Development, Implementation, and Evaluation of a Community-Based Trespass Prevention Model

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Above: Railroad trespassing is inherently risky. The Federal Railroad Administration has developed a four-point strategy for trespassing prevention.

In the United States, more people are struck and killed by trains each year while railroad trespassing—illegally entering or remaining on a railroad right-of-way (ROW)—than in motor vehicle collisions with trains at highway–rail grade crossings.

Between 2012 and 2017, the annual number of trespassing-related pedestrian fatalities increased 18%, from 725 in 2012 to 858 in 2017 (*1*). In 2018, 783 pedestrian trespassing fatalities had occurred by September 30. Data indicate that the number of trespassing occurrences on railroad property each year far exceeds the number of fatalities and injuries. This raises the serious concern of a high potential for even more trespasser accidents.

By definition, trespassers are illegally on railroad property without permission. In the majority of states, trespassing is codified as a property crime and a general offense, and trespassing on railroad property is specifically forbidden.[1]

[1] A list of state-by-state trespassing laws is available at www.fra.dot.gov/StateLaws.

Most often, trespassers walk across or along railroad tracks as a shortcut to another destination; rail ROWs often provide an easy, though illegal, shortcut to many walking destinations. Trespassers also may be engaged in other activities like loitering, hunting, bicycling, snowmobiling, or riding all-terrain vehicles. In other cases, a trespasser may have accessed the ROW in an attempt to end their life.

A study conducted in 2014 determined that the most commonly observed risk factors for pedestrian and bicyclist trespassing include intoxication, disregard for highway–rail grade crossing warning systems, and the use of electronic handheld devices (*2*).

Trespass Prevention

The railroad operating environment is inherently hazardous, and one in which railroad employees receive extensive safety training. Trespassers do not have the benefit of this safety training nor are they aware of current and pending train movements. Many trespassers risk life-threatening injury and loss of life by failing to use designated

crossing locations properly. To other trespassers, the dangers of the rail environment may present a perceived opportunity to harm themselves via an act of suicide.

Most trespassing casualties can be avoided. The Federal Railroad Administration (FRA), along with its safety partners, has been tackling this issue on several fronts, including developing guidance and conducting and sponsoring research. FRA has conducted several major activities in rail trespassing mitigation and has funded two studies to conduct a demographic and market analysis of rail trespass fatalities (*3–4*). The objective of these studies was to establish a foundation for either an outreach or a public education program and to create law enforcement efforts focused on those most at risk of rail trespassing.

The results of the studies indicated that "trespassers who are involved in fatal incidents on railroad rights-of-way are most typically identified as white males who are possibly intoxicated, with a mean age of 38, and with low socioeconomic status" (*3*). In his article "Scope and Trend of U.S. Rail Trespassing and Suicide Fatalities" on page 8 of this issue, Kurt Topel provides more detailed data about the characteristics of those who trespass.

Additionally, FRA held national rail trespassing workshops to identify and share industry best practices and to explore new abatement and mitigation strategies that may reduce the number of ROW and trespasser incidents and fatalities. Three workshops have been held to date, in 2008, 2012, and 2015, and one is scheduled for 2019 (*5–7*). Along the way, FRA also developed rail ROW trespass prevention guidance for local communities.

Photo: Schnitzel_bank, Flickr

Railroad tracks are private property and in many states, trespassing is a criminal offense.

Community Trespass Prevention Guide

As part of its Community Trespass Prevention Program, FRA developed and published a guidance document, *Community Trespass Prevention Guide*. This document details a collaborative, step-by-step problem-solving approach for local communities to address rail ROW trespassing (*8*) and presents a problem-solving model called Community, Analysis, Response, and Evaluation (CARE). As shown in Table 1 (page 19), CARE consists of four general steps:

1. **Community:** Identification of the trespassing problem and the associated stakeholders within the community.
2. **Analysis:** Data analysis of the trespassing problem and identification of the underpinning causes.
3. **Response:** Identification and implementation of the most effective response(s).
4. **Evaluation:** Evaluation of the effectiveness of the implemented treatment(s).

The objective of CARE is to "create safer communities by fostering the development of long-term trespass prevention strategies through collaborative community problem-solving partnerships to reduce trespass fatalities" (*8*). It is aimed

Photos courtesy daSilva et al

Rail trespassers in West Palm Beach, Florida.

Railroad Fatalities in the United States 2012–2017

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According to Federal Railroad Administration (FRA) data, 6,204 people were fatally injured on railroad property between 2012 and 2017. Trespassing on railroad rights-of-way (ROWs) rather than at a highway–rail crossing is the leading cause of railroad-related death—accounting for 44% of all railroad-related fatalities (Table 1, below). Suicide on railroad property is the second-leading cause of death, followed by fatalities that are due to non-suicide-related highway–rail crossing collisions. Of particular note is that, between 2012 and 2017, the rate of total fatalities per million train miles of operation increased by 19.6%.

When the fatality data are grouped by type, the magnitude of each group is highlighted, as well as the trend in quantity between 2012 and 2017 (Figure 1, at right). It appears that trespassing incidents are increasing and suicide incidents are declining; however, after further analysis and follow-up with local medical examiners and coroners, a small number of the trespassing incidents reported in 2017 likely will be reclassified as suicides—smoothing out the trend.

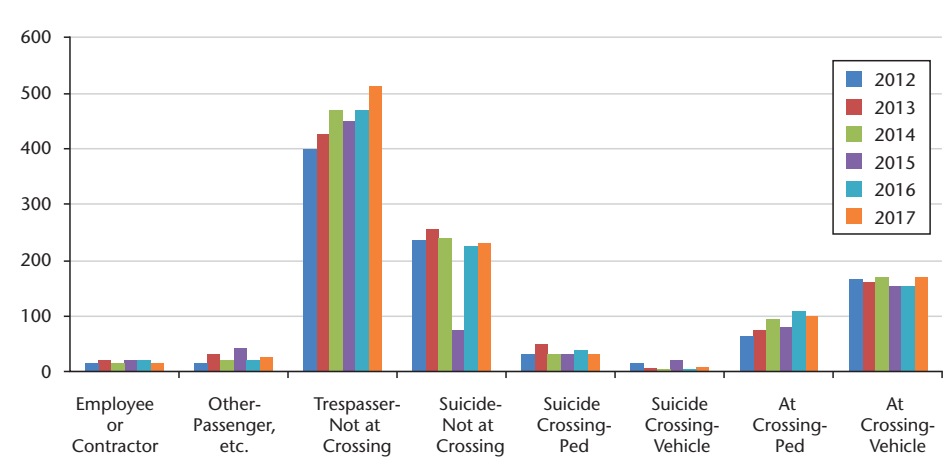

FIGURE 1 Railroad fatalities, 2012–2017.

TABLE 1 Summary of FRA Fatality Data by Type of Fatality

Type of Fatality	Number of Fatalities							Percent of Fatalities	
	2012	2013	2014	2015	2016	2017	Total		
Employee or Contractor	18	19	16	20	19	15	107	1.7%	
Other, e.g. Passenger	15	24	20	42	19	25	145	2.3%	
Trespasser: Not at Crossing	405	427	470	450	467	513	2,732	44.0%	
Suicide: Not at Crossing	234	256	242	278	228	229	1,467	23.6%	27.9%
Suicide at Crossing: Pedestrian	30	50	28	33	39	30	210	3.4%	
Suicide at Crossing: Vehicle	12	8	6	17	5	6	54	0.9%	
Crossing Collision: Pedestrian	67	70	94	83	104	103	521	8.4%	24.0%
Crossing Collision: Vehicle	164	162	167	154	152	169	968	15.6%	
Total	**945**	**1016**	**1043**	**1077**	**1033**	**1090**	**6204**	**100.0%**	
Rate Per Million Train Miles	**1.292**	**1.357**	**1.362**	**1.458**	**1.498**	**1.544**	**1.417**		

SOURCE: Federal Railroad Administration.

Pedestrians, trespassers, and other nonmotorized users constitute the majority of railroad-related fatalities. A common perception is that most people fatally injured by trains are motorists at highway–rail crossings; in reality, non-suicide vehicle operators at highway–rail crossings account for only 15.6% of all railroad-related fatalities.

What Can Be Done?

The traditional three E's approach of engineering, education, and enforcement has been successful in reducing the number

TABLE 1 CARE Model Steps

COMMUNITY	ANALYSIS	RESPONSE	EVALUATION
• Identify and describe the trespassing problem. • Identify community resources and begin involvement. • Organize a problem-solving committee with community stakeholders and develop an action plan.	• Develop data collection and analysis plan. • Collect trespassing data. • Analyze the data collected to determine the underlying causes of the trespassing problem. • Establish baseline and identify measures to be used to determine program's effectiveness.	• Identify and implement feasible countermeasures. • Develop countermeasures implementation plan. • Implement such countermeasures as engineering, education, enforcement, and other strategies developed by the committee.	• Assess impact of the response and determine whether the trespass problem was displaced, reduced, unchanged, or eliminated. • Evaluate the process used and assess whether the key stakeholders were identified and included, the underlying causes were correctly identified, and the response was implemented as planned, as well as why any part of the plan may not have been implemented. • Develop and implement a long-term program monitoring plan if needed.

of highway–rail crossing collisions. Unfortunately, the three E's have had little impact on reducing the number of trespassing- and suicide-related fatalities or on the number of pedestrians fatally injured at highway–rail crossings: the rate of these fatalities increased 19.6% between 2012 and 2017. The approach may benefit by incorporating some new E's, such as:

- **Eliminating** easy access to rail ROWs, especially known "hot spots";
- **Enhancing** proactive intervention with at-risk populations, for example, as in Metra's "Question, Persuade, Refer" program;
- **Engaging** nontraditional partners, such as mental health professionals;
- **Embracing** new technology for surveillance, detection, and deterrence; and
- **Evaluating** the effectiveness of current safety and resource allocation programs.

Finally, one missing component seems to be the lack of an overall goal to reduce the number of railroad-related fatalities by a significant number in a set time frame. An example of such an effort can be seen in a 2016 attempt to set a measurable goal by the DuPage Railroad Safety Council, which suggested a 50% reduction in the total number of fatalities nationwide within 10 years. Using the 1,033 railroad-related deaths of 2016 as a benchmark, this would mean a reduction of 516 railroad-related fatalities by 2026.

at local stakeholders such as city and town governments, local operating railroads, and other interested groups. The ultimate goal is to reduce the number of rail ROW trespassing incidents nationwide by promoting partnerships at the local level.

Implementing the Guide

The Community Trespass Prevention Guide was tested from 2009 to 2013, when FRA funded a major research initiative (*9*). Specifically, FRA directed the Volpe National Transportation System Center to conduct a trespassing prevention research study demonstrating the CARE model on a roughly 7-mile stretch of South Florida Regional Transportation Authority (SFRTA) ROW in the city of West Palm Beach, Florida.

This area was selected based on fatal incidents in 2008 on the SFRTA line as well as because by 2009 a stakeholder group already had been created to address the issue—reflecting the first step in the CARE process, or Community. FRA determined that West Palm Beach was most appropriate for a research study on precursors, mitigation strategies, and support for the development of national guidance related to trespass prevention.

WEST PALM BEACH: COMMUNITY

The purpose of the demonstration was to show potential benefits of the CARE community-based approach, document lessons learned, and provide recommendations for implementation and evaluation of trespass prevention strategies.

An example of trespassing on the ROW captured by the research team in West Palm Beach is shown in the photo below.

Stakeholder representatives from federal, state, and local (that is, city and

Photo courtesy daSilva et al.

Trespassing event in West Palm Beach.

FIGURE 1 Trespass prevention research study stakeholders in West Palm Beach, Florida.

county) governments—as well as railroads, neighborhood groups, and Operation Lifesaver, Inc.—participated in the demonstration (see Figure 1, above).

The photo at right shows one of several stakeholder group meetings held during the demonstration project. A picture of the stakeholder group during one of its site visits in the city is shown on page 21.

WEST PALM BEACH: ANALYSIS

For the second step in the process, Analysis, the research team adapted and applied a hazard analysis methodology described in FRA's "Collision Hazard Analysis Guide: Commuter and Intercity Passenger Rail Service" (*10*). This resulted in the development of a risk-based hazard analysis process and prioritization algorithm to analyze trespassing data, which consisted of casualty incidents, trespassing observations by train crews, contacts by law enforcement, analysis of locomotive video data, and field observations by research staff.

The development and implementation of the risk-based analysis used to identify several trespassing high-risk areas in West Palm Beach was detailed in a technical paper published and presented at the American Society of Mechanical Engineers 2013 Joint Rail Conference (*11*).

WEST PALM BEACH: RESPONSE

Figure 2 (page 21) shows the results of the trespassing risk analysis on the SFRTA route through the city of West Palm Beach. These results were used by the study's stakeholder group to develop a set of mitigation strategies for identified higher-risk locations, shown in yellow and red; this comprises the third step of the process, Response.

Recommended strategies included engineering treatments like fencing and signage; education programming, such as rail safety mailers, station posters, and outreach to local schools; and enforcement initiatives like enforcement blitzes. Some of these strategies were immediately deployed; others proved to be resource intensive and required additional work to secure the needed funding for such improvements.

WEST PALM BEACH: EVALUATION

Evaluation, the last step in the CARE model, assesses the effectiveness of the responses based on the measures identified in the data-analysis step. The research team evaluated the strategies implemented during the study and determined their effectiveness in mitigating the trespassing problem.

Evaluating the Guide

FRA conducted an evaluation identifying lessons to use in the design and implementation of future trespassing prevention studies (*12*). A key finding was that community-based intervention strategies such as CARE can help railroad agencies and other stakeholders better leverage community resources and apply diverse safety strategies.

Photo courtesy daSilva et al.

Stakeholder group meeting at the West Palm Beach mayor's office.

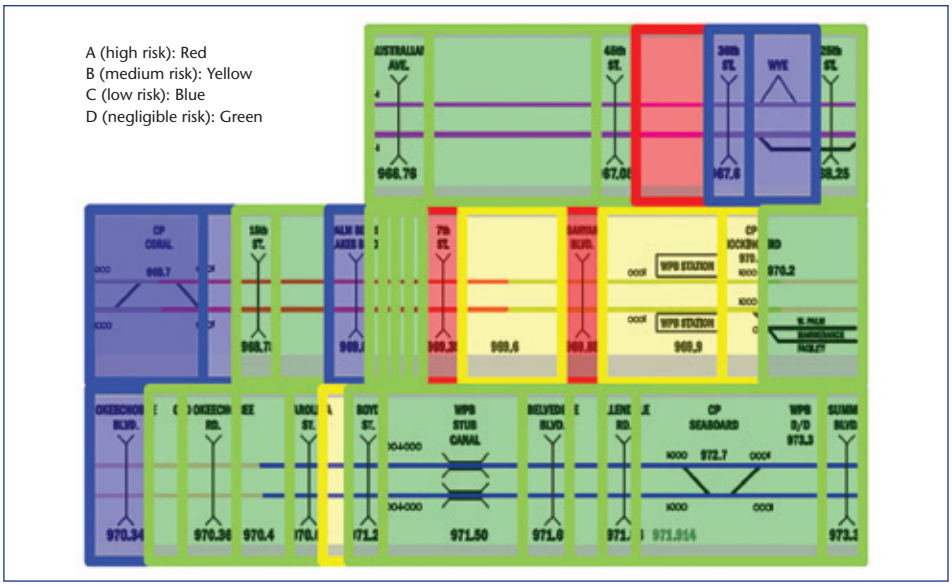

FIGURE 2 Trespass risk analysis results.

MAXIMIZING EFFECTIVENESS

A key weakness of the model, however, is its resource and time intensiveness. The CARE model requires committed stakeholders with the power and incentives to implement proposed responses. For this approach to be effective, the underlying causes of trespassing must be determined, as well as the specific target audience for problem-solving efforts. Unless both of these variables are identified and addressed, it is unlikely that significant reductions in trespassing will be realized. Ultimately, the study successfully identified how to refine the CARE model and how to improve its effectiveness in the communities in which rail trespassing is a problem.

The general guidance worked well to establish a framework for the stakeholders to organize, collect, and evaluate the data, develop solutions, and implement trespass mitigation strategies. It increased stakeholder collaboration, leveraged collective resources, and maximized overall effectiveness of the community-based effort to decrease trespassing on railroad ROWs within the city. The implementation of the CARE model also educated non-rail stakeholders about the nature and severity of the trespassing problem with respect to their community, an issue that is often not well understood outside of the operating railroads.

WORCESTER PILOT

After the study, FRA has demonstrated the use of the CARE model on the rail ROWs in Worcester, Massachusetts. That effort, initiated in 2016, resulted in the identification of three high-risk locations along one of the city's rail ROWs in the city. The stakeholder group developed a set of recommended strategies, many of which already have been implemented, including the removal of an unauthorized skate park under railroad property and the removal of an abandoned loading dock on the ROW that could have been used for unauthorized encampments. Signage and surveillance cameras also were installed.

The city of Worcester currently is implementing the remaining strategies that were recommended for law enforcement.

Lessons from implementing the CARE model in West Palm Beach and Worcester helped identify appropriate circumstances in which community-based interventions are warranted and likely to be effective. FRA and the Volpe Center are engaged actively in the process to show the benefits of the CARE model in the approach to solving the rail ROW trespassing problem.

Prevention Strategy Status

In its report on the Fiscal Year 2018 budget, the U.S. House of Representatives Committee on Appropriations asked FRA to study and identify the factors that lead to trespassing incidents on railroad property and to develop and submit a national strategy to prevent these accidents to the House and Senate Committees on Appropriations by August 1, 2018 (*13*). The House Committee directed FRA to include milestones, timelines, and metrics to define success in its strategy, with the expectation that FRA implement a tres-

Photo courtesy daSilva et al.

Stakeholder group site visit in West Palm Beach.

passer accident prevention strategy within the recommended timelines.

In October 2017, FRA formed a team of experts to study the problem of people being killed or injured while trespassing on railroad property. To help define the scope of the problem, the team conducted an analysis of the costs of railroad trespassing accidents to railroads and to society. They found that the total cost to society of all trespassing accidents—the value of fatalities, injuries, and travel-time delay caused by trespassing incidents over 5 years, from 2012 to 2016—was approximately $43.2 billion (*14*).

The team also reviewed research and data related to railroad trespasser fatalities nationwide for the 4-year period between November 2013 and October 2017. They concluded that, out of the 3,100 counties and county equivalents in the United States, approximately 14% of all fatalities had occurred in the same 10 counties located in four states. Additionally, 74% of all trespasser casualties during the same period occurred within 1,000 feet of a grade crossing—less than one-quarter of a mile away.

To this end, FRA has developed the National Strategy for Trespass Prevention on Railroad Property, which focuses on four areas: 1) data gathering and analysis, 2) community site visits, 3) funding, and 4) partnerships with the affected stakeholders (*14*). The report to Congress has been finalized and was detailed at the FRA Grade Crossing and Trespasser Summit, held on October 30, 2018 (*15*).

The CARE Guide, which details a collaborative step-by-step rail ROW trespassing problem-solving approach for local communities, is one of the tools in the overall National Strategy.

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