

United States Department of the Interior  
National Park Service

# National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in National Register Bulletin, *How to Complete the National Register of Historic Places Registration Form*. If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions.

## 1. Name of Property

Historic name: West Fork Pigeon River Pratt Truss Bridge

Other names/site number: Bridge No. 79

Name of related multiple property listing: N/A

(Enter "N/A" if property is not part of a multiple property listing)

## 2. Location

Street & number: Spans the West Fork of the Pigeon River between Lake Logan Road and Heavenly Drive, 0.6 mile south of US276.

City or town: Bethel State: N.C. County: Haywood

Not For Publication:  N/A Vicinity:  X

## 3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended,

I hereby certify that this  nomination \_\_\_ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60.

In my opinion, the property  meets \_\_\_ does not meet the National Register Criteria. I recommend that this property be considered significant at the following level(s) of significance:

national  statewide  local

Applicable National Register Criteria:

A  B  C  D

<p>_____  <b>Signature of certifying official/Title:</b></p>	<p>_____  <b>Date</b></p>
<p>_____  <b>State or Federal agency/bureau or Tribal Government</b></p>	
<p>In my opinion, the property <input checked="" type="checkbox"/> meets ___ does not meet the National Register criteria.</p>	
<p>_____  <b>Signature of commenting official:</b></p>	<p>_____  <b>Date</b></p>
<p>_____  <b>Title :</b></p>	<p>_____  <b>State or Federal agency/bureau or Tribal Government</b></p>

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#### 4. National Park Service Certification

I hereby certify that this property is:

- entered in the National Register
- determined eligible for the National Register
- determined not eligible for the National Register
- removed from the National Register
- other (explain:) \_\_\_\_\_

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Signature of the Keeper

Date of Action

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#### 5. Classification

##### Ownership of Property

(Check as many boxes as apply.)

- Private:
- Public – Local
- Public – State
- Public – Federal

##### Category of Property

(Check only **one** box.)

- Building(s)
- District
- Site
- Structure
- Object

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**Number of Resources within Property**

(Do not include previously listed resources in the count)

Contributing	Noncontributing	
<u>0</u>	<u>0</u>	buildings
<u>0</u>	<u>0</u>	sites
<u>1</u>	<u>0</u>	structures
<u>0</u>	<u>0</u>	objects
<u>1</u>	<u>0</u>	Total

Number of contributing resources previously listed in the National Register N/A

**6. Function or Use**

**Historic Functions**

(Enter categories from instructions.)

Transportation/road-related

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**Current Functions**

(Enter categories from instructions.)

Transportation/pedestrian-related

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## 7. Description

### Architectural Classification

(Enter categories from instructions.)

Other: Pratt Through Truss

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**Materials:** (enter categories from instructions.)

Principal exterior materials of the property:

Foundation: concrete abutment and concrete pier

Walls: N/A

Roof: N/A

Other: wrought iron and cast iron truss elements, timber flooring system, and asphalt deck coating

### Narrative Description

(Describe the historic and current physical appearance and condition of the property. Describe contributing and noncontributing resources if applicable. Begin with a **summary paragraph** that briefly describes the general characteristics of the property, such as its location, type, style, method of construction, setting, size, and significant features. Indicate whether the property has historic integrity.)

The West Fork Pigeon River Pratt Truss Bridge (Bridge No. 79) is located in western North Carolina's Haywood County. This mountainous region, which is primarily drained by the Pigeon River running from south to north into Tennessee, is host to a rural farming community known as Bethel. Situated five miles south of Canton and six miles east of Waynesville, Bethel is the home of Bridge No. 79 spanning the west fork tributary of the Pigeon River. The river is relatively flat and shallow at the bridge site, where the stream's cold, clear waters flow slowly northward. Some twenty feet above the rocky river bed, the bridge decking spans between steep embankments covered with low undergrowth and lined with hardwood trees. Working farms and well-kept houses, dating mostly from the middle to latter half of the twentieth century, are scattered throughout the bridge's picturesque rural-valley setting. A mobile home along Heavenly Drive just opposite the bridge is an exception, but in the distance behind it and within view is a well-preserved farmhouse, whose construction features suggest that it likely dates to

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the late nineteenth or early twentieth century.<sup>1</sup> When standing in the center of Bridge No. 79, one can look in any direction and see the surrounding forested mountains with Cold Mountain looming just five miles off to the southeast, but blocked from view by yet another mountain.

Bridge No. 79 is a wrought iron, pin-connected, Pratt through-truss roadway span originally erected in 1891 to span the West Fork of the Pigeon River. Its utility was to carry the traffic of a one-lane, graded road that would later become State Road 284. For years the bridge served this purpose, until it was replaced in the early 1920's with a wider and stronger bridge. Bridge No. 79 was subsequently relocated in about 1925 to its current site on the West Fork, roughly one mile upstream from the original location, purportedly to give local farmers a more convenient place to make the river crossing. There the bridge remained for the next eighty-five years serving the local farmers as intended. Then, in 2013, when a new vehicular bridge was installed approximately seven hundred feet further upstream, Bridge No. 79 was repurposed to support pedestrian and bicycle traffic only. It is now easily accessed from Lake Logan Road (SR 1111), which runs northeast to southwest and passes within eleven feet of the bridge's northwestern approach. On the opposite side of the river, there are two public roads, Chambers Farm Lane (SR 1112) and Heavenly Drive, that lead to the bridge.

Today, more than 125 years since its original iron elements were puddled and formed, Bridge No. 79 welcomes hiking and cycling passersby through its Phoenix column trusses. Although currently relegated to light-duty service, the bridge retains its original structural integrity. The two-span, 99-foot long and 13-foot wide bridge consists of an 80-foot Pratt through truss main span and a relatively new 19-foot long timber stringer approach span at its northwest end. Two eighty-foot long, five-panel trusses still incorporate the Phoenix Bridge Company's patented wrought iron Phoenix columns—the only remaining example of this breakthrough technology in a North Carolina bridge.<sup>2</sup> These distinctive built-up columns, which are approximately four inches outside diameter, are used for the vertical compression members, portal inclined end posts, top chords, and lateral struts.<sup>3</sup> One of the four vertical posts (downstream, southeast side) has been replaced with a pipe at an unknown date. Pairs of square-shaped, forged eye-bars work in unison to carry the tensile forces in the lower and diagonal chords, as well as the hip verticals. Original cast iron compression fittings join the Phoenix columns and accept the tension bars and lateral bracing in pinned-connections. The diagonal chords in the center panels include clevis connections on each end, providing a means to adjust the tension in the truss elements. Suspension loops attached to the lower panel points support the old built-up iron floor beams, which carry a 2013 refurbished timber stringer and plank-flooring system covered with a 2-in layer of asphalt. Rare decorative elements—reported to be the only ones left on a North Carolina truss bridge—continue to adorn the portals, including iron starburst motifs, urn-shaped finials, and recognition plaques at each end.<sup>4</sup> The plaque on the southeast portal recognizes the county

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<sup>1</sup> Dating based on consultation with N.C. Historic Preservation Office staff.

<sup>2</sup> George Fore, *North Carolina Metal Truss Bridges: An Inventory and Evaluation* (March, 1979), 56.

<sup>3</sup> Hagley Museum and Library, Wilmington, Delaware; Phoenix Iron Company archives, "Sections of Phoenix Patent Wrought Iron Columns" (1875).

<sup>4</sup> Fore, 56.

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commissioners who authorized the bridge construction: “Haywood County Commissioners – E.H. Howell, C.B. Roberts, J.M. Gwynn.” On the northwest end another identically shaped plaque presents the name of the bridge builder: “Built 1891 by Dean & Westbrook Engineers, New York.”

According to community tradition and anecdotal testimony, a group of local farmers was responsible for relocating the bridge in about 1925. These men also poured the existing foundations which include a concrete winged abutment wall to support the southeast end of the bridge and a concrete pier on the northwest side to hold up the trusses and a nineteen-foot long timber approach span.<sup>5</sup> In 2013, when the bridge was refurbished for its new service, the entire structure was sandblasted and painted. Additionally, the old creosote wood deck was replaced with a new timber and plank flooring system with an asphalt deck. Following the installation of new wooden guard railing and timber bollards to block automobile traffic, the bridge was re-opened for pedestrians and cyclists.

Although it was relocated from its original site (roughly one mile downstream from the present location), the West Fork Pigeon River Pratt Truss Bridge retains a high degree of historic integrity. The Bethel community, in which the bridge was constructed, and within which relocated, was and remains a rural area characterized by widely spaced farms and residential properties with only minimal development. The wide river valley features a gently rolling landscape, all of which contributes to the high integrity of setting. With few exceptions, the bridge retains a high degree of integrity of design, materials, and workmanship. The truss system, which is what makes the structure locally significant, is intact to its 1891 design, fabrication, and installation with one exception. A Phoenix column vertical chord (middle vertical, downstream side) was replaced with a section of pipe at an unknown date, but it was done in a manner faithful to the bridge company’s original design. Both ends of the pipe column were fitted to the existing cast iron joinery such that the strength and aesthetics of the pinned connection were not lost (see photo no. 9). Other than that, only the design and materials used for the pier and abutment, approach span on one side, and decking have been altered. While the bridge has lost some integrity of association due to the fact that it is no longer used for road-related vehicular traffic, its continued use for pedestrian and cycling traffic results in regular maintenance and a physical and visual connection to the roads on either side of the river. For this reason, it retains a high degree of integrity of feeling.

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<sup>5</sup> Bethel Rural Community Organization DVD Video Production, *Walking in the Footsteps of Those Who Came Before Us*, “Truss Bridge No. 79 – Ava Chambers Barrett and Troy Hargrove” (2008).

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## 8. Statement of Significance

### Applicable National Register Criteria

(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- A. Property is associated with events that have made a significant contribution to the broad patterns of our history.
- B. Property is associated with the lives of persons significant in our past.
- C. Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- D. Property has yielded, or is likely to yield, information important in prehistory or history.

### Criteria Considerations

(Mark "x" in all the boxes that apply.)

- A. Owned by a religious institution or used for religious purposes
- B. Removed from its original location
- C. A birthplace or grave
- D. A cemetery
- E. A reconstructed building, object, or structure
- F. A commemorative property
- G. Less than 50 years old or achieving significance within the past 50 years

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**Areas of Significance**

(Enter categories from instructions.)

Engineering

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Period of Significance**

1891

\_\_\_\_\_  
\_\_\_\_\_

**Significant Dates**

1891

\_\_\_\_\_  
\_\_\_\_\_

**Significant Person**

(Complete only if Criterion B is marked above.)

N/A

\_\_\_\_\_  
\_\_\_\_\_

**Cultural Affiliation**

N/A

\_\_\_\_\_  
\_\_\_\_\_

**Architect/Builder**

Phoenix Bridge Company of Phoenixville, Pennsylvania—designer and fabricator

Dean and Westbrook Engineers of New York—agent and builder

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**Statement of Significance Summary Paragraph** (Provide a summary paragraph that includes level of significance, applicable criteria, justification for the period of significance, and any applicable criteria considerations.)

### **Summary**

The West Fork Pigeon River Pratt Truss Bridge (Bridge No. 79), which is located approximately 0.6 mile south of US 276 in Haywood County's rural community of Bethel, is locally significant under Criterion C in the area of engineering, as an excellent and remarkably intact example of a pin-connected Pratt through truss built using innovative iron fabrication technology. When completed in 1891, it incorporated the Phoenix Bridge Company's wrought iron Phoenix columns which had brought about a significant advance in engineering design and construction in the years immediately following the Civil War. Patented in 1862, the Phoenix columns were unlike the standard iron columns. These hollow structural members were built up of rolled wrought iron segments riveted together through flanges. More ductile and lighter than cast iron, the Phoenix columns enabled larger and stronger structures to be built to withstand vibration and heavier loads. By the 1880's, the advantages of the Phoenix columns had become apparent to more and more engineers, as they sought ways to solve the problems of bridging divides for the railroad industry and reaching higher into the skies with their buildings. The Phoenix Bridge Company refined and standardized their bridge designs, with many of them incorporating the Phoenix column. This allowed the company to quote and sell bridges from a catalog at lower costs to not only railroad companies but municipalities and rural communities as well. By the time Bridge No. 79 was fabricated and erected in 1891, the use of Phoenix columns was in decline, as Zee-bars, rolled "H" columns, and Bessemer steel were being used more and more.<sup>6</sup> Albeit late in the design life of the Phoenix column, Haywood County was able to order their Phoenix column bridge from a catalog to span the West Fork of the Pigeon River. It still stands today and is the oldest metal truss bridge and only remaining example of a Phoenix column bridge in Haywood County, or any other county in North Carolina.<sup>7</sup>

### **Criteria Consideration B**

Bridge No. 79 was originally constructed in 1891, roughly one mile downstream from its current location on the West Fork of the Pigeon River. After it was replaced by a wider and stronger bridge in the early 1920's, No. 79 was relocated to its present-day site sometime around 1925. It meets Criteria Consideration B because it is locally significant under Criterion C for its significance in the area of Engineering as an excellent and remarkably intact example of a Pratt through truss constructed using innovative iron fabrication technology patented by the Phoenix

<sup>6</sup> Thomas R. Winpenny, *Without Fitting, Filing, or Chipping: An Illustrated History of the Phoenix Bridge Company* (Easton, Pennsylvania: Canal History and Technology Press, 1996), 6-23.

<sup>7</sup> Fore, 56; and Lichtenstein Consulting Engineering, Inc., *North Carolina DOT Historic Bridge Inventory Report* (February, 2003), 88.

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Bridge Company. It retains the requisite historic features to convey its architectural values and retains integrity of design, materials, workmanship, feeling, and association.

### **Historical Background**

During the decades following the Revolutionary War, pioneers began finding their way through the mountain passes and establishing homesteads throughout the wild river valleys of western North Carolina's Buncombe County. In the early 1800's settlers populating Buncombe's former Cherokee Indian territory lodged an appeal with the state's General Assembly, declaring the distance to the county courthouse in Asheville too great and inconvenient. Moreover, they pleaded that the roads were frequently impassable, especially during the winter season. Thus in 1808, the state legislators established the new county of Haywood, with its county seat in the small village of Waynesville, thirty miles west of Asheville. At the time Haywood included all of the land along the Pigeon River and its tributaries, and encompassed the region extending from the Pigeon watershed to North Carolina's border with Tennessee.<sup>8</sup>

By about 1850, a stagecoach and wagon road known as the Western Turnpike had been completed, joining Waynesville and points further west with the largest town in the region, Asheville. Present-day U.S. Highway 19-23, which connects Asheville to the east and Waynesville to the west, generally follows the original path of the old turnpike, directly through Canton. For many years Haywood County's farmers used this rough road to drive their livestock and haul produce such as corn and apples to markets outside of the mountains. Not only did these drovers have to negotiate the rutted and oftentimes muddy road, but they were also forced to wade small streams and ford the wider Pigeon River at the small settlement called Ford of Pigeon—later to be formally named Pigeon River in 1891 and then Canton in 1893. Once reaching Asheville, the travelers encountered yet another heavily-used turnpike road. The Buncombe Turnpike, which ran north to south, was a graded road with some sections improved and paved with logs. It coursed through the French Broad River valley, offering access to Tennessee and Virginia to the north or the southern markets in Greenville, South Carolina and Augusta, Georgia. Until the arrival of the railroad in the early 1880's, these two turnpike roads were the primary commercial arteries used by Haywood County's farmers and merchants to escape the mountains.<sup>9</sup>

The railroad finally reached Waynesville in 1882, its tracks first passing through the tiny settlement of Pigeon River (Canton), located astride the river with the same name. These two Haywood County communities immediately gained an importance beyond all anticipation of the locals, becoming rail hubs where livestock, timber, and produce could be shipped to markets outside of the surrounding mountains. It was not long before wealthy outlanders began to

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<sup>8</sup> W.C. Allen, *The Annals of Haywood County North Carolina* (Waynesville, 1935), 31-42.

<sup>9</sup> Ora Blackmun, *Western North Carolina: Its Mountains and Its People to 1880* (Boone, N.C.: Appalachian Consortium Press, 1977), 207-221; and Carroll C. Jones, *Rooted Deep in the Pigeon Valley: A Harvest of Western Carolina Memories* (Wilmington, N.C.: Winoca Press, 2009), 63-73.

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converge there to enjoy the majestic mountains and soak-up its healthful climate, while lounging and recreating in the hotels and hot springs.<sup>10</sup>

Another important county road at this time connecting Waynesville and Pigeon River passed through the community of Forks of Pigeon (present-day Bethel).<sup>11</sup> The "Forks" was an old farming settlement that had developed in the first half of the nineteenth century on the land surrounding the confluence of the west and east forks of the Pigeon River. These streams that brawled out of southern Haywood County's mountain wilderness areas, flowed much more languidly by the time their waters joined to form the Pigeon River.<sup>12</sup> Since there were no bridges in Forks of Pigeon, the farmers had to ford the West and East Fork Rivers to get to the schools, churches, county court, markets, mills, and their neighbors' farms. The closest bridge was the railroad bridge located at least five miles downstream in the bustling rail hub village of Pigeon River. So when the rains came and the fording spots became too dangerous to cross, daily activities were interrupted and considerable hardships imposed upon the local folk.<sup>13</sup>

As a consequence of the increasing prosperity brought about by the arrival of the railroad in the early 1880's, the county was able to fund road improvements and infrastructure projects. Aware of the dire need of not one but two bridges at Forks of Pigeon, the county commissioners contracted to build two "wrought iron bridges"—an "80 ft span" across the West Fork near the Terrell ford and a "100 ft span" over the East Fork, just a quarter of a mile to the northeast next to Blaylock's Mill.<sup>14</sup> Wood Brothers & Company was hired to build the stone foundations and abutments and Dean and Westbrook Engineers of New York was selected to supply and erect the wrought iron bridges.<sup>15</sup> Acting as an agent for the Phoenix Bridge Company in Phoenixville,

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<sup>10</sup> Randy Cotton, *The Built Environment of Haywood County, North Carolina* (1983), 21.

<sup>11</sup> Based on reputable works of history about Haywood County, including those by W. Clark Medford and W.C. Allen. The existence of the road through Forks of Pigeon is further substantiated by the study of period maps such as the "The New Map of the State of North Carolina" published in Fayetteville, N.C. in 1833.

<sup>12</sup> In addition to the old postal address of "Forks of Pigeon" that can be found on most of the nineteenth century correspondence addressed to the local Bethel residents, historic maps identify the community as "Forks of Pigeon" as well. One example is a map titled "A New Map of the State of North Carolina" dated 1854 and published under the patronage of the N.C. Legislature.

<sup>13</sup> "In Empire of Trees, He Found Sunburst," *Asheville Citizen-Times* (Jan. 18, 1991).

<sup>14</sup> Since both bridges (West Fork and East Fork) were ordered at same time from the same agent of the Phoenix Bridge Company—Dean and Westbrook of New York, it is reasonable to presume that the East Fork bridge was also fabricated by the Phoenix Bridge Company, although there is no known documentary evidence to verify this conclusion. The first East Fork River Bridge was demolished at the same time the two new bridges were erected in the early 1920's. The fate of that iron structure is unknown, but the east pier built by Wood Brothers & Co. is extant and that old stonework supports the modern-day bridge, erected in the 1990s, that spans the river in the same place today.

<sup>15</sup> Haywood County Commissioners' Minutes Book (May 5, 1891), 581.

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Pennsylvania, Dean and Westbrook selected a Phoenix column bridge from the bridge company's catalog to span the West Fork. Phoenix order no. 613, dated May 16, 1891, specified "1—80' Rdwy Thro' Span" for Haywood County, N.C. (see Figure 1). Fabrication began on the West Fork bridge's two eighty-foot-long Pratt trusses in June and it was completed and ready to be shipped in September of 1891. The weight of the bridge components totaled 12,058-lbs and Phoenix's material and labor costs were \$3,944.<sup>16</sup>

Dean & Westbrook # 249 1-80' Rdwy Thro' Span Haywood Co. N.C.		613 <sup>3</sup>
Bridge Co.'s Order No. 613 Tender Made, May 16/91 Put in Shop, June 22 + 30/91 Estimated Weight, 13490 Actual Weight, 12058 Contract Price, 4.3 <sup>1</sup> f.o.b. Phyp	When to be completed, Sept-10 <sup>1</sup> { P. I. Co.'s Bill, \$ 475.45 { Date, Sept 16/91 Material, 2040 Labor, 1904 Total, 3944	
DATE 18	IRON COMPLETED 1891 Sept	DATE Full IRON SHIPPED 12058

Figure 1: The Phoenix Bridge company order #613 for Haywood County's "80' Rdwy Thro Span" Phoenix column bridge

It is unknown what price Dean and Westbrook passed along to Haywood County for the purchase and shipment of the Bridge No. 79 components. However, the minutes from a May, 1891 Haywood County Commissioners' meeting reveal that a contract for \$4,675 was awarded to "Dean and Westbrook, bridge contractors, and Wood Brothers & Co., stone masons," to build the West Fork and the East Fork bridges: "the super & sub structure compleet (sic)... in first class style."<sup>17</sup> Judging from the May date of the meeting minutes and the September completion date given on the Phoenix order, the contractors would likely have erected the bridge over the West Fork before the end of the year 1891.<sup>18</sup>

<sup>16</sup> Hagley Museum and Library, Wilmington, Delaware; Phoenix Bridge Company archives, Phoenix Bridge Company order no. 613.

<sup>17</sup> Haywood County Commissioners' Minutes Book (May 5, 1891), 581.

<sup>18</sup> The fabricated bridge components would have been shipped by railroad from Phoenixville, Pennsylvania to Pigeon River (Canton). Certainly it would have taken no more than a month's time to do this. From Pigeon River, the many parts and pieces of the bridge would have been hauled in wagons and delivered to the Bethel bridge site no later than the end of October, 1891. It is more than likely that Wood Brothers & Co. had the stone foundations ready by that time, since they had all summer to construct them. Dean and Westbrook's subcontractor would have needed no more than a few weeks to erect the

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For more than thirty years thereafter, pedestrians, horses, livestock, wagons, and later automobiles, trucks, and tractors crisscrossed the West Fork of the Pigeon River over the single-lane Bridge No. 79. As a result of growing traffic, State Road No. 284 passing through Forks of Pigeon and connecting Waynesville with the booming pulp mill town named Canton (formerly Pigeon River) was eventually improved and upgraded after the Champion Fibre Company began operations in 1908. These highway upgrades in the early 1920's included construction of new spans across the West Fork and the East Fork Rivers in essentially the same location as today's bridges. Local tradition has it that in 1925 a band of men from up the river disassembled the outmoded Bridge No. 79, hauled it piece by piece in horse and wagons to the contemporary site, and reassembled it on foundations made of hand-mixed concrete. The utility of the relocated bridge was immediately appreciated and exploited by the many valley farmers living and working on the fertile lands along the banks of the West Fork, as the traveling distance required to safely cross the river was shortened by several miles.<sup>19</sup>

It has now been more than 125 years since Bridge No. 79 was first built and 90 years since it was relocated. In 2013, the bridge was refurbished after being permanently closed to four-wheel vehicular traffic. The entire structure was sandblasted and painted and a new timber and plank flooring system with asphalt deck added. Following the installation of new wooden guard railing and timber bollards to block automobiles, the bridge was re-opened for pedestrians and cyclists. Today, the Phoenix column trusses look as fresh and strong as they did when the first wagons filled with corn and apples began rolling through them.

### **Engineering Significance and Context**

Throughout the advance of humankind man has struggled to achieve a means to cross over watery divides, be they small streams, large rivers, swamps, or coastal waterways. Log spans, hemp ropes or vines slung across a stream, stepping stones, and floating transport (rafts, boats, and ferries) were only a few of the ingenious methods concocted early on to solve the dilemma. Over the ages, the Romans and other civilizations and governments managed to construct magnificent arched masonry structures, spanning rivers and streams to carry people, animals, goods, and even flowing water across. But these were tremendously expensive undertakings and required extraordinary investments of manpower and time to complete. By the end of the eighteenth and early nineteenth century, great strides in bridge design were being made primarily because of the advances in engineering education. Mathematical methods began to be used to analyze the shapes, sizes, and materials of bridge components and determine how best to assemble them so that heavy loads could be supported.

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original bridge over the West Fork of the Pigeon River. Therefore, completion of the span was probably sometime in early December, 1891.

<sup>19</sup> Bethel Rural Community Organization DVD Video Production, *Walking in the Footsteps of Those Who Came Before Us*, "Truss Bridge No. 79 - Ava Chambers Barrett and Troy Hargrove" (2008); and "Bridge 79 has stood test of time," Asheville Citizen Times (July 5, 1992).

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Trussed structures were devised to span rivers, originally made of timber and later a combination of timber and iron. The first patent truss to incorporate iron elements was the Howe truss developed by a young millwright named William Howe in 1840. Howe's truss utilized timber for the diagonal bracing and the top and bottom chords and iron rods for the vertical tension chords. Four years later, Thomas and Caleb Pratt patented their Pratt truss which reversed the Howe design, using vertical timbers in compression and iron diagonals in tension. In 1847, Squire Whipple became the first person to correctly analyze the stresses in truss members and went on to develop an all-iron truss, with cast compression members in the top chords and wrought members for the diagonals and lower chords in tension.<sup>20</sup>

As the railroad industry and miles of trackage expanded across the United States in the mid-nineteenth century, so did the number of companies vying to supply the iron rails and railroad bridges. The Phoenix Iron Company of Phoenixville, Pennsylvania was one of these. Phoenix Iron, whose origins could be traced back to a late-eighteenth-century nail factory near Philadelphia, was not only a major supplier of rails at the time, but also fabricated structural shapes and beams. Just prior to the Civil War, a superintendent at Phoenix named John Griffen designed a spirally wrapped wrought iron cannon which the United States Army successfully tested—successful in the fact that it did not explode and rupture when fired. Although Phoenix Iron produced 1,400 Griffen guns during the war, gaining the company substantial publicity, there was another Phoenix innovation during this era that is much more historically significant—the Phoenix column.<sup>21</sup>

Patented in 1862 by Samuel Reeves, son of the founder of Phoenix Iron, the Phoenix column took advantage of the superior properties of wrought iron. Lighter, stronger, and more resilient—or ductile—than cast iron, wrought iron was not prone to crack and fail suddenly, as was cast iron. To form a Phoenix column, wrought iron bars were bent into a curved profile and flanged so that when arranged together in the direction of their length and fastened by rivets or bolts through their flanges they formed a hollow shaft or column (see Figures 2 and 3).<sup>22</sup> This hollow column became famously known as the Phoenix column, and it would influence the shift in bridge-building materials from cast iron to wrought iron.<sup>23</sup> Its use as compression members in trusses and buildings would soon revolutionize American engineering by enabling stronger trusses and taller buildings to be built.<sup>24</sup>

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<sup>20</sup> Parsons Brinckerhoff and Engineering and Industrial Heritage, *A Context for Common Historic Bridge Types: NCHRP Project 25-25, Task 15* (October, 2005), 2-3 to 2-7.

<sup>21</sup> Winpenny, 6.

<sup>22</sup> U.S. Patent 35582 (6/17/1862).

<sup>23</sup> J.A.L. Waddell, *Bridge Engineering* (New York, New York: John Wiley & Sons, Inc., 1916), 24.

<sup>24</sup> Winpenny, 7-9.

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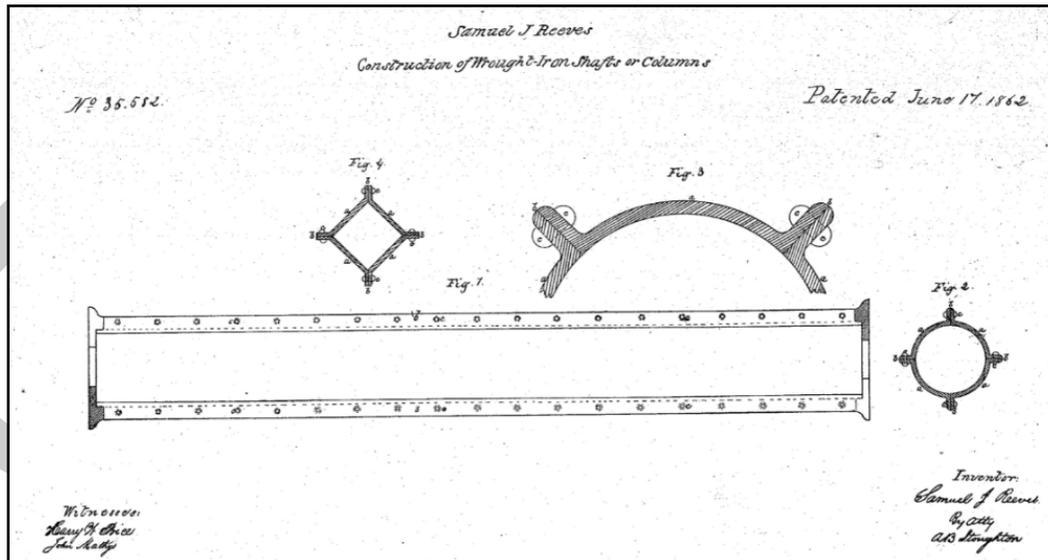


Figure 2: Diagram of a Phoenix column included in Samuel Reeves' 1862 patent application.

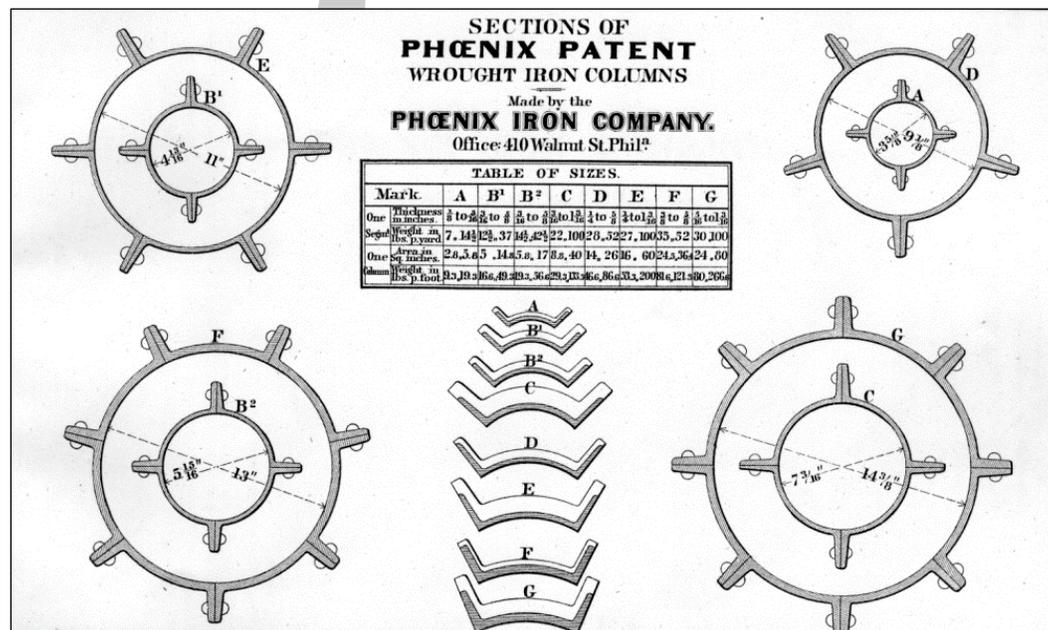


Figure 3: Illustration of Phoenix columns taken from 1875 trade catalog of the Phoenix Iron Company

After the Civil War, Samuel Reeves moved boldly to establish a bridge company in consideration of several factors. Importantly, he anticipated the potential growth of railroads west of the Mississippi, given the federal government's commitment to transcontinental railroads.<sup>25</sup> Also, he was keenly aware that the rapid and economical manufacture of strong bridge structures had been made possible with the recent introduction of new and better materials

<sup>25</sup> Winpenny, 9.

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for resisting the strains of compression and tension. His own Phoenix column and eye-bars manufactured and forged at Phoenix Iron—the latter utilizing a new hydraulic manufacturing process—were prime examples of the new and better materials.<sup>26</sup> Reeves' bridge company would organize under several names over the years and by 1884 (six years after his death) was known as the Phoenix Bridge Company. No matter the name, the bridge company would always be a subsidiary of the Phoenix Iron Company, serving as an outlet for the parent company's iron products and providing a means of weathering downturns in the iron business.<sup>27</sup>

The several talented engineers and professional men hired by Samuel Reeves enabled the Phoenix Bridge Company to develop a competitive edge and niche market. Bridge designs and components were standardized and promotional albums of design, or catalogs, were produced to feature a variety of pin-connected wrought iron truss bridges, many of which incorporated Phoenix columns. These catalogs allowed bridge builders and Phoenix Bridge Company's agents, like Dean and Westbrook Engineers of New York, to assist the railroads, municipalities, and counties in selecting the appropriate bridges for specific applications. Phoenix and their agents promoted the fact that they could produce quality cheap bridges faster than anyone heretofore. And not only that, they touted their bridges were pre-assembled to insure proper fitting and hasty erection at the job site.<sup>28</sup> However, by the beginning of the twentieth century further developments in the steel industry caused the "old" wrought iron Phoenix column to fall out of favor with engineers. Also, difficulties with the built-up structural shape, such as inspecting, repainting, and making connections, caused designers and builders to choose newer iron and steel shapes.<sup>29</sup>

Although the Phoenix column was a transitional design, its introduction and use by the Phoenix Bridge Company had a significant impact on bridge and building construction from the late 1860's to the late 1880's. Dean and Westbrook company records indicate they erected over 280 Phoenix column highway truss bridges from Maine to North Carolina between 1885 and 1895.<sup>30</sup> No more than two dozen of these bridges are thought to survive today, with the greatest concentration being in New Jersey, New York, and Pennsylvania.<sup>31</sup> Haywood County's West Fork Pigeon River Pratt Truss Bridge is the only remaining example of the Phoenix column truss bridge technology in North Carolina. It is the only known survivor of the nineteenth century in the United States.<sup>32</sup>

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<sup>26</sup> *Album of Designs of the Phoenix Bridge Company: Edition of 1888* (Philadelphia, Pennsylvania: J.B. Lippincott Company, 1888) 21.

<sup>27</sup> Winpenny, 20-22.

<sup>28</sup> Ibid, 20-21.

<sup>29</sup> Horace R. Thayer, *Structural Design* (New York, New York: D. Van Nostrand Company, 1913) 36.

<sup>30</sup> Phoenix Bridge Company sources and the North Carolina funded bridge surveys and reports do not reveal the actual number of Phoenix column highway bridges constructed in North Carolina.

<sup>31</sup> Lichtenstein Consulting Engineering, Inc., *North Carolina DOT Historic Bridge Inventory Report* (February, 2003), **PAGE NUMBER**.

<sup>32</sup> Fore, *North Carolina Metal Truss Bridges: An Inventory and Evaluation* (March, 1979), 56.

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## Haywood County Bridge Context

Haywood County encompasses 740 square miles of rugged Appalachian terrain with the Pisgah and New Found ranges to the east and the Balsam Mountains to the west.<sup>33</sup> In between, and roughly bisecting the county, lies the Pigeon River, which flows in a northwesterly direction from its headwaters in what is now the Pisgah National Forest. The East Fork of the Pigeon River originates on Big Pisgah (5,721') and Frying Pan (5,340') Mountains, while the West Fork originates in Richland Balsam (6,410') and Fork Mountain (5,980'). Rising between the East and West Forks, and forming a significant barrier between them, lies Cold Mountain (6,030'). These two mountain streams, along with other tributaries, descend dramatically and rapidly increase in flow before meeting at the Forks of Pigeon. Here begins the fertile bottomlands of the Pigeon River valley, which winds for approximately nine miles through the unincorporated communities of Bethel, the Forks of Pigeon, and Garden Creek before it reaches the towns of Canton and Clyde. Just west of Clyde, the valley narrows again as the New Found Mountains and Balsams close in on the river corridor.

Outside of the municipalities of Waynesville, Canton, and Clyde, Haywood County's economy was primarily agricultural through the mid-twentieth century. Transportation through the mountain county was crucial to commerce and communication. The Pigeon River, and its main tributaries—the East and West Forks—were a significant barrier to both through the nineteenth century. There is no definitive documentation on the total number of bridges constructed through the early twentieth century in Haywood County. Yet a review of USGS maps from the 1890s and early 1900s indicates that several bridges had been built.<sup>34</sup> Until the 1930s, when reinforced concrete became the standard building material for bridges statewide, most of these were metal truss bridges.

In the early 1960s, the North Carolina Department of Transportation began surveying metal truss bridges across the state to document their construction and assess their structural integrity. By 1960, seventeen metal truss bridges remained throughout the county, with five spanning the Pigeon River, five spanning the West Fork, four spanning the East Fork, and three spanning Jonathan Creek, a tributary flowing directly into the Pigeon River north of Waynesville. Of these seventeen structures, nine were through truss bridges, while the remaining eight were pony trusses. The earliest documented replacement of a metal truss bridge with a reinforced concrete bridge in Haywood County occurred in October 1965, with the removal of a 151-foot, eight-panel, single-span camelback through truss of steel I-beam construction. Surveyed by the Department of Transportation in 1963, it spanned the Pigeon River and connected Hyder Mountain and Richland Creek Roads. Approximately a mile downriver was a second camelback metal through truss bridge that was removed after 1983. A third bridge of similar design was

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<sup>33</sup> Branson, Levi, ed., *Branson's North Carolina Business Directory, Volume VIII* (Raleigh, NC: Levi Branson, Publisher, 1896), 332; see also *Handbook of North Carolina* (Raleigh, NC: North Carolina Department of Agriculture, 1893), 148.

<sup>34</sup> From a review of the historic USGS maps Asheville 1894, Mt. Guyot 1893, Cowee 1897, and Pisgah 1905.

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located farther downriver near the community of Waterville, in the northern part of Haywood County. It, too, was replaced in the late twentieth century. Though the dates of construction of these three bridges remains unknown, they were most likely installed between 1890 and 1920, a robust manufacturing period for metal truss bridges.

The most common metal truss bridge type in Haywood County was the Pratt through truss. Of the six documented by the North Carolina Department of Transportation in the 1960s and 1970s, three spanned the West Fork, with two crossing the East Fork and Pigeon River. The third spanned Big Creek just south of the unincorporated community of Waterville. With one exception, all were of steel I-beam construction and most likely erected between 1900 and 1920. That exception was the West Fork Pigeon River Pratt Truss Bridge (Bridge No. 79) which was constructed using Phoenix column. Only two of these bridges remain, and they represent evolving technologies in bridge construction.

The two longest Pratt through truss bridges erected in Haywood County around the turn of the twentieth century spanned the Pigeon River and Big Creek. Both were 130-foot, seven-panel, steel bridges. Both bridges were replaced in the late 1970s or early 1980s with reinforced concrete bridges due to deteriorating conditions.

Two more Pratt through truss bridges carried State Highway 284 as it reached east from Bethel across the Forks of Pigeon (see Figure 4). The bridge crossing the East Fork was a 101-foot, seven-panel, steel bridge, while its sister across the West Fork was a ninety-five foot, six-panel, steel structure. This latter bridge was the one installed in its current location in the early 1920s to replace the wrought iron bridge that was relocated upriver on the West Fork. This second West Fork bridge was replaced with a reinforced concrete bridge in 1990. There is no documentation on when the Pratt through truss bridge crossing the East Fork was replaced with a reinforced concrete bridge, though it was likely around the same time.

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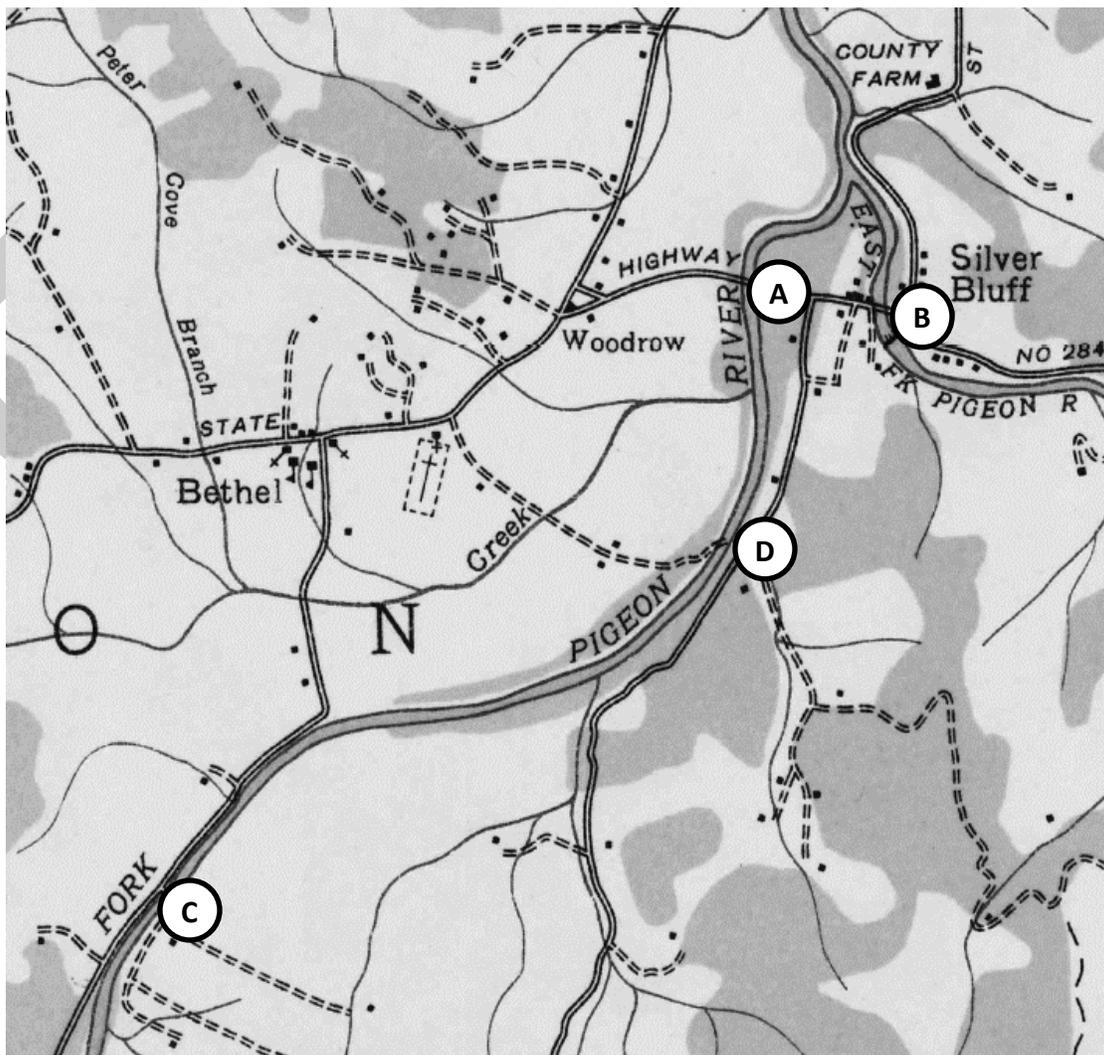


Figure 4: 7.5-minute series USGS Quadrangle "Waynesville, NC". At this point, two Pratt through-truss bridges (located at A and B above), built of steel and erected in the early 1920s, carried State Highway 284 as it spanned the Forks of Pigeon. The West Fork Bridge located at A above replaced the wrought iron bridge constructed using Phoenix columns, which was relocated upriver on the West Fork to the site illustrated as C above. The bridges at A and B were replaced in the 1990s with reinforced concrete deck bridges. Nothing is known about the structure located at D above.

The only other extant through truss in Haywood County lies several miles upriver on the West Fork. While the form of this 108-foot, six-panel bridge is similar to the bridge constructed using Phoenix columns, its overall appearance is remarkably different. The utilitarian structure is typical of metal truss bridges constructed during the turn of the twentieth century, with heavy steel I-beams framing the east and west portals and no decorative elements like the starbursts and finials that decorate the portal of its sister downriver.

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The remaining eight metal truss bridges documented in the 1960s were Pratt and Warren pony trusses crossing the Pigeon River and its tributaries in Haywood County. All of these were erected in the late nineteenth or early twentieth centuries and replaced in the late 1900s or early 2000s.



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## 9. Major Bibliographical References

**Bibliography** (Cite the books, articles, and other sources used in preparing this form.)

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**Previous documentation on file (NPS):**

- preliminary determination of individual listing (36 CFR 67) has been requested
- previously listed in the National Register
- previously determined eligible by the National Register
- designated a National Historic Landmark
- recorded by Historic American Buildings Survey # \_\_\_\_\_
- recorded by Historic American Engineering Record # \_\_\_\_\_
- recorded by Historic American Landscape Survey # \_\_\_\_\_

**Primary location of additional data:**

- State Historic Preservation Office
  - Other State agency
  - Federal agency
  - Local government
  - University
  - Other
- Name of repository: \_\_\_\_\_

**Historic Resources Survey Number (if assigned):** HW0022

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### 10. Geographical Data

**Acreeage of Property** Less than one acre

Use either the UTM system or latitude/longitude coordinates

#### Latitude/Longitude Coordinates (decimal degrees)

Datum if other than WGS84: \_\_\_\_\_

(enter coordinates to 6 decimal places)

- |                        |                       |
|------------------------|-----------------------|
| 1. Latitude: 35.463618 | Longitude: -82.899945 |
| 2. Latitude:           | Longitude:            |
| 3. Latitude:           | Longitude:            |
| 4. Latitude:           | Longitude:            |

**Or**  
**UTM References**

Datum (indicated on USGS map):

NAD 1927    or     NAD 1983

- |          |           |           |
|----------|-----------|-----------|
| 1. Zone: | Easting:  | Northing: |
| 2. Zone: | Easting:  | Northing: |
| 3. Zone: | Easting:  | Northing: |
| 4. Zone: | Easting : | Northing: |

#### Verbal Boundary Description (Describe the boundaries of the property.)

The nominated property includes the bridge, bridge abutment and pier, bridge approach span on northwest end, and short approach from Heavenly Drive on southeast end—about 0.19 acres in total. The boundary is drawn approximately five (5) feet from all sides of the resource as shown on the accompanying National Register Boundary Map.

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**Boundary Justification** (Explain why the boundaries were selected.)

The boundary encompasses all of the historic elements of the bridge, as well as an appropriate context to convey its significance.

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**11. Form Prepared By**

name/title: Carroll C. Jones  
organization: Bethel Rural Community Organization  
street & number: 113A E. Main Street  
city or town: Morristown state: TN zip code: 37814  
e-mail: ccrymes.jones@gmail.com  
telephone: (850) 686-1472  
date: 8/20/2018

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**Additional Documentation**

Submit the following items with the completed form:

- **Maps:** A **USGS map** or equivalent (7.5 or 15 minute series) indicating the property's location.

(National Register Boundary Map and Location Map are included with West Fork Pigeon River Pratt Truss Bridge photos.)

- **Sketch map** for historic districts and properties having large acreage or numerous resources. Key all photographs to this map.
- **Additional items:** (Check with the SHPO, TPO, or FPO for any additional items.)

**Photographs**

Submit clear and descriptive photographs. The size of each image must be 1600x1200 pixels (minimum), 3000x2000 preferred, at 300 ppi (pixels per inch) or larger. Key all photographs to the sketch map. Each photograph must be numbered and that number must correspond to the photograph number on the photo log. For simplicity, the name of the photographer, photo date, etc. may be listed once on the photograph log and doesn't need to be labeled on every photograph.

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## Photo Log

Name of Property: West Fork Pigeon River Pratt Truss Bridge (Bridge No. 79)

City or Vicinity: Bethel

County: Haywood County State: North Carolina

Photographer: Carroll C. Jones and Roland Osborne

Date Photographed: February and March, 2017

Description of Photograph(s) and number, include description of view indicating direction of camera:

- 1 of 15 Looking downstream at Bridge No. 79, showing West Fork of Pigeon River, its embankments, and vegetative cover
- 2 of 15 Bridge No. 79 looking southeast with mountains in the background
- 3 of 15 Bridge No. 79 looking northwest with mountains in the background
- 4 of 15 Southeast concrete abutment wall, original suspended floor beams, and new timber flooring system and guard railing
- 5 of 15 Northwest, downstream side Pratt truss anchorage on concrete pier
- 6 of 15 View of northwest approach span with concrete pier and timber pile and beam supports
- 7 of 15 An original Phoenix column with foundry marking of "PHOENIX IRON CO"
- 8 of 15 Detail of Phoenix column connection showing lower and diagonal chords and original suspended floor beam
- 9 of 15 Detail of replacement pipe vertical chord (middle vertical, downstream side) connecting with the original cast iron joinery and Phoenix order no. "613" visible on fitting
- 10 of 15 View looking northwest (upstream side) showing Phoenix column verticals, lower and diagonal eye-bar chords, original floor beams, and concrete pier
- 11 of 15 Connection detail of Phoenix column upper and vertical chords, lateral strut, and diagonal chord with clevis connection for adjustment
- 12 of 15 Detail of Phoenix column and forged eye-bar chord joinery at upper portal connection
- 13 of 15 Northwest portal plaque presenting date of construction and name of the builder of Bridge No. 79
- 14 of 15 Southeast portal plaque presenting names of Haywood County commissioners who authorized the purchase and construction of Bridge No. 79
- 15 of 15 Upper corner of portal with original ornamentation intact and "PHOENIX" foundry mark visible on angle iron bracing

**Paperwork Reduction Act Statement:** This information is being collected for applications to the National Register of Historic Places to nominate properties for listing or determine eligibility for listing, to list properties, and to amend existing listings. Response to this request is required to obtain a benefit in accordance with the National Historic Preservation Act, as amended (16 U.S.C.460 et seq.).

**Estimated Burden Statement:** Public reporting burden for this form is estimated to average 100 hours per response including time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding this burden estimate or any aspect of this form to the Office of Planning and Performance Management, U.S. Dept. of the Interior, 1849 C. Street, NW, Washington, DC.