

Soot and Cinders

An Educator's Guide for the Cumbres & Toltec Scenic Railroad National Historic Site

Prepared by the Friends of the Cumbres & Toltec Scenic Railroad,
March, 2007

Artwork by Friends member Mary Cardin "1924 Coal Tipple with arriving train" Chama, New Mexico

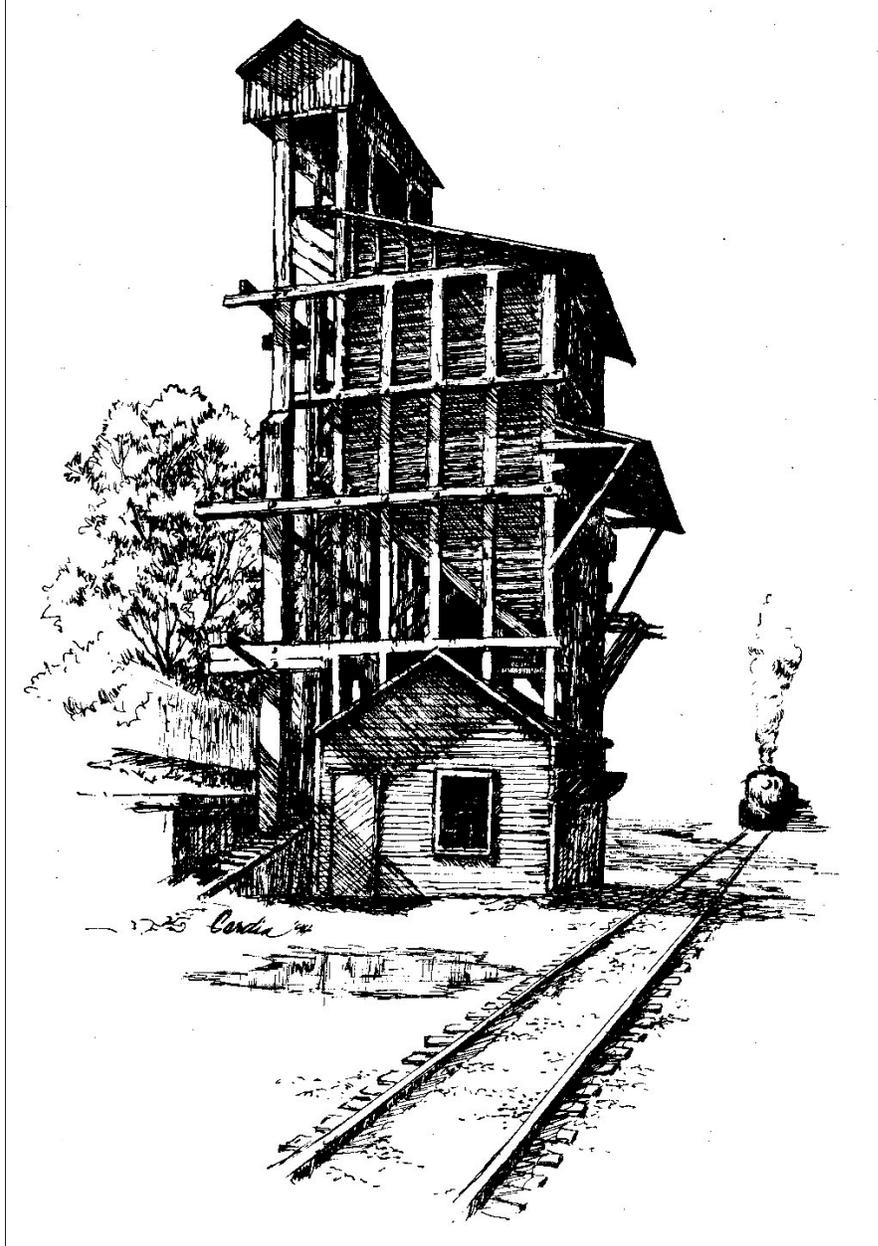


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Dear Educator,

On behalf of the Cumbres & Toltec Scenic (C&TS) Railroad National Historic Site, we are pleased to welcome you and your class.

The Friends mission is to preserve, restore, and interpret the C&TS Railroad as a 64-mile “living museum”. Education plays a vital role in accomplishing this objective. The hands-on approach to historical/cultural heritage education is interdisciplinary. You are strongly encouraged to incorporate all subjects into your pre- and post- visit activities. It is important that your students take the historic site experience back to the classroom, and be able to integrate it into the learning environment and their lives.

The Cumbres & Toltec Scenic Railroad offers the rare opportunity to experience an operational steam railroad in its historic setting.

Our primary educational goals are:

- To stimulate awareness and appreciation of the rich historic resources and the heritage that makes up the living museum.
- To understand the history of Rocky Mountain steam railroading.
- To foster student understanding that all citizens must act as stewards of these resources and actively participate in their protection and preservation.

With your help, we can achieve these goals by developing in young people a feeling of kinship and connection with their heritage.

Sincerely,

The Friends

General Outcomes

Friends of the C&TS Educational Goals For the 64-mile Living Museum that is the C&TS Railroad

- Increase appreciation and understanding of the role railroads played in American history generally and in the development and settlement of the Rocky Mountain West specifically.
- Offer a context for post-Civil War westward expansion due to railroad building and the transition from an agricultural society to an industrialized America.
- Provide information and encourage insight and awareness into mountain railroad building, steam powered locomotives, and the impact the railroad made in mining, ranching, transportation, oil, agriculture and the timber and lumber industries.
- Intensify the knowledge and understanding of the history of the Durango & Rio Grande Railroad and the emergence of the Cumbres & Toltec Scenic Railroad as the premier historic steam railroad experience in America.
- Promote the preservation, restoration and interpretation of the railroad as a National Historic Site and National Civil Engineering Landmark.
- Promote and foster a sense of stewardship, caring and responsibility for protecting our historical and cultural resources and the living culture of the skills needed to operate and maintain a narrow gauge mountain steam railroad in its historic context.

Possible School Program Outcomes

- Students will describe the important role steam railroads played in American history generally and the Rocky Mountain West.
- Students will be able to explain the economic and social impact of the D&RG (W) railroad in the industrial development of the Rocky Mountain West.
- Students will understand the interconnectedness of railroads with various industries: mining – ore and mining machinery; ranching – cattle and sheep; timber – logs and lumber; oil; grain and other agricultural products.
- Students will understand the early history of northern New Mexico and southern Colorado.
- Students will examine the rich nature and cultural heritage that resulted from the growth of railroads.
- Students will understand the impact of geology and mountainous terrain on railroad building and the “life zones” of the communities of plants, animals and birds living along the line.
- Students will appreciate the importance of the “safety first” motto of railroads.
- Students will recognize the 64-mile C&TS Railroad as a living museum of industrial Americana and explain the importance of preserving this history in the region.

Western Terminus, Chama NM and Eastern Terminus, Antonito CO – 64 Mile Living Museum

- Students will orient themselves to the 64-mile living museum by identifying the yards and section towns along the line – Chama, Cresco, Cumbres Pass, Los Pinos, Osier, Toltec, Sublette, Big Horn and Antonito.

Experiencing the C&TS background information, students will learn how the railroad was built, why narrow gauge was selected for track width, the economic factors that led to near abandonment, saving the railroad, the efforts of the Friends in preserving, restoring and interpreting the historic assets, dynamic interpretation with freight and maintenance of way charters, and understanding current operations of the C&TS as an historic tourist railroad.

- Students will become aware of the impact of weather and topography on railroad operations.
- Students will understand how steam is generated and then converted to energy to power a locomotive for pulling trains.
- Students will become aware of and observe the people who keep the railroad running and operate and maintain the 64-mile line.
- Students will witness the impact a volunteer organization can have by fulfilling its mission restoring, preserving, educating and interpreting the railroad's historic assets.
- Students will learn the importance of the D&RG (W) and the C&TS Railroad as major contributors to the economy of the region.

The Depot

- Students will experience the Railroad Depot as the hub of railroad activity and become familiar with the communication and movement of the railroad – hand signals, whistle signals, telegraph use, switches and sidings.

Railroad Structures

- Students will be introduced to the structures along the line – section houses, bunkhouses, water tanks, bridges and trestles, the sand house, coal tipple.
- Students will be able to recognize the major paint and lettering schemes used on the D&RG (W).

Chama Yard

- Students will become acquainted and be able to identify all types of rolling stock – cabooses, passenger cars, RPO's, cars that haul sheep and cattle, freight, lumber, rock and ballast, oil, and special maintenance of way cars necessary to keep the railroad operational for track work, bridge building and transporting railroad supplies and materials needed along the line.
- Students will visit the Scale House and tour the stock pens.

Roundhouse, Engine and Mechanical Shops, Friends Restoration Facility and Car Barns

- Students will be able to describe some of the processes of maintaining a locomotive fleet.
- Students will see how component parts are made and machined.
- Students will understand the purpose of the Roundhouse in steam railroading.
- Students will learn the wheel configurations of locomotives.
- Students will be able to describe the restoration philosophy of the Friends.

The Cumbres & Toltec Scenic Railroad as a National Historic Site and National Civil Engineering Landmark

The Cumbres & Toltec Scenic Railroad is a functioning, operating railway and an invaluable 64-mile long museum of railroad history and technology. It is not a static display of relics of railroad engines, cars and track-side structures. The building and maintenance of the railroad in a rugged mountainous terrain makes it an engineering wonder. The student thus has a living textbook of American railroad history and technology, bolstered by the railroad's recognition from the National Trust for Historic Preservation, the American Society of Civil Engineers and being listed on the National Register of Historic Places.

The railroad played a vital role in the settling of the American West, and this particular remnant of the once extensive narrow gauge railroads was significant in the mining, lumber and livestock industries of northern New Mexico and Southwestern Colorado. It is also unique in that the present tourist-oriented railroad is still doing the job that it was once designed to do – operating over the same track alignment, over historic trestles and bridges, using much of the original equipment. Some of that equipment is now the sole-remaining, working examples of its kind in the country. Steam operation has vanished from many areas of the world and being able to partake in the use of historic engines and equipment is one of the irreplaceable aspects of the Cumbres & Toltec. The appearance of numerous foreign tourists substantiates the rarity of narrow gauge, steam railroads throughout the world and further emphasizes the importance of this National Historic Site.

Trip Information

This guide can be used a basic introduction to the 64-mile living museum that is the Cumbres & Toltec Scenic Railroad. It is provided for teachers from Colorado and New Mexico.

When you decide to bring your group to the C&TS Railroad National Historic Site, you should contact the railroad to make arrangements for your visit. The Chama yard is the core complex to visit. Students should plan to visit the exhibits in the old log bunkhouse and the Depot and take a tour of the yard to see the water tank, coal tipple, sand house, scale house, stock yards and all the rolling stock. It is also possible to have a guided tour for small groups in the roundhouse, engine, and mechanical shops. During the operational season, a train trip to and from Cumbres Pass is possible for a fee. If a site visit is made during Friends work sessions, groups may observe restoration work in process and/or visit the Friends Car Restoration Facility in Antonito.

Travel Directions

Insert Map and driving directions

Program Fee Assistance

School groups are not charged the normal fee if their trip is educational in nature. To qualify for fee assistance, please explain on school letterhead the educational goals for your visit and send it to: Friends of the C&TS, 6005 Osuna Rd., NE, Albuquerque, NM 87109

Preparation

1. The success of your visit will depend on how well you and your group have studied the background information provided.
2. To make the trip more personal, students should wear name tags.
3. The class must stay together as a group but students are free to explore under the guidance of a docent.
4. This is a national historic site: to help preserve the historic and cultural resources, we do not allow removal of any objects from the yard. We suggest taking photographs, writing in journals or drawing pictures as materials to be used in the classroom for further study. One adult chaperone is required for every 10 students.
5. There are no food or drink concessions on the premises. Students may bring lunch and a beverage with them; picnic tables are available. Please label student lunches.

Dress

1. Chama is located at an elevation of 7863 feet and weather can be unpredictable. Sunscreen, and a light jacket or raincoat is recommended.
2. Wear sturdy, comfortable walking shoes – no sandals or high heels.
3. The C&TS locomotives use coal for fuel. Be aware that cinders and soot may get on clothes and they may smell of coal smoke after your trip.

Safety

The C&TS Railroad is a working railroad yard. For your protection, teachers should discuss these rules before arriving on site. The railroad motto is "Safety First".

1. Watch for trains, speeders and other moving equipment in the yard.
2. Pay special attention for moving trains when near or crossing railroad tracks.
3. Watch your step when crossing tracks. **STEP OVER RAILS – DO NOT STEP, STAND OR WALK ON RAILS.**
4. The steam locomotives use coal for fuel and cinders are a common problem. If you or one of your students gets a cinder in the eye, **DO NOT RUB** your eye. Please contact staff for assistance and eye wash.
5. If your class is riding on the train, information about safety during your trip will be provided prior to departure.

Background History

Steam Railroading

In the 1830s and 1840s, America's railroads were small, private businesses of limited mileage, scattered along the Atlantic seaboard from Maine to Georgia, with a few enterprising companies pushing westward into the Appalachians. By 1852 more than 9,000 miles of track had been laid, mostly in the New England and Middle Atlantic states. During the next decade, American railroads grew into a coordinated iron network of more than 30,000 miles serving all the states east of the Mississippi River.

Railroad expansion slowed during the Civil War, but this was the first major conflict in which railroads played a major role as movers of troops and supplies. After the war, railroad construction resumed on a large scale, so that by 1880 the United States had 94,000 miles of track binding the country together.

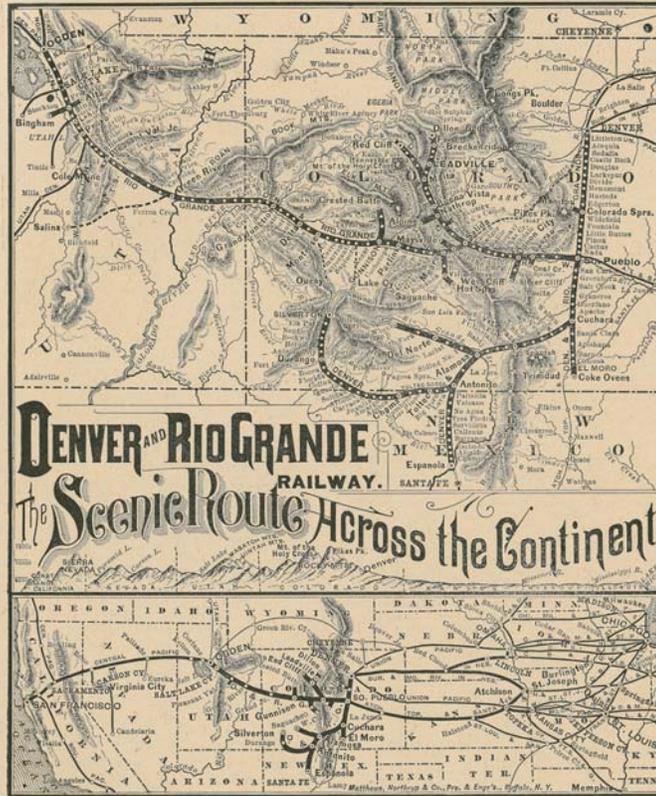
As the railroads expanded, so did the country. Between the Civil War and World War I, the United States was transformed from an agricultural to a manufacturing nation because of the railroads. They brought raw materials such as coal, oil, iron ore, and cotton to the factories and carried away steel, machines, cloth, and other finished products. They moved livestock, grain and produce from farms to the cities. And they carried people everywhere. Most of the people settling the Rocky Mountain West traveled by train to get there. The railroads shortened the time it took to travel great distances, thus bringing cities closer together. Instead of taking weeks to travel across the country, it now took only days. Rail deliveries of freight and passengers were, for the most part, more reliable, and faster than stagecoach, wagon, or steamboat.

Until the end of World War I, the railroads carried the bulk of all freight and passengers. After 1918, they faced increased competition from automobiles and trucks. By the 1950's railroads were hauling less freight, had reduced passenger service and began abandoning unprofitable lines. By that time the railroads had undergone dramatic changes, beginning in 1925 with the introduction of the diesel-electric engine or motor. Within fifteen years diesels replaced the coal-burning steam locomotives because of a reduction in labor needs, operational flexibility, relative cleanliness and, most importantly, operating efficiency. Railroad passenger service in the US remained a viable option until the end of WWII when the automobile became the primary source of transportation.

Since the late 1990's railroads again have become a growing industry. The steel wheel on the steel rail has become the most efficient mode of transportation. The price of fuel has forced trucking companies to rely on the railroads for shipment of their trailers from coast to coast. Also, the demand for coal to supply power plants for America's cities has provided a steady source of revenue. As a result of the global economy, railroads now transport containers full of goods and materials from all over the world. The use of computers, fuel efficient and modern locomotives, and satellite communications has enabled the railroads to operate more cost-effectively. In response to fuel prices and overcrowded highways, more and more metropolitan areas are turning to commuter rail services. New Mexico's expanding "Roadrunner" is an example. The one area where railroads have not regained a foothold has been passenger service. While Amtrak is still operating, it is dependent on government subsidies like other means of public transportation. One of the most important benefits of the remaining tourist railroads is the opportunity to again experience rail travel. And, in the case of the C&TS, it is a historic trip back in time.

THE DENVER AND RIO GRANDE RAILWAY,
 CONNECTING THE
**CENTRAL PACIFIC AT OGDEN, WITH THE BURLINGTON AND MISSOURI RIVER AT DENVER, AND
 THE ATCHISON, TOPEKA AND SANTA FE AT PUEBLO,**
 AND FORMING THE
NEW SCENIC ROUTE ACROSS THE CONTINENT,
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The Denver & Rio Grande Railroad

The story of the Denver & Rio Grande Railroad began with Civil War veteran, General William Jackson Palmer.

During the years just after the end of the Civil War, young officers such as Palmer migrated to the plains states and Rocky Mountain West. As veterans of the Civil War, they were in search of fresh economic opportunities in a land that was new and as yet relatively undeveloped. Some of them sought out the gold fields while others became cattle or sheep ranchers, but Palmer cast his lot with the railroad builders. He believed transportation was the key to success in the limitless stretches of public domain beyond the Missouri River. Like fellow officer, Union General Grenville Dodge, chief engineer of the Union Pacific Railroad, and former Confederate General Thomas L. Rossner, who had a similar position with the Northern Pacific Railroad, General Palmer was starting life anew and pursuing the next frontier – railroad building in the American West.

Few, if any, former soldiers returned to civilian life with better prospects. Using his previous railroad experience as private secretary to J. Edgar Thomson of the Pennsylvania Railroad line, Palmer chose a business promising to expand in the postwar boom. It was with careful consideration that he chose to work for the Union Pacific's Eastern Division, a road being built across the plains of Kansas and one that soon would adopt the optimistic name Kansas Pacific. Because he foresaw, quite correctly, that the West offered enormous opportunities for enterprising individuals who were qualified to act as agents for eastern capitalists, he accepted the position of treasurer of the road. He was also given the post of secretary/treasurer of the construction company that proposed to build it.

During 1867 surveys were made across the plains. That fall, advance parties under Palmer's jurisdiction were sent to choose a route west of the Rio Grande River to the Pacific Coast in anticipation of a transcontinental road. It was here that Palmer became acquainted with the American Southwest. Enthusiastically he reported that while the population of these parts was still small, the potential was great. He argued that a line built through a country with both agricultural and mining resources would be profitable. Congress did not share Palmer's enthusiasm however and declined to provide the necessary subsidy to build to the Pacific Coast. When Denver welcomed the arrival of the tracks of the Kansas Pacific in the summer of 1870, Palmer cut himself loose from his employers and struck out on his own.

[Show map of the D&RG from Denver to Silverton]

The Denver and Rio Grande Railway Company (D&RG) was incorporated in the Territory of Colorado and the Territory of New Mexico on October 27, 1870 to build a railroad from Denver south to El Paso, Texas. The company also planned to extend rails to Mexico City. The route to El Paso was to go south to Pueblo, west through the Arkansas River Canyon (Royal Gorge), across Poncha Pass (then called Poncho Pass), and into the San Luis Valley to the Rio Grande River. Tracks were to follow the Rio Grande southward to El Paso. Six branches were planned to the mining areas of the Colorado territory and one branch was projected to reach Salt Lake City, Utah. The President of the Railroad was none other than William Jackson Palmer.

Photograph on facing page of General William Jackson Palmer. He was born in Baltimore on September 17, 1836 and became a general in the Union Army in March 1865. He served the D&RG Railway as president between 1870 and 1883 and died in 1909 [Denver Public Library Collection]



Palmer was aware of the Festiniog Railway of North Wales, two-foot in gauge. Its chief engineer, Charles Spooner, had written extensively about the Festiniog and made favorable comments about the possibility of a gauge somewhat wider than two-foot. Palmer was impressed with this possibility and had rejected what had become standard in the United States - rails 4-feet 8 ½ inches apart. Based on Spooner's writings he wanted a rail width that would be superior for hauling larger revenue cars and increasing profitability. Consequently, the D&RG decided to build its railroad "narrow gauge" but with rails three feet apart. The choice was made because narrow gauge construction was cheaper, equipment cost less, and building sharper curves in mountainous terrain was possible. The railroad was only eleven years old though when Palmer and his associates realized they were bucking great odds with a narrow gauge operation. Trans-loading shipments from narrow gauge cars to other standard gauge railroads for delivery proved costly. Consequently by late 1890, the main line to Salt Lake City was converted to standard gauge and also standard gauge rail was laid from Denver to Antonito in 1901. Portions of the narrow gauge operation would remain in parts of Colorado and New Mexico, however.

Grading for the narrow gauge line commenced in July, 1871 and it was opened for business between Denver and Colorado Springs in June, 1872. Construction continued and the railroad reached Pueblo by August of that year. Money and political problems delayed construction for several years, however, changing the original plans for the route. Track reached La Veta, Colorado in 1876. By that time mining activities in central and southwestern Colorado were booming, which caused the D&RG to abandon the plan to go to El Paso, and turn west toward the irresistible lure of transporting mining riches. In 1877 rails were completed to El Moro coal mine near Trinidad and across La Veta Pass to Garland City (now Ft. Garland) in the San Luis Valley. In July 1878 narrow gauge track rested beside the cottonwood trees along the Rio Grande River at the new company town of Alamosa, CO. Thus, eight years after its inception, the Denver and Rio Grande Railway could justify its name.

Financial problems still haunted the railroad. An expensive court fight with the Atchison, Topeka and Santa Fe Railroad (AT&SF) stopped all construction until a lawsuit was settled by a US Supreme Court decision in 1879. This fight concerned which railroad had first rights to build across Raton Pass and through the Royal Gorge on the Arkansas River to Leadville, CO.

When the Rio Grande owners realized they had finally won the route to Leadville and other mining towns in Colorado, new money for construction appeared. The price of D&RG stock advanced dramatically on the New York stock exchange and work officially began on the San Juan and New Mexico Extensions November 28, 1879. Thus began a period of extensive building and expansion for the ten-year-old company.

A frequently asked question is why the D&RG chose a meandering route from Antonito to Chama to reach the booming mining camps in the San Juan Mountains? Why did the D&RG engineers choose the Cumbres Pass route instead of other routes they surveyed? Engineering parties had examined the mountain range dividing the waters of the Rio Grande River from the San Juan Mountains, looking for the best line to the town of Silverton Colorado, the heart of the San Juan mining activity. Lines were contemplated over Cunningham Pass, South Fork Pass, Alamosa Pass and Cumbres Pass. Although Cunningham Pass was shorter, it was higher and more difficult to build and maintain. Even though Cumbres Pass was a considerably longer route, as a compromise, it was selected.

A chief factor leading to the compromise was the existence of a toll road to the top of Cumbres Pass that would aid the railroad in moving men and materials for grading. In 1874, Lt. George Anderson of the Sixth Cavalry had led a group of ten men to survey a route across the pass. He was looking for a



Cumbres Pass [Denver Public Library Collection]

suitable route from Ft. Garland, CO to Ft. Wingate, NM. Anderson also noted the existence of an old Indian trail south of Cumbres Pass and recommended that be used as the military route. Then in 1876, early day land developers laid out a plan for a town called “Parkview” to be built in the Chama valley a few miles South of the present day Chama. These promoters, from Santa Fe and Chicago, were interested in encouraging immigration to the area and sold property to many pioneers. Part of their promotion effort was to build a road over which these immigrants could travel on the way to their property. The road would generally follow the route surveyed by Lt. Anderson and was to go from Parkview, New Mexico, northeast to Fort Garland, Colorado. It was called the Parkview and Fort Garland Freight Road and Telegraph Co. (commonly known as the Parkview and Ft. Garland Toll Road). During 1877, these developers built a very crude trail to the top of Cumbres Pass from the east, but most of the “road” was probably hacked out of the wilderness by the pioneers themselves as they dragged their belongings, livestock and wagons over the mountain.

Another reason for choosing Cumbres Pass was accessible coal deposits west of Chama – a source of revenue for the struggling railroad. And further, it was believed the AT&SF might attempt to build their own line to the San Juan Mountains from the south to compete with the D&RG for the lucrative mining business. It was thought the Cumbres Pass route might forestall any such construction by the Santa Fe Railroad.



Rock Tunnel overlooking Toltec Gorge [Denver Public Library Collection]

Proposals for work on the two new extensions of the D&RG were published in Colorado newspapers in November, 1880. The plan was to extend the line to Antonito with the San Juan extension heading west for Silverton, Colorado and the New Mexico extension proceeding south toward Espanola. Grading and track-laying began in January from Alamosa to Antonito. By March of 1881, construction crews were housed in tents near Antonito, CO moving westward as track-laying progressed. On the San Juan line, the track reached Lava Tank and Big Horn Wye in the spring. Toltec Siding was reached in June and the line was open for business. Grading crews continued at a quick rate, reaching Cumbres Pass on July 31 and continued down the steep four percent grade reaching Chama in September. Track crews were not able to keep up a similar pace, however, and rails did not reach Osier until October. Despite bitter cold and a snowy winter, track gangs continued working and reached the outskirts of the infant town of Chama on December 31, 1880. A bridge over the Rio Chama River still needed to be constructed before

tracks could enter the Village but business on the San Juan Division opened between Denver and Chama January 18, 1881. By the end of 1882 the tracks finally reached Silverton, CO – the intended terminus.



[Denver Public Library Collection]

The D&RG San Juan Extension from Antonito to Chama had a relatively short but glorious life from 1880 until 1967 when the D&RG applied for abandonment. Passenger service, hauling ore, timber, sheep and cattle had been the mainstays for the railroad over the years. The factors that led to the demise of the railroad were many. The first was the difficult nature of maintaining and operating a railroad over beautiful, but rugged mountainous topography and the effect of mountain winters. (Those struggles continue to this day for the C&TS.) The second blow was the collapse of the price of silver. The repeal of the Silver Purchase Act in 1893 meant the federal government would no longer purchase silver for coinage, bringing an end to the silver mining, as well as negatively impacting the revenue for the newly built railroad. Third, the lumber industry's practice of clear-cutting trees had, by 1914, depleted the vast forests of the area. It meant the railroad's best customer - the logging companies - virtually put them out of business. Finally, the improvement of roads in Northern New Mexico and Southern Colorado made car and truck travel more convenient. Railroad passenger service to the area was viable because of these notoriously bad roads. With improved road conditions, however, passenger service declined and finally ended January 30, 1951.

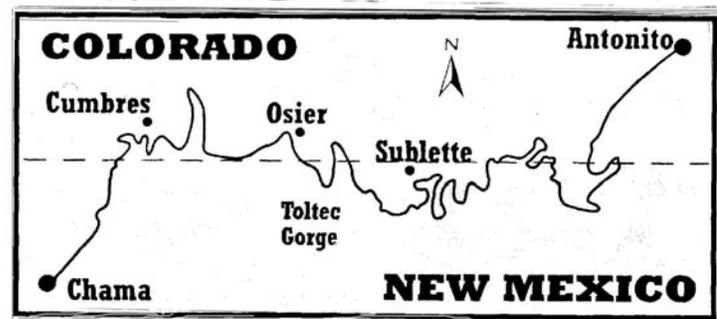
There was a temporary boom for the D&RG (W) in the freight business during the 1940's and 1950's when oil was discovered in Farmington, New Mexico, and at Gramps oil field near Chromo, Colorado. Generally, railroad freight service dwindled with better highways and as trucking service became available. As the Rio Grande's freight service declined there was less money to spend on track, equipment maintenance and repair, further reducing their capacity. The legendary difficulties the D&RG had endured over the years in keeping the track open over Cumbres Pass in the winter also began

to appear ridiculously expensive in view of the lack of freight being carried by rail. The rotary snow plows were operated for the last time during the winter of 1963-64 and freight operations after this time were shut down until spring. The Rio Grande ran 20 freight trips during the spring and summer of 1966 but lost \$544,000. On September 18, 1967, the D&RG filed a formal application for abandonment.



Coal Tower – Chama NM [Denver Public Library Collection]

The Cumbres & Toltec Scenic Railroad



The Cumbres & Toltec Scenic Railroad (C&TS), operating between Chama, New Mexico and Antonito, Colorado, is widely recognized as America's premier historic steam era narrow gauge railroad. The Friends of the Cumbres & Toltec Scenic Railroad, Inc (Friends) is a 501© (3) organization dedicated to the historic preservation and public interpretation and education of the C&TS. Built in 1880, the railroad is a spectacular and ruggedly beautiful remnant of the once larger system of narrow gauge railroads - the Denver and Rio Grande Western – which was built to tap the mines, timber and grazing lands of western Colorado and northern New Mexico. The railroad is designated both a State and National Historic Site and National Civil Engineering Landmark.

In 1968, the Denver and Rio Grande Western received approval to abandon what remained of its narrow gauge mainline, and in 1970 the most stunning portion was purchased by the states of Colorado and New Mexico. The survival of this historic treasure results from a creative public-private partnership between the Friends and the states of Colorado and New Mexico. An interstate compact was approved by Congress several years after the states purchased the line which established the C&TS Railroad Commission. The Commission, with two representatives appointed by each state, oversees the development and operation of the railroad as both a living museum and as a stimulus for economic development. While the Commission selects the railroad operator, control over all of the railroads' historic assets has been entrusted to the Friends. Volunteers have been an important part of saving the railroad since 1970 but in 1988 the Friends were formally incorporated. The Friends are dedicated to the preservation, restoration and interpretation of the living museum that is the C&TS Railroad.

Significance

Why bring your students to the C&TS Railroad Historic Site? What makes this place special?

It fosters student understanding and appreciation of the development of narrow gauge steam railroads in the Rocky Mountain West.

It offers students the opportunity to experience a live steam operating railroad in its historic setting.

It preserves and protects the structures, locomotives, rolling stock and artifacts and the living culture of the steam railroading era.

It relates the economic, political and social impacts in the industrial revolution and the expansion of America.

It tells the story of the people who worked in the steam railroad industry and the people in the industries the railroad served – mining, ranching, and timber.

As you and your students tour the site, think of what it would be like without this National Historic Site to tell the story of steam railroading in the Rocky Mountain West.

Orientation to the Railroad

Locomotives

Steam locomotives use a system in which water is boiled, like a tea kettle, and steam energy is converted to power the cylinders of the engine. This propels the locomotive by connections between cylinders and driving wheels. The driving wheels are located under the heaviest part of the locomotive, and help support the frame and the boiler. On a powerful locomotive, the boiler is often longer than the driving wheels and the locomotive needs more support. For stability to the driving wheels “leading” wheels can be added ahead of the drivers or “trailing” wheels can be added behind. This leads to a classification system by wheel arrangement in which the number of smaller leading (non-powered) wheels is given, then the number of driving wheels, and finally the number of small trailing (non-powered) wheels. This method was devised around 1900 by Fredric M. Whyte and is named after him.

The wheel arrangements for locomotives are the accepted method of identifying their type. It consists of a set of numbers or zeros with dashes between them, indicating the number of wheels under the locomotive. For example, many of the early engines were the 4-4-0 type (the zero is pronounced “oh”). They had four front wheels, four driving wheels and no trailing wheels. Additionally, locomotives were almost always given adopted names. The 4-4-0 is also called the “American” type, as it was the most common type of locomotive in North America for many decades. Most of the names that became associated with types were developed by the first railroad using locomotives with that wheel arrangement. Some, like the “ten-wheeler”, have obvious meaning (it was a 4-6-0). Other names represent the features of the area where the railroad ran, such as the 2-6-2 or “Prairie”. The first 2-8-2 was built in 1898 in the US for Japan. It was named “Mikado” or “Mike” in honor of the Mikado family of Japan. All of the locomotives running on the C&TS Railroad are of this latter type.

It should be mentioned in parts of the country outside the Rocky Mountain West, there were steam locomotives called “articulated” engines. The purpose of these locomotives was to permit longer, bigger engines to negotiate curves. In this case, the first set of driving wheels pivoted in the turn. These first set of drivers were hinged off the front of the second set of driving wheels. The second set was attached to the boiler, permitting the front drivers to move separately. This separate movement, in effect, caused the front part of the engine to swing side to side, or articulate, in response to track curves. The Union Pacific’s “Big Boy”, a 4-8-8-4, is an example of this type.

Another type of locomotive used by railroads was called a switch engine. It spent most of its time in the yard, switching rolling stock around, and only had driving wheels. This locomotive, a 0-6-0, spent as much time moving backwards as going forward, so its tender had to be short, providing better visibility when moving backwards. In some cases, this type of locomotive might not even have a tender, storing its coal in the cab and its water in a tank around the boiler, hence the name “Tank” engine. A “T” attached to this type, 0-6-0T identified this engine.

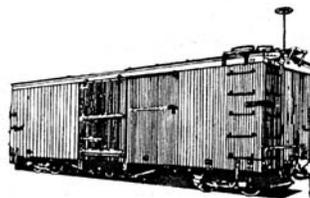
Finally, a locomotive designed to work in an area with steep grades and sharp curves such as a lumber operation might have power transmitted to the wheels by a geared mechanism. There were three manufacturers of geared locomotives – Shay, Climax and Heisler – each a distinct type. The Shay was the most common and had two or three cylinders on one side of the boiler driving the wheels through gears. The Climax had two cylinders, one on each side of the boiler, at a 45 degree angle and drove the wheels through multiple gears. The Heisler also had cylinders on either side of the boiler but met each other under the boiler in a “V” configuration driving the wheels through shafts and gears. An example of the Shay, formerly operating on the Georgetown Loop, is now at the Colorado Railroad Museum in Golden, CO.

Rolling Stock

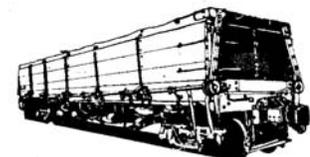
From the middle of the 19th and first half of the 20th century, the railroad was the easiest way to transport people and goods in this country. It transformed America from an agricultural society dependent on access to water for transportation, to an industrial society in which towns and cities could be developed anywhere on the vast landscape. In this scheme, the locomotive provided the power to move and deliver the passenger and freight cars.

The C&TS Railroad has the most extensive collection of historic freight and maintenance of way cars in the world. Examples are:

Boxcar



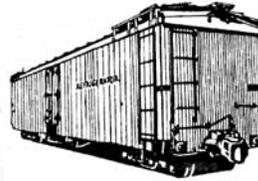
Gondola



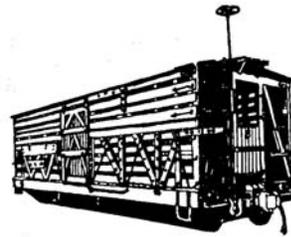
Flat Car



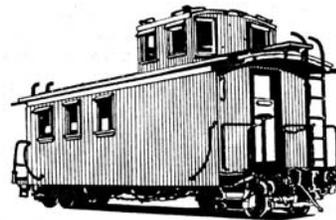
Refrigerator Car



Stock Car



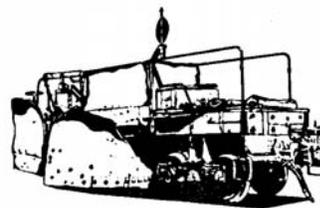
Caboose



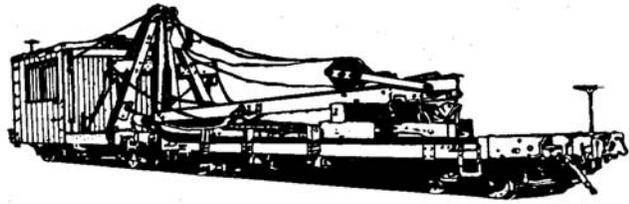
Rotary Snow Plow



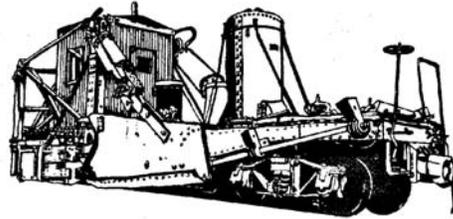
Flanger



Derrick Car



Jordan Spreader



Whistle Signals

Communication on the railroad as to engine movement and warning signals comes from the engineer in the cab of the locomotive by using a variety of whistle signals. When trains are moving from place to place along the line, or passenger or freight trains are preparing to load or unload or moving about in the yard, or when track gangs are working out on the line – the engineer needs to be able to communicate engine movement to people on the ground. The signal may be stop, proceed forward, back up, or a warning when passing highway grade crossings. The following are train signals:

Each • indicates a short sound; each — indicates a long sound

Apply brakes; stop •

Warning whistle at places where view is obstructed or answer to yellow flag — •

Release brakes; start or proceed; High Ball — —

Trainman/flagman to protect rear of train — •••

Trainman/flagman to protect front of train ••• —

Trainman/flagman return from west or south; the “all aboard” signal on C&TS — — — —

Trainman/flagman return from east or north — — — — —

Answer to any signal not otherwise provided for ••

When standing or stopped, back up; when running, stop at next passenger station •••

Call for signals ••••

Approaching highway grade crossing — — • —

Approaching meeting or waiting points — — •

Approaching meeting or waiting points of trains — •

A number of short sounds closely spaced are a warning for persons or livestock on the track

The People

The story of the C&TS Railroad is really two stories: the history of the people who built, operated, maintained and traveled on the D&RG; and, those people who presently operate, maintain and travel on the C&TS tourist railroad.

It is the history of:

1. the builders
2. the engineers – operators of the locomotives
3. the firemen - shoveling coal and stoking the fire
4. the conductor – the person in charge or, “captain” of the train
5. the brakeman – subservient to the conductor and responsible for aligning switches
6. the track crew – or gandy dancers as they were called, responsible for maintenance of the line and track
7. the engine house crew – the mechanics, welders, steamfitters, boilermakers, sheet metal workers, electricians, machinists
8. the office staff – dispatchers, ticket agents, telegraph operator
9. the Superintendent – overseeing all railroad and mechanical operations
10. those living in the section houses along the line – track workers, train inspectors, the agent/operator and the section foreman

The story is also that of the families of these railroad workers – parents, wives, sons and daughters and second and third generations following in the footsteps of their ancestors. It is the story of their struggle to survive in the mountain setting – high elevations, large amounts of snowfall in winter, blazing sun in summer, dehydration, great distances along the line, working with equipment that is big and heavy and the uncertainty of their employment with a railroad struggling financially.

It is also the story of the passengers on the trains, the travelers, the business people, and those dependent on the railroad as customers and suppliers.

Most importantly, it is the story of how steam railroads transformed and influenced the everyday lives of the people of the region and the history of America for over one hundred years. From the 1830’s through the early 1950’s, railroads were the dominant means of transportation and shipping in America. Today, with railroads such as the C&TS, it is possible to be transferred back in time to the heyday of rail passenger travel. In particular, the C&TS survives as a *living* museum - still doing the job that it was originally designed to do. Trains move along the same track alignment, over the same trestles and bridges, and with much of the same equipment as the Denver & Rio Grande trains of a century ago. Railroad enthusiasts worldwide recognize the C&TS Railroad as the most accurate portrayal of steam era railroading in North America.

Learning Opportunities

In order to help fulfill the mission of the Friends of the Cumbres & Toltec Scenic Railroad, we must educate future generations as to the importance of preserving this National Historic Site, but also the history, artifacts and culture of the railroad which are part of our heritage as a nation.

The living museum that is the C&TS Railroad offers the opportunity and the resources to incorporate an inter-disciplinary approach to education. Its thematic framework advocates the use of broad universal themes to help students and visitors understand the significance of this historic railroad. Educators can use these themes to create lesson plans that encompass the many stories that the railroad has to tell. These themes are:

1. People and places – this theme explores the settlement of the Rocky Mountain West; the family and life cycle of railroad builders and railroad workers; how passenger rail travel dramatically increased the mobility of America; and how the structures along the line and the communities that developed are a reflection of the story of America.
2. Developing the American economy – this theme can be used to highlight the impact of the railroads on the growth of America: the prerequisites for railroad building (money for funding, materials for construction and the people to hire); the economy that evolved and became possible because of rail transport of people, raw materials and freight; businesses that became dependent on the railroad to transport their goods; ongoing operation and maintenance of railroads; and finally, government policies and practices that relate to railroads and railroad development.
3. Expanding science and technology – this theme can be used to emphasize the science and technology of railroad building practices (surveying, grading, laying track, tunnel and bridge building), and railroading in general (maintaining the line, building and maintaining locomotives and rolling stock, telegraphy); through experimentation, and improvements in technology, railroad inventions helped transform America.
4. Expressing cultural values – this theme can be utilized to draw attention to the heritage of railroads and the Rocky Mountain West; the lore and literature, architecture, music, art and the blending of cultures.
5. The impact of weather, elevation and topography on railroad building – this theme can underline the geography of the Rocky Mountain West; the influence of weather on operations – rain, snow, flooding, drought and fire; the impact of changing elevations, watershed in the mountains, rivers and the Continental Divide.
6. The “life zones” of the railroad are the communities of plants, animals and birds that live in specific elevational zones – this theme can be used to highlight the presence of abundant flora and fauna and the balance achieved between climate and elevation for those living things. The 64-mile railroad meanders through State and National Forests, BLM land, and large ranches, crossing the New Mexico/Colorado border eleven times in its journey. The **animals** – (elk, deer, bear, pronghorn, mountain lion, coyote, foxes, cotton-tail rabbits and jackrabbits, squirrels, chipmunks, skunk, porcupine, badger, muskrat, bats, toads, frogs, lizards, snakes), the **birds** – (eagles, osprey, magpie, raven, grouse, crow, pheasant, quail, doves, junco, finch, woodpeckers, several species of hawks, mountain blue birds, Stellar jay, hummingbirds, grosbeaks, gold finch, robins, black birds, swallows and other migratory birds) and thousands of **wildflowers, grasses, forbs, shrubs** and **trees** are all part of the living museum that make up the C& TS Railroad.
7. The influence of geology in building and maintaining the 64-mile line – this theme highlights the geologic history along the C&TS line as part of the railroad story. It affords the student the opportunity to study geologic time dating back as far as 140 million years ago. All classifications

of rock exist - igneous, sedimentary and metamorphic. Volcanic activity is evident, and the effect of erosion from water, ice and wind are readily observed.

Activities

Pre-Visit (Led by the Educator)

As mentioned in the introduction, this booklet can be used as a stand-alone guide or used in conjunction with other curriculum guides. Consider your purpose for coming to the C&TS Railroad National Historic Site and discuss this with your students. The trip should be related to your school curriculum.

Since one of the Friends goals is to stimulate awareness and appreciation of the rich historic resources of the “living museum” that makes up the 64-mile line of the C&TS, it is important that students understand all National Historic sites are part of America’s heritage and need to be protected.

If this guide is used alone, in preparation for your trip, the following pre-visit activity is suggested:

What makes a National Historic Site?

Ask the students for their definition of a national historic site. Ask them what might make a place nationally significant.

Other topics:

1. Why is it important to preserve historical places?
2. How did people travel and transport goods in the past? Using a map of the United States, explain how the early settlement of the country was dependent on access to water. Then explain how the development of the railroad changed how areas were settled.
3. Introduce students to the railroad vocabulary and discuss the definitions.
4. Familiarize students with the use of whistle signals on the railroad as the chief form of communication.
5. Initiate discussions about the formation of the Rocky Mountains, the impact that mountains had on travel, weather in the mountains, the presence of precious metals and coal, and the abundance of plants and wildlife in the “life zones” in the mountains.
6. Explore the difficulties in building and operating a mountain railroad. Talk about the weight and size of the equipment, the significance of all the work being done by hand, the distances that needed to be covered in rugged terrain.
7. Review the basic topics of earth science and how they apply to railroad building and railroad operation – geography, geology, rocks and minerals.
8. Do the students have any other concerns?

Finally, please be sure to discuss the safety issues before your trip. As a reminder, do not step, stand or walk on top of the rails and remember the C&TS National Historic Site is a living, operating railroad.

On-Site Explorations (Accompanied by a docent)

There are a variety of activities possible while visiting the C&TS National Historic Site. The Friends volunteer staff will act as a docent for your guided tour. Highlights include:

1. The Depot
2. The old log bunkhouse – oldest structure on the property built in 1880
3. The Coal Tipple
4. The double spouted water tank
5. The sand house
6. The oil loading dock
7. The scale house
8. The stock pens
9. The “Wye” – where locomotives can be turned.
10. Walking the yard to explore rolling stock – see boxcars, flat cars, gondolas, refrigerator cars, stock cars, tank cars, cabooses, and maintenance of way equipment including the rotary snow plows
11. The steam locomotive – explanation about how a steam locomotive works and identifying the different parts of the engine – tender, firebox, boiler, cylinders, driving rods, drivers, sand dome, steam dome
12. View two remaining stalls of the old roundhouse, understand the use of the roundhouse and the purpose of the turntable in steam railroad operation
13. Examine switches, multiple set of tracks and how tracks are connected
14. Taking a trip to Cumbres Pass, the highest point on the 64-mile line. See the section house, car inspector’s house, and snow sheds.

Post-visit activities (Led by Educator)

In the pre-visit activity, the students learned about the importance of National Historic Sites. After the visit, students should be able to describe the significance of the C&TS as a historic site and as a tourist railroad operating in its historical context. Additionally students should understand the importance of preserving steam railroading.

Activities

1. Discuss the field trip to the C&TS and review the most interesting aspects to the group – the steam locomotives, the rolling stock, the yard, the historic nature of the property?
2. Compile a list of products and services that the D&RG historically provided.
3. Create an activity about the lives of the various railroad workers in the early 1900’s. What was life back then? Describe the kind and size of tools used by track workers, machinists, and in mechanical operations? What were living conditions like for those living out on the line?
4. Discuss the importance of preserving the 64-mile living museum – the use of steam locomotives, the structures, artifacts and rolling stock.

Possible follow-up Projects

Build models of locomotives or rolling stock, research one aspect of railroading history, or create mural or photographic journals of the visit.

Railroad Vocabulary

Anthracite (hard) coal – A type of coal mined in the late 1790's until the early 1960's. Due to its high carbon content, it burns cleaner and hotter than bituminous (soft) coal. Hard coal burns very slowly though, requiring a huge grate area in the **firebox**. Most locomotives using this coal had to be designed differently to burn it.

Ballast – Material placed on the roadbed for the purpose of holding track in place providing a smooth track surface, good drainage and weed control.

Bituminous (soft) coal – This is the type of fuel that was used for most coal-burning locomotives. It is a low carbon content coal creating more smoke when it burns but it is less expensive than hard coal. The coal used on the C&TS is delivered by truck from a mine in Hesperus, CO near Durango. The C&TS tenders can hold up to 9 1/2 tons of coal and on an average trip from Chama to Antonito, 4 1/2 to 5 tons of coal are burned.

Blue Flag – A blue signal that is displayed at one or both ends of an engine, car or train, indicating that workmen are under or about it; when thus protected, it must not be coupled or moved. When this signal is displayed, no cars or locomotives can leave or come onto that track until the person who put it there removes the flag.

Boiler – The enclosure on a locomotive where steam is produced. The boiler must be filled with water almost to the top. When the water boils, the steam it generates forms in the space between the top of the water and the top of the boiler. When enough steam collects, the pressure begins to build up until it reaches a useful working level. Steam will continue to build up until the maximum pressure is reached. This is between 150 and 300 psi, depending on the age and type of locomotive. On the C&TS, a K-36 locomotive reaches @195 psi. To get a locomotive boiler up to pressure from a cold start takes several hours. Water in the boiler is heated by fire. The fire is placed in the **firebox** at the rear end of the boiler. The hot gases generated by the fire pass through hollow tubes, or flues, running the length of the boiler. At the front end these hot gases escape from the flues into the **smokebox** and then upward into the atmosphere through the smoke stack.

Boiler Pressure – The fireman is in charge of making sure that enough steam is generated in the boiler. As steam builds up and starts expanding it creates pressure. The pressure must be kept at a high enough level to make the locomotive produce pulling power.

Boxcar – A closed rectangular car having a floor, side ends and a roof with doors on the sides, or sides and ends. It is used for carrying goods such as food, barrels, grain, lumber, etc that must be protected from the weather.

Brakeman – In the steam era, this worker was in charge of stopping the train in the days before air brakes. When instructed by the engineer's whistle, he walked on top of the train and physically turned brake handles on each car. The brakeman is now responsible for the safety of the train and aligning switches.

Bunkhouse – A dwelling for crew quarters. On the D&RG, bunkhouses were found in Chama, a crew change point, and also along the line for section house crews.

Caboose – A car usually placed at the rear of the train which provides an office and quarters for the conductor and/or trainmen while in transit, and for carrying the various tools, supplies, etc., used in freight train operations. Modern railroads, with radios, cell phones and satellite communications, have in most cases, discontinued the use of cabooses. During the heyday of cabooses there were many nicknames: crumb car, crummy, cabin Car, shack, hack, and way car.

Coal Tipple – A structure designed to deliver coal to locomotive tenders. In Chama, the tipple is the last operating coaling tower for steam locomotives left in the U.S. It was built in 1924.

Conductor – The train crew member who is in charge of the train. In the steam era, this worker communicated with the engineer by using hand signals, a flag or a lantern. Present day conductors communicate with radios.

Consist – (pronounced con' sist) Cars within a train.

Coupler – A device located on both ends of all rolling stock and locomotives, it connects each car together. A trainman prepares the rolling stock and locomotives coupling them together and/or decoupling them from each other.

Cowcatcher – A slang word for “pilot”, it is a device on the front of a locomotive used to move debris from the tracks in front of the train.

Cupola – Located on many cabooses, this high area with windows enabled the crew to observe the condition of the train and initiate measure to stop the train in unfavorable conditions.

Cylinder – The heart of the power conversion system of the steam engine. A locomotive has at least two cylinders, usually mounted at the leading (front) end so as to be clear of the driving wheels. Next to each cylinder is a valve which controls the flow of steam into and out of it. Normally, a cylinder and its valve chest are cast in a single block which is carried on one of the side frames.

Cylinder operation – When steam is released into a cylinder, it expands into the space available. If a piston is placed inside the cylinder, the pressure of the steam and its expansion will push on the piston. When the piston reaches the end of its stroke, steam is admitted to the cylinder on the other side of the piston. This pushes the piston back to its original position. The steam used for the initial stroke is now pushed out of the cylinder as the piston returns and is exhausted into the **smokebox**, where it escapes through the smokestack into the atmosphere. The puffs of exhaust steam escaping into the air make up the characteristic chugging sound of the steam locomotive.

Dead Head – An operating term used to describe off-duty travel of a train crew member from some point back to his or her home terminal. It can also indicate a locomotive without passengers or freight, or a car carrying off-duty train crew.

Derailment – Anytime the wheels of a locomotive or car come off the head of the rail.

Diesel Engine – An internal combustion engine invented by Rudolf Diesel differing from other internal combustion engines because its compression is high enough to cause combustion without the necessity of introducing a spark for ignition.

Diesel-Electric Locomotive – A locomotive with one or more diesel engines that develops power that in turn is converted to electrical energy. This energy is delivered to electric traction motors and subsequently traction axles by means of shafts and gears.

Dispatcher – The person with this title is responsible for all train and engine movement between terminals. In steam days, the instructions of the dispatcher were passed along to telegraph operators who in turn issued those written orders to crews of the trains. The dispatcher was the “boss” of all train movement making certain railroad traffic was accident-free.

Doubleheader – A term used to indicate when at least two steam locomotives are used together to pull large trains, particularly up steep grades.

Drive wheels – The large wheels connected to the steam engine pistons which therefore drive the locomotives.

Engineer – The driver or the operator of a locomotive or a train. He or she communicates with the crew by using the steam whistle. The slang term used for engineer is “Hog Head”.

Firebox – The compartment at the rear of the boiler that houses the fire. The firebox is where the fuel, usually coal, (but it can be oil or wood) is burned to provide the heat to boil the water in the boiler. The firebox has a silvery look to it which comes from being covered with a graphite heat-resistant paint.

Fireman – The second crew member for a locomotive responsible for the production of steam. This requires that he or she looks after upkeep and maintenance of sufficient water in the boiler. The fireman also shovels coal and stokes (feeds) the fire. He/she will also assist the engineer with observation of the track, care of the locomotive, coupling and uncoupling, etc.

Freight Car – A general term used to create a distinction between passenger cars and those that carry freight. It designates all kinds of railroad cars that carry goods, merchandise, produce and minerals.

Gandy Dancers – A slang term for workers who repair, replace and inspect railroad track.

Grade – The rate of climb or descent for a railroad crossing over the mountains. From the Antonito side of the line, the grade averages 1½ % - a modest ascent or descent for the locomotive and train. But from the Chama side, the grade is a steep 4% up the hill to Cumbres Pass, rising 4 feet per 100-foot of travel. This requires tremendous work from the locomotive and dictates that only 8 passenger cars can be pulled from that side without adding a second locomotive to power the train up the mountain.

Gauge – the distance between two rails.

Helper Locomotive – A second or third engine added to a train to assist up a steep grade.

Loop – An arrangement of track in the form of a loop. It provided another method of turning a locomotive and/or other short consists.

Mileposts – A marker placed near the tracks to indicate mileage between specific points. On the C&TS, Chama is milepost 344 and Antonito is milepost 241- indicating the distance to Denver by rail. Denver

was milepost 0. The Friends volunteer crews continue to maintain mileposts in several styles along the line representing a cross-section of what once existed on the D&RG.

Narrow Gauge – The term used to indicate any track gauge that was less than the standard width of track in North America - 4 feet, 8 ½ inches. On the C&TS, the rail width is three feet. The narrower gauge was less expensive to construct and maintain and made it possible to negotiate sharper turns in the mountains. Narrow Gauge railroads were prominent in the Rocky Mountain West and for mining and timber operations.

Pumpcar/Handcar – A small vehicle used in the early days of railroading by track workers to inspect the track. Two people pushing down or pulling up on its handles in a pumping motion moved this vehicle up and down the track.

Railway Post Office Car (RPO) – A railroad car in which postal workers would sort mail as the train went from station to station. In some cases, a mail hook was used to pick up the mail from the station without stopping the train.



Railroad Crossing Sign – A white sign in the shape of an X that is placed near a grade crossing to alert automobiles and people to use caution when crossing the tracks and to observe whether a train might be coming.

Red Flag – A signal used by railroad workers to communicate to the engineer to stop the train or indicate danger ahead or behind.

Roundhouse – A round building with pie-shaped stalls where inspections, adjustments, maintenance and repairs are made to steam locomotives. The original six-stall wooden roundhouse built in Chama in 1882 by the D&RG, burned down in 1899. The present brick roundhouse in the Chama yard originally had nine stalls. Four stalls were removed by the D&RGW in 1936 and three more disappeared in the 1950's, leaving only the present two stalls.

Scale House and Scale Track - A special track was built for a scale and was used for weighing loaded cars in order to set the rate charged to the shipper. Extra rails were set across the scale bed to permit the passage of locomotives that were too heavy for the capacity of the scale. The scale house in the C&TS yard was built in 1929 replacing an older version.

Section - A section of the railroad that is the dedicated responsibility of a certain track (section) gang. The section was defined by the distance a track maintenance crew could travel with handcars, the availability of water and on the C&TS the availability of relatively level land in mountainous country.

Section House – Section houses were set up along the right-of-way to house the section foreman and his family. Other track workers were housed in a bunkhouse, near the section house. Other structures might include a coal shed, water closet or privy (outside toilet), and storage shed.

Siding – An additional set of tracks placed along side the main line and controlled by switches at both ends. The purpose was to permit trains to pass each other, provide a spot along the line to set out inoperable cars within a train consist and for occasional storage. There are many sidings that still exist

along the C&TS including: Lobato, Cresco, Cumbres, Los Pinos, Osier, Toltec and Sublette. The D&RG classified all sidings as stations.

Smokebox – As exhausted steam passes from the cylinders, it travels through a nozzle stand at the base of the smokestack. As it blasts up through the center, it creates a vacuum in the smokebox which draws the hot gases from the fire through the flues. The exhausted steam and hot gases collect in the smokebox and are expelled through the smokestack. On most locomotives the smokebox is located at the front of the boiler. On the C&TS, the smokebox can be identified as it has a silvery look to it. The color comes from a graphite solution painted on the boiler that is heat resistant.

Snow Fence – Fences were often necessary, and strategically placed along the line, to prevent snow from drifting on the track. Portions of D&RG fences exist today along the right-of-way.

Snowsheds – A wooden structure centered over certain portions of the track to protect the track against deep and/or drifting snow and against snow slides. On the C&TS a remaining portion of the snowshed at Cumbres Pass has been rebuilt. Between 1884 and 1908 more than 13,000 feet of snowsheds were built on the both sides of the summit at or near Cumbres Pass.

Speeders – Also called motor cars or “pop” cars replaced the pump/hand cars. They are small engine powered vehicles used by track maintenance workers to travel over their section of track. On the C&TS, speeders are used to precede the train for rock patrol and/or follow the train for fire patrol when necessary.

Spike – A steel nail with a flat cutting point used to secure a rail in place.

Spur – Storage track, one end of which is a dead end.

Standard Gauge – The width between tracks – 4 feet, 8 ½ inches, that is the most common gauge used in the United States.

Steam – Steam is the gas that is given off as the result of boiling water. The normal boiling point of water at sea level is 212 degrees F or 100 degrees C. To achieve the 195 psi on C&TS locomotives, the temperature of the steam reaches 339 degrees. Unconfined steam will expand to about 1325 times the size of the water from which it came. If it is confined, it will build up pressure which can be harnessed to do work. Pure steam is actually invisible. The vapor associated with steam which we normally see is really small droplets of water which occur as a result of condensation. The work which can be extracted from the steam is achieved by allowing its’ natural expansion. This expansion can be used to do work, like pushing a piston inside a cylinder.

Stock Pens - Wooden pens built for holding and loading cattle and sheep being shipped to market. On the C&TS, the stock pens are located at the very south end of the yard. Originally built in 1888, they were enlarged in 1915 and a 10-ton capacity scale was installed in the midst of the pens in 1955. Cattle and sheep shipments continued to the last years of the railroad.

Switch – A section of rail that makes it possible for locomotives, cars and/or trains to move from one track to another. For safety reasons, switches are kept under lock and key so that only railroad personnel can operate them. During steam days, switches were manually controlled and on the C&TS they are still aligned by hand.

Tangent – A mathematical term also used to denote straight track.

Telegraph Booths and Telegraph Operators – Communication along the railroad early on was dependent on telegraph and later telephone booths. The telegrapher was stationed in a special extended room in the Depot. From that vantage point, the telegrapher could see passing trains and could communicate train orders anywhere along the line using Morse code. Use of telegraph booths placed in wooden booths along the line was by the Conductor of the train who could verbally communicate the status of his train to the Dispatcher in Alamosa.

Tender – A vehicle attached to the locomotive for carrying coal or water (or other fuel like oil or wood). The locomotive tenders on the C&TS carry 5000 gallons of water. The engines require at least one stop to fill up with water on the trip from Chama to Antonito. The stop is almost always at Cumbres Pass, with the engine working hard up the 4% grade.

Ties – or Cross Ties – wooden beams, upon which the rails are placed, spiked down to maintain the distance between the rails. Ties are called “sleepers” in many other countries.

T-Rail – The standard rail design for railroad track in America.

Train – An engine, or engines, with or without cars, displaying markers. For practical purposes, a train is a group of coupled cars hauled by a locomotive.

Turntable – A rotating section of track used to turn locomotives to face the proper direction for running. Originally hand operated, they could later be found to be steam, air or electrically operated. The turntable provided the best means for turning steam locomotives around or placing it into or out of the roundhouse stalls. In Chama, the original roundhouse had a 50-foot Keystone turntable. This was replaced by a 65-foot turntable in 1925 to handle larger helper engines. It was removed in 1940.

Water Tanks – These primarily wooden structures were built so that locomotives could take on water while in route. In the Chama yard, the double spouted water tank is very unusual and may be the only remaining example left in the country. It was built in 1897 and is still used today. The oldest water tank remaining on the line was built in 1893 and is located at Cresco.

Wrecking crane – A steam powered crane used to remove derailed railroad cars off the tracks. The D&RG version of the wrecking crane was called derrick car OP (all maintenance-of-way cars were designated with two letters – always beginning with “O”). It was built in 1911 and was used in cleaning up wrecks, building rail cars and other activities requiring use of a crane. When it moved, it traveled with its boom flat car 06063 and work cars carrying cable, tackle and other needed equipment. Power to operate the steam winches was supplied by the locomotive assigned to push the derrick car. OP sits in the Chama yard today.

Wye – An arrangement of track in the form of a “Y” that can be used to turn a locomotive. The locomotive enters one leg of the wye traveling through the stem. This permits the engine to now back onto the other leg of the wye, leaving the locomotive facing in the opposite direction.

Yard locomotive (switch engine) – A small locomotive used to move cars around the railroad yards. On the C&TS, all the steam engines are 2-8-2 and all perform switching duties. The C&TS also owns a diesel locomotive but it is not used in passenger service.

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THERE IS NOTHING AS STRONG AS THE HEART OF A VOLUNTEER

Notes and Sketches

