux vocabulary during the time at Calumet Bluff and obtained information about the Yanktons from Dorion. Clark also tried to sort out the complicated nature of Sioux tribes and bands. The Sioux or Dakota people may be classified into three regional and linguistic divisions from east to west: Santees, Yanktons-Yanktonais, and Tetons. Later in the nineteenth century the Sioux referred to themselves as the "Seven Council Fires," although they were never known to have a central government. Four of the seven councils were Santees, while the remaining three were the Yanktons, Yankonais, and Tetons. To further complicate the branches of the Sioux, the Tetons (or Lakotas) are further subdivided into seven tribes, including the better known Oglalas and Hunkpapas. For Clark to be able to sort these various groupings in the brief time he visited the Yanktons was impossible. His notes demonstrate an awareness of the divisions but not a clear grasp of the nuances. While at Fort Mandan during the winter of 1804–5, he developed an elaborate

"Estimate of Eastern Indians," and gave greater attention and more understanding to Sioux synonymy. But it took decades and the modern studies by linguists and ethnohistorians to develop a full understanding of Sioux linguistic and cultural divisions.

Throughout the eighteenth century the Yanktons, Yanktonais, and Tetons had been moving west, making the change from a woodlands people to the life of High Plains buffalo hunters. The Yanktons of the middle Missouri were a transitional people who never converted to an entirely nomadic, buffalo-hunting life. Part of the year they occupied villages along the Missouri and subsidiary streams like the James where they cultivated corns, beans, squash, and tobacco, and harvested natives plants like Indian breadroot. At other specified seasons, they entered the plains and hunted buffalo. After acquiring horses about 1750, they had steadily but not fully given over to the buffalo culture. A small tribe—Clark counted about 1,600 Yanktons—they never acquired the renown and dominance in their region that the Tetons did in theirs. Moreover, they did not put up a fierce resistance to Americans in the mid-nineteenth century as their Lakota brethern. After the Civil War they were relegated to reservations in South Dakota where their descendants remain today.

Given his military background, Clark was particularly intrigued by one group of Sioux warriors that he observed among the Yanktons. The *akicita,* a soldier society or warrior fraternity, served not only as battle units in the field but also as a fraternal organization at home. Such groups were characteristic of the Sioux and other plains tribes who needed to keep order in the field, discipline in battle, and reward heroism against enemies. The societies also acted as civilian police during peace-time by maintaining orderliness in the villages and on the march into buffalo country.

To the Rocky Mountains the Missouri was the party's river of reference. Each day the captains gauged its conditions, sometimes with more than a little apprehension, and they were always on the lookout for obstructions that were a common feature of river life. The captains recognized the Missouri's tendency to wander across its valley floor. They mapped and measured its sinuous course from its mouth at the Mississippi to its Rocky Mountain heights. In a natural state rivers with room snake across their valleys, but the Missouri is particularly notorious for its unrestrained meanderings. Not only does the valley of the middle Missouri provide space enough for a wandering, ever-changing course, but annual spring floods carrying heavy loads of debris and silty deposits allow the river to remap its route almost annually. Meanders are a natural feature of rivers because the winding course enables a river to keep an even slope as it flows toward the sea and minimizes the energy used by the stream. The river takes the path of least resistance, dodging obstacles, breaking against bluffs, and generally overrunning whatever gives easily away. Indeed, in recent time meanders on the Missouri have been measured to migrate across the floodplain at a rate of about 250 feet a year. In Lewis and Clark's time the migration would have been much more dramatic.

Besides working against the relentless current that sought to push them back to the Mississippi, the explorers had to evade hindrances that the river threw in their path. On August 26 Clark wrote that the river was crowded with sandbars. Two days later, still filled with sandbars, the river suddenly revealed a hidden snag that tore through one of the pirogues and nearly sank it. The damage was so great that the boat was practically unfit for service. After another dozen days, as the party left the middle Missouri, Clark conceded, "the Sand bars So noumerous, it is not worth mentioning." Sandbars and snags, and planters and

sawyers were obstacles that quickly made Missouri river experts out of Virginia horsemen. A traveler either learned to read the river quickly and correctly or boat, cargo, and occupants suffered the consequences of ignorance. The Corps was fortunate to have skilled French boatmen to wield the poles and pilot the boats. Pierre Cruzatte, of French and Omaha descent, was such a man. He was hired at St. Charles, Missouri, because of his river knowledge and boating skills, but he also brought another talent to the Corps. His fiddle playing provided many a night of tuneful relief to bone-weary boatmen and entertained Indians who watched the explorers dance to his bow. Unlike other French *engagés,* Cruzatte became a member of the permanent party but is best remembered for accidently wounding Lewis during the return trip in 1806. His expert hand navigated the boats around many potential disasters.

When the party reached the Niobrara River on September 4, they had not only arrived at the point of a new ecological zone and a geographic demarker, they had also reached one of the distinctive confluents of the Missouri watershed. The Niobrara was a sandbar strewn, prairie river even more so than the Missouri. Lewis and Clark knew it by the name used by the French hands, *qui court*, the "rapid river." Clark walked three miles up the stream to determine its character. He found the river swift, shallow, and wide, much like the Platte River he had examined below, but throwing out a much coarser sand than the Platte. And like the Platte, the Niobrara conditioned the Missouri for some miles below its entrance and made it less the "Big Muddy" in this stretch of the river. But studying subsidiary streams was short-term employment. The party pushed on. The Corps wintered in North Dakota in 1804–5, followed the Missouri to the Rockies, crossed those peaks and descended the Columbia River

to the Coast, wintered in Oregon in 1805–6, and started for home in the spring.

Hurrying home on the return trip in the late summer of 1806 the party passed quickly through the middle Missouri. The investigations that had occupied the captains' time on the trip upriver were unnecessary on the way down. It was familiar terrain. Now was the time to bend to the paddles and race home with the current. But the unpredictable weather of the Great Plains could still delay the best of plans and throw hazards in the way of unwary explorers. During the early morning hours of August 31, 1806, while the party camped above Fort Randall Dam, the weary travelers were wakened by hard rain, joined by lightning and thunderclaps. A sudden squall of wind broke the securing cables of two canoes and sent the boats and their sleeping occupants blowing across the river. It was two o'clock in the morning before a rescue party was able to assist the men in getting safely to shore. "All wet and disagreeable," was the way Clark put it.

Moving on during the day, the party passed Old Baldy and the village of prairie dogs that had so intrigued the captains on the previous passing. The next day the party brought two years of exploration together as they passed Bon Homme Island, the "antient fortification," and their camp of September 1, 1804, at Calumet Bluff. Clark took the opportunity to augment his notes on the mounded sand ridges and make additional maps of the phenomenon. The men initially got a scare when some of the party encountered Sioux Indians during the day who they thought to be a war party. The Indians turned out to be friendly Yanktons, but the captains did not linger for long talks. They gave them some small trinkets from their meager supply of goods and sent them off to their village with renewed pledges of peace and friendship.

On September 3, 1806, the captains met traders who were coming upriver to barter with the Sioux. James Aird was at the head of two boats filled with trade goods he had brought from Prairie du Chien, Wisconsin, and from St. Louis. The Scotsman Aird had been a trader out of the Great Lakes region since 1779 and was now working for Robert Dickson, one of the leading traders on the upper Mississippi. Aird had declared himself an American in 1805 in order to better his chances in the Missouri trade, but his allegiances were slippery. During the War of 1812 he was a British agent, but before he died in 1819 he was working for the American Fur Company. He was the first of many traders coming upriver that the captains would meet before they arrived at St. Louis. He had much news for the captains.

The captains first wanted to know about the president and the state of political affairs in the United States. Aird gave what information he had, but on politics it was spotty. If he told them about Jefferson's re-election, the captains did not record it. But he had other interesting news to tell, so the information-famished captains stayed up late to quiz him for every tidbit. They learned that the house and furnishings of Jean Pierre Chouteau, the St. Louis fur trader and friend of the captains, had been lost in a fire; that General James Wilkinson was the governor of Louisiana at St. Louis; that United States troops had taken a Spanish post a few miles west of Natchitoches, Louisiana, in order to stop smuggling and illegal border crossings; and that American vessels had been fired on by Spanish gunboats near Algercias, Spain, and by a British warship off New York. Although the latter incident is not directly connected, such acts eventually led to the War of 1812 between the United States and Great Britain. Perhaps the most surprising news of all was that Aaron Burr and Alexander Hamilton had fought a duel in which the latter man was killed. Lewis must have been

personally acquainted with both these men, but since he was not keeping a journal during this period, his reaction to the news is not known.

Before separating the next day, the captains purchased enough tobacco from Aird to get the party back to St. Louis. Aird also gave the captains a barrel of flour and the officers gave him about six bushels of corn. Each man in the party was rationed a cup of the trader's flour. Incredibly, the men still had a little flour with them from a supply that the men had buried at the Marias River in Montana. At noon the party reached Floyds River and delayed while several men climbed the hill to pay respects to their departed comrade. Indians had opened the grave and left it partially uncovered, so the men filled it up again. Near the grave Clark noticed a stand of flourishing black walnut trees and he watched the flight of geese and pelicans in the evening. Mosquitoes so troubled the men during the night that they got little sleep, but the rain had ceased and they were able to dry out a bit. The party traveled thirty-six miles that day, a short distance for travelers anxious to get home. They had moved beyond the reach of the middle Missouri.

The middle Missouri can serve as a microcosm of the expedition. Nearly all the activities that the party was to engage in were acted out in this region: ethnographic investigations, diplomatic councils, astronomical and weather observations, cartographic drafts, ecological considerations, scientific inquiries, military activities, and geographic discoveries. Add to these the regular round of daily activities and one gets a snapshot picture of the entire exploration during this brief period. But if there is a sameness on the middle Missouri when compared to the trip as a whole, it is also unique in its time and place. The only death on the expedition occurred here, Clark took a singular temperature reading during

a period when he made no other weather observations, the party moved into unfamiliar environmental zones encountering new species and a changed climate and terrain, and the Corps made contact with one of many divisions of the great Sioux nation of Indians. Like so many points on the compass of Lewis and Clark's exploring world, the middle Missouri was ordinary and routine at the same time that it was extraordinary and rare. It holds both a standard and a special place in the history of the expedition.

Appendix: Principal sites and events

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1804	Site or event
August 20	Floyd's death and burial
August 21	Lewis's latitude reading, 42° 28′ 29″
August 21 & 24	Description of *Shepherdia argentea,* buffaloberry
August 22	Lewis nauseated by fumes
August 22	Gass chosen sergeant to replace Floyd
August 23	First buffalo killed by member of party
August 24	Passed bluff later called Ionia Volcano
August 24	Vermillion River reached
August 24	First indication that York carried a gun
August 24	Spirit Mound discussed
August 24	Lewis's chronometer malfunctions again
August 25	Spirit Mound visited and described
August 25	Only temperature reading between May 14 and September 19
August 25	Collect specimen of *Cleome serrulata,* Rocky Mountain bee plant
August 26	Official appointment of Gass as sergeant
August 26	Shannon sent out to find horses, not to return until September 11
August 27	Search for Shannon begins
August 27	Lewis's latitude reading, 42° 53′ 13″
August 28	Consider sending a return party, not actually to occur until April 1805
August 28–31	Camp at Calumet Bluff
August 29	Yankton Sioux arrive at Calumet Bluff camp
August 30–31	Meet with Yankton Sioux; exchange gifts, give speeches, demonstrate air gun
August 31	First mention of *Pediomelum esculentum,* Indian breadroot
September 1	Clark mentions abundance of fish
September 1	First mention of *Ursus horribilis,* grizzly bear

1804	Site or event
September 1	Collect specimen of *Mirabilis nyctaginea,* wild four-o'clock
September 2	Survey formations in Bon Homme County, South Dakota
September 2	Collect specimen of *Artemisia frigida,* pasture sagewort
September 2	Collect specimen of *Dalea purpurea,* purple prairie clover
September 3	First sighting of *Antilocapra americana,* pronghorn
September 3	Signs of Shannon, but not found
September 4	Camp at Niobrara River, investigate the stream
September 4	Collect specimen of *Shepherdia argentea,* buffaloberry
September 5	First sighting of *Odocoileus hemionus,* mule deer
September 5	Lewis's second description of *Pituophis melanolecus sayi,* bullsnake
September 5	Collect specimen of *Quercus macrocarpa,* bur oak
September 5	Collect specimen of *Rosa arkansana,* prairie wild rose
September 6	Colter unsuccessful in finding Shannon (rejoins September 11)
September 7	Old Baldy described and camp established nearby
September 7	First description of *Cynomys ludovicianus,* prairie dog
1806	**Site or event**
August 31	Storm during night causes two canoes nearly to be lost
August 31	Old Baldy highest point Clark observed *Sciurus niger,* fox squirrel
September 1	Meet and hold council with some Yankton Sioux
September 1	Camped near Calumet Bluff camp of August 28–September 1, 1804
September 1	More examination of formations in Bon Homme County, South Dakota
September 2	Find trading house of Robert McClellan, below mouth of James River
September 2	Clark finds American linden and slippery elm at their limit on Missouri River
September 3	Meet trader James Aird coming upriver; get news of events in U.S.
September 4	Obtain tobacco from Aird
September 4	Visit and make repairs to Floyd's grave

Select bibliography

Allen, John Logan. *Passage through the Garden: Lewis and Clark and the Image of the American Northwest*. Urbana: University of Illinois Press, 1975.

Ambrose, Stephen E. *Undaunted Courage: Meriwether Lewis, Thomas Jefferson, and the Opening of the West*. New York: Simon & Schuster, 1996.

Barkley, T. M., ed. *Flora of the Great Plains*. Lawrence: University Press of Kansas, 1986.

Bedini, Silvio A. "The Scientific Instruments of the Lewis and Clark Expedition." *Great Plains Quarterly* 4 (Winter 1984): 54–69.

Botkin, Daniel B. *Passage of Discovery: The American Rivers Guide to the Missouri River of Lewis and Clark*. New York: Perigee, 1999.

Chuinard, Eldon G. *Only One Man Died: The Medical Aspects of the Lewis and Clark Expedition*. Glendale, Calif.: Arthur H. Clark, 1979.

Cutright, Paul Russell. *Lewis and Clark: Pioneering Naturalists*. 1969. Paperback reprint. Lincoln: University of Nebraska Press, 1989.

DeVoto, Bernard, ed. *The Journals of Lewis and Clark*. 1953. Reprint. Boston: Mariner Books, Houghton Mifflin, 1997.

Jackson, Donald, ed. *Letters of the Lewis and Clark Expedition with Related Documents, 1783-1854*. 2d ed. 2 vols. Urbana: University of Illinois Press, 1978.

Moulton, Gary E., ed. *The Journals of the Lewis and Clark Expedition*. 12 vols. to date. Lincoln: University of Nebraska Press, 1983–.

Ronda, James P. *Lewis and Clark among the Indians*. Lincoln: University of Nebraska, 1984.

Part II:

Locating Lewis and Clark Sites

Locating Lewis and Clark Sites

A review of the journals and maps of Meriwether Lewis and William Clark covering our study area from the location of the present-day city of Sioux City, Iowa, to the location of Fort Randall Dam in South Dakota, allowed us to produce a list of 39 different places or sites visited, investigated, described, or commented upon by the captains. These sites included 20 campsites, 3 Indian villages, the mouths of 13 rivers or creeks, and 5 bluffs or peaks (a total exceeding 39 because some camps were located at one of the rivers or bluffs). Although it is relatively simple to make a list of sites from the journals and maps of Lewis and Clark, it is very difficult to locate most of those sites today, on the ground within this study area, with any reasonable degree of certainty.

One way to understand this difficulty is to consider one of the very few of more than 660 campsites that has ever been precisely located, that is, the Lower Portage Camp on the Missouri River, about 10 miles east of Great Falls, Montana. In 1998, archaeologist Ken Karsmizki announced finding the first conclusive evidence for the location of this site, one of the longer-occupied campsites of the journey. The explorers camped above the floodplain for 12 days in June 1805, stored food and supplies for their return in a cache, and prepared for an upcoming month-long portage by butchering meat, dressing animal skins, repairing their canoes, and constructing wagons in which to carry their goods. Evidence of the exact location of this camp was found only after a 12-year search. (Carolyn M. Buan, *American Archaeology*, spring 1999, 11-16.)

In contrast, all but 8 of the sites in our study area are on the Missouri's floodplain. At only one of the campsites did Lewis and Clark remain for more than one night; that for 4 nights near Calumet Bluff at a location described in the journals as "below the Calumet Bluff in a Plain on the L.S. [Nebraska] side." The 8 sites above the flood plain include the 3 Indian villages and the 5 bluffs or peaks.

Two general factors contribute to the difficulty of identifying the location of Lewis and Clark sites within the study area on the ground today. First is the imprecise information in the original journals and maps, including unreliable calculations of latitude and longitude. In fact, the original maps for our area are lost. The earliest available are copies made by Clark for Prince Maximilian of Wied in 1833. The second reason for the difficulty in locating sites is the substantial change to the Missouri River since the journey. For decades, large-scale seasonal flooding changed the river's channel frequently, also affecting its tributaries; since the mid-20th century, human efforts to control this flooding through channelizing downstream and damming upstream have had significant effects on the river in the study area.

Over the years many individuals, scholars and enthusiasts alike, have pursued the

goal of precisely locating Lewis and Clark sites. Among them is Robert Bergantino, who has developed approximate latitude and longitude figures for all of the campsites. Also, Martin Plamondon II has taken advantage of new digital technology to overlay a series of maps from Clark's originals to recent satellite images; and so by comparison over time proposes to identify the locations of sites. Others have undertaken similar research, focusing on one or more sites or on portions of the trail.

These kinds of studies can be intellectually stimulating and enjoyable while providing useful information, but none can provide the precision needed to locate a site on the ground. Such investigations will no doubt aid in locating some sites. Unfortunately, they are not very helpful for our study area. The frequent and substantial changes to the course of the Missouri in this area mean that pinpointing the majority of the sites in our area, more precisely than the general locations that can be gotten from the original sources, is extremely unlikely. Further, because most of our sites were occupied only briefly and were located on the floodplain, the likelihood of finding any archaeological evidence is so remote as to be regarded as impossible, even if further research should narrow the parameters of the general locations for one or more of these sites. Most of the places visited, investigated, described, or commented upon by Lewis and Clark in the study area cannot be located with a degree of certainty that allows for the ground-truthing initially envisioned by the Missouri National Recreational River managers for this project.

Because the ultimate purpose of the project is to assist in interpreting Lewis and Clark within the study area for the general public, a set of 5 criteria was developed by which to select particular sites for ground-truthing, from among all of those places mentioned in the journals and noted on the maps of Lewis and Clark:

Authenticity: The site is as near as possible to the original Lewis and Clark site, while acknowledging the problems of precision for this section of the Missouri River.

Access: The site must be reachable from established highways or reliable roads.

Ownership: The site should be under the control of a public agency; or a private individual or a tribal government that will allow access to it.

Historical worth: The site should have noteworthy events connected to the expedition, not simply mentioned in passing.

Scientific Significance: The site may have expedition scientific studies associated with it, for example, the discovery of new plant or animal species, the collection of botanical specimens, descriptions of major physical features, or weather commentary.

First, the three Indian villages were eliminated. Currently, these are unprotected archaeological sites, almost certainly containing burials. It was deemed unwise to draw public attention to them. Information about their locations, maintained by the Nebraska State Historical Society in Lincoln, is accessible under conditions designed to protect their integrity while allowing reasonable research.

Next, the criteria were applied to the sites remaining on the list originally compiled for the study area. Ten sites fit these criteria; although, not all 5 criteria are equally applicable to all of the sites:

Site #1 Floyd's Bluff
Site #2 Gass's Election
Site #3 Ionia Volcano
Site #4 1804 Mouth of the Vermillion River
Site #5 Spirit Mound
Site #6 Shannon's Absence
Site #7 Calumet Bluff
Site #8 "Ancient Fortifications"
Site #9 Mouth of the Niobrara River
Site #10 Old Baldy

Finally, a revised list of sites and events was drawn up to include in chronological order the 10 sites chosen, the events associated with these sites, and significant events that occurred within the study area but cannot be precisely located. [See the 2 pages following]

Interpretive signs or markers currently exist for some of these sites; some are also routinely mentioned in brochures and guides to area attractions. All of the 10 sites have the potential for new or enhanced interpretation through a variety of methods including markers, brochures, maps and audio-tapes for self-guided tours, as well as guided tours and on-site lectures, storytelling, and re-enactments.

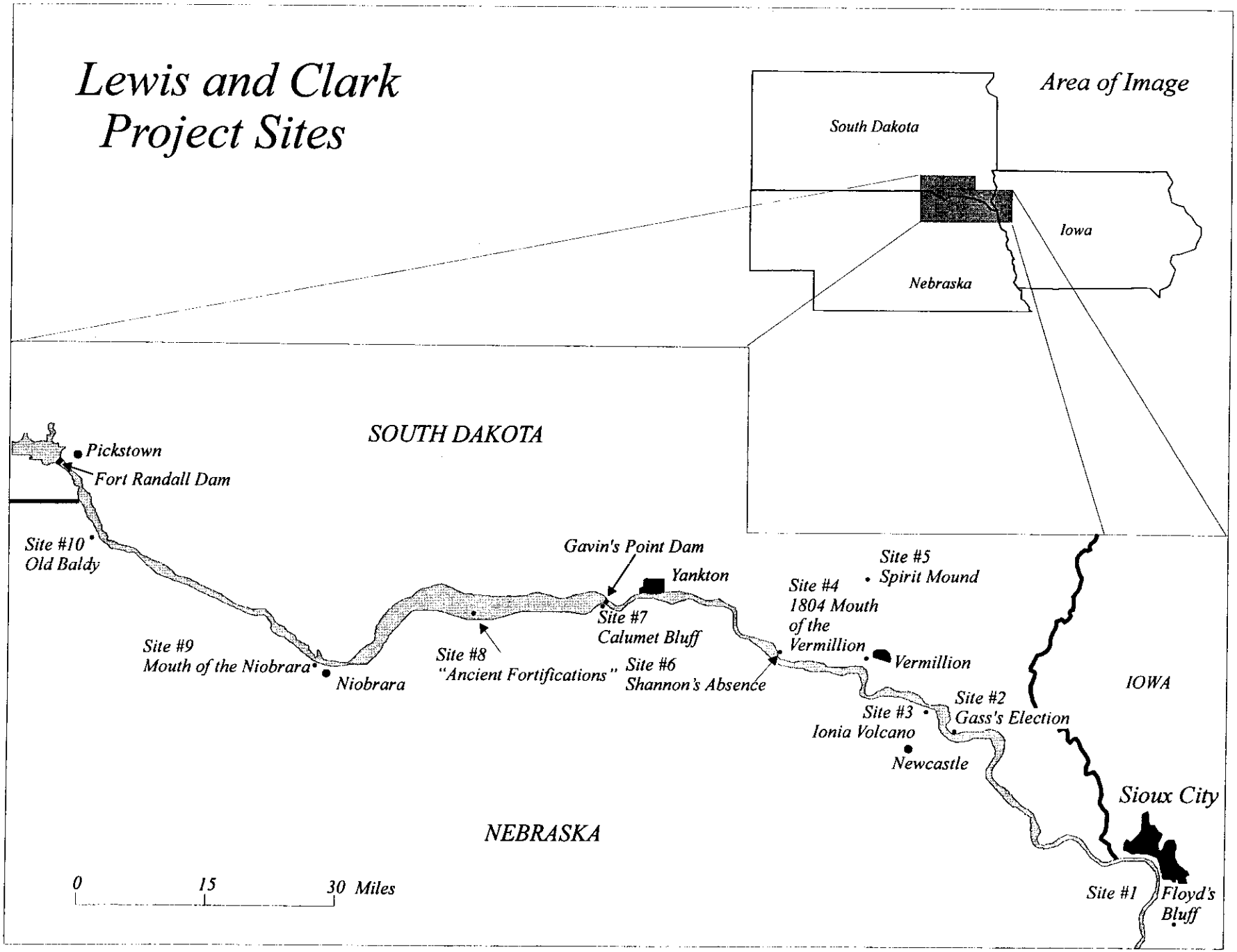
The natural history of the area as described and documented by Lewis and Clark is a general theme linking all of the sites that provides an opportunity to enhance the current interpretation of the are. Another general theme with similar potential is the personal or "human" aspect of the journey from the perspective of its participants. In addition to these general themes, each site suggests particular subjects for interpretation that are listed in the evaluative profiles that follow.

Lewis and Clark Sites and Events

Missouri River Reconnaissance Survey

ID	1804	Site or event
1	Aug 20	Floyd's burial site
	Aug 21	Lewis's latitude reading, 42° 28′ 29″
	Aug 21 & 24	Description of *Shepherdia argentea,* buffaloberry
	Aug 22	Lewis nauseated by fumes
2	Aug 22	Gass chosen sergeant to replace Floyd
	Aug 23	First buffalo killed by member of party
3	Aug 24	Passed bluff later called Ionia volcano
4	Aug 24	Vermillion River
	Aug 24	First indication that York carried a gun
	Aug 24	Discussion of Spirit Mound
	Aug 24	Lewis's chronometer malfunctions again
5	Aug 25	Spirit Mound visited and described
	Aug 25	Only temperature reading between May 14 and September 19
	Aug 25	Collect specimen of *Cleome serrulata,* Rocky Mountain bee plant
	Aug 26	Official appointment of Gass as sergeant
6	Aug 26	Shannon sent out to find horses, not to return until September 11
	Aug 27	Search for Shannon begins
	Aug 27	Lewis's latitude reading, 42° 53′ 13″
	Aug 28	Consider sending a return party, not actually to occur until April 1805
7	Aug 28–31	Camp at Calumet Bluff
	Aug 29	Yankton Sioux arrive at Calumet Bluff camp
	Aug 30–31	Councils with Yankton Sioux, exchange gifts, speeches, demonstrate air gun
	Aug 31	First mention of *Pediomelum esculentum,* Indian breadroot
	Sep 01	Clark mentions abundance of fish
	Sep 01	First mention of *Ursus horribilis,* grizzly bear
	Sep 01	Collect specimen of *Mirabilis nyctaginea,* wild four-o'clock

ID	1804	Site or event
8	Sep 02	Survey of formations in Bon Homme County, South Dakota
	Sep 02	Collect specimen of *Artemisia frigida,* pasture sagewort
	Sep 02	Collect specimen of *Dalea purpurea,* purple prairie clover
	Sep 03	First sighting of *Antilocapra americana,* pronghorn
	Sep 03	Signs of Shannon, but not found
9	Sep 04	Camp at Niobrara River, investigate the stream
	Sep 04	Collect specimen of *Shepherdia argentea,* buffaloberry
	Sep 05	First sighting of *Odocoileus hemionus,* mule deer
	Sep 05	Lewis's second description of *Pituophis melanolecus sayi,* bullsnake
	Sep 05	Collect specimen of *Quercus macrocarpa,* bur oak
	Sep 05	Collect specimen of *Rosa arkansana,* prairie wild rose
	Sep 06	Colter returns unsuccessfully from seeking Shannon (rejoins September 11)
10	Sep 07	Old Baldy described and camp established nearby
	Sep 07	First description of *Cynomys ludovicianus,* prairie dog
ID	**1806**	**Site or event**
	Aug 31	Storm during night causes two canoes nearly to be lost
10	Aug 31	Old Baldy highest point Clark observed *Sciurus niger,* fox squirrel
	Sep 01	Meet and hold council with some Yankton Sioux
7	Sep 01	Camped near Calumet Bluff camp of August 28–September 1, 1804
8	Sep 01	More examination of formations in Bon Homme County, South Dakota
	Sep 02	Find trading house of Robert McClellan, below mouth of James River
	Sep 02	Clark finds American linden and slippery elm at northern limit on Missouri
	Sep 03	Meet trader James Aird coming upriver and get news of events in U.S.
	Sep 04	Obtain tobacco from Aird
1	Sep 04	Visit and make repairs to Floyd's grave


Lewis and Clark
Project Sites
Area of Image
South Dakota
Iowa
Nebraska
SOUTH DAKOTA
Pickstown
Fort Randall Dam
Site #10
Old Baldy
Gavin's Point Dam
Yankton
Site #5
Spirit Mound
Site #4
1804 Mouth
of the
Vermillion
Site #7
Calumet Bluff
Site #9
Mouth of the Niobrara
Niobrara
Site #8
"Ancient Fortifications"
Site #6
Shannon's Absence
Vermillion
IOWA
Site #2
Gass's Election
Site #3
Ionia Volcano
Newcastle
Sioux City
NEBRASKA
0
15
30 Miles
Site #1
Floyd's
Bluff

Site # 1

Name: Floyd's Bluff

Date: August 20, 1804; September 4, 1806
Event: Burial place of Sergeant Charles Floyd

Location: Floyd Park on US75 at Glenn Avenue in Sioux City, IA; atop the bluff along the Missouri River

USGS Quadrangle (1:24,000): Sioux City South

Legal Description: SW1/4 of SE1/4, sec. 1, T.88N., R.47W.

Owner: City of Sioux City

How to reach: US75 north from I-29 exit 143 and from US20; US75 south from USBus20; and local streets in Sioux City.

Where to view: On the site. The monument at the site is visible from many locations while driving on I-29, I-129, US75, and US20. However, there are no stopping places on the interstates. Stopping or slowing to view on these roads is dangerous.

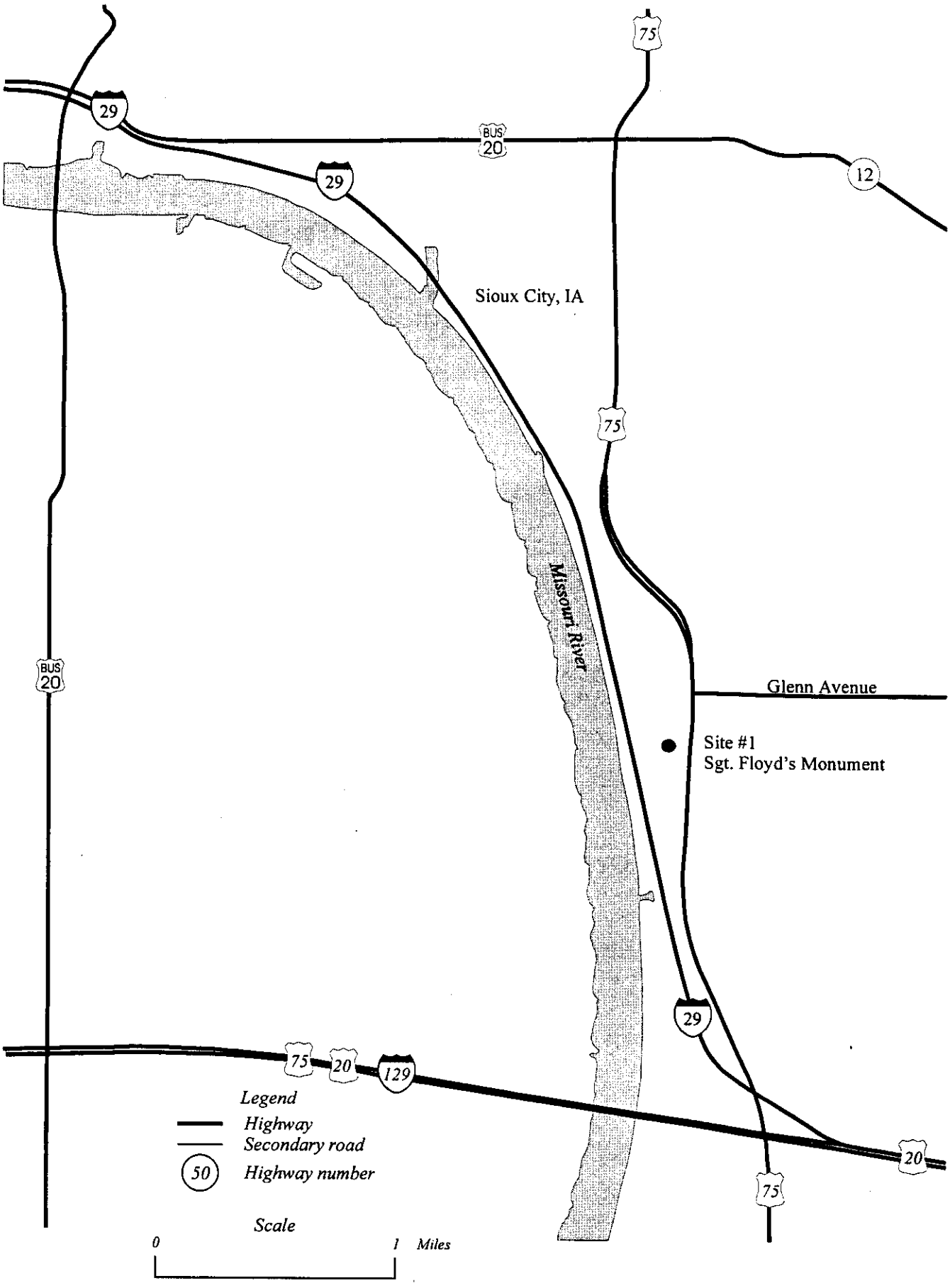
Present use/condition: City park; paved parking

Present markers/interpretive signs: Large stone obelisk marking the grave site; a half-dozen signs interpreting Floyd's death and burial as well as other events of the journey in the immediate area.

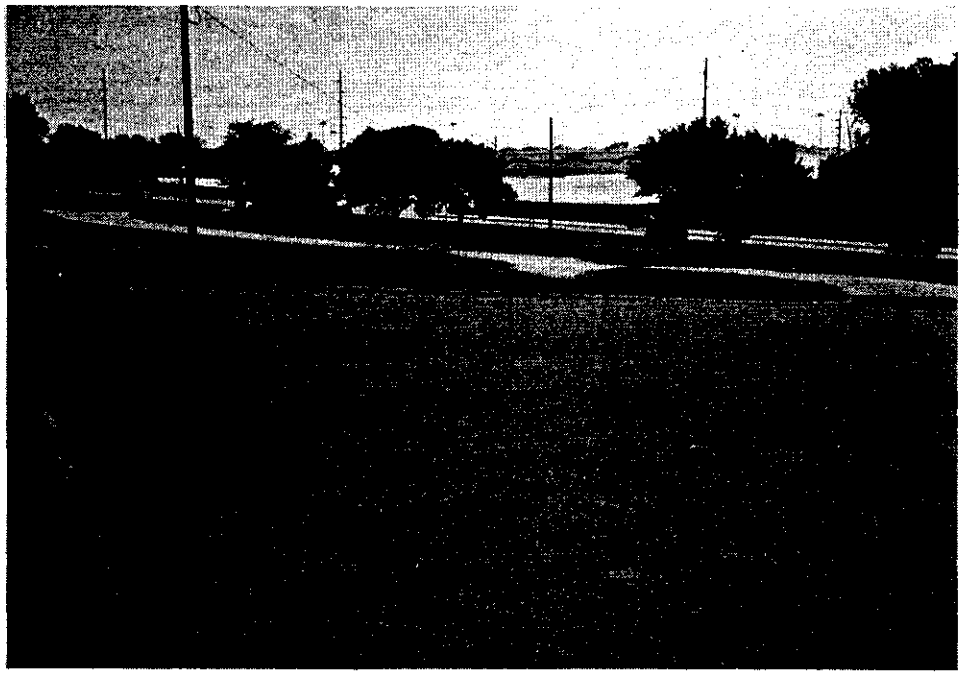
Potential interpretive themes: This is by far the best-known and most widely publicized site in our study area. Although the interpretation of any site can be improved or enhanced, this one is least in need of any of our sites. Themes that could be added here include aspects of natural history, especially the Corps' botanical collecting and observations of animals, and considerations of the relationships among the men, especially in view of the death of one of their members.

Geology: The site is underlain by light tan, wind deposited silts of the Peoria Loess. Widespread across the central midwest from Illinois into Nebraska, these deposits are about 10,500 to 20,000 years old and formed during the most recent ice age to affect this area, the Wisconsin glaciation. They contain some buried topsoils, or paleosols, and fossils of land snails and vertebrates such as mammoths.

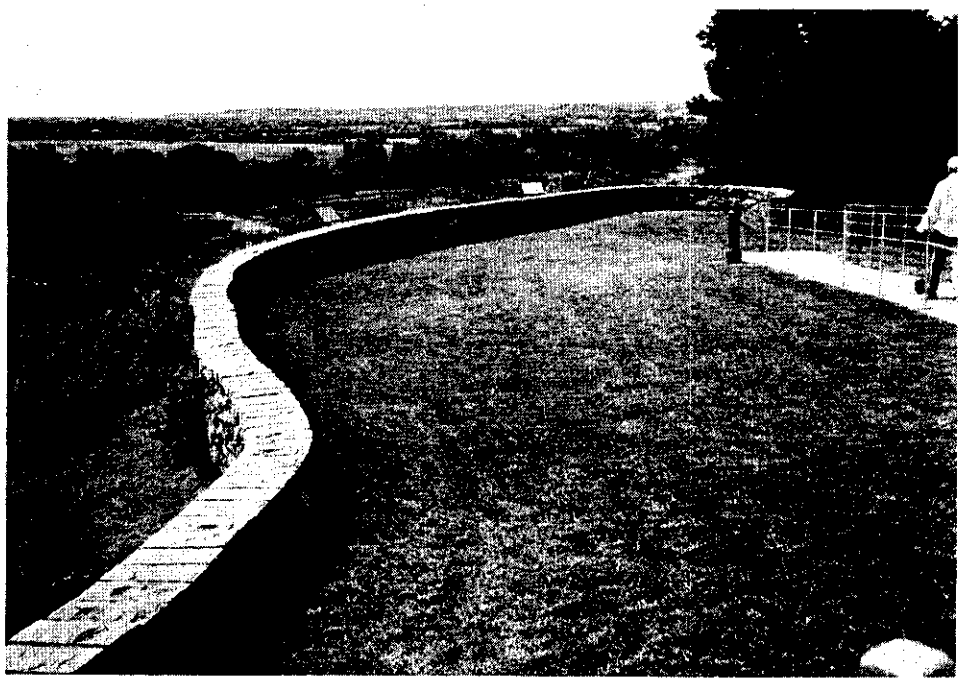
Site #1 Floyd's Bluff



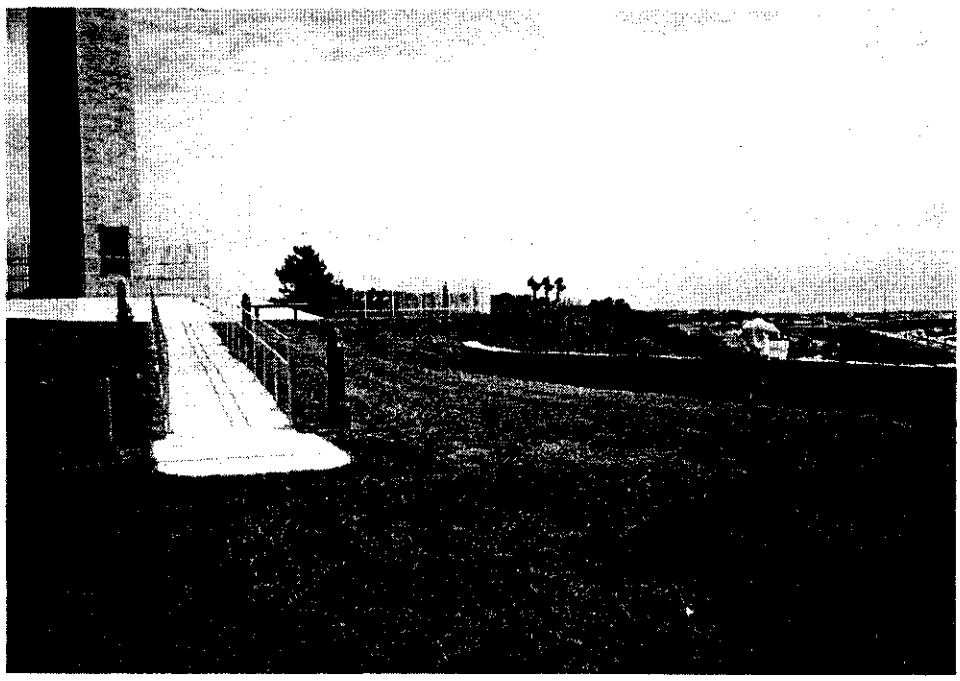
#1-1 Monument marking Floyd's grave.



#1-2 Parking lot at the monument; access drive; US75 in background.



#1-3 Interpretive markers with the Missouri River and its valley below; view to the northwest.



#1-4 Area at the base of the monument; view to the southeast.

Site # 2

Name: Gass's Election

Date: August 22, 1804

Location: 4 miles southwest of Elk Point, SD

USGS Quadrangle (1:24,000): Burbank

Legal Description: NW1/4 of SW1/4, sec. 8, T.31N., R.6E.

Owner: State of South Dakota Game, Fish, and Parks Department

How to reach: From Elk Point, SD -- northwest on Burbank Road approximately 2 miles; south on County Road 26 and then immediately west on 324 Avenue for approximately 4 miles; south on 471 avenue for approximately 2 miles to the site.
From Vermillion, SD -- east on SD50 approximately 3 miles; south on Fairview Avenue approximately 2 miles to Burbank Road; southeast on Burbank Road for approximately 5 miles; south on 471 Avenue for approximately 4 miles to the site.

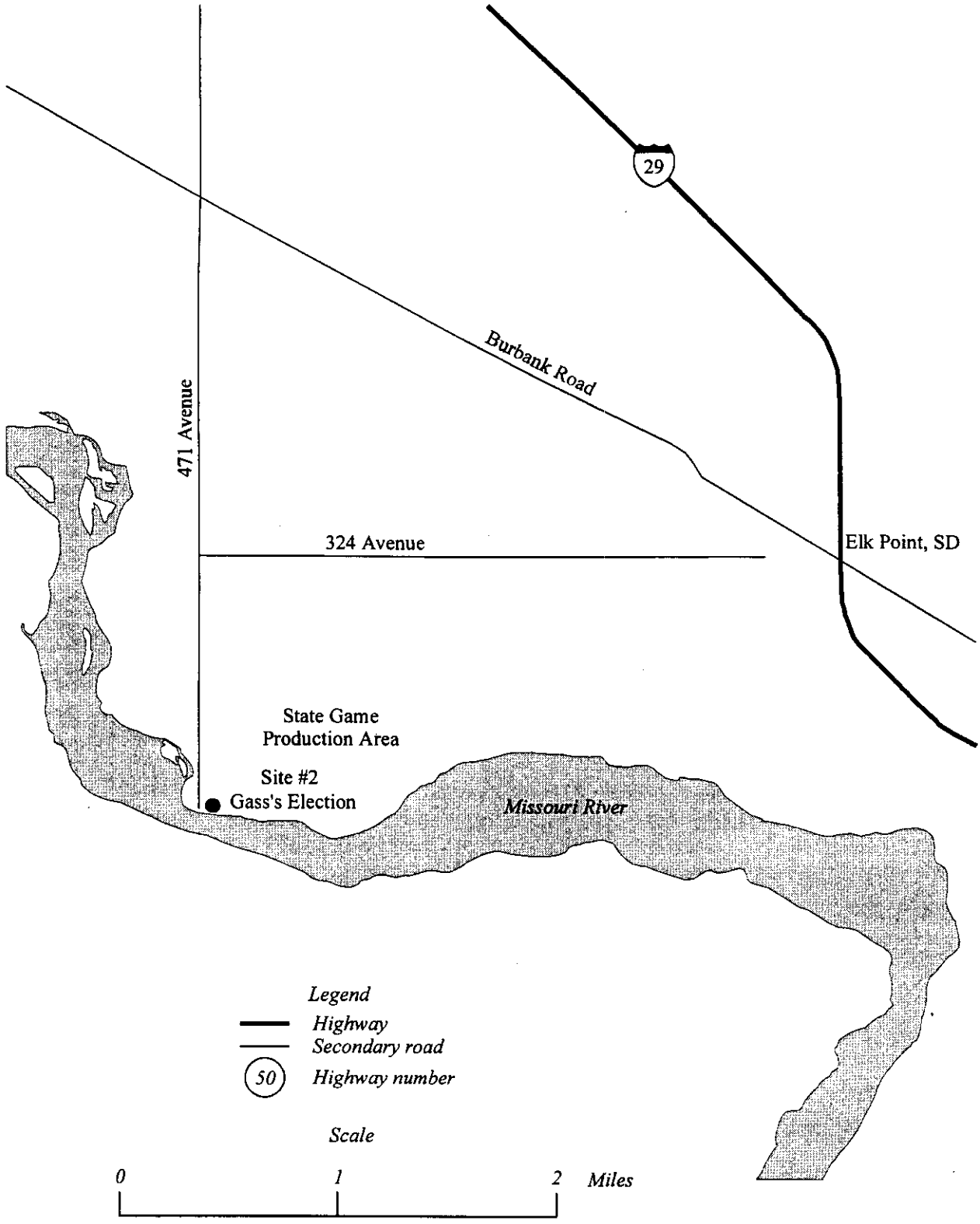
Where to view: On the site.

Present use/condition: Public water access; parking area; rest rooms

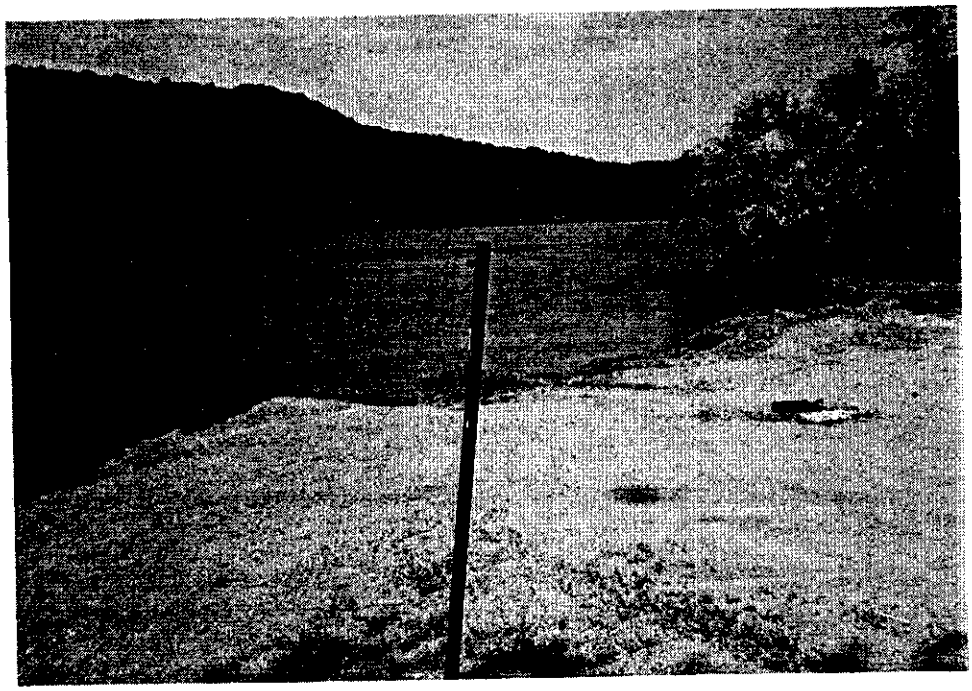
Present markers/interpretive signs: None

Potential interpretive themes: One of two recommended sites not at the location of a Lewis and Clark event, but near a number of them. The Missouri is almost certainly not in the same location as in 1804. In fact, the floodplain is near its widest point within our study area, and the river has changed course several times since then. Nonetheless, this site offers a place to interpret several events, most significantly the election of Patrick Gass as Sergeant to replace Charles Floyd, but also observations on the natural history of the area.
This site brings the visitor directly to the Missouri River in an area where it more closely resembles the river that Lewis and Clark experienced than any other part of the study area. It provides an opportunity to interpret the changing river.

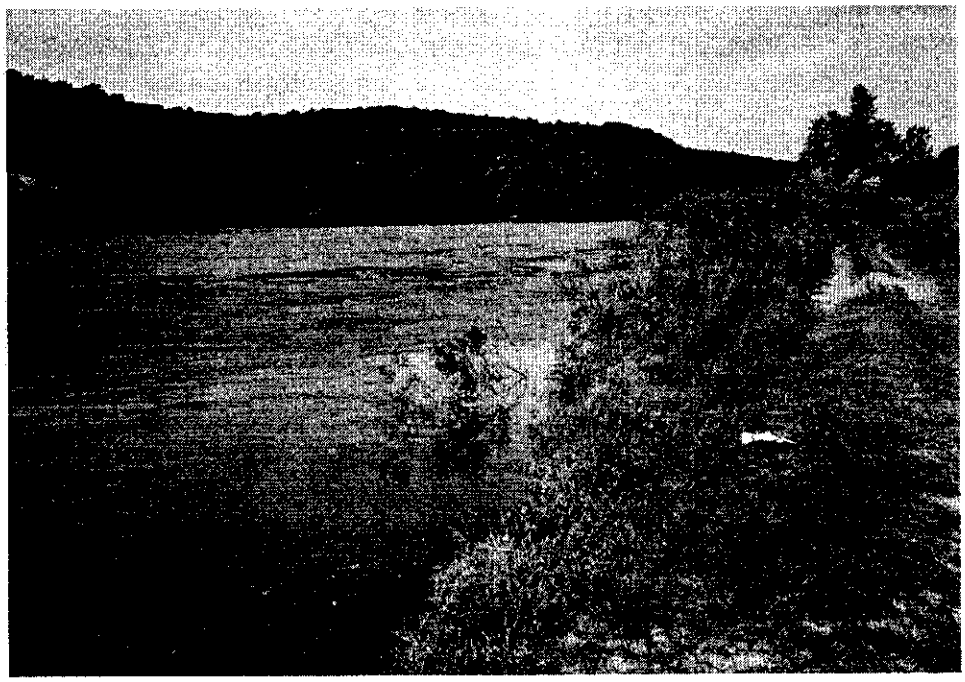
Site #2 Gass's Election



#2-1 Access road and parking area for Public Water Access Area; view away from the Missouri River.



#2-2 Boat access to the river; Nebraska shore in the background.



#2-3 Path along the river at the Public Water Access Area.

Site #3

Name: Ionia Volcano

Date: August 24, 1804
Event: Observations of a hot bluff, lately on fire

Location: A bluff on the south side of the Missouri River, approximately 4 miles north of Newcastle, NE

USGS Quadrangle (1:24,000): Burbank

Legal Description: NE1/4 of SW1/4, sec. 3, T.31N., R.5E.

Owner: David Curry, 585444-887 Road, Newcastle, NE 68757; and Susan Von Minden, RR1, Box 61, Ponca, NE 68770

How to reach: From Newcastle (Dixon County), NE: north from NE12 across from the historical marker, follow the gravel road approximately 2.5 miles; right at the fork, County Road 887, approximately 1.5 miles. To the right, Ionia Cemetery; to the left, a loop road to the edge of the bluff.

Where to view: From the top of the bluff.
There is no road below the bluff on the Nebraska side of the river and all of the land is privately held. There is no publicly accessible view site on the South Dakota side; trees obscure the view from all roads. Trees and other vegetation make the bluff very difficult to identify from a boat on the river.

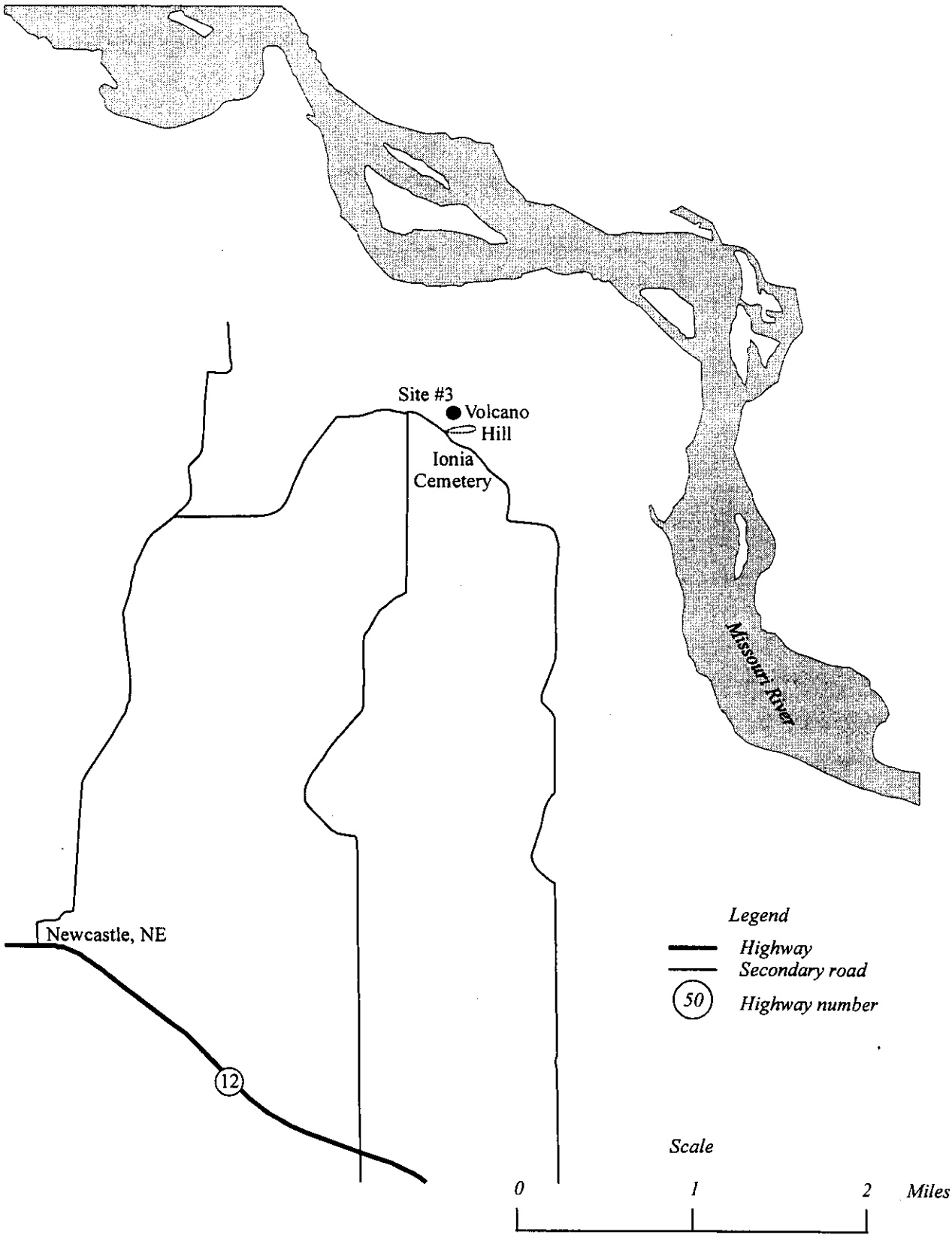
Present use/ condition: A narrow strip of land between the county road and the edge of the bluff. The landowner maintains a loop of road that serves as a pull-off and parking area.

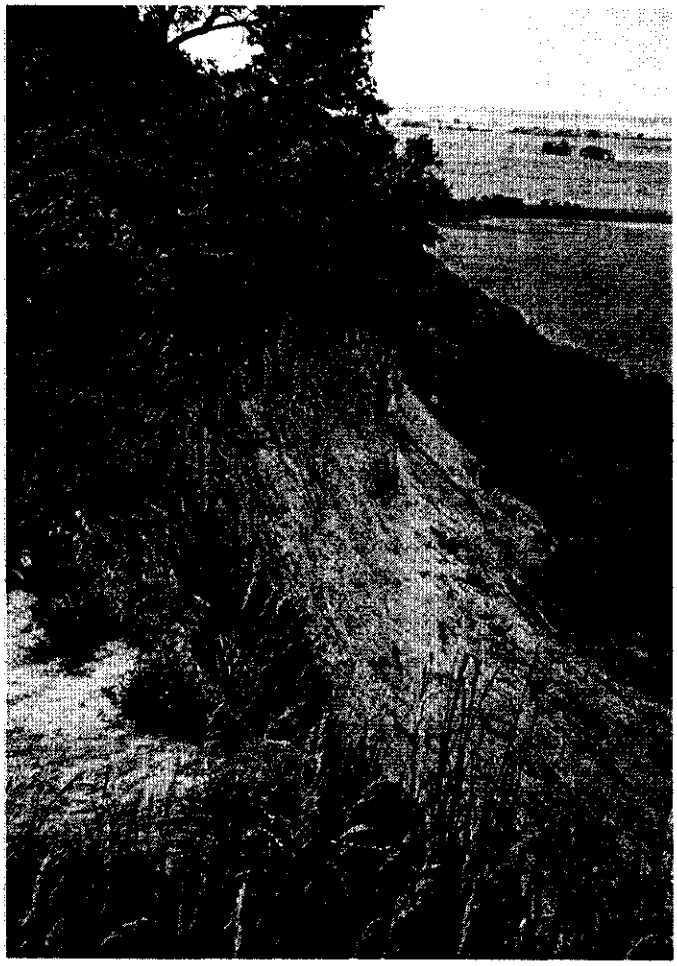
Present markers/interpretive signs: None at the site. There is an interpretive marker on NE12 in Newcastle, NE, at the intersection with the road north to the site.

Potential interpretive themes: Observed in passing by Lewis and Clark from the river that then flowed at the base of the bluff on the Nebraska side. Believed by scientists in the 19th century to be a volcano, it has subsequently been understood as explained below.
The site provides a spectacular view of the valley. Potential interpretive themes here include Lewis and Clark events in the general area as well as the changing nature of the river.

Geology: The rocks exposed in the face of the bluff are part of the Carlile Shale Formation, a gray-to-black shale with carbonaceous beds and abundant marcasite. Water in contact with these materials produces a chemical reaction in the exposed and near-surface shales that liberates heat and sulfurous odors. In cold weather, the heat produces steam; and the sulfur compounds smell like those from volcanoes. (See Threet, 1955, Nebraska Academy of Sciences *Proceedings*.)

Site #3 Volcano Hill

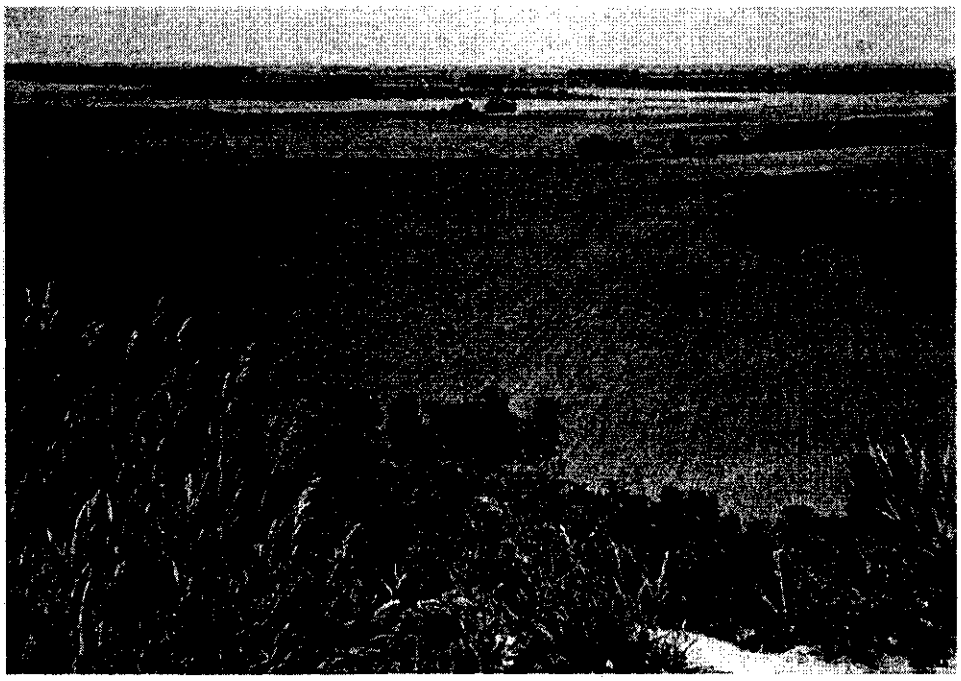




#3-1 Face of the volcano from the top of the bluff; the horizontal black layer is probably carbonaceous; the Missouri River on the horizon.

#3-2 Turn-off to the top of the bluff from the county road; entrance to Ionia Cemetery across the road in background.

#3-3 Turn-off loop; car parked at the edge of the bluff.



#3-4 Missouri River flood plain from the top of the bluff.

Site #4

Name: 1804 Mouth of the Vermillion River

Date: August 24-25, 1804; September 3, 1806
Event: Reached the mouth of the Vermillion River and proceeded up-river to visit Spirit Mound.

Location: Below the curve at the west end of the bluff in the present-day city of Vermillion, SD. The 1804 location of the mouth of the Vermillion River is the site of northern end of the new Newcastle/Vermillion bridge over the Missouri River, scheduled to be completed in 2001-03.

USGS Quadrangle (1:24,000): Vermillion

Legal Description: SW1/4 of SE1/4, sec. 14, T.92N., R.52W.

Owner: Various

How to reach: Local roads in the city of Vermillion

Where to view: Presently, the best view site of the site is from the top of the bluff at the 700 block of W. Main Street in the city of Vermillion

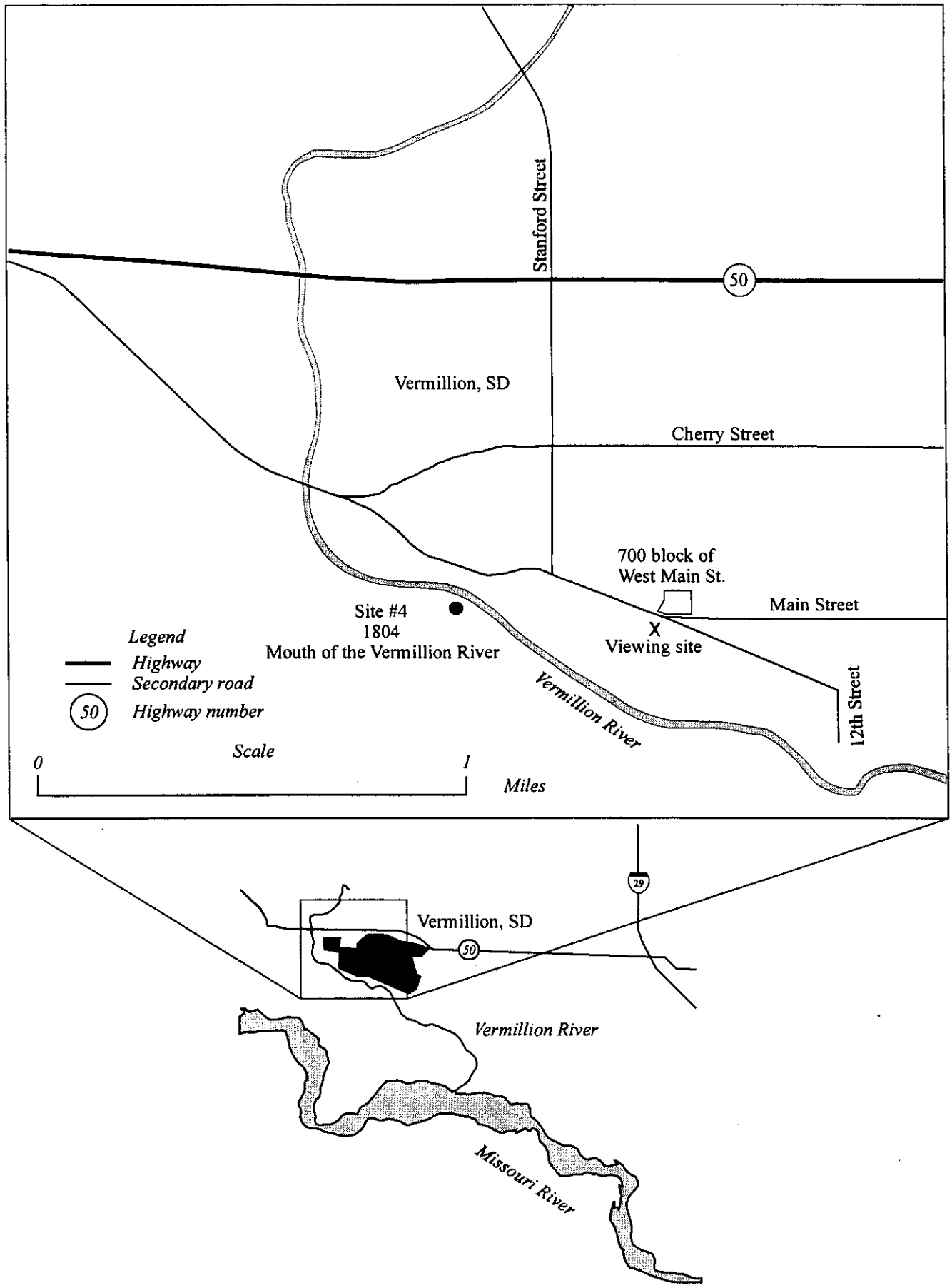
Present use/condition: The present view site is on the city right-of-way along Main Street. The present day location of the 1804 river mouth is multi-use, including residential, industrial, and agricultural.

Present markers/interpretive signs: None

Potential interpretive themes: Native American accounts of Spirit Mound; the journey to Spirit Mound; the changing course of the Missouri and its tributaries; Lewis and Clark's observations on the plants and animals in the area.

Geology: At the time of Lewis and Clark, the mouth of this river was hard upon the west end of the bluffs atop of which the city of Vermillion is mostly built today. Since then the Missouri has shifted south and the Vermillion's mouth has followed.

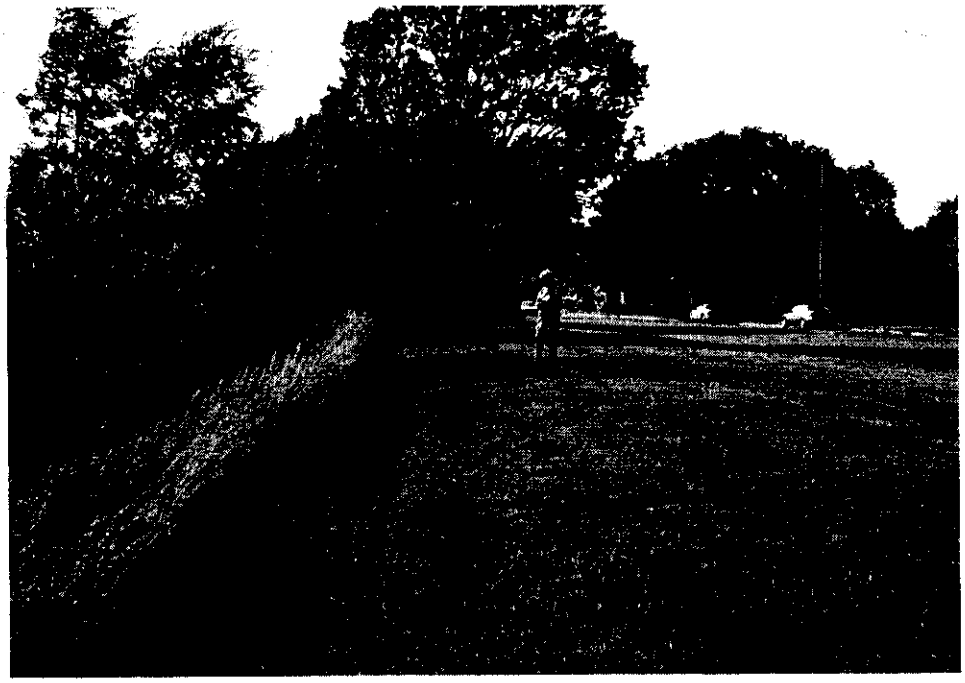
Site #4 1804 Mouth of the Vermillion River



#4-1 Flood plain of the Vermillion River near the probable site of its mouth in 1804; view from the bluff at the 700 block of W. Main Street, town of Vermillion, SD.

#4-2 A similar view from the same location.

#4-3 The top of the bluff across W. Main Street in the 700 block.



#4-4 The top of the bluff at the 700 block of W. Main Street.

Site # 5

Name: Spirit Mound

Date: August 25, 1804
Event: Visit to Spirit Mound

Location: 6-7 miles north of Vermillion, SD

USGS Quadrangle (1:24,0000): Vermillion

Legal Description: SE1/4 of NW1/4, sec. 14, T.93N., R.52W.

Owner: A private foundation, the Spirit Mound Trust, is raising funds to purchase this property from a group of eight landowners. State and federal appropriations are also being sought with the intent that the state of South Dakota would administer the site. The Trust is represented by Larry Monfore 510 Catalina, Vermillion SD 57069 (605/624-2790). One of the landowners is also a member of the Board of Directors of the Trust: Mark Wetmore, Vermillion, SD (605/624-3748)

How to reach: North from Vermillion on SD19

Where to view: Pull off on SD19 immediately east of the site.

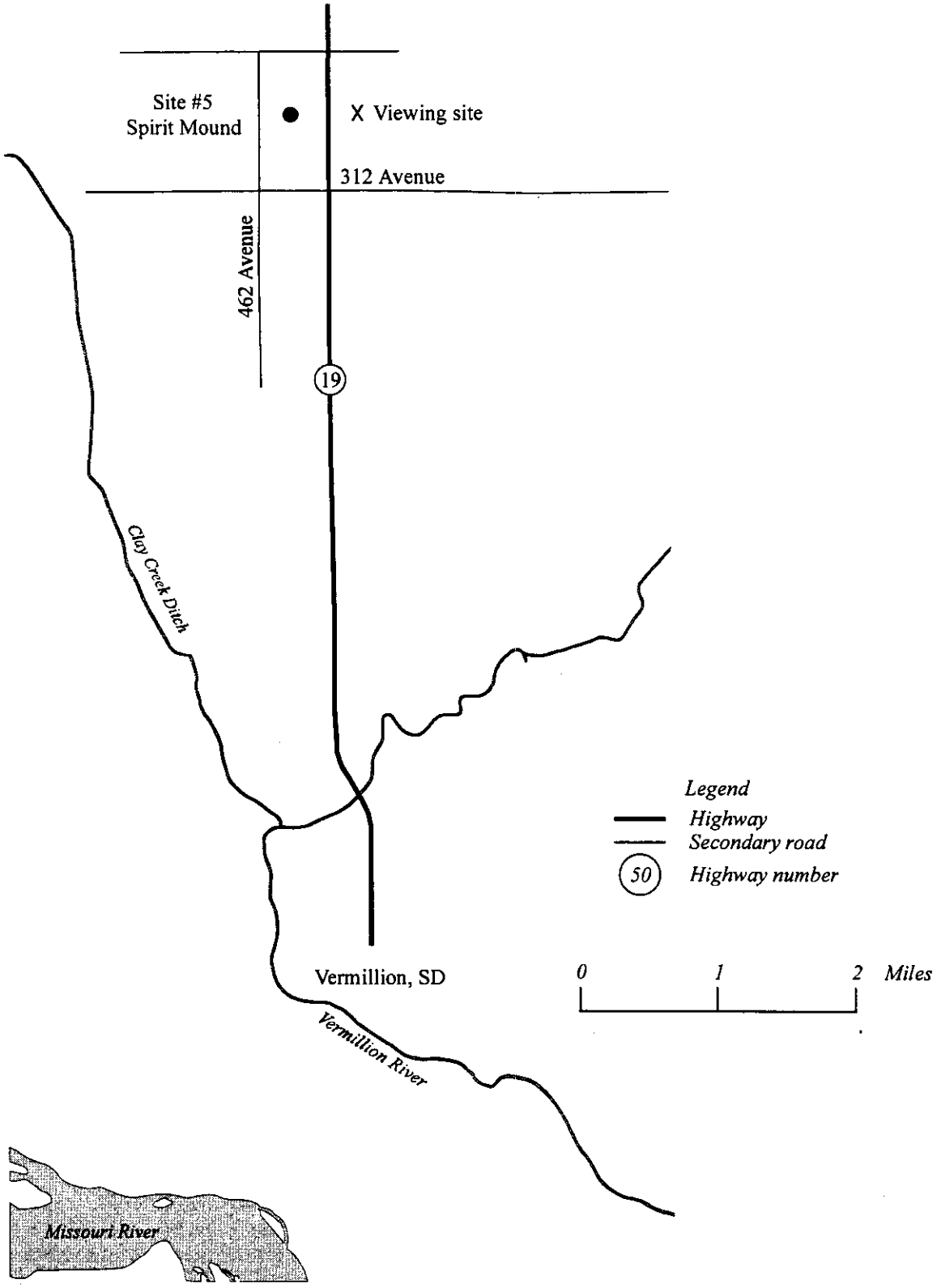
Present use/condition: Agricultural; feed lot

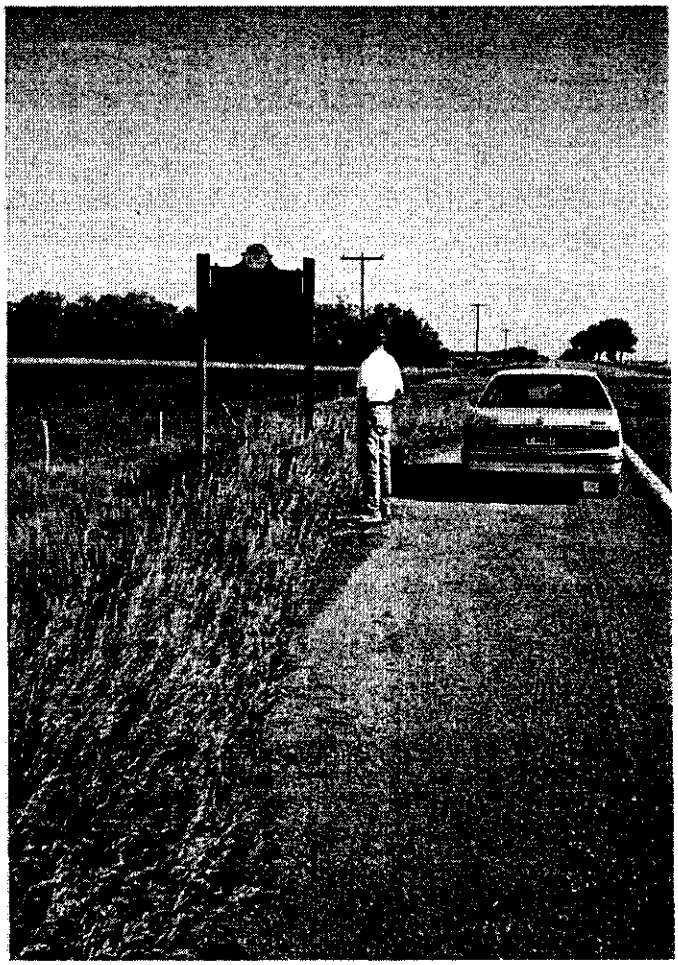
Present markers/interpretive signs: Historical marker on SD19, immediately east of the site.

Potential interpretive themes: Native American accounts of Spirit Mound; the natural history and geology of the area.

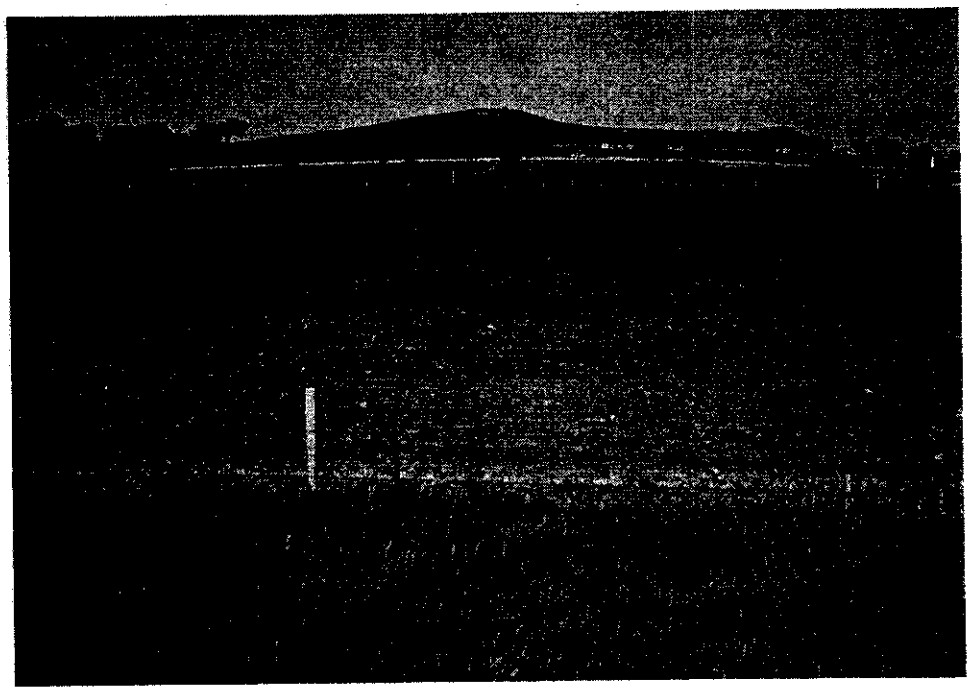
Geology: Vermillion, SD, is built on a glacial till plain. Spirit Mound, about 6.5 miles north of the city, is a remnant bedrock knob of the lower part of the Niobrara Chalk Formation that was not completely eroded away by the overriding continental ice sheet. The chalk can be seen on the northern end of the mound. The southern end is covered by clays with boulders, called glacial till, deposited by the melting glacier as its front retreated northward. (See J.E. Todd, *Elk Point Quadrangle*, USGS Folio 156, 1907.)

Site #5 Spirit Mound

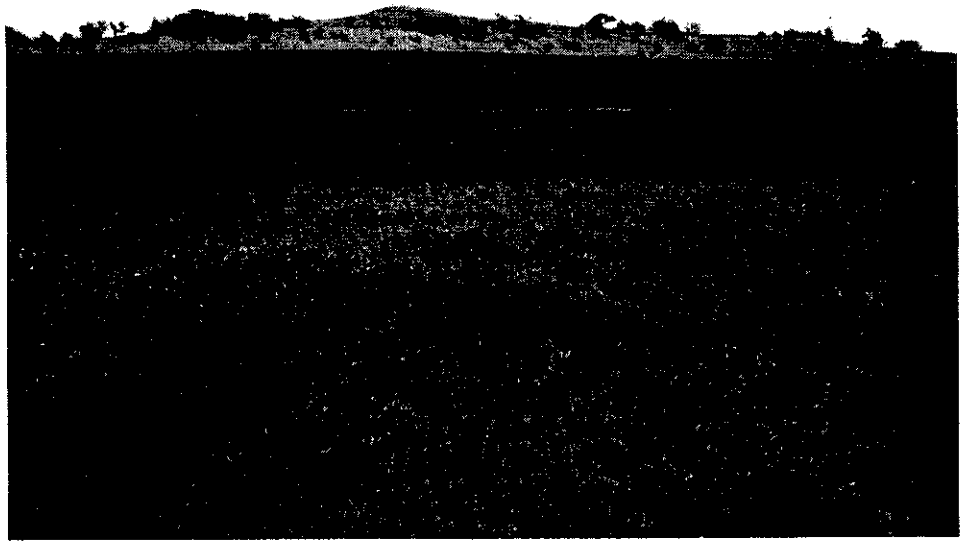




#5-1 Pull-off on SD19 and marker on east side of Spirit Mound.



#5-2 View of east side of Spirit Mound from pull-off on SD19.



#5-3 View of west side of Spirit Mound from county road - 462 Avenue.

#5-4 View of south side of Spirit Mound from county road - 312 Avenue.

Site # 6

Name: Shannon's Absence

Date: August 26, 1804

Location: 10 miles W of Vermillion, SD; 10 miles SE of Gayville, SD

USGS Quadrangle (1:24,000): Meckling; also, St. Helena

Legal Description: SW1/4 of SE1/2, sec. 17, T.92N., R.53W.

Owner: State of South Dakota Game, Fish, and Parks Department

How to reach: From Vermillion, SD -- northwest on SD50 approximately 10 miles to 454 Avenue (3 miles west of Meckling, SD); south approximately 6 miles to the site.
From Yankton, SD -- east on SD50 approximately 14 miles to 454 Avenue (3 miles southeast of Gayville, SD); south approximately 6 miles to the site.

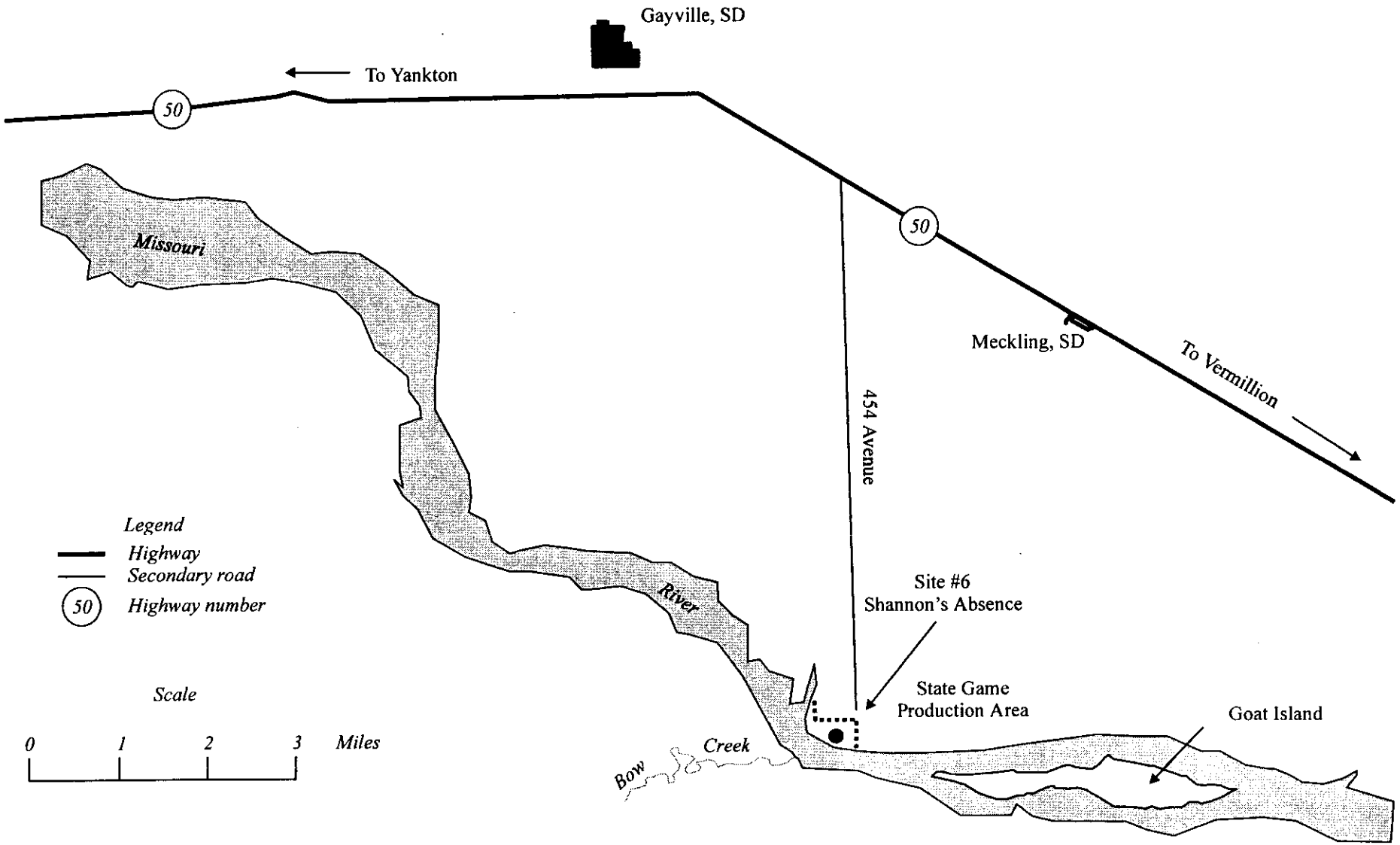
Where to view: On the site.

Present use/condition: Public water access; parking area

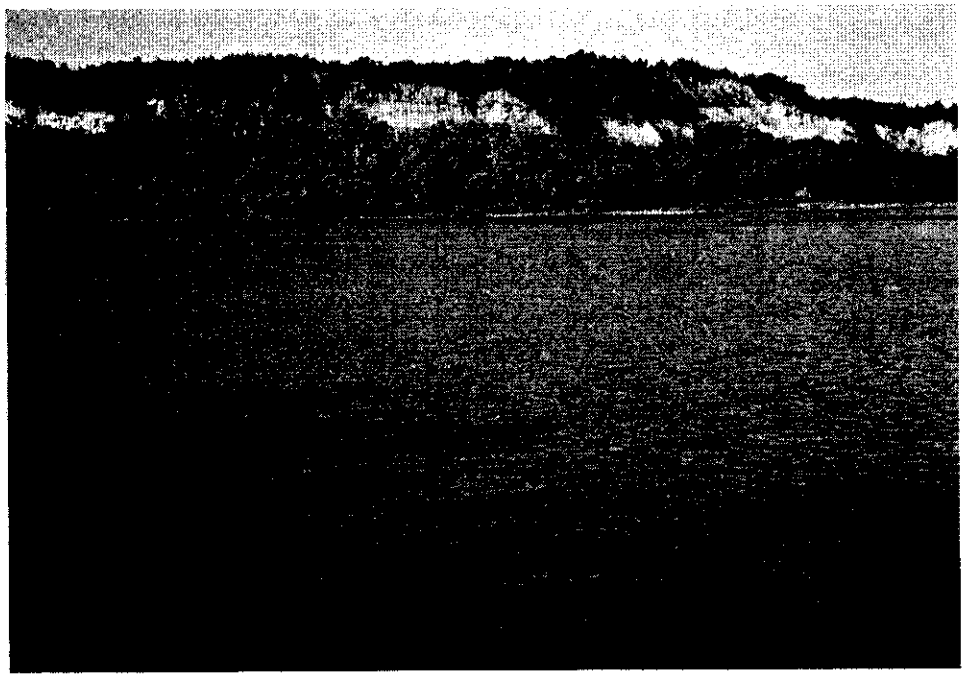
Present markers/interpretive signs: None

Potential interpretive themes: This site is similar to Site #2, in that it is not the location of a Lewis and Clark event but is near to a number of them. It, too, is located in the widest part of the Missouri's floodplain to be found in our study area and in an area where the Missouri more closely resembles the river that Lewis and Clark experienced than elsewhere in the study area.
A key event near this site was the beginning of the absence of Shannon, who was not reunited with the group until September 11, beyond our study area. As with Site #2, this location also provides and opportunity to interpret the natural history of the area as well as the changing river.

Site #6 Shannon's Absence



#6-1 Parking area for the Public Water Access area.



#6-2 View from the Public Water Access; Missouri River with bluffs.

Site #7

Name: Calumet Bluff

Date: August 28-31, 1804; September 1, 1806
Event: Meet with Yankton Sioux; camps

Location: Site of present Gavins Point Dam; Nebraska side of the Missouri River

USGS Quadrangle (1:24,000): Gavins Point Dam

Legal Description: Secs. 7 & 8, T.33N., R.1W.; secs. 12 & 13, T.33N., R.2W.

Owner: U.S. Army Corps of Engineers

How to reach: From US81 -- west 5 miles on NE 121; From Yankton, SD -- west 5 miles on SD52

Where to view:
a) from the two pull-offs on the road over the top of the dam
b) from the road paralleling the bluff in front of the dam

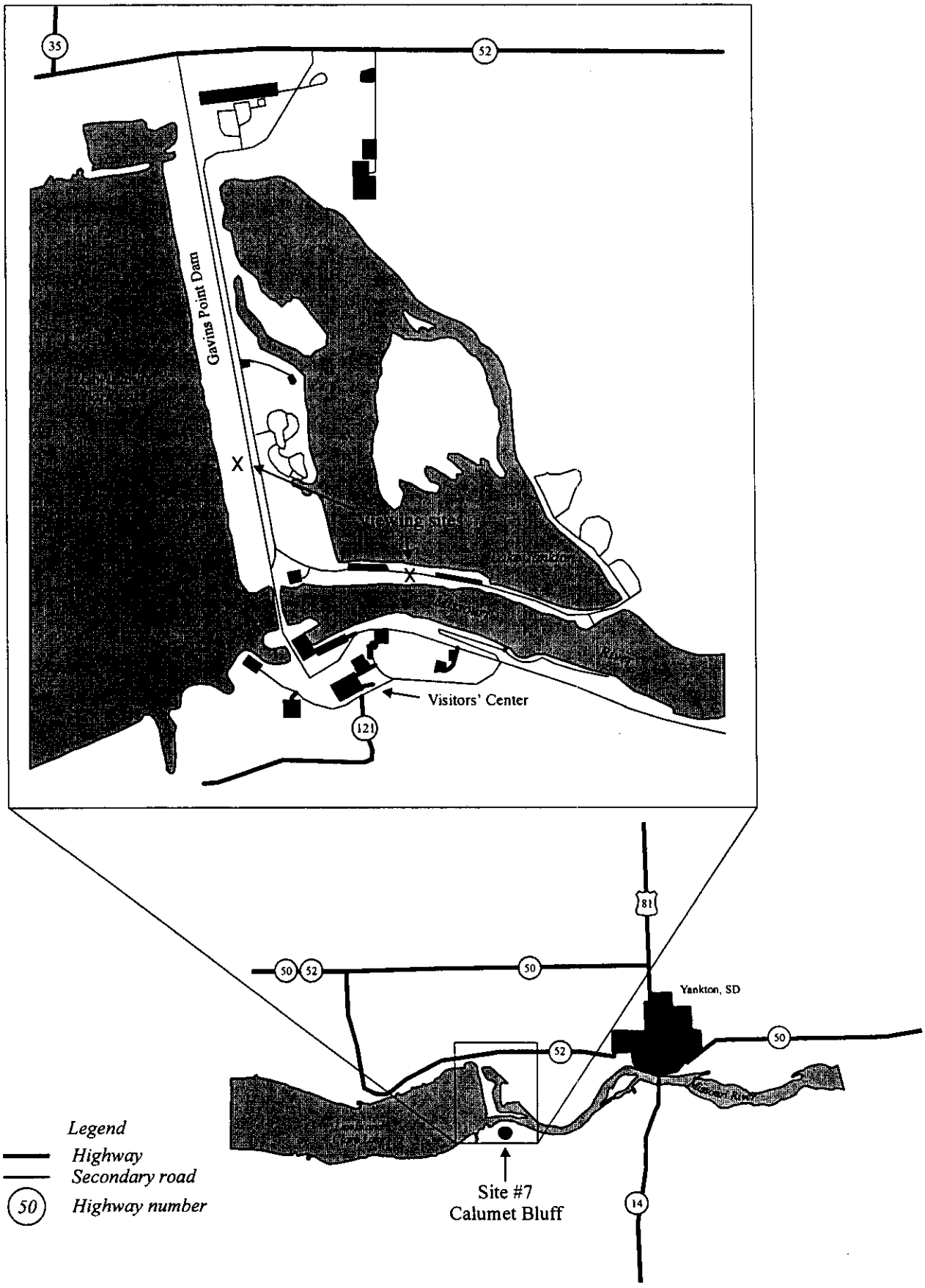
Present use/condition: flood control; recreation: camping, fishing, boating, hiking

Present markers/interpretive signs: At the Visitors' Center at Gavins Point Dam

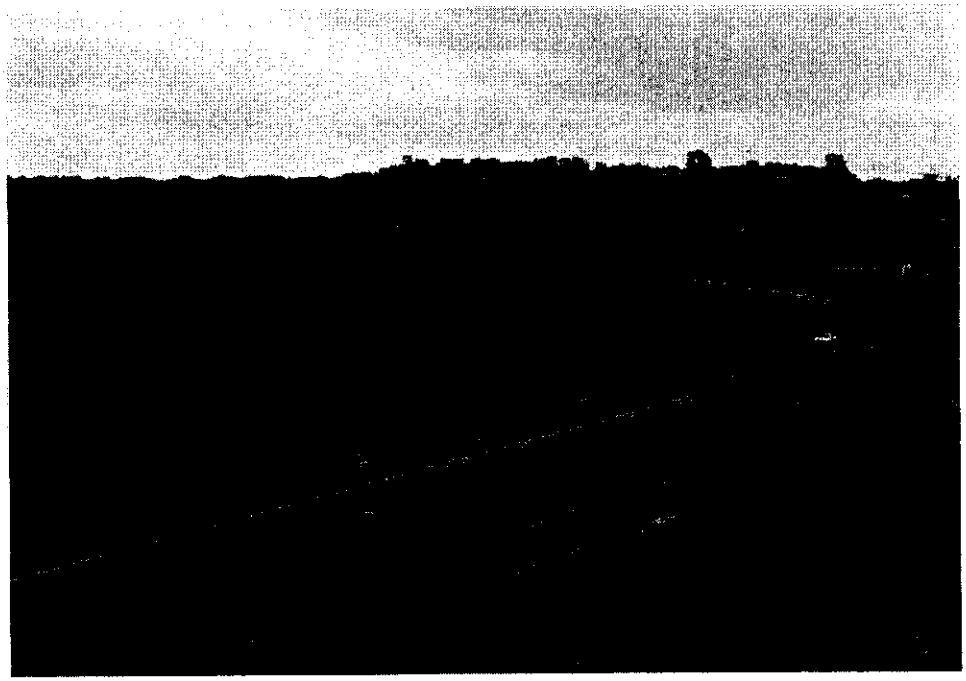
Potential interpretive themes: The second best-known site in the study area. It offers the greatest potential for increased and enhanced interpretation in the area because of the excellent facilities at the Visitors' Center, the large number of visitors attracted for recreation, and its ease of access.
Themes for interpretation include the meetings with the Yankton Sioux; the traditional culture of the Yankton; and an overview of the study area, including its natural history as described by Lewis and Clark.

Geology: Calumet Bluff is located about four miles southwest of Yankton, SD, on the south side of the Missouri River and at the south abutment of Gavins Point Dam. The bluff is underlain by the cream-to-light gray colored Niobrara Chalk Formation. This formation is composed mostly of minute calcium carbonate debris from coccolithophorid algae and shells of planktonic foraminifera. The chalk also contains fossils of clam and oyster shells, fish, swimming reptiles and birds from the Cretaceous Period, the youngest geologic time period in the Age of the Dinosaurs, that is, the Mesozoic Era.

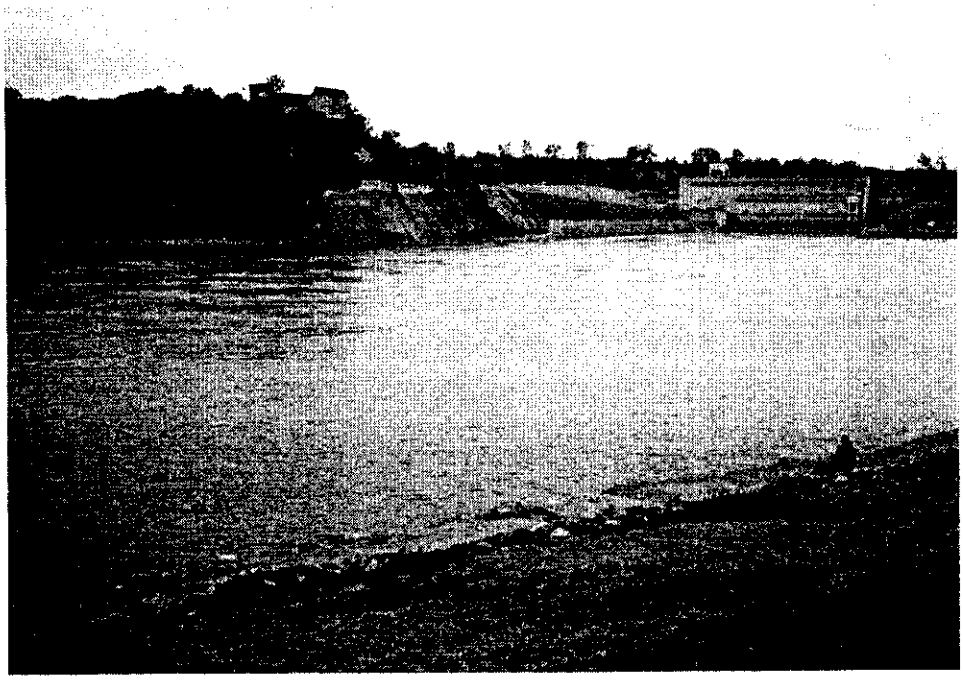
Site #7 Calumet Bluff



#7-1 View to the southwest from pull-off on road over the dam; Lewis and Clark Lake and Calumet Bluff behind the dam.



#7-2 View to the southeast from pull-off on road over the dam; Visitors' Center on Calumet Bluff.



#7-3 View from the road below the dam; Visitors' Center on Calumet Bluff and dam.

Site # 8

Name: "Ancient Fortifications"

Date: September 2, 1804; September 1, 1806
Event: Measuring, describing, and mapping sand structures on and near Bon Homme Island; called "the antient fortification" by Lewis and Clark

Location: The site, now covered by the waters of Lewis and Clark Lake, is just to the west of the town of Bon Homme Colony, SD, on the Nebraska side of the lake, approximately 13 miles west of Gavins Point Dam

USGS Quadrangle (1:24,000): Bon Homme Colony; also, Santee

Legal Description: now beneath Lewis and Clark Lake; secs. 10-11, 14-15, 30-32, T.33N., R.4W.

Owner: U.S. Army Corps of Engineers

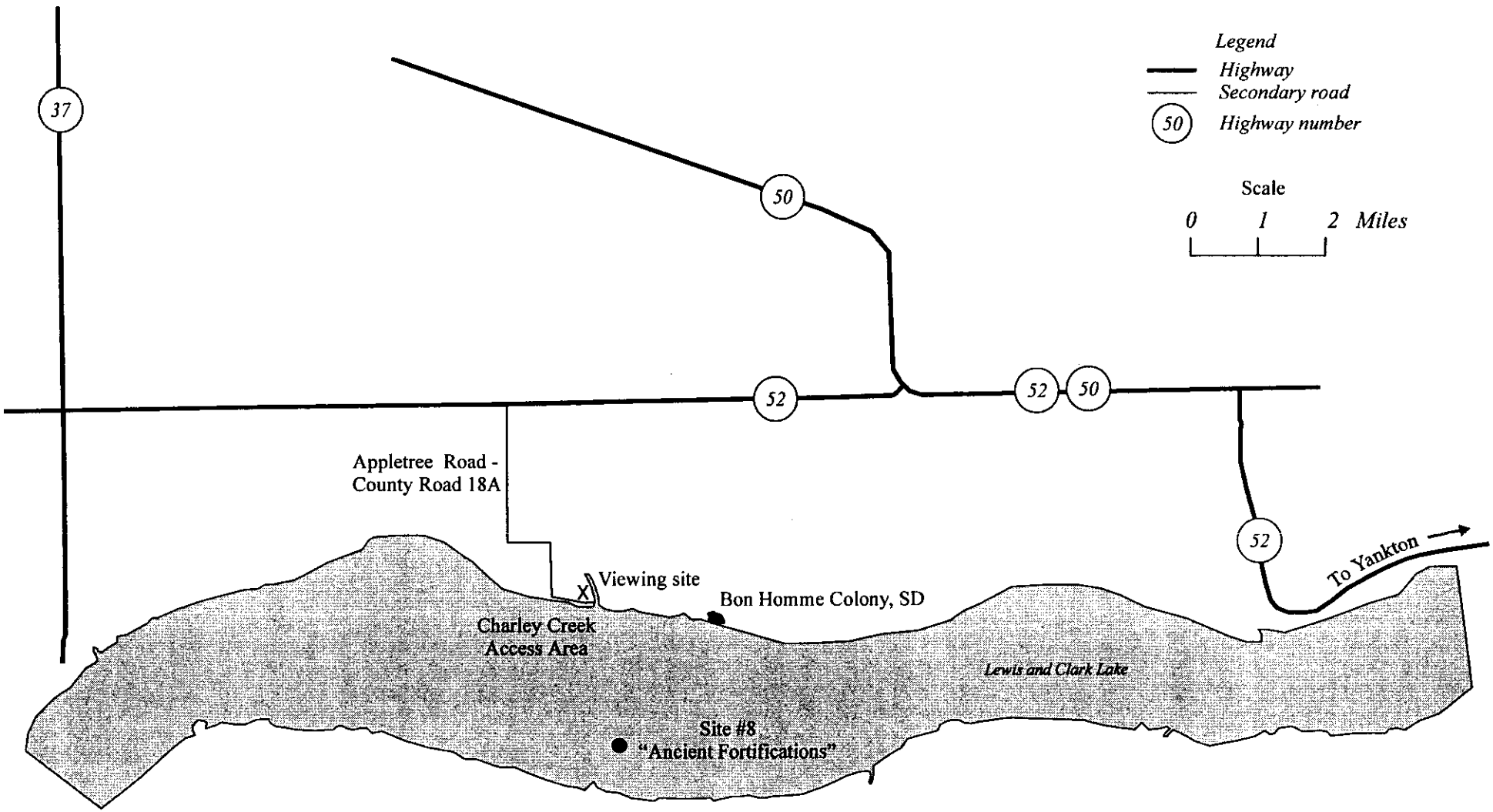
Where to view: Charley Creek Recreation Area (S1/2, sec. 18, T.93N., R.58W.)

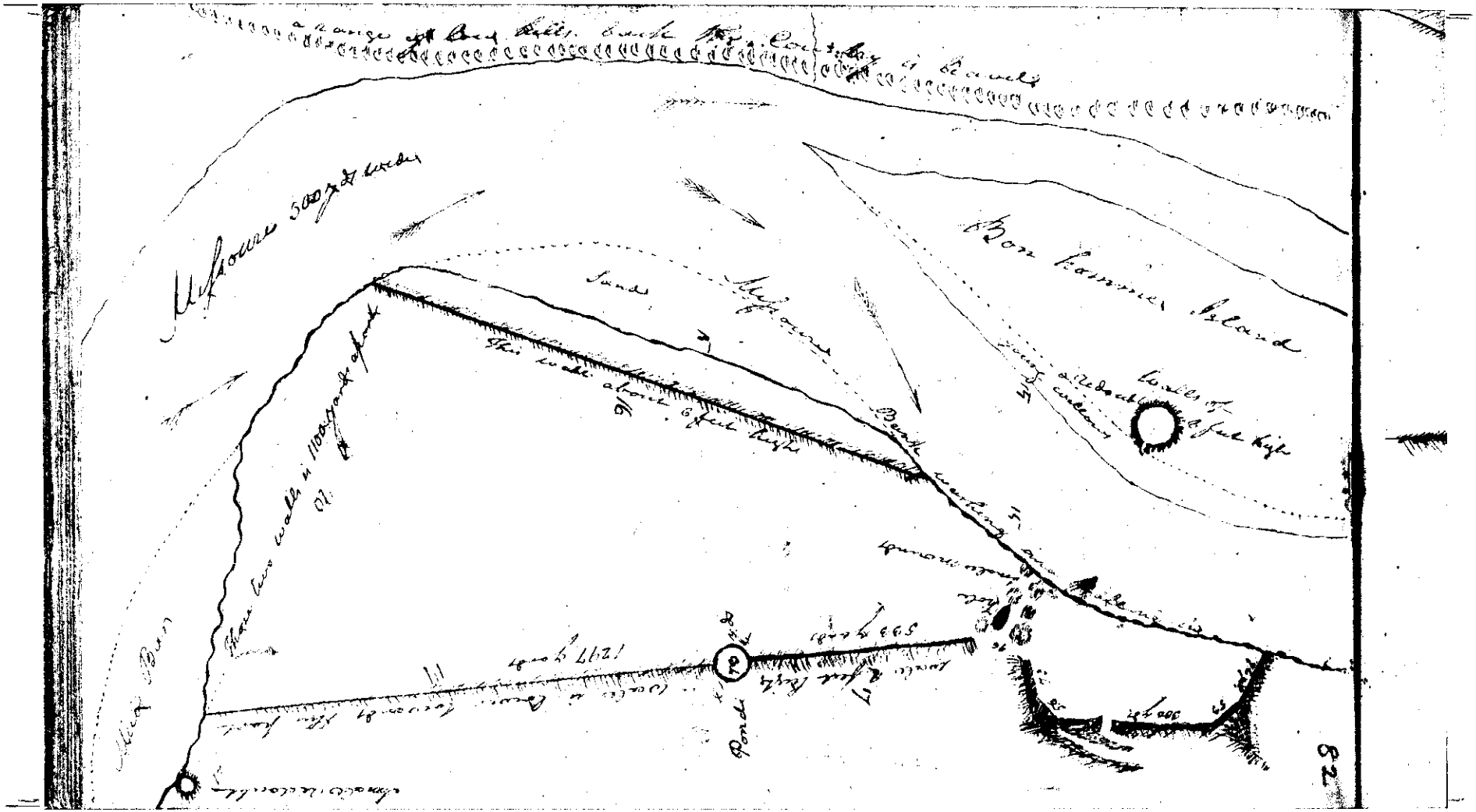
How to reach: The site is now covered by Lewis and Clark Lake. To reach the view site: SD52, approximately 17 miles west from Yankton; at the sign "To Sand Creek Access," south on Appletree Road (County Road 18A) 3 miles; left at the sign to Charley Creek Access Area, approximately 0.5 miles.

Potential interpretive themes: present view offers a dramatic contrast to the river as Lewis and Clark knew it; the now-flooded sand formations illustrate the speed and volume of water in the Missouri at flood stage.

Geology: Located about 13 miles upriver from Calumet Bluff, these sedimentary features on the floodplain of the Missouri are completely covered today by the waters of Lewis and Clark Lake. A 1949 U.S. Army Corps of Engineers topographic map of this reach of the Missouri, made before Gavins Point Dam was closed, shows features similar to those measured, described and sketched in their journals by Lewis and Clark. These features are best explained as scroll bars that form along the inside of meanders of rivers during flooding. When the meandering river shifts its channel, mounds of sand and gravel may be left behind. They form low mounds with a rectangular plan similar to earth mounds dug for a fort.
Clark reported that these features measured up to 16 feet high, up to 16 feet wide at the top and 105 feet at the base, and were up to several hundred yards long. These dimensions are larger than those found along modern rivers and on down-stream sections of the Missouri today. Currently, however, the river is controlled by dams, and flooding is thus lessened. Prior to 1804, floods much larger than any experienced in modern times along this reach of the Missouri could have produced very large scroll bars. (Private communication with Dr. Norman Smith, Department of Geosciences, University of Nebraska-Lincoln)

Site #8 "Ancient Fortifications"

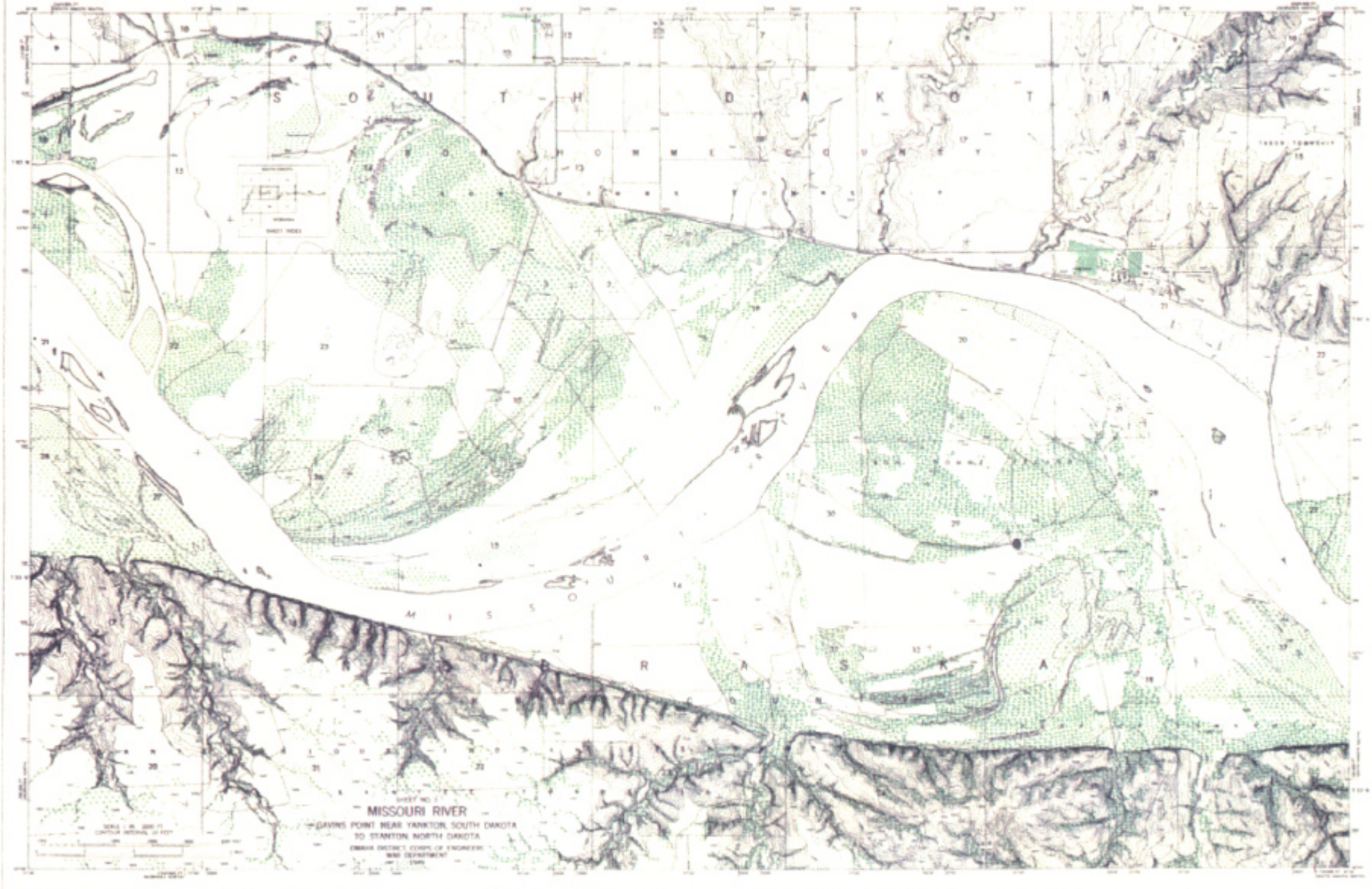




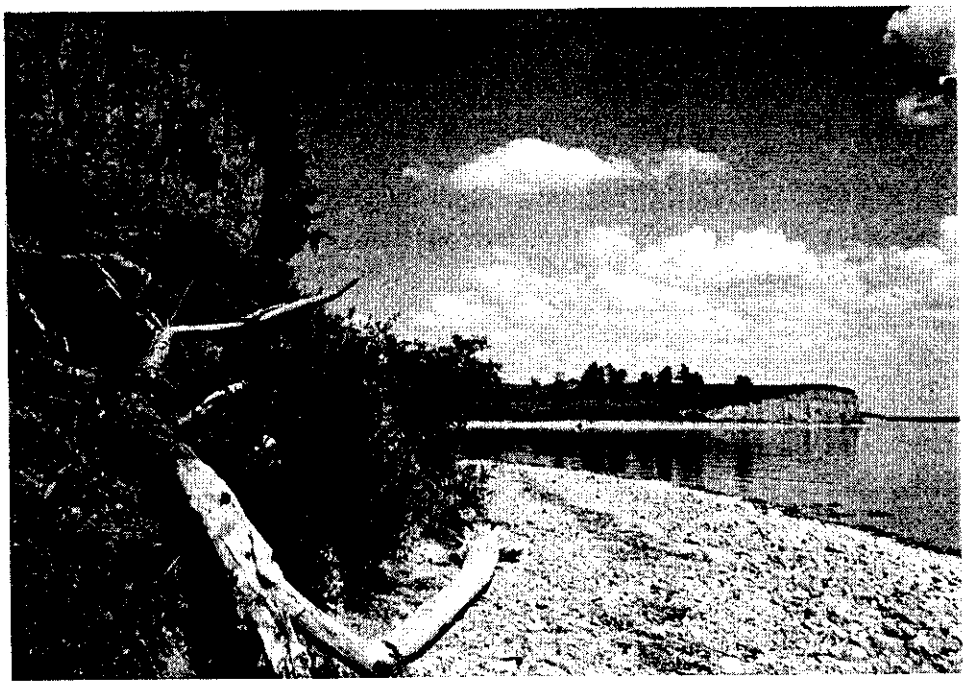
"Bon Homme Island on the Missouri River, Bon Homme County, South Dakota and Knox County, Nebraska September 1, 1806," by William Clark, American Philosophical Society

WAR DEPARTMENT

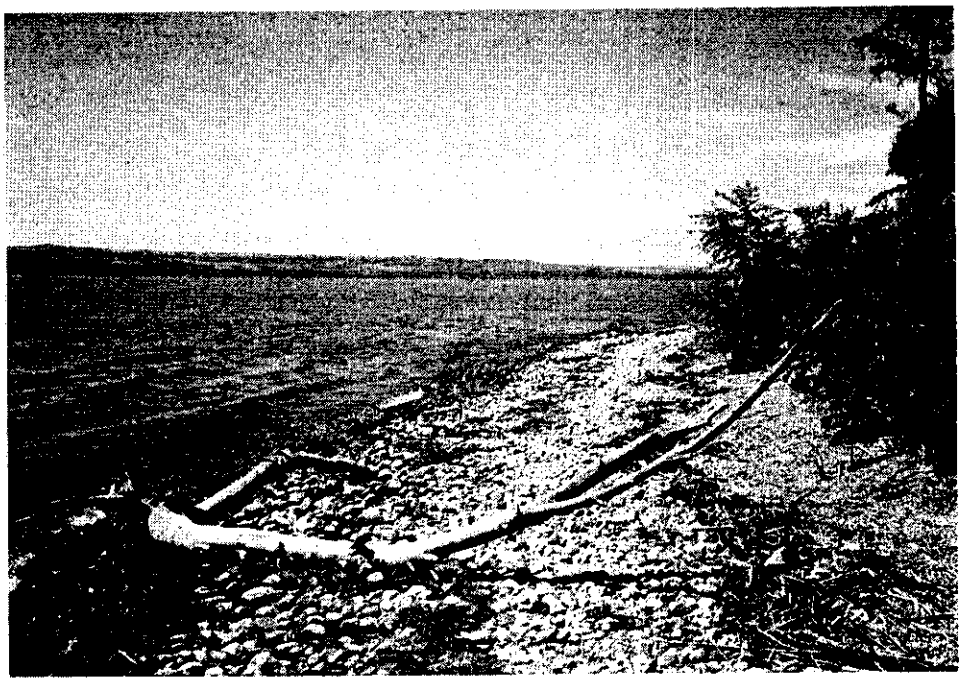
CORPS OF ENGINEERS, U. S. ARMY



#8-1 Charley Creek Access Area; road and parking area.



#8-2 Mouth of Charley Creek; view to the east from shore of Lewis and Clark Lake.



#8-3 Lake and shore at Charley Creek Access Area; view to the southwest.

Site # 9

Name: Mouth of the Niobrara River

Date: September 4, 1804; September 1, 1806
Event: Travel a short way up the Niobrara River; camp near the mouth

Location: NE12 approximately 3 miles northwest of the town of Niobrara, NE

USGS Quadrangle (1:24, 000): Niobrara

Legal Description: SE1/4 of NW1/4, sec. 8, T.32N., R.6W.

Owner: Various along the flood plain of the Missouri and Niobrara Rivers

How to reach: The mouth is accessible by boat, but not by car or by foot. Interpretation at the site is not practical. Two view sites provide locations for interpretation.

Where to view:
a) Several locations in Niobrara State Park: off NE12 atop the bluffs overlooking the mouth of the Niobrara from the west.
b) Overlook at the northern (SD) end Chief Standing Bear Bridge linking SD37 and NE12: approximately 12 miles (by road) southwest of Springfield, SD, and 4 miles east of Niobrara, NE.

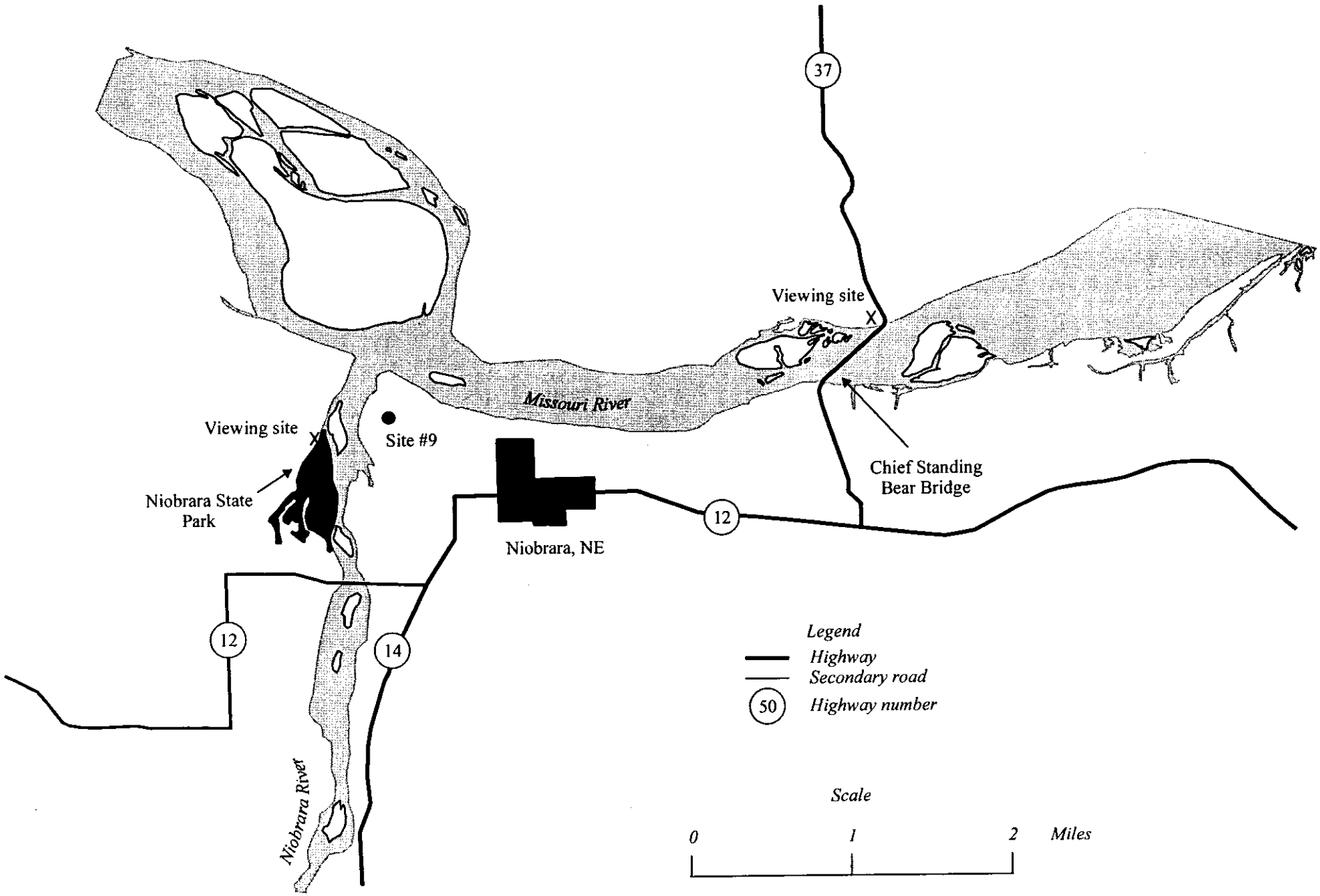
Present use/condition:
a) General recreation: camping, hiking, horseback riding
b) Highway rest stop

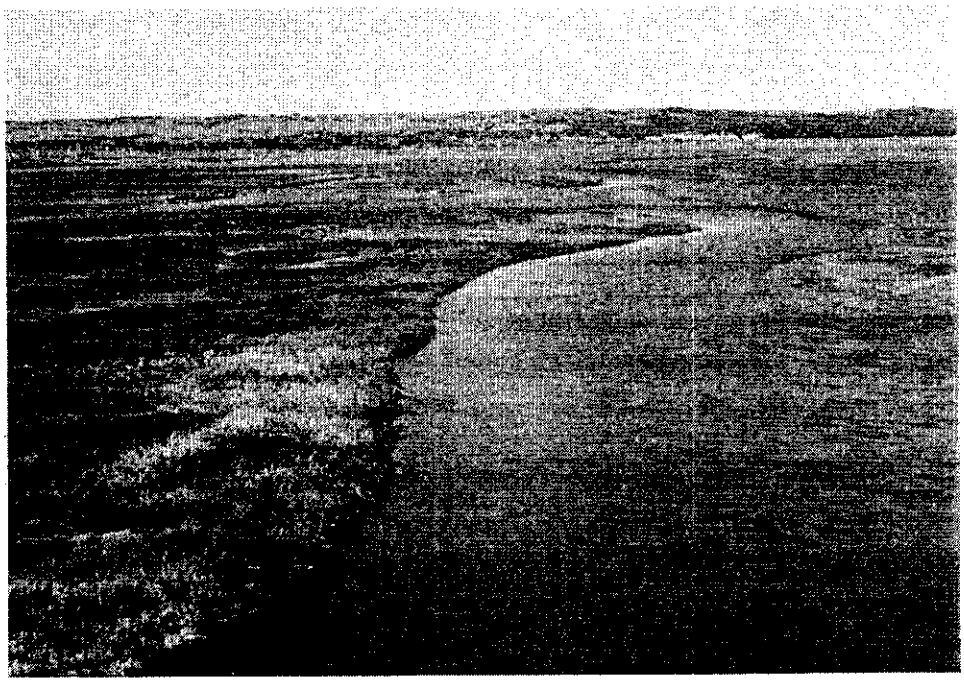
Present markers/interpretive signs:
a) Two panels in a shelter near a high spot overlooking the river's mouth.
b) Three panels at the bridge overlook.

Potential interpretive themes: The natural history of the area; Lewis and Clark's visit to the Ponca village; their meeting with the Yankton on the return journey.

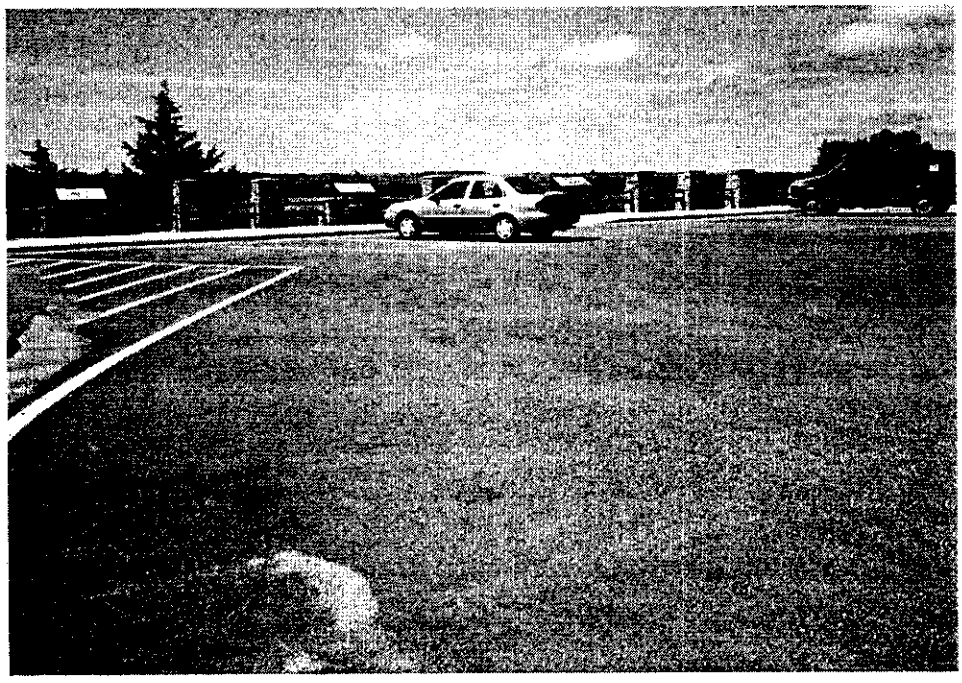
Geology: Because the valley of the Niobrara River, where it enters the Missouri, is confined by bedrock of the Niobrara Chalk Formation on both sides, it is in the same general position as in 1804. There are, however, obvious signs from old maps and aerial photographs that the main channel has shifted back and forth across its flood plain since then. The main channel is now along the west side of the valley, encroaching on the bluffs of the valley sides and eroding the exposed Niobrara Chalk there. This channel change took place in March 1995.
Similarly, the valley of the Missouri, where the Niobrara enters it, is confined by bedrock valley sides. Old maps and aerial photographs show that its principal channel has also shifted several times since 1804.

Site #9 Mouth of the Niobrara River

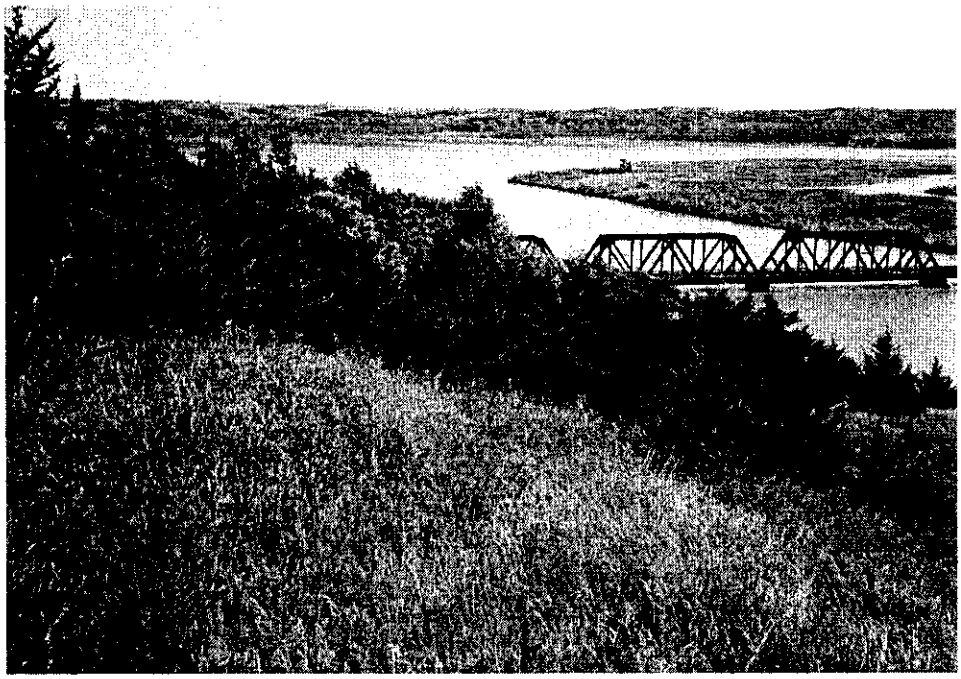




#9-1 From view spot at the north end (SD) of the Chief Standing Bear Memorial Bridge; view to the southwest; mouth of the Niobrara River between the bluffs on the opposite (NE) side of the Missouri.



#9-2 Parking area at the view spot at Chief Standing Bear Bridge.



#9-3 Mouth of the Niobrara River; view to the northeast from a path east of an interpretive shelter at Niobrara State Park.

#9-4 Mouth of the Niobrara River from a picnic shelter at the highest point in Niobrara State Park.

Site # 10

Name: Old Baldy

Date: September 7, 1804; August 31, 1806
Event: Called a "cupola" (1804) and a "doome" (1806) by Lewis and Clark; climbed this pinnacle; scientific description of the prairie dog; camped near

Location: 7.5 miles north of Lynch, NE

USGS Quadrangle (1:24,000): Marty

Legal Description: NE1/4 of SW1/4, sec. 10, T.34N., R.10W.

Owner: Chester Miller; but contact Robert E. Courtney, Rt 1, Lynch, NE 68746 (402/569-2583)

How to reach: From Lynch, NE: north on gravel road approximately 9 miles

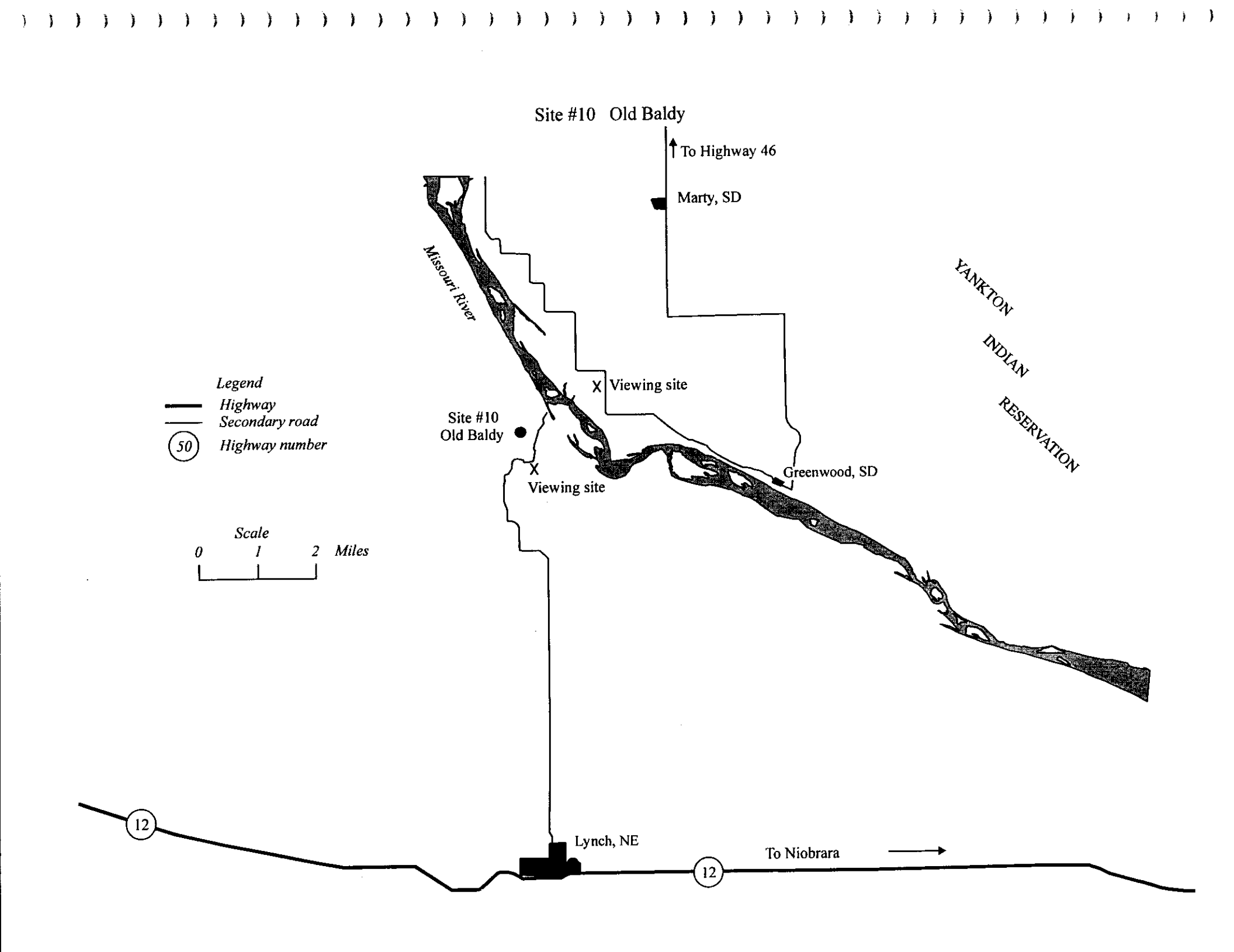
Where to view:
a) county road (NE) -- from gravel road approximately 0.75 miles southeast of the site
b) Yankton Sioux Reservation (SD) -- from a paved road bordering the Missouri River. From Pickstown, SD, east on SD46 approximately 6 miles; south on the road to Marty though the reservation and then to Greenwood, approximately 15 miles; east approximately 7 miles to view the site across the river.

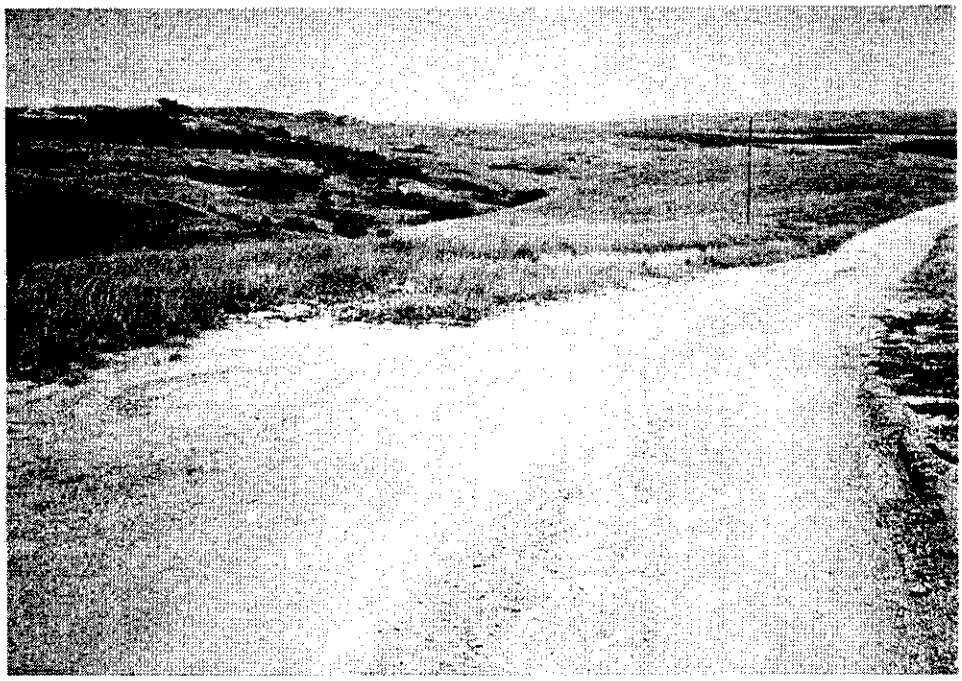
Present use/condition: grazing land

Present markers/interpretive signs: None

Potential interpretive themes: First scientific description of the prairie dog; natural history of the area; storm at night on the return journey.

Geology: The rocks exposed in this hill on the south side of the Missouri River valley in Boyd County, NE, are part of the Pierre Shale Formation of Cretaceous Age. The Pierre is mostly a gray-to-black shale that contains some chalky strata. One of these chalk members caps the top of Old Baldy. Because the chalk does not support abundant plant growth on steep slopes, it is mostly exposed on this hill giving it a "bald" appearance in contrast to the surrounding area. Somewhat unimpressive when approached from the south, the Nebraska side, the hill is very prominent when viewed from the Missouri River bottom on the South Dakota side. (For descriptions of the Pierre Shale in this area, see G.V. Mendenhall, "Bedrock Geology of Boyd and Northern Holt Counties, Nebraska," MS thesis, University of Nebraska, 1953.)


Site #10 Old Baldy
To Highway 46
Marty, SD
Missouri River
YANKTON
INDIAN
RESERVATION
Viewing site
Site #10
Old Baldy
Viewing site
Greenwood, SD
Legend
Highway
Secondary road
50
Highway number
Scale
0 1 2 Miles
12
Lynch, NE
To Niobrara
12



#10-1 Old Baldy at the far upper left of photograph; view to the northwest from a county road at a pull-off spot.

#10-2 View to the southwest from road parallel to the Missouri River on the Yankton Sioux Reservation; of the two peaks on the horizon to the right, Old Baldy is the one to the left.