Railroads and Weather

From Fogs to Floods and Heat to Hurricanes, the **Impacts** of Weather and Climate on American Railroading

Stanley A. Changnon

American Meteorological Society

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CONTENTS

PREFACE

MUCH OF MY WEATHER and climate research over the past 50 years has focused on how atmospheric conditions impact the environment, the economy, and human activities/health. These studies have led to several scientific papers and two books, one about the great floods of 1993 and the other about El Niño, 1997/98. Coupled with this scientific career orientation was a lifelong interest in railroads. This avocation led me to write six books and numerous articles about many facets of railroads. The coupling of these two central intellectual interests led to the preparation of this book.

Prior to the 1980 deregulation of the industry, there were many more railroads in operation. This text focuses on weather impacts and railroad adjustments since the 1940s. It covers decades when the challenges of weather and climate were faced by a larger number of companies, and this is well emphasized in the wide variety of photographs, which show trains belonging to companies that have now been absorbed or otherwise relegated to the halls of history. Most of the photographs were taken by me and two of my sons, David and Marc. Several friends supplied other photographs.

This book has been made possible by several persons and institutions. The concept of a book about how weather and climate affect railroads and their operations was first suggested to me by Michael Glantz; and my wife, Joyce Changnon, encouraged me to do it. The Intelligent Transportation Systems Committee of the American Meteorological Society responded very favorably to my proposal to prepare a book on this topic. In particular, I thank committee members Rich Wagoner and Mike Rossetti for their encouragement and suggestions to make the book a publication of the American Meteorological Society. Mike also provided insightful comments that improved the book's content.

The support of the Illinois State Water Survey, as part of its program of assessing impacts of weather and climate, was instrumental in getting the book written and assembled. I am indebted to Derek Winstanley, survey chief; Kevin Merrifield, computer graphics expert; and Ken Kunkel, head of atmospheric sciences, for their support and assistance.

Many railroad personnel also helped with advice and information. During my emerging career as an atmospheric scientist in the 1950s, I got to know Bill Hay, who got me interested in assessing weather and railroad relationships.

I am also indebted to Ken Heideman, Director of Publications, and Sarah Jane Shangraw, Books and Monographs Manager at the AMS. They graciously and skillfully handled the book and prepared it for publication.

CHAPTER

Dealing with the Weather

WEATHER AFFECTS every kind of outdoor activity. For as long as they have been in existence, railroads have been impacted by weather conditions 24 hours a day, 7 days a week, and in all seasons. Railroads have designed structures and right-of-ways to minimize weather problems, built refrigerated freight cars and air-conditioned passenger trains to reduce weather stress, and found ways to function in all forms of adverse weather, ranging from floods to snowstorms.

Railroad maintenance and operations have always been locked in a continuing battle against the forces of weather, which almost always affect railroads adversely. Temperature extremes, ice, fog, snowfall, wind, and precipitation influence the design of plants and equipment, maintenance and operating practices, train movements, capital and operating costs, and revenue. It is not easy to establish absolute cause-and-effect relationships between individual weather conditions and railroad operations. Usually the worst weather effects on rail operations occur when two or more factors combine, such as when snowfall, wind, and low temperatures combine to form blizzards. The tremendous diversity of climate in the United States presents numerous challenges to railroads, as they must address the particular climatic extremes in the regions they serve. We find tropical climates in Florida and southern California, desert climates in the Southwest, a moist maritime climate in the Northwest, humid coastal climates along the West and East Coasts, mountain climates in much of the West, and a continental-type climate in the central and eastern sections of the nation. Continental climates,

in particular, are known for their extremes, with hot, humid summers and cold, snowy winters. Some railroad companies operate lines in several of these different climate regions, and these lines must be designed to handle the variety of weather-induced problems found in each zone.

The story of railroads and weather is one of unusual conflicts and benefits to society and the development of the United States. As railroads developed during the nineteenth century, they offered the world's first means of transportation that was largely weatherproof and able to function throughout the year. The development of the nation's rail network from 1840 through the 1890s brought safe and reliable movement of people and goods throughout the nation, with many fewer seasonal impacts than befell other existing forms of transportation, all of which suffered greatly with the weather's capriciousness. Railroads now enabled farmers to get their harvested crops to market in a matter of days, whether they were shipped in July or January (Fig. 1.1). Prior to the advent of the railroads, shipments of anything could not be accomplished during many months of the year, and other forms of moving goods were extremely slow and apt to be inexplicably halted for days and weeks by conditions such as low water, muddy roads, and storms. By contrast, except in extreme weather conditions, trains could be counted on to reach their destinations on time. Even today, fog, heavy precipitation, and low ceilings stop commercial aircraft operations and slow vehicular traffic, often causing multiple accidents. But trains continue to operate in such conditions.

Over the past 150 years, with ever-newer technologies, the railroads have constantly worked to minimize their weather problems. They have buried cables and employed radios for communication to escape the major losses that snowstorms and freezing rain once caused to their exposed wire-

Fig. 1.1. Railroads enabled the widespread development of farming by delivering grain crops to market, an important service as illustrated by this Indiana grain train passing maturing corn crops. The train is led by an Alco RS11, built in 1956, a rare breed still operating in 1998 on the Kankakee, Beaverville & Southern.

based communication systems. They built snow sheds in mountainous areas where heavy snow caused trouble. They installed gas-fired heaters to keep their switches from freezing. Diesel engines and their operating needs are much less weather-sensitive than were steam engines and their more extensive support and maintenance. Taller and stronger bridges have reduced many flood-related problems.

The railroads of the past, and to some extent those of today, suffered from certain vagaries of the weather. Despite huge improvements in building rail lines and bridges, every year brings forth stories of how railroad service in some areas has been temporarily delayed or stopped by weather extremes (Figs. 1.2–1.12). Trains and their facilities suffer, sometimes severely, from major weather extremes, such as massive snowdrifts, flood washouts of roadbeds, and rails broken by extremely low temperatures.

Fig. 1.2. Heavy rain reduces visibility and traction. Here a CSX train moves cautiously through heavy rain, which blurs the illumination from the headlight, at a junction in southern Ohio.

Fig. 1.3. Sometimes locally heavy rains produce 6 to 10 inches of rain in a few hours, resulting in flash flooding that causes sudden washouts of roadbeds and bridges, as seen in this Missouri branch line. A May rainstorm produced 11 inches of rain in 6 hours, resulting in these massive damages, with vehicles swept off a highway that paralleled the line.

Fig. 1.4. Prolonged heavy rains and spring snowmelt can produce massive deep flooding over large areas. Such a flood in the 1950s immersed the Mississippi River Valley and swept around this CB&Q depot at McPaul, Iowa.

Fig. 1.5. Snowfall is a curse for railroads, bringing reduced visibility, slippery rails, and frozen switches. Here an IC train moves slowly along the main line during a heavy snowfall.

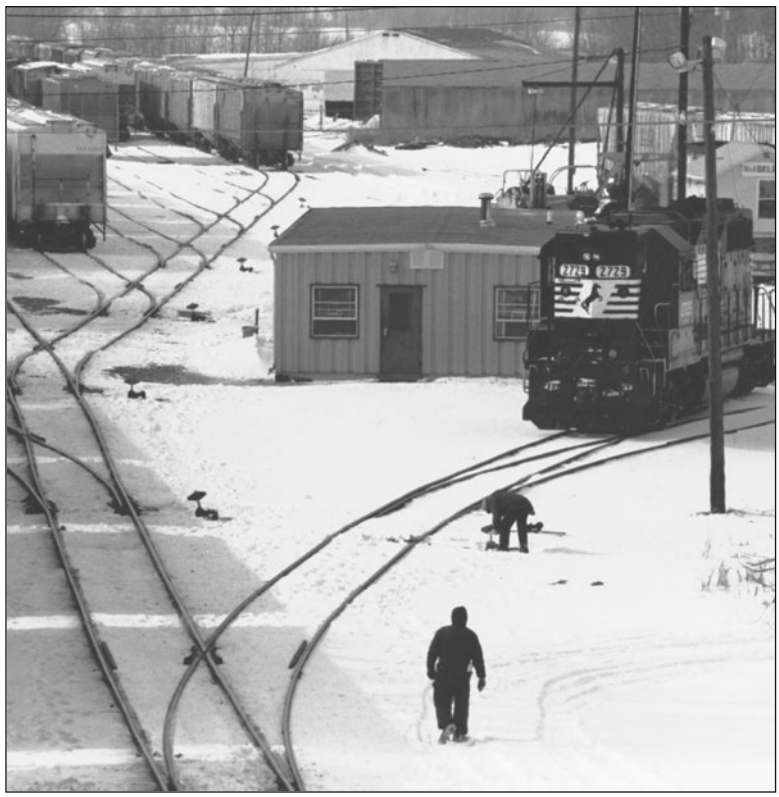

Fig. 1.6. Snowfall in rail yards brings a multitude of problems including frozen switches, frozen couplers, and discomfort and danger to work crews. Here, two heavily clad yard workers are trying dig out the frozen, snow-clogged switches so the yard's switcher can move out and go to work.

Fig. 1.7. Deep snow impedes train movement. Here an IC grain train struggles through a 15-inch snowfall with heavy drifts on the rail line in northern Illinois.

Fig. 1.8. Fogs can dangerously limit visibility, making signals, and anything else on the tracks ahead, hard to see. Here the northbound "City of New Orleans" bursts out of a thick summer morning fog.

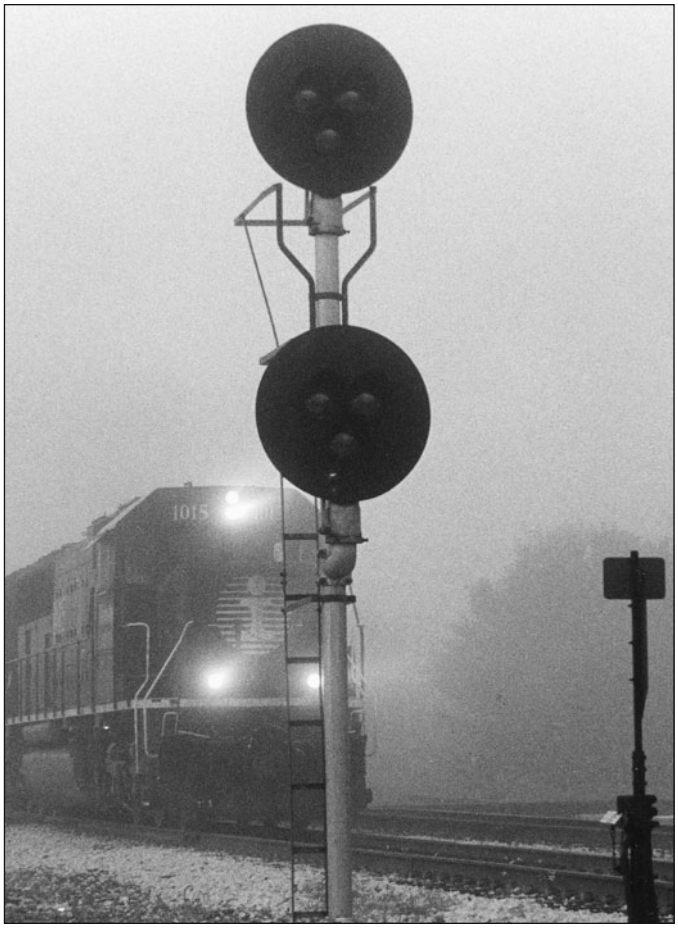

Fig. 1.9. A heavy Louisiana fog has made the lights of this junction signal nearly indistinguishable as a freight train penetrates the fog.

Fig. 1.10. High temperatures, typically 100°F or higher, can produce "sun kinks" in rails, leading to derailments. Here a Conrail train on a branch line in New York state cautiously pulls upgrade on a hot, 99°F, hazy August day with the rails ahead showing many disconcerting oscillations.

Fig. 1.11. A combination of high winds, blowing snow, severe cold, and a temperature of 10°F have clogged the engines on this Wisconsin train, which stalled in this blizzard.

Fig. 1.12. A combination of snow and extremely cold temperatures left icing on the rails leading to the derailment of the leading wheels of this Conrail SD60 engine sitting in a rail yard in western Pennsylvania.