



*Above: Red Oak Creek Bridge, Merriweather County, Georgia. Rural icons today, covered bridges were 19th-century necessities, the product of a growing population, economic need, and the burgeoning field of engineering and design. This specimen dates from the 1840s.*

ALL PHOTOS JET LOWE/NPS/HAER; DRAWINGS NPS/HAER





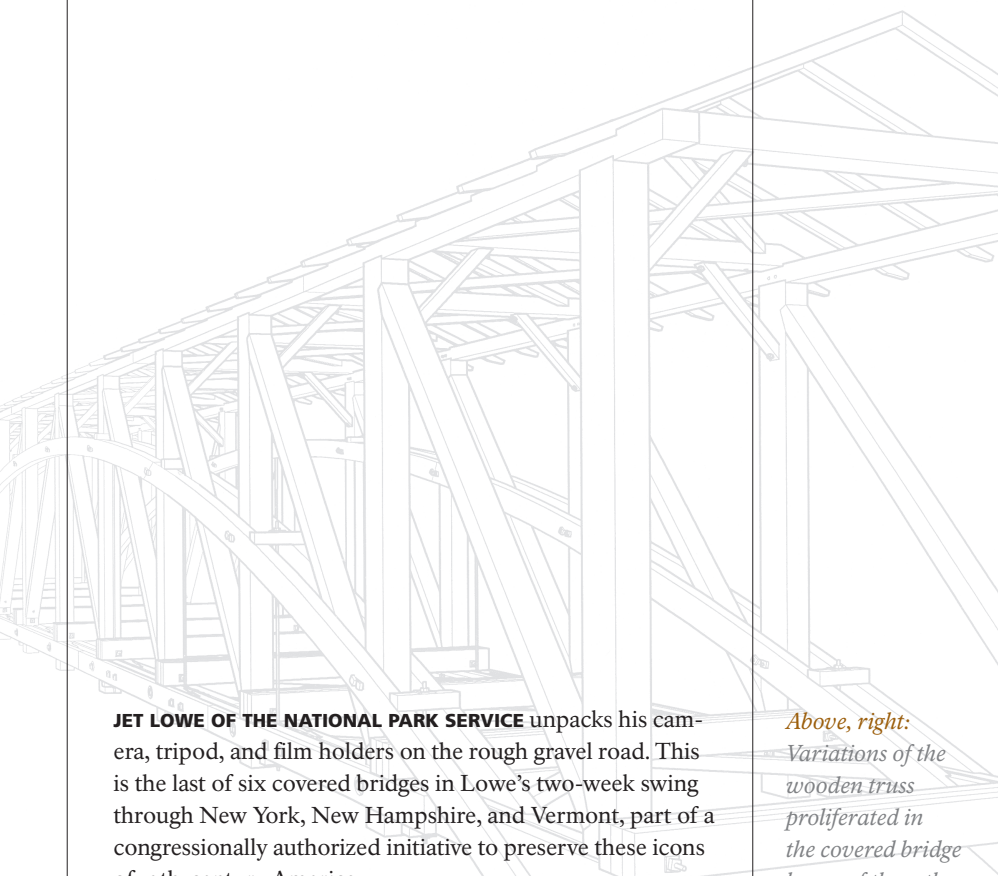
*The roads that wind through the Catskills are lightly traveled. The lonely villages, the ramshackle farmhouses, the looming mountains half cloaked in clouds call to mind the bewitched landscape of Washington Irving's imagination. It's a place that moves with its own tempo. If time flows quickly out on the turnpike, one suspects that here the days eddy around places that recall the early frontier. Blenheim: the practical ambition of the early Germans. Schoharie: the ancient voice of the Iroquois.*

*So when a traveler rounds a bend and approaches a broad, shallow waterway, an otherwise surprising sight seems completely logical: a large covered bridge, dark brown and weathered, cut off from the main road, sitting high and dry as it were, leading from nowhere to nowhere.*

# SPANNING AMERICA

by Joe Flanagan

The Historic American Engineering Record documents a legacy of covered bridges *Photographs by Jet Lowe*



**JET LOWE OF THE NATIONAL PARK SERVICE** unpacks his camera, tripod, and film holders on the rough gravel road. This is the last of six covered bridges in Lowe's two-week swing through New York, New Hampshire, and Vermont, part of a congressionally authorized initiative to preserve these icons of 19th-century America.

A photographer with the Historic American Engineering Record, Lowe prowls defunct mills and auto factories, documenting historic industrial sites and relics of early engineering. He's at home around steel and machinery, but the echo of his steps on the cavernous structure's scarred planks evokes a distinctly agrarian world.

National Park Service architects made measured drawings of Blenheim Bridge in the 1930s, which are part of HAER's vast archive of historic documentation at the Library of Congress. With the addition of Lowe's photographs—and a historical report—Blenheim Bridge will be, in a sense, recreated there. HAER aims to record some 60 bridges by the end of the three-year project, in measured drawings as well as photographs and written histories.

Blenheim Bridge is one of the world's longest wooden covered spans at approximately 210 feet between abutments. Lowe, looking up at the elaborate geometry, says "in scale and size this was the pinnacle of the technology."

Like old gristmills and rusting farm equipment, covered bridges have always charmed tourists exploring the nation's backroads and byways. But they mean much more to a loose

*Above, right: Variations of the wooden truss proliferated in the covered bridge boom of the 19th century. Designers patented their own versions, which builders had to pay a fee to use. North Carolina's Bunker Hill Bridge, right, features a rare truss designed by Civil War general Herman Haupt. Only two of these bridges exist today.*

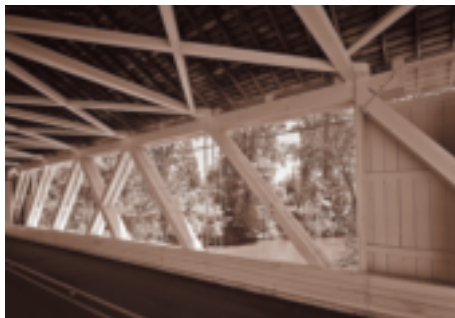


confederation of preservationists, historians, craftsmen, and advocacy groups. David Wright, president of the National Society for the Preservation of Covered Bridges, calls them "documents of the age that produced them."

The HAER project is part of an initiative known as the National Historic Covered Bridge Preservation Program. A result of legislation introduced by Senator James M. Jeffords of Vermont, the program funds repair and restoration while promoting research and outreach.

The Federal Highway Administration administers the program, with about \$25 million in grants





*Above left: Interior of Oregon's Larwood Bridge. Center and right: Blenheim Bridge in New York's Catskills. The site of political rallies and weddings, covered bridges took on social roles not likely anticipated by their builders.*





awarded since 1999. Restoration grants go to the states, who must make the case for their threatened bridges. Spans must be listed in (or eligible for) the National Register of Historic Places, and must be preserved according to standards set by the Secretary of the Interior.

When HAER received a \$1 million grant for research, one of the first steps was convening a group of historians, architects, engineers, and craftsmen, which yielded a list of important bridges along with plans to develop a traveling exhibit [see sidebar, page 35] and a database to monitor the condition of the bridges.

Between 5 and 10 bridges are lost every year. Some fall victim to floods, some simply decay with neglect. Many are the objects of arson. Others are compromised by well-intended alterations—what one advocate calls “demolition through redesign.”

### **In the Mind of the Builder**

HAER staffers are like forensic portraitists, documenting structures that sometimes have been abandoned for decades. On occasion, they are the last sympathetic visitors before the wrecking ball swings.

However, Blenheim Bridge, built in 1855, is not threatened. It was designated a national historic landmark in 1964. In addition to being one of the world’s longest covered bridges, it is one of the few two-lane varieties that survive. Lowe puts his hand on the structure’s central arch, nearly black with age, still bearing the marks of the chisels and broad axes wielded by the builders. “This was probably virgin timber,” he says. “Some of the pieces are over 30 feet long. And look how many there are.”

Lowe seeks out the telling features to photograph. He often looks at the center first. “There’s usually something interesting going on with the timbers,” he says. “The older bridges are very expressive that way . . . you can see what’s under tension and what’s under compression.” He examines the cross bracing that supports the roof, where it intersects with the collar ties and upper framing. “What I plan to do is shoot that nexus up there in the middle,” he says.

Lowe positions the tripod on the planks as Schoharie Creek rushes below. With the shutter open and a dark cloth over his head, he takes aim at the intersecting timbers, and it’s not simply a record of the





framing he's after, but a glimpse into the mind of Nichols Powers, bridge builder.

### **Native Ingenuity**

The nation's oldest bridges are in New England and the Middle Atlantic. Some on the West Coast predate those of the Midwest because of roads needed during the Gold Rush.

In the nation's early history, the waterways of the East were major travel routes, but by the 19th century they were an obstacle to the progress of an expanding young country. When the first covered bridges appeared, in the early 1800s, they borrowed an innovation developed in Europe centuries before: the wooden truss. Engineers and carpenters took liberty with the technology and before long variations proliferated, the new forms usually known by the surname of their inventors, Paddleford, Partridge, Haupt, Burr. Bridges came to be classified by their trusses. Huge, rough-hewn assemblies of timber, the trusses were carefully calculated equations of compression and tension.

Truss bridges could span much longer distances than the arched stone structures of old. It soon became evident that an uncovered bridge would rot in 10 to 15 years. Protected, they are as close to permanent as wood can be. Some have stood for well over a century and a half.

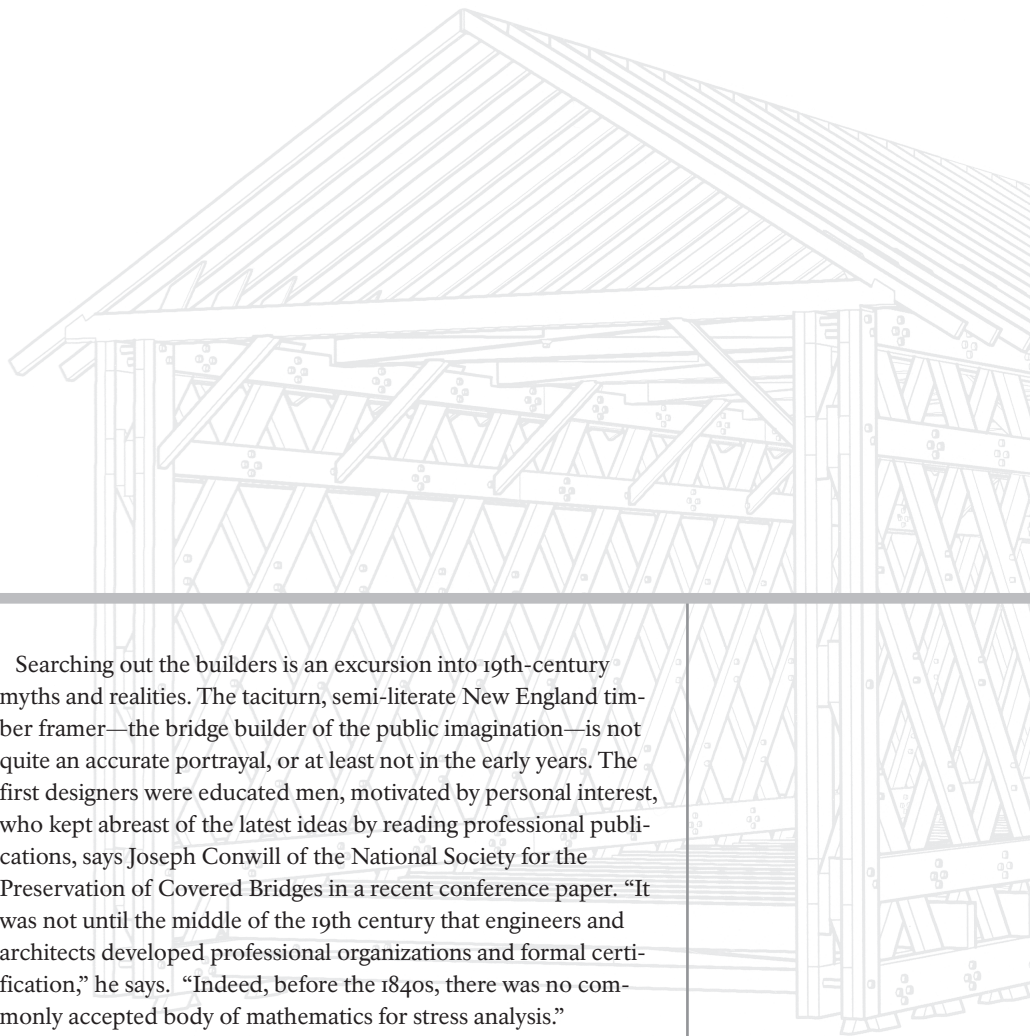
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*Above: Neal Lane Bridge, Douglas County, Oregon. Local building traditions produced styles that varied from region to region. Western bridges have a distinct appearance compared to those built in New England.*



*Above: The Flat River flows beneath White's Bridge in Michigan, built shortly after the Civil War.*





Searching out the builders is an excursion into 19th-century myths and realities. The taciturn, semi-literate New England timber framer—the bridge builder of the public imagination—is not quite an accurate portrayal, or at least not in the early years. The first designers were educated men, motivated by personal interest, who kept abreast of the latest ideas by reading professional publications, says Joseph Conwill of the National Society for the Preservation of Covered Bridges in a recent conference paper. “It was not until the middle of the 19th century that engineers and architects developed professional organizations and formal certification,” he says. “Indeed, before the 1840s, there was no commonly accepted body of mathematics for stress analysis.”

The earliest bridges were custom designed. But before long, designers and builders began patenting plans. Standardization took hold fairly early. Like kit houses, the bridges could be assembled with prefabricated parts transported to the site.

But in some places, regional culture held sway, leaving its mark on bridge styles. In New England and Pennsylvania, where there was a strong craftsman tradition, individual builders handled the job from start to finish. Standardization never got much of a foothold in the area.

So the rustic bridge builder of lore has at least some basis in fact. Many were farmers moonlighting as carpenters. Others were millwrights who took on the occasional bridge. Says Lola Bennett, the project’s lead historian, “Most had no formal training, but a lot of mechanical aptitude and common sense.”

Historians estimate that at the peak of their popularity, there were some 14,000 covered bridges in the United States. Today, about 800 are widely scattered around the country, most in Pennsylvania, Vermont, Ohio, and Indiana.

Many states have covered bridge societies, which not only try to raise awareness, but fund repairs to ailing and endangered spans. These groups frequently work with state departments of trans-

*Above: Brown Bridge, built in Vermont in 1880.*  
*Right: Holliwel Bridge, Madison County, Iowa. Building a bridge in a 19th-century rural community engendered a social process that illustrates the local business relationships, the political landscape, and craftsman traditions. “The process differed from region to region,” says historian Lola Bennett.*







portation, intervening on behalf of bridges scheduled for repair or alteration.

The National Society for the Preservation of Covered Bridges, formed in the 1940s, is one of the most active. In its early years, “bridges were disappearing one after another,” says David Wright. The pace has slowed dramatically, but there is the new threat of what he calls “demolition through redesign.”

Today, the engineer’s first impulse is to apply modern materials and technology to a sagging or worn-out bridge. Wright describes “invading a truss,” or applying steel gussets and modern fasteners to the original work.

Arnold Graton, Jr., a descendant of New Hampshire bridge builders who performs historically accurate repairs, is the type of craftsman advocates try to bring aboard. According to Graton, engineers often want to increase a covered bridge’s load capacity. The preferred technique is to add new piers in the river and run steel stringers from pier to pier to reinforce the deck. This yields what he calls a “romantic structure sitting on steel.”

To promote preservation, FHWA has published engineer Phil Pierce’s *Covered Bridge Manual*, an exhaustive 340-page guide intended primarily for professionals that addresses loads, structural analysis, connections, and maintenance. It offers an entire section of restoration case studies. Yet its author concedes that some things about covered bridges continue to defy explanation: “How [to] explain the discrepancy between theoretical weakness and observed performance?”

Lowe has chosen to photograph the interior of Blenheim Bridge at night, because of the daylight glare at the entrances. Across the creek, the little town of North Blenheim is quiet, probably not much changed since the bridge’s heyday.

Major Hezekiah Dickerman built a tannery on Schoharie Creek in 1850, but the hemlock he needed for tannin was on the other side. So Dickerman hired Nichols Powers, Vermont’s best-known bridge builder. The span was built in the village, then disassembled, moved to the creek, and put back together again. It took 127 tons of lumber plus a few tons of hardware. Locals thought it would collapse of its own weight. In its 149 years, it has been flooded, hit by lightning, and set on fire three times.

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intersection of verticals and diagonals. And in that split second of light, one can see generations of graffiti carved in the wood.

The bridges were often community centers, says Bennett. “At some, they held town meetings, political rallies, and church functions.” And they were a good place to post advertisements. Traces of paper in the Blenheim Bridge—still stuck to nail heads—are so old they have the consistency of cigarette ash.

### Rethinking the Truss

The crisp drawings that line the walls of the HAER offices look like a designer’s concept for a set of retro structures. It’s only when one reads “Sunday River Bridge, 1872” or “Taftsville Bridge, 1836” that it becomes clear that one is looking at the past, not the future.

HAER architects spend days at a bridge, producing plans, elevations, details, and per-

spective drawings. Each architect handles a different aspect of the documentation.

“Some bridges have interesting details, like the joinery and through-bolts,” says project leader Christopher Marston, “and we’ll try to capture that.” The drawings, which include exploded diagrams with numbered parts keyed to descriptive text, are so well rendered that they could be instructions for the ultimate build-it-yourself bridge kit.





*Clockwise from left: Flint Bridge in rural Vermont; Virginia's Humpback Bridge; Uhlerstown Bridge in Pennsylvania. The structures still conceal things about themselves and the world that produced them. "Some of these bridges ask their own questions," says photographer Jet Lowe.*

## Bridges on tour Smithsonian Exhibition Hits the Road in 2006

A covered bridge exhibition, developed by HAER with the Smithsonian Institution Traveling Exhibition Service, starts its road trip in March 2006. For interested venues, time slots are still available at this writing. The core of *Covered Bridges: Spanning the American Landscape* will be photographs and drawings like the ones here. There will also be a section

on engineering taken from the analyses performed during the HAER project, with models showing the structural action of beams, arches, and trusses. Actual segments of bridges will be included too, as well as stories unearthed in the research on people and communities. Rounding out the exhibit will be ephemera from the National Museum of American History—adver-

tisements, documents from bridge building companies, and so forth. The exhibit is available to venues nationwide. For more information, contact Shannon Perry, Smithsonian Institution Traveling Exhibition Service, 1100 Jefferson Drive, SW, Suite 3146, Washington, DC 20013-3168, (202) 633-3140, email [perrys@si.edu](mailto:perrys@si.edu), [www.sites.si.edu/exhibitions](http://www.sites.si.edu/exhibitions).



*Right: West Virginia's Barrackville Bridge, built in 1853 to cross Buffalo Creek. Below: Honey Run Bridge, Chico, California, saved from demolition by preservationists in the 1960s.*



Eric DeLony, retired manager of HAER and one of the project's originators, brought in civil engineers to look at the dynamics of the truss construction. "There were a dozen successful truss forms patented," he says. "And there would be drawings in the patent documents. You really get a sense of what the builders were thinking."

Using this information, the engineers looked at the bridges using modern structural evaluation computer programs. "You can actually load a bridge," says DeLony.

"As a hay wagon and horse go across, you see how the components react." He says that such analysis is one of the most cutting-edge aspects of the documentation. Some of this information will be in the exhibit developed with the Smithsonian Institution Traveling Exhibition Service [see sidebar, page 35].

There are other innovative facets, including the first "best practices" conference on covered bridges, convened by the National Park Service Historic Preservation Training

Center with the help of the University of Vermont and Historic Windsor, Inc., a non-profit. An online database—developed by the National Park Service Cultural Resources Geographic Information Systems Office, mainly for the preservation community—will be a way to monitor and update information about the bridges. Users will be able to search by county, name, year built, and length, with drawings, photos, and histories. An interactive mapping component will give detailed geographic information.





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### **Saved from Progress**

For the most part, covered bridges went out with the 19th century. In Blenheim Bridge's bolts, square nuts, and washers, one can see the approaching dominance of steel.

The old bridge was bypassed in 1932. A concrete and steel span went up about a hundred yards downstream. That bridge, now a crumbling, rusted antique, is being replaced by yet another. As Lowe sets up for a distance shot the following morning, both of Blenheim Bridge's latter-day cousins

crowd the picture. Asked if they are in the way, he says, "One of the things that's very important in HAER documentation is context. And this definitely captures context."

The crew erecting the span shows no curiosity about the photographer or the weathered hulk behind him. Tucked into a bend in the road, with the Catskills rising behind it, Blenheim Bridge looks like part of the landscape. The crew's sense of urgency speaks of a world that has no time for wooden relics. But something in the way the

old bridge sits there, the fact that it is there at all, says otherwise.

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