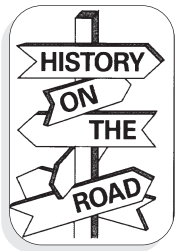


# HISTORY ON THE ROAD

## CHARCOAL AND UTAH'S EARLY MINING INDUSTRY

By Douglas H. Page Jr., Sarah E. Page, Thomas J. Straka, and Nathan D. Thomas

Photographs by Douglas H. Page Jr.



One of the American West's oldest and best-known industries is mining, but an associated industry, just as old, has been largely forgotten. Mining required smelters, and smelters required fuel. That fuel was charcoal for much of the 1870s and 1880s, until the railroads could supply coal and coke. Producing charcoal was a profitable industry, and powerful people made fortunes from it while exerting huge influences over smelter operations. Nell Murbarger, a prolific chronicler of the West, called it "reviled, greedy, troublesome, wasteful and corrupt."<sup>1</sup> Smelters in Utah resulted in large clearcuts around kilns, created a labor class of woodcutters

tied to charcoal markets,<sup>2</sup> and devastated the pine nut crop, a food staple of Native Americans.<sup>3</sup>

Little precious-metal mining occurred during the early days of white settlement in Utah. Mormon leader Brigham Young discouraged it in favor of farming, light industry, and mining for industrial uses, like salt, coal, and iron. This changed in 1862, when Colonel Patrick Connor and the Third California Volunteers established Camp Douglas, overlooking Salt Lake City, to secure the overland mail routes. Relations between the U.S. government and Mormon leaders had been tense for several years. Some felt Connor was there more to keep watch on the Mormons than to oversee the U.S. mail route. Indeed, Connor was anti-Mormon and set out to "Americanize" Utah, calling Mormons "a

community of traitors, murderers, fanatics, and whores."<sup>4</sup> He anticipated that Utah's gold and silver would encourage a massive flood of "gentiles" (non-Mormons) to weaken the Mormon church's influence, and perhaps some of the wealth would also benefit the colonel and his friends. Connor encouraged his men to prospect.<sup>5</sup>

Utah's precious-metal mining history starts with a discovery of silver in Bingham Canyon (now primarily known for copper production) in the Oquirrh Mountains about 20 miles southwest of Salt Lake City. Soon Connor's troops found gold and silver in nearby areas. Brigham Young was not happy and questioned the government's motives: "Were they really here to protect the mail and telegraph lines, or to discover, if possible, rich diggings in our immediate vicinity?"<sup>6</sup> The West Mountain Quartz



*A handful of wooden buildings and kilns are all that remain of the once bustling town of Piedmont, Wyoming. Visitors should beware that some sites like the town of Piedmont are on private land.*

Mining District was established, but a gold rush did not ensue. Utah's treasures were buried deep, and it would take large investments of capital and technology to reach them. From 1863 to 1869 mining was limited in Utah by high transportation and labor costs, a scarcity of charcoal, and the lack of experienced miners.

The completion of the transcontinental railroad in 1869 transformed the region: the mining boom Brigham Young had feared began, and gentiles swarmed into Utah. Soon spur railroad lines were rushing to the newly established mining towns. Improved smelting techniques were developed almost at the same time the central Great Basin ores were discovered. These ores were "refractory" or "rebellious"—complex ores that had to be dry-crushed and roasted with salt, a time-, labor-, and wood-intensive process, before amalgamation would occur and the valuable elements could be extracted.<sup>7</sup> Coal, which produces high heat, was not yet available in mining districts, however. Miners turned to a local source of fuel, pinyon pine-juniper forests, and converted the wood into charcoal, which produces double the heat of seasoned wood and is essentially pure carbon.<sup>8</sup> In 1869 Carl A. Stetefeldt designed a furnace that increased the efficiency of the smelting process and used considerably less labor and a third less charcoal. The Stetefeldt furnace significantly boosted the profitability of central Great Basin mining operations.<sup>9</sup>

Early mining districts were on either side of Salt Lake Valley: the Bingham, Ophir, and Mercur districts were in Oquirrh Mountain canyons, and the Big and Little Cottonwood, Thaynes, and American Fork were in Wasatch Mountain canyons. The Tintic District was just south of the Oquirrh Mountains. Farther south, major mining districts included the San Francisco, Iron Springs, and Silver Reef.<sup>10</sup> Railroad spurs ran south to the mining areas, and by 1872 a few mining areas, mainly those in the Oquirrh and Wasatch mountains, were considered fully developed and productive.<sup>11</sup> By then there were 21 smelters in Utah, all located near mining activity: 4 were near Salt Lake City and 1 at a transportation hub, Corinne, north of the city. The others were south of Salt Lake City, with 7 in the Oquirrh Mountains (5 near Ophir and 2 near Stockton), 7 in the Wasatch Mountains (3 near Cottonwood, 2 near Bingham, and 2 near American Fork), and

2 near Tintic.<sup>12</sup> All these areas had charcoal kilns to support the smelters.

### CHARCOAL PRODUCTION

Charcoal is made by partially burning wood in the absence of oxygen. This "carbonization" involves the regulation of air flow to the burning wood. Volatile gases from the wood are burned, leaving almost pure carbon. Charcoal has great advantages over wood in the smelting process: not only does it burn twice as hot as wood, it is also lighter than wood and thus cheaper to transport to the smelter.

Most charcoal was made in earth "pits," a misnomer, since a charcoal pit is entirely above ground. Its base was a flat, cleared space about thirty to forty feet in diameter. Wood was carefully stacked into a free-standing structure of logs that leaned

inward. The pit was covered with soil to limit air so that the wood would not be fully consumed by the fire. The size of pits varied. Most charcoal was produced in pits of 100 cords that burned out in about 15 to 20 days and yielded about 2,500 to 3,500 bushels.<sup>13</sup>

Charcoal kilns, usually constructed of brick or stone in the shape of a beehive, were more efficient than earth pits, and drafts could be better controlled to enhance quality. A kiln might hold 35 cords of wood. Short sections of logs split lengthwise were cut from nearby forests and hauled to the kiln site, which was usually located between the wood source and the smelter to minimize overall transportation cost of the heavy wood and lighter charcoal. Vents controlled the burning rate. Charring and cooling would take around





two weeks. If the kiln was opened too soon or on a windy day, spontaneous fires could rapidly destroy the new charcoal. The description of the Frisco kilns (below) gives additional detail.

All the lead-smelting furnaces of the Great Basin used charcoal as fuel. Charcoal's price ranged from 15 to 34 cents per bushel (1.59 cubic feet). The lowest price was at the American Fork and Tintic districts in Utah, which had abundant timber, and the highest at Little Cottonwood District, where charcoal had to be shipped in from Truckee, California. Utah charcoal was mainly produced from pinyon pine, but where this preferred species was not available, juniper, aspen, mountain mahogany, and other species were used. Experienced Italian charcoal burners at Eureka, Nevada, produced the best product; the poorest product, with waste reaching 15 percent, came from places in Utah that were forced to use small timber. The fuel value of a ton of coke, which was derived from coal, was equivalent to about 200 bushels of charcoal. Diminishing timber supply in Utah caused wood prices to increase, and as the Utah Southern Railroad extended southward, coke eventually became the preferred fuel for the smelters.<sup>14</sup>

## FOREST DEVASTATION

A mining community quickly developed a demand for wood: insufficient charcoal could close a smelter or mining district. Mining required timber for tunnels and shafts, buildings, and heating as well as for the smelters. Harvesting the surrounding forests could devastate forests near the development, and often for miles around the mining activity. Franklin Hough's first *Report upon Forestry* (1878) noted the forest clearing in Utah:

*The mining operations of the Wahsatch and other ranges have created a new and extensive demand for timber and especially fuel. The consumption of charcoal in the smelting-furnaces of the Territory is becoming every year of practical importance, and the difficulty of procuring it an increasing item of expense. According to the Deseret Agricultural and Manufacturing Society, for 1875, the amount of charcoal made in the Territory during the year was 8,674 tons, valued at \$132,837.50. It is chiefly used in the silver smelting-furnaces of the valley, and the timber mostly used for this*

*purpose is the quaking [aspen]. This timber grows at the upper levels in the valleys, and well up to the timber-line... Since the opening of numerous mines in the Great and Little cottonwood cañons, or rather on the dividing ridge that separates them, the timber has found a local demand which is hastening its destruction. In a recent visit to this country, an instance of random destruction came under notice, which cannot be regarded as unusual in the mining region of the West. The supply having failed in the Little Cottonwood, an adventurer had come over the snow-clad divide in the basin at the headwaters of the Great Cottonwood, and cut down a million feet or more of valuable pine, as a speculation, but failing to realize from sales, it was left to rot on the ground. The rings of growth on one of the stumps thus cut, showed the age of the tree to have been over four hundred years, which may be regarded as about the usual period required for timber to grow to its greatest dimensions in these high altitudes.*<sup>15</sup>

Mines and smelters used the nearest available timber, and by 1882 the supply of mining timbers and wood for fuel and charcoal had become a limiting factor at some mines. As distance to the timber increased, so did the cost of timber. Timber became a valuable commodity, sparking conflicts over its control. In his last *Report upon Forestry* (1882), Hough describes the abuses on federal lands:

*As for the right of property in the timber of the mountains, few questions have hitherto been asked, and it has been taken from the public lands wherever found. Excepting to the very limited extent to which efforts for its protection have recently been made by the agents of the Department of the Interior, no returns have ever been made as to the amount taken, and but a feeble income, as compared with consumption, has been derived from the penalties received on account of this spoliation of timber upon the public lands. As a rule, the first who came had the first chance, and in some cases an understanding was had between different operators by which each was to have the exclusive cutting upon certain portions without hindrance from the other. In other instances a collision of interests has arisen, which, as both*

*parties were alike trespassers before the law, could scarcely be settled by the court, or otherwise than by appeal to force. Instances of bloodshed and violence have happened time and again from the efforts of parties to monopolize the timber, or to exclude competitors, and in other cases immense quantities of trees have been felled for speculative purposes, either to secure a right of possession, [which] might be sold at an advance, or to supply a perspective demand that never came. In both cases, large quantities thus felled have sometimes been left to rot upon the ground. In the other cases, the disappointed contestant for an opportunity to cut timber has revenged his fancied injury by maliciously setting fire to the timber of his rival, and thus a hundred-fold greater damage has been done to this country than if both had done their utmost toward depleting the forests by the usual operations of lumbering.*<sup>16</sup>

By the late 1880s the damage from the charcoal industry was well noted in government reports. The charcoal burners were likened to criminals:

*From the best information obtainable, it is believed that the charcoal burners of the Rocky Mountain region are doing immense injury to the forests. They draw their supplies of wood almost wholly from the public domain, and although they profess to make large use of dead timber, there is no doubt that the growing forests are largely encroached upon by them. A person well informed upon this subject recently expressed himself thus: "The charcoal burner is the most conscienceless violator of law we have, cutting everything down to poles 2 inches in diameter. He leaves behind him barrenness and desolation. The traffic in charcoal is so exhaustive upon the forests, and so injurious to the best interests of the State, that wherever permitted it should be done under a license only, by the giving of a bond, and by the rigid enforcement of conditions and penalties. There are no reasons why the charcoal burner should longer be allowed to prey upon the timber and young forest growth. On the contrary, many strong and urgent reasons exist for limiting his operations."*<sup>17</sup>

Real control of the federal forest lands did not occur for another twenty years until the Forest Reserve Act of 1891 and the Organic Act of 1897 set the stage for the



Two of the original four kilns built just east of Leamington remain alongside Highway 132.

first true efforts to designate and manage the public lands that would be allocated to forest production. Gifford Pinchot's U.S. Forest Service took control of federal forest land and its recovery from earlier abusive practices.

### CHARCOAL INDUSTRY ROAD TRIP

A visit to Salt Lake City offers an opportunity to visit some of Utah's old charcoal kilns, along with the associated mines and ghost towns.

#### Leamington or Morrison Charcoal Ovens

Two of four charcoal kilns remain near Leamington, in central Utah. Built for George Morrison in 1882 after the railroad arrived in 1879, they supplied the Ibx smelter two miles to the northwest until at least 1895, after which the smelter shut down because of a lack of ore; presumably the kilns soon ceased operating.<sup>18</sup> This is the most accessible of the kilns but not the most exciting. They are on the side of a paved highway and can be visited by taking a back way to the Frisco kilns via Delta, Utah.

Wood was cut in the nearby canyons to the east (one is named Wood Canyon) and hauled by horse or mule, one quarter

of a cord per animal, to the canyon mouth. With four mules and three trips per day, one man could transport three cords per day. The wood then moved by wagon or cart to the kilns. The historical marker reads, "Standing inside the oven or outside looking to top of Wood Canyon, one can almost hear the sound of axes, of men and mules, wagons and trains."

Directions: From Interstate 15, take Exit 225 at Nephi and drive west on UT-132 for 27.5 miles; kilns are in the right-of-way on the north side of the highway. (Web directions: <http://binged.it/XuUxg2>.)

#### Frisco Charcoal Kilns

Southwest of the Leamington kilns are the Frisco kilns, in the San Francisco Mountains that gave the kilns their name. Two prospectors accidentally discovered silver-bearing ore in 1875, and Frisco was founded in 1876. The prospectors mined for a short while and sold out for \$25,000, thinking they had made a great deal. Under new ownership the claim became the Silver Horn and produced ore worth \$100 a ton; by 1879 it was the richest silver mine in the world.<sup>19</sup> New mines were scattered all over the area, and smelters and charcoal kilns quickly followed throughout the district. The Frisco Mining and Smelt-

ing Company built the five kilns at Frisco.<sup>20</sup> The town of Frisco was a classic mining boom town: "Frisco became as wild and tumultuous a town as any in the Great Basin...and the wildest camp in Utah. Twenty-one saloons had so many killings the undertaker's wagon made daily rounds."<sup>21</sup> After the Silver Horn had a major cave-in in 1885, Frisco started to decline; in 1894 most of the mill works were destroyed in a fire. Nonetheless, the mines are rich enough to support some level of activity even today.<sup>22</sup>

Pit production of charcoal was used in the district, but the cone-shaped kilns were built to produce a higher grade of charcoal. A government report described the Frisco kilns in detail:

*Charcoal burning.—Thirty-six beehive charcoal kilns supply the furnaces of the district with fuel. They were in eight groups, under separate individual management, at places where wood was accessible, and at distances of from 6 to 18 miles from Frisco. Some pit coal is burned in the [Wah Wah] Mountains, but it is sold for 1 or 2 cents per bushel less than kiln coal, as the latter is cleaner and of better quality. The kilns are made of granite float found in the neighbor-*





Frisco's five kilns built in the foothills of the San Francisco Mountains are situated with what remains of the town of Frisco.

hood and a lime mortar. They are of various sizes, from 16 to 26 feet in diameter. It is the rule in this section to make the height of the kiln equal to the diameter. The thickness varies from 18 to 30 inches at the base and from 12 to 18 inches at the summit. There are two openings, closed by sheet-iron doors, one at the ground level, 4 by 6 feet, and the other in the side two-thirds of the distance to the apex, 3 by 4 feet. There are also three rows of vent holes, 3 by 4 inches, near the ground. The rows are about 18 inches apart, having vent holes 3 feet apart in each row. The kilns cost from \$500 to \$1,000 each and last a very long time if used regularly. The 16-foot kiln holds about 15 cords and the 26-foot kiln 45 cords. Sometimes the wood is piled radially, but generally very closely in cordwood fashion. The wood is all piñon pine, and is cut all seasons by Mormons at \$1.25 per cord. It is brought from 1 to 4 miles by sledges or wagons to kilns for from \$1.50 to \$2.50 per cord. The kilns are fired in the center at the bottom (though sometimes at the top), and the fire is drawn to the top by leaving a small unsealed space around the upper door. This is then closed entirely, and the fire is regulated by the vent holes. The

duration of burning is from three to seven days and of cooling from three to six days. Charring, which includes packing the wood in the kiln and drawing the coal, is usually done by contract and costs from  $2\frac{3}{4}$  to  $3\frac{1}{2}$  cents per bushel for hauling, depending on the distance. The price received is 18 cents per bushel. Kiln brands are paid from \$2 to \$2.75. The labor required averages one man per kiln per 24 hours.<sup>23</sup>

Directions: Starting in Milford at the junction of Highways 21 and 257, go west on Highway 21 for 14.0 miles to Frisco Summit. Turn right onto the dirt road. The road can be rough, so park low-slung vehicles here and walk. The kilns are visible to the west. Walk or drive west 0.3 mile to a junction with the old railroad grade. The kilns are clearly visible from this point. Park or continue walking 0.3 mile northwest along dirt roads to the kilns. (Web directions from Milford to Frisco Summit: <http://binged.it/VnnQWh>.)

Directions to Frisco Cemetery: Return to Highway 21 and go southwest another 0.6 mile to the historical marker and picnic table on the right. Take the road on the left (south side) of the picnic table for 0.5 mile west to the cemetery. (Web directions

from Frisco Summit to Frisco Historical Marker: <http://binged.it/1ctY4rn>.)

If you are planning to proceed to Old Iron Town or Leeds from Frisco, you may want to go back through Milford, Minersville, and Cedar City.

### Old Iron Town (Iron City) Kiln

Iron City was a Mormon-sponsored mining town. The iron resources of Iron County were well known to the early Mormon settlers, and Brigham Young was supportive of a town built around an industrial metal; it was precious metals he did not want mined. The Union Iron Company was organized in 1868, and by the time of the 1870 census, the population was nearly 100 and the town had a post office. By 1871 a 2,500-pound furnace was operational, and in 1873 a blast furnace was built. There were two charcoal kilns and a charcoal house.

Iron production was so great that Iron City was dubbed the "new Pittsburgh in the desert."<sup>24</sup> Between 1874 and 1875, five to seven tons of pig iron were produced daily, enough over the course of a year to meet Utah's annual needs, 1,000 tons, plus supply much of the needs in all the adjoining states and territories. However, there were transportation problems. In 1874 the



cost of freighting iron to Salt Lake City was \$40 per ton. The railroad had lower freight rates from the East and eastern iron was cheaper. The furnace closed in 1876 because of a lack of financing, competition from other Utah iron works, and a federal tax of a half-cent per bushel of charcoal and 15 cents per load of wood. Today one can see the ruins of the town and furnace, including the furnace chimney and one charcoal kiln.<sup>25</sup> Old Iron Town is administered by the Frontier Homestead State Park Museum in Cedar City (the theme of the museum is Utah's early iron industry).

Directions: From Interstate 15, take the UT-56 exit at Cedar City and follow UT-56 west for 19.7 miles, turn left onto Old Irontown Road (paved), and continue for 2.7 miles, where the road makes a sharp left into the Old Iron Town Ruins parking lot. The state park has restrooms, a covered picnic area, and interpretive trails. (Web directions: <http://binged.it/XuU0ul>.)

### Silver Reef or Leeds Creek Charcoal Kiln

Continuing south on I-15 will bring you to the Silver Reef kiln. The history of Silver Reef begins in the 1860s, when a prospector found a small amount of silver in sandstone. He ignored it, since it was commonly known that silver did not form in sedimentary rock like sandstone. Out of curiosity, he came back in the early 1870s and struck a rich claim. Others soon followed. By 1875 Silver Reef was a boom town, with a mile-long paved main street and a boardwalk on each side. The peak years of mining activity were 1878 to 1882, but by 1884 most of the mines had closed because silver prices dropped on the world market, the mine suffered water problems, and ore quality declined.<sup>26</sup> Some of the ghost town remains adjacent to new homes, and the old Wells Fargo building is now a mining museum with artifacts from both Silver Reef and Frisco.

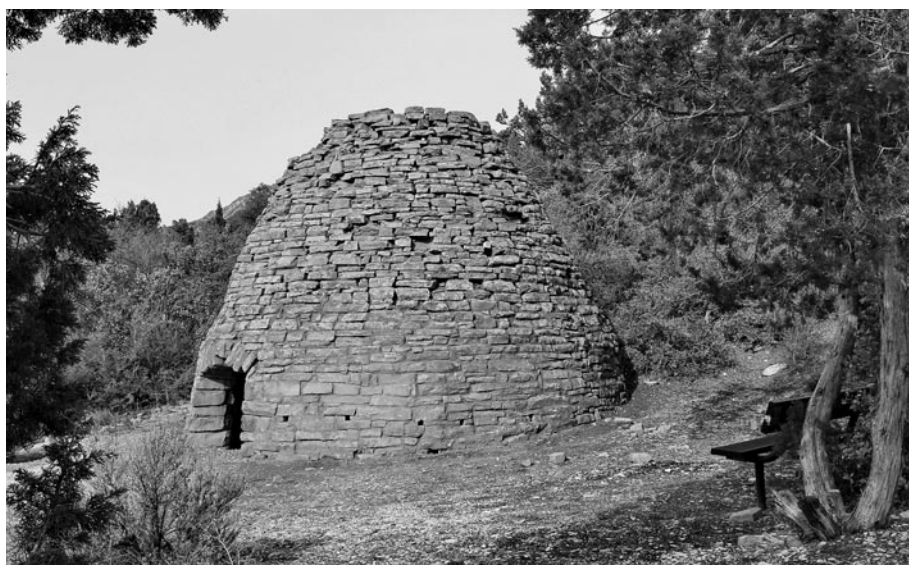
Italian and Swiss immigrants to the Great Basin brought kiln construction and charcoal-making skills with them from the old country. One sandstone-and-mortar kiln, constructed along Leeds Creek around 1885, has a Roman arch and is located 1.5 miles west of Italian Wash—two clues that it was built by Italian stone masons. Aside from its entryway arch, it is traditional beehive style, measuring 20 feet at the base and 25 feet in height. Charcoal production was for the smelter to the southeast. The nearby Pine Valley



*An interpretive walk leads by the foundations of the iron forge at Old Irontown.*



*The oldest surviving Wells Fargo Express building now serves as the Silver Reef Museum.*



*Built from sandstone, this kiln provided charcoal for the mines at Silver Reef.*





Visitors at the Piedmont kilns offer a sense of scale.

Mountains provided the pinyon pine and gambel oak for fuel.

Directions: This site is in the Dixie National Forest. From southbound Interstate 15, take Exit 23 (Leeds–Silver Reef), turn west on Silver Reef Road (if northbound, take Exit 22 and follow UT-228 for 1.7 miles and turn left onto Silver Reef Road), continue for 0.7 mile; the road name changes to Oak Grove Road. (You will pass a road on the left that leads to the ghost town and Wells Fargo museum, a side trip you should not miss.) At 1.5 miles the road crosses a creek and turns to dirt and gravel. At mile 2.1, bear right, staying on Oak Grove Road, and park in the Children's Forest parking lot at mile 4.2. Follow the gravel footpath northeast to the kiln. (Web directions: <http://binged.it/VxxbX9>.)

### Piedmont (Wyoming) Kilns

The headwaters of the Bear River are in northeastern Utah. The river flows north into Wyoming and then straddles the Utah, Wyoming, and Idaho borders, eventually turning south and draining into the Great Salt Lake. Forests at higher elevations were a source of lumber, railroad ties, mine timbers, and wood for charcoal. Harvesting started about 1870, and the principal species were lodgepole pine and Englemann spruce. These Wyoming kilns have a Utah connection: the charcoal was consumed

by ore smelters in Utah and Colorado.<sup>27</sup>

Logging on the Upper Bear River from 1879 to 1900 was a huge operation. Most of the timber was floated down the river or transported by flume to a large sawmill on the Bear River at Evanston, Wyoming (near the Utah border). Thirty-six miles of flume flowed from the mountains of Utah north to Hilliard, Wyoming, about 14 miles southeast of Evanston and on the main line of Union Pacific Railroad. The main trunk line was 30 miles long, about half in Utah and half in Wyoming. Both timber (for railroad ties) and cordwood for the kilns traveled on the flume. When the price of cordwood dropped, the flume was sold and eventually dismantled.

Twelve charcoal kilns were constructed in the immediate vicinity of Evanston, fed by four-foot long cordwood floated down the Bear River. The charcoal industry flourished at Hilliard during the late nineteenth century. Hilliard had more than 30 kilns constructed from rock; these were fed by the flume.<sup>28</sup> Two kilns were built about five miles south of Hilliard on Sulphur Creek, and another five kilns were constructed at Piedmont, Wyoming, about 12 miles northeast of Hilliard. The Piedmont kilns were supplied by wagon or sled.<sup>29</sup> Three have been restored, one has only foundation walls, and of the fifth, nothing but a circle remains, visible only with high-

resolution aerial photography.

Directions: From Salt Lake City, take Interstate 80 east for 80 miles to Evanston, Wyoming. Continue past Evanston to Exit 24 (Leroy Road) and turn right (south) onto graveled Piedmont Road (County Road 173). At 1.75 miles, cross County Road 180 and continue south on Piedmont Road toward Trout King Lake. The kilns and interpretive site are on the east side of Piedmont Road 6.8 miles farther on. Remains of the town of Piedmont are scattered along the road to the southwest for another half-mile; they are on private land and can be viewed only from the road. Following County Road 173 (the old railroad grade) southwest for about 15 miles takes you through Hilliard and connects to Wyoming 150, which leads back to Evanston. (Web directions: Piedmont to Hilliard: <http://binged.it/1fX6bfN>; Hilliard to Evanston: <http://binged.it/1fX5FOV>.)

### Nevada Charcoal Kilns

If after making the Utah circuit you have not had your fill of kilns, close to the Utah-Nevada border are some of the best-restored charcoal kilns in the Great Basin—the Ward charcoal kilns near Ely, Nevada. These and other Nevada kilns were described in an earlier article in this journal.<sup>30</sup> This is an overnight trip, four hours each way, but two major Nevada gambling cities and Great



A few remains of Piedmont are still nearby, including the old cemetery. Tombstones tell a story of personal hardship.

Basin National Park (including Lehman Caves) are on the route. From Salt Lake City, take Interstate 80 west for about 120 miles to Wendover, Nevada, and then another 120 miles on US 93 south to Ely. The kilns are 16 miles south of Ely (Web directions: <http://binged.it/16TKyZJ>), and the main entrance to Great Basin National Park is 62 miles southeast of Ely in Baker, NV.

Douglas H. Page Jr. is the Southwest Utah Zone Forester for the Bureau of Land Management in Cedar City, Utah, and Communication Chair for the Intermountain Society of American Foresters. Sarah E. Page is an archaeologist for HDR Environmental, Operations and Construction, Inc., in Salt Lake City. Thomas J. Straka is a professor in the School of Agricultural, Forest, and Environmental Sciences at Clemson University in South Carolina. Nathan D. Thomas is an archaeologist for the Bureau of Land Management in Cedar City.

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25. Carr, *Historical Guide to Utah Ghost Towns*, 59.
26. *Ibid.*, 138–42.
27. L. J. Colton, "Early Day Timber Cutting along the Upper Bear River," *Utah Historical Quarterly* 35 (Summer 1967): 202–208.
28. Different sources report different numbers of kilns at Hilliard. Colton, "Early Day Timber Cutting along the Upper Bear River," 207, reported that 32 kilns were located there. However, Elizabeth A. Stone, *Uinta County: Its Place in History* (Laramie, WY: Laramie Printing Company, 1924), 178–81, and Margaret M. Lester, *From Rags to Riches: A History of Hilliard and Bear River, 1890–1990* (Evanston, WY: First Impressions, 1992), 7, both reported 36 kilns.
29. Carr, *Historical Guide to Utah Ghost Towns*, 149–50.
30. Thomas J. Straka and Robert H. Wynn, "History on the Road: Charcoal and Nevada's Early Mining Industry," *Forest History Today* Fall 2008: 63–66.