



U.S. Department of  
Transportation

**Federal Railroad  
Administration**

## Law Enforcement Strategies for Preventing Rail Trespassing Risk Factors

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Office of Research  
Development,  
and Technology  
Washington, DC 20590



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13. ABSTRACT (Maximum 200 words) The Volpe Center has investigated law enforcement methods that have successfully prevented trespassing along the railroad right of way. The types of law enforcement strategies currently being used and procedures followed in the field are documented, along with any findings on the effectiveness of these approaches.  The end result of this effort is to produce a compilation of available procedures, best practices, data sources and findings to inform effective law enforcement rail trespass prevention programs.				
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## ENGLISH TO METRIC

### LENGTH (APPROXIMATE)

- 1 inch (in) = 2.5 centimeters (cm)
- 1 foot (ft) = 30 centimeters (cm)
- 1 yard (yd) = 0.9 meter (m)
- 1 mile (mi) = 1.6 kilometers (km)

### AREA (APPROXIMATE)

- 1 square inch (sq in, in<sup>2</sup>) = 6.5 square centimeters (cm<sup>2</sup>)
- 1 square foot (sq ft, ft<sup>2</sup>) = 0.09 square meter (m<sup>2</sup>)
- 1 square yard (sq yd, yd<sup>2</sup>) = 0.8 square meter (m<sup>2</sup>)
- 1 square mile (sq mi, mi<sup>2</sup>) = 2.6 square kilometers (km<sup>2</sup>)
- 1 acre = 0.4 hectare (he) = 4,000 square meters (m<sup>2</sup>)

### MASS - WEIGHT (APPROXIMATE)

- 1 ounce (oz) = 28 grams (gm)
- 1 pound (lb) = 0.45 kilogram (kg)
- 1 short ton = 2,000 pounds (lb) = 0.9 tonne (t)

### VOLUME (APPROXIMATE)

- 1 teaspoon (tsp) = 5 milliliters (ml)
- 1 tablespoon (tbsp) = 15 milliliters (ml)
- 1 fluid ounce (fl oz) = 30 milliliters (ml)
- 1 cup (c) = 0.24 liter (l)
- 1 pint (pt) = 0.47 liter (l)
- 1 quart (qt) = 0.96 liter (l)
- 1 gallon (gal) = 3.8 liters (l)
- 1 cubic foot (cu ft, ft<sup>3</sup>) = 0.03 cubic meter (m<sup>3</sup>)
- 1 cubic yard (cu yd, yd<sup>3</sup>) = 0.76 cubic meter (m<sup>3</sup>)

### TEMPERATURE (EXACT)

$$[(x-32)(5/9)]\text{ }^\circ\text{F} = y\text{ }^\circ\text{C}$$

## METRIC TO ENGLISH

### LENGTH (APPROXIMATE)

- 1 millimeter (mm) = 0.04 inch (in)
- 1 centimeter (cm) = 0.4 inch (in)
- 1 meter (m) = 3.3 feet (ft)
- 1 meter (m) = 1.1 yards (yd)
- 1 kilometer (km) = 0.6 mile (mi)

### AREA (APPROXIMATE)

- 1 square centimeter (cm<sup>2</sup>) = 0.16 square inch (sq in, in<sup>2</sup>)
- 1 square meter (m<sup>2</sup>) = 1.2 square yards (sq yd, yd<sup>2</sup>)
- 1 square kilometer (km<sup>2</sup>) = 0.4 square mile (sq mi, mi<sup>2</sup>)
- 10,000 square meters (m<sup>2</sup>) = 1 hectare (ha) = 2.5 acres

### MASS - WEIGHT (APPROXIMATE)

- 1 gram (gm) = 0.036 ounce (oz)
- 1 kilogram (kg) = 2.2 pounds (lb)
- 1 tonne (t) = 1,000 kilograms (kg) = 1.1 short tons

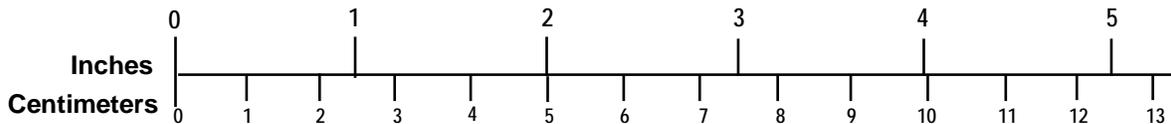
### VOLUME (APPROXIMATE)

- 1 milliliter (ml) = 0.03 fluid ounce (fl oz)
- 1 liter (l) = 2.1 pints (pt)
- 1 liter (l) = 1.06 quarts (qt)
- 1 liter (l) = 0.26 gallon (gal)
- 1 cubic meter (m<sup>3</sup>) = 36 cubic feet (cu ft, ft<sup>3</sup>)
- 1 cubic meter (m<sup>3</sup>) = 1.3 cubic yards (cu yd, yd<sup>3</sup>)

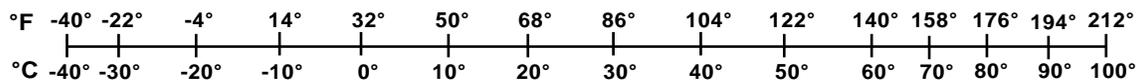
### TEMPERATURE (EXACT)

$$[(9/5)y + 32]\text{ }^\circ\text{C} = x\text{ }^\circ\text{F}$$

## QUICK INCH - CENTIMETER LENGTH CONVERSION



## QUICK FAHRENHEIT - CELSIUS TEMPERATURE CONVERSION



For more exact and or other conversion factors, see NIST Miscellaneous Publication 286, Units of Weights and Measures. Price \$2.50 SD Catalog No. C13 10286

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# Contents

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Acknowledgements.....	iii
Table of Figures .....	v
Table Listing .....	vi
Executive Summary .....	1
1. Introduction .....	2
1.1 Background .....	2
1.2 Objectives .....	2
1.3 Overall Approach .....	2
1.4 Scope .....	2
1.5 Report Outline .....	3
2. Methodology.....	4
2.1 Data Review .....	4
2.2 Literature Review .....	4
2.3 Outreach .....	5
3. Data Exploration.....	6
3.1 FRA Railroad Accident and Incident Reporting Data.....	6
3.2 Little Neck/Long Island Rail Road Data .....	9
4. Literature and Outreach Findings .....	11
4.1 Regulations, Laws and Policies .....	13
4.2 Identify Problem Areas .....	15
4.3 Physical Presence .....	16
4.4 Technology and Engineering Solutions .....	17
5. Conclusions .....	20
Appendix A. Abbreviations and Acronyms.....	22
Appendix B. Resources.....	<b>Error! Bookmark not defined.</b>

## **Table of Figures**

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Figure 1. Trespass Fatalities 2004-2013 .....	7
Figure 2. Trespass Fatalities (Three-year Rolling Average) 2005-2012 .....	7
Figure 3. Trespass Fatalities (Percent Change from Prior Year) 2004-2013 .....	8
Figure 4. Trespass Fatalities versus Total Fatalities (Reportable Incidents) 2004-2013 .....	8

## Table Listing

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Table 1. Violation Rates at the Little Neck Crossing during the Baseline Period and "Enforcement Hours" .....	9
Table 2. Violation Rates at the Little Neck Crossing during the Baseline Period and "Commuting Hours" .....	10
Table 3. Law Enforcement Strategies for Deterring Trespassing on the Right of Way .....	11
Table 4. Trespass Prevention Measures .....	12

## Executive Summary

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The John A. Volpe National Transportation Systems Center has investigated the strategies of law enforcement in reducing the incidence of trespass on rail rights of way, along with any findings on the effectiveness of these approaches.

The Center looked at trespass fatalities and analyzed the effectiveness of law enforcement in curbing trespass on the rights-of-way by examining accident data from the FRA's Railroad Accident and Incident Reporting System (RAIRS) and reviewing video from surveillance cameras mounted at the Long Island Rail Road Little Neck grade crossing, which was collected for a related trespass research study. Additional relevant information was uncovered in news reports and research papers. This information was used to compare the rate of trespass-related incidents with all other rail related fatalities and investigate the approaches and options being used to resolve the problem of trespass.

Railroad trespass fatalities were investigated using data reported to the FRA's Office of Safety<sup>1</sup> for a ten year period (2004 – 2013). Excluding highway-rail grade crossing and suicide-related data, the number of reported trespass fatalities remained relatively stable for this ten year period, between a low of 407 and a high of 511. The highest percent change in trespass fatalities occurred as recently as 2013, showing an increase of 13.8 percent over the prior year's data. Finally, over 70 percent of all reported casualties for each year involved trespassing, which highlights the gravity of the issue.

The ability to research into the effectiveness of law enforcement strategies in reducing the incidence of trespass is limited, partially due to the lack of data regarding enforcement efforts and the absence of uniformity in trespass regulations. Future efforts to review, update, and encourage uniform guidelines for legislation and data collection are recommended.

Also, this area of research has a limited amount of literature and much of the available information is based on case studies anecdotal in nature, as opposed to scientifically designed experiments. To provide conclusive evidence on this issue, additional controlled experimental research is recommended.

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<sup>1</sup> <http://safetydata.fra.dot.gov/OfficeofSafety/Default.aspx>, accessed on March 12, 2014.

# 1. Introduction

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## 1.1 Background

The John A. Volpe National Transportation Systems Center (Volpe Center) provides technical support to the Federal Railroad Administration's Office of Research and Development on issues involving railroad safety and trespass prevention. Both of them are working together to produce a preliminary body of information that will assist current and future researchers in evaluating the law enforcement strategies which are designed to reduce rail trespassing.

FRA's Office of Safety Analysis makes railroad accident and incident data available to the public on its website. Although most data is available from 1975 to the present, the authors have chosen to examine a recent 10-year time span from 2004 through 2013.

The leading cause of rail-related deaths in the United States is trespassing along railroad and transit rights-of-way<sup>2</sup>. Over the past 10 years, more than 70 percent of all fatal incidents reported to FRA's Office of Safety Analysis involved trespassing<sup>3</sup>, an activity that is both voluntary and preventable.

The participants at the 2012 Right-of-Way Fatality and Trespass Prevention Workshop<sup>2</sup>, which was sponsored by FRA and the Federal Transit Administration (FTA), identified current research needs and one of those needs was to document how law enforcement has successfully curbed rail trespassing. As a result, FRA tasked the Volpe Center with addressing this need.

## 1.2 Objectives

This research identified strategies used in preventing the incidence of trespass on rail rights of way. These efforts are diverse in nature and focus on emergent technologies, education, data mining, law enforcement, or different combinations of these. The goals of this report are twofold, with a clear focus on law enforcement strategies. First, a list of law enforcement strategies that are either found in practice or proposed for use is created and, next, these strategies are considered for effectiveness in the field.

## 1.3 Overall Approach

This study reviews available data and sought documentation or firsthand information on law enforcement initiatives that successfully targeted trespassing on the right of way. A more detailed discussion of the research methodology can be found in Chapter 2.

## 1.4 Scope

This study reviews available information on efforts by law enforcement to reduce the frequency of rail trespassing. The focus is on programs that have experienced positive results. The end product is a source of information on the successful strategies implemented by a sample of law enforcement agencies.

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<sup>2</sup> 2012 ROW Fatality Trespass Prevention Workshop, <http://www.fra.dot.gov/conference/trespass2012/> cited on 5/1/2014.

<sup>3</sup> FRA Safety Data Website at <http://safetydata.fra.dot.gov/officeofsafety/default.aspx>, query 4.08: Casualties by type person and primary event from FRA 6180.55. Calendar years include 2004 to 2013.

## **1.5 Report Outline**

This report is organized into the following chapters:

- Chapter 1 - Introduction.
- Chapter 2 - Discusses the methodologies used in researching law enforcement strategies.
- Chapter 3 - Gives an overview of the data exploration and review.
- Chapter 4 - Presents the findings from the literature review and outreach efforts.
- Chapter 5 - Summarizes the conclusions and keys to successful law enforcement initiatives.

## 2. Methodology

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The research documented in this report was gathered by performing data analysis, reviewing the literature, and talking with rail safety stakeholders as well as law enforcement personnel. First, a list of anti-trespass law enforcement techniques was compiled, and this list was then reviewed and updated as new information was discovered or new technologies, regulations and procedures were put into practice.

### 2.1 Data Review

This research began by exploring the trespassing accident and incident data that is collected and housed by FRA in the Rail Accident Incident Reporting System (RAIRS). RAIRS serves as a uniform repository for rail accident and incident data within the United States. One advantage of using data from RAIRS is that the data has been consistently collected over a long-term period of time since 1975. The RAIRS data collection process follows well-documented guidelines and it is readily accessible, so the data was used to perform analyses that establish a perspective on rail trespassing in the U.S.

In addition to the RAIRS data, the research team also examined a video recording that was collected at a highway-rail grade crossing in Little Neck, NY. The footage, which featured rail safety professionals conducting education and enforcement efforts, was viewed. The data that was produced from the crossing was analyzed to determine the impact of the initiative.

### 2.2 Literature Review

Most of the law enforcement strategies used in anti-rail trespassing have been documented, either by media outlets or in formal reports. The research team reviewed the literature to look for the various anti-trespass strategies and initiatives used by law enforcement departments. The literature review consisted of:

- Reviews of regulations, laws and policies
- Exploring news reports via the Internet
- Examining existing field research and new technologies.

A summary was compiled which categorized all articles and/or research by law enforcement strategy. Information based on this review is presented throughout this report.

#### 2.2.1 Regulatory Review

The research team also examined existing regulations, laws and policies that assist or hinder law enforcement officials as they attempt to prevent rail trespassing. The FRA recently published the *2013 Compilation of State Laws and Regulations Affecting Highway-Rail Grade Crossings, 6th Edition*<sup>4</sup>. Chapter 9 of this tome focuses on trespassing laws. Other sources of information on legislative efforts were also considered.

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<sup>4</sup> <http://www.fra.dot.gov/Page/P0693>

### **2.2.2 News Articles**

To gather knowledge about efforts to reduce the incidence of trespass with targeted law enforcement strategies and gauge the level of concern with the problem, the research team conducted an Internet search which used keyword searches such as “railroad law enforcement”, “railroad trespass”, “trespass fatalities”, “trespass research”, “officer-on-a-train”, “railroad patrol” and “trespassing regulations.”

Responses to this search were ordered geographically: most information was based in the United States. However, any information deemed relevant to this effort, regardless of origin, was collected and considered for inclusion. In addition, the time frame for collected articles was in the recent past, with the earliest article dating from 2003 to 2014.

### **2.2.3 Research Reports**

Rail trespassing studies related to trespass enforcement first appeared in 2002 and some of them are ongoing or are still in their infancy. Many of these studies were sponsored by FRA, with final reports and results available at the eLibrary within FRA’s website<sup>5</sup>. International studies were also considered.

## **2.3 Outreach**

The research team contacted rail industry and law enforcement personnel who work on rail safety and trespass abatement, then submitted email requests to them for information on programs that were led by law enforcement and produced benefits in reduced trespassing. Responses to the request for information were followed up with a telephone interview, where appropriate. Information was received from a limited number of sources, but these experiences were documented and are included in this report.

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<sup>5</sup> <http://www.fra.dot.gov/eLib/Find>

### 3. Data Exploration

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#### 3.1 FRA Railroad Accident and Incident Reporting Data

The data that the team used for investigating trespassing incidents in this report is from the FRA Safety Data website<sup>6</sup>. The specific time period examined was 2004 to 2013. Where rolling averages or percent change from previous time periods are calculated, time periods are adjusted using the same base of data: calculations use data from 2004 to 2013 with final reporting on dates from 2005 to 2012.

Two separate pre-programmed queries pulled trespass data from all reported accidents and incidents:

- Query 2.07 - Trespasser Casualties (Fatalities Only)
- Query 4.08 - Casualty Summary Tables

The data pulled from these reports include the following:

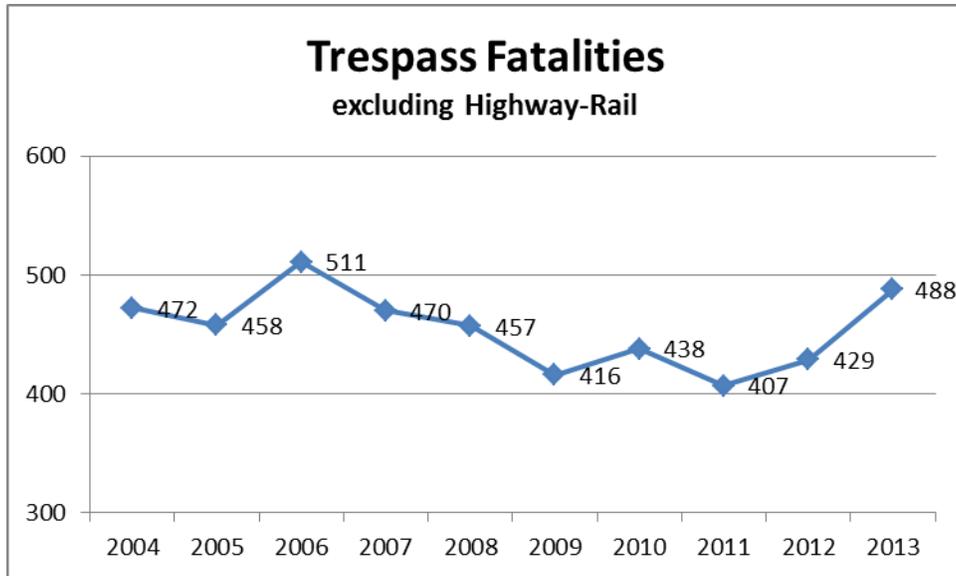
- The total number of fatalities attributed to trespass by year
- The total number of incidents attributed to trespass by year
- The total number of incidents regardless of category by year

The charts below were generated from data that was assembled during the first two weeks of March 2014. The data at FRA's website has been updated since then, which means that different results may occur if the charts are generated now.

Figure 1 (next page) charts the number of trespass fatalities by year that were reported to FRA over the report's ten year time period. These numbers are conservative because they do not include trespass fatalities that occur at highway-rail grade crossings or counts of suicides on the right of way. Also, the numbers appear to be relatively stable, as seen in Figure 2, where a rolling three-year average for trespass fatalities is presented. From 2005 to 2012, a smooth trajectory is displayed over time, and the rolling average indicates that the number of fatalities lies within a slight margin of 60, between 420 and 480 fatalities per year.

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<sup>6</sup> [FRA Safety Data site](http://safetydata.fra.dot.gov/officeofsafety/default.aspx) <sup>7</sup> <http://safetydata.fra.dot.gov/officeofsafety/default.aspx>

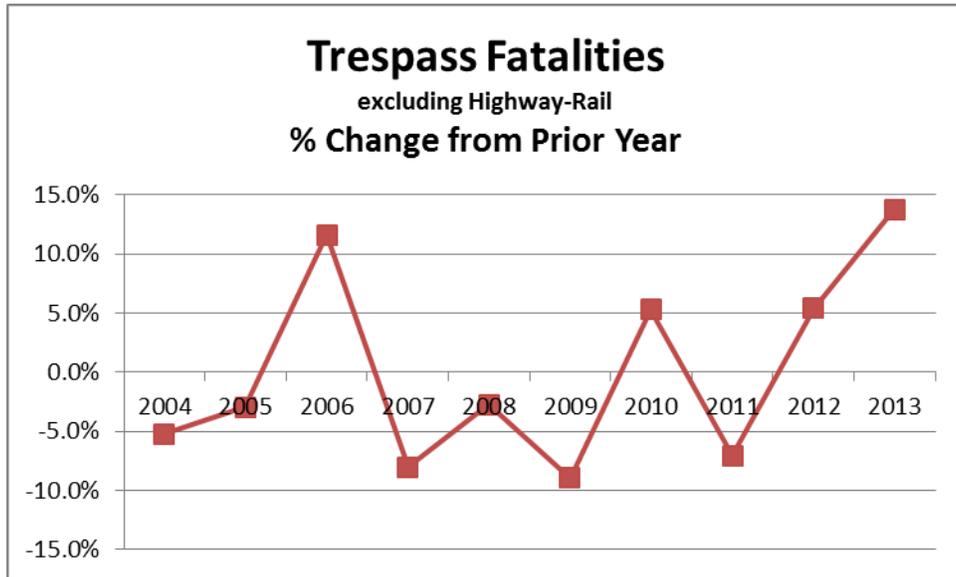


**Figure 1. Trespass Fatalities 2004-2013**



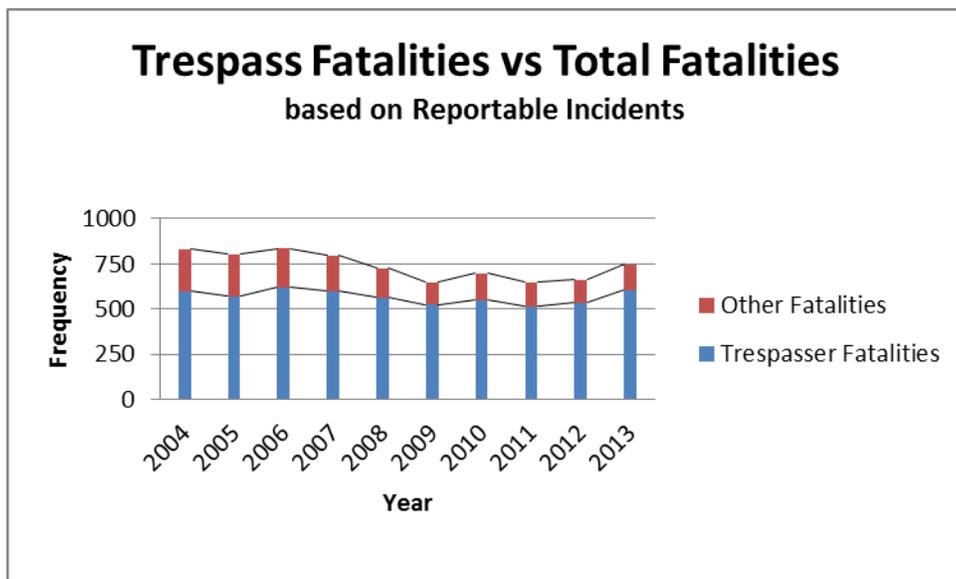
**Figure 2. Trespass Fatalities (Three-year Rolling Average) 2005-2012**

However, when the amount of change is viewed on a year by year basis, the trend appears to be choppy and unpredictable. Figure 3 shows the percentage change in trespass fatalities over time. A pattern is not clearly evident and a trend cannot be determined from these measurements. As examples, the year 2006 shows 11.6 percent increase in fatalities from the prior year while the year 2013 shows 13.8 percent increase. Conversely, data from 2007 shows 8 percent decrease while data from 2009 produces 9 percent decrease in fatalities from the previous year.



**Figure 3. Trespass Fatalities (Percent Change from Prior Year) 2004-2013**

It is also possible view the data in terms of incidents as opposed to individual fatalities. Each incident may be examined as one unique and preventable event. Figure 4 presents incident data and measures incidents that involved trespassing against all reportable incidents. As mentioned earlier in this report, of all reported incidents involving casualties, over 70 percent involved trespassing, highlighting the gravity of the issue.



**Figure 4. Trespass Fatalities versus Total Fatalities (Reportable Incidents) 2004-2013**

### 3.2 Little Neck/Long Island Rail Road Data

In 2003, an article appeared in the Queens Chronicle<sup>7</sup> which documented pedestrians as they routinely trespassed at a busy grade crossing (No. 338289D) by violating down pedestrian and vehicle gates at Little Neck Parkway in Little Neck, NY. Due to increased awareness of the problem, the Volpe Center was asked to perform research on trespassing at the Little Neck, Long Island railroad tracks. Video monitoring equipment was installed to capture individual incidences of pedestrian trespass.

Initially, the study was meant to capture behaviors that occurred before, during, and after new safety measures were instituted at the grade crossing. In this particular study, gate skirts would be safety technology of choice.

During the period of data collection for the intended baseline, the video cameras captured law enforcement conducting safety blitzes. Although the original study was terminated before any data was collected *after* the blitz period, the data that was collected lends itself to further examination. This data can help determine whether on-site safety blitzes can promote safety and prevent trespassing. For the purpose of this report, the data collected before the blitz period is considered baseline data and the data collected during the blitz is referred to as enforcement data. The baseline and enforcement data were compared against each other to determine if the behavior of the crossing users changed after the safety blitzes began.

Five days of blitz activity—from Tuesday through Friday and continuing on the following Monday—were examined, while a corresponding time period prior to the blitz days served as baseline data. When the enforcement data, which was collected during the hours when law enforcement officials were on-site (“enforcement hours”), was compared against the baseline, an expected decrease in the rate of trespass occurred. The same pattern was observed when data collected during “commuting hours”, defined as the time between 7 am and 5 pm, was examined (see Table 1 and Table 2 below). Unfortunately, there is no post-enforcement data that can be used to determine whether a long-term change in behavior occurred as a result of the on-site presence of an enforcement official.

**Table 1. Violation Rates at the Little Neck Crossing during the Baseline Period and "Enforcement Hours"**

<b>Day</b>	<b>Baseline Violation Rate</b>	<b>Enforcement Blitz Violation Rate</b>	<b>% Change</b>
<b>T</b>	<b>0.35</b>	<b>0.05</b>	<b>-86%</b>
<b>W</b>	<b>0.28</b>	<b>0.24</b>	<b>-14%</b>
<b>T</b>	<b>0.55</b>	<b>0.36</b>	<b>-34%</b>
<b>F</b>	<b>0.14</b>	<b>0.10</b>	<b>-27%</b>
<b>M</b>	<b>0.67</b>	<b>0.04</b>	<b>-94%</b>

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<sup>7</sup> [http://www.qchron.com/editions/north/pedestrians-crossing-at-lirr-in-little-neck-still-problematic/article\\_8f8da96f-2aba-5126-84f7-8a7ef76c418c.html?mode=print](http://www.qchron.com/editions/north/pedestrians-crossing-at-lirr-in-little-neck-still-problematic/article_8f8da96f-2aba-5126-84f7-8a7ef76c418c.html?mode=print)

**Table 2. Violation Rates at the Little Neck Crossing during the Baseline Period and "Commuting Hours"**

<b>Day</b>	<b>Baseline Violation Rate</b>	<b>Commuting Violation Rate</b>	<b>% Change</b>
<b>T</b>	<b>0.32</b>	<b>0.10</b>	<b>-68%</b>
<b>W</b>	<b>0.36</b>	<b>0.25</b>	<b>-31%</b>
<b>T</b>	<b>0.31</b>	<b>0.27</b>	<b>-14%</b>
<b>F</b>	<b>0.36</b>	<b>0.23</b>	<b>-35%</b>
<b>M</b>	<b>0.49</b>	<b>0.26</b>	<b>-47%</b>

## 4. Literature and Outreach Findings

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A variety of strategies that are meant to prevent and mitigate the impacts of rail trespassing were revealed through media and research reviews, as well as discussions with law enforcement and rail safety professionals. During these reviews, two common themes surfaced—that law enforcement efforts need stronger support through policy and regulation and that the ability to collect and analyze data plays a key role in understanding the local trespassing problem. While many railroads and communities have taken to implementing a physical police presence along the right of way to deter would-be trespassers, others are implementing technological solutions. Table 3 is a summary of law enforcement strategies that were uncovered as part of this study.

**Table 3. Law Enforcement Strategies for Deterring Trespassing on the Right of Way**

Strategy	Description
Aircraft flyovers	Remote patrol by aircraft
Blitzes	Education aimed at targeted, at-risk community
Clean up	Removal of high-risk/high-offender population (i.e. homeless)
Data mining/Targeting	Data-based demographics identifying high-risk/high-use areas
Fencing	High security fencing/barricades
Incentives	Rewarding positive behavior
Media coverage	Increasing public awareness via public/social media
Officer-on-a-train	Officers ride on train, identify violations, report violations
Patrol	On-site observation
Punishments	Citations, fines, arrest, community service, offender education
Regulatory review	Review of existing regulations and legal remedies for sufficiency
Remote trespasser deterrence	Closed-circuit television, remote monitoring
Security related initiatives	Remote and on-site patrol and observation
Signage	Posted signs at high-risk/high-use areas

Beyond the strategies that are used in the United States, Europeans are working to identify successful methods that will stop trespassing on the right of way. The Reduction of Suicides and Trespasses on Railway property (RESTRAIL) project<sup>8</sup>, which is based in Europe, is a 3-year effort coordinated by the International Union of Railways (UIC) and its goal is to prevent suicides and trespass incidents on railway property and stop the other consequences of these events. RESTRAIL analyzes the causes of suicides and trespass, identifies available prevention and mitigation measures, and it will create a toolkit that features the most relevant and cost-

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<sup>8</sup> <http://www.restrail.eu/>

effective recommendations available.

The work of the RESTRAIL project is divided by relevant topic into separate work packages. Work Package 1 (WP1) focuses on data. Two major international databases concerning railway suicides and trespassing accidents are mentioned: the European Railway Agency Database of Interoperability and Safety database and the UIC<sup>9</sup> safety database. WP1 concluded with the following four recommendations:

- Additional data collection
- Additional analyses
- Provide better access to information
- Encourage cooperation between organizations

In Work Packages 2 and 3, trespass (and suicide) prevention measures are assessed (see Table 4).

**Table 4. Trespass Prevention Measures**

Targeted campaigns	Promising
Fences and barriers at specific parts of stations	Recommended
Fences and barriers at locations outside stations where people take shortcuts across tracks	Recommended
Surveillance to deter based on patrols	Promising
Mass media campaigns	Promising
Risk assessment (e.g. of stations, circumstances, at risk groups or individuals)	Promising
Monitoring and learning from research and best practice	Promising
Education and prevention in schools and outside of school	Recommended
Warning signs and posters to address trespassing	Recommended
Prohibited access signs	Promising

Although Table 4 does not mention law enforcement outright, there is ample evidence to support the need for law enforcement. Surveillance based on patrols is mentioned, which implies that law enforcement is involved. A separate RESTRAIL deliverable suggested that “education campaigns should not be conducted in isolation, and should be reinforced by punitive measures”<sup>10</sup>. This hints that law enforcement should play a role in trespass enforcement.

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<sup>9</sup> <http://uic.org/spip.php?article2290>

<sup>10</sup> [http://www.restrail.eu/IMG/pdf/restrail\\_newsletter2-last\\_version.pdf](http://www.restrail.eu/IMG/pdf/restrail_newsletter2-last_version.pdf), as of 05/007/2014

## 4.1 Regulations, Laws and Policies

In 2004, the Secretary of Transportation published a *Secretary's Action Plan* that addressed highway-rail crossing safety and trespass prevention. The report stated that trespassing on railroad property and collisions at highway-rail grade crossings are the two leading causes of death in the railroad industry<sup>11</sup>. Ten years later, the cost of illegal rail trespass is still high and can be viewed as disproportionate when measured against the total number of rail-related fatalities. As seen in Figure 4, over 70 percent of all the reported rail incidents during the last decade that involved casualties had a trespassing component. From this, we know that the issue of illegal trespass has been and is still of great concern to the general public, the rail industry, law enforcement and the FRA.

Initially, the Secretary's 2004 action plan contained a review of the 1994 Rail-Highway Crossing Safety Action Plan. This original plan addressed law enforcement and judicial initiatives, included suggestions for increased enforcement of traffic laws at crossings, and supported an effort to reach out to local civic and police officials. Additionally, the report highlights the FRA's law enforcement liaison program, describes its efforts at judicial outreach, and outlines the liaison program's goals of 1) to increase the awareness of trespass violations and 2) encourage the consistent enforcement of existing laws pertaining to trespassing.

Overall, the 2004 action plan contained eight goals, as follows:

1. Establish Responsibility for Safety at Private Crossings
2. Advance Engineering Standards and New Technology
3. Expand Educational Outreach
4. Energize Enforcement
5. Improve Data, Analysis, and Research
6. Complete Deployment of Emergency Notification Systems
7. Issue Safety Standards
8. Evaluate Current Safety Efforts for Effectiveness

From this report, it can be deduced that for over 20 years, FRA has been studying the trespass issue and the ways that law enforcement can be part of the solution and it remains a top priority of the FRA.

Law enforcement can reduce the number of trespass incidents and ultimately the number of casualties. However, challenges can arise. Jurisdictional issues can become a problem when railroad police arrest or cite trespassers, but these issues can be resolved by working cooperatively and establishing an understanding between local authorities, judges and the railroads on how trespass violations will be handled. Since there are instances where violations may be treated trivially when examined in a judicial environment, judges should be encouraged to adjudicate cases in a way that effectively discourage dangerous and illegal behaviors. Thus, continuing campaigns of awareness on the dangers and costs associated with trespass need to be aimed at both communities and the judiciary.

This finding was reinforced during discussions with the chair of the DuPage Rail Safety Council (DRSC). DRSC attempted to persuade the judicial system to work in tandem with rail safety

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<sup>11</sup> <http://www.fra.dot.gov/eLib/Details/L02726>

efforts. For example, the county raised tickets fees for not obeying signals at a grade crossing, only to see the judges throw out the violations because the penalties were considered too steep. In response, DRSC lobbied to reduce the fines, which improved the conviction rate. They also invited the judges to participate in DRSC, which helped to invest the judges in railroad safety.

In December of 2010, the Office of Railroad Safety at the FRA published a report titled *Railroad Trespassing, Vandalism, and Highway-Rail Grade Crossing Warning Device Violation Prevention Strategies*<sup>12</sup>. The existence of the Federal Railroad Safety Improvement Act (RSIA) of 2008 was one of the reasons why the report was produced and Section 208 of the law is relevant to this report. Section 208.2(a) states that the “Secretary of Transportation shall evaluate and review current local, State, and Federal laws regarding trespassing on railroad property”, etc. As a result, FRA produced two documents that focus on trespass-oriented state regulations:

- *2013 Compilation of State Laws and Regulations Affecting Highway-Rail Grade Crossings, 6<sup>th</sup> Edition*<sup>13</sup>
- *Model State Legislation – Trespass Prevention*<sup>14</sup>

Clear rail trespassing legislation adds to transparency and strengthens enforcement cases. A review of regulations, fines and punishments may be needed to discourage rail trespassing. Authorities came to this conclusion in the state of New York because existing railroad trespassing laws were extremely limited. According to Railroads of New York, a not-for-profit statewide association that represents the freight railroad industry in New York State, a new law is needed because “when it comes to enforcing railroad trespass offenses in New York, law enforcement officials are forced to do so with an outdated law that has only seen a few updates since the mid nineteenth century.”<sup>15</sup> Prior to the new law, only snowmobilers and horseback riders faced fines for trespassing on railroad property (\$100 fine and \$10 fine, respectively). Trespassing on railroad property on foot was only prohibited on Long Island, in New York City, and in Monroe County.<sup>15</sup>

The example above highlights the importance of being current and relevant with regards to statutory regulations, as well the need for uniformity in the code. Law enforcement stretches much further than warnings, citations and fines. With this in mind, regulatory audits may prove beneficial in assisting law enforcement and rail agencies in performing their duties in the field. These issues need investigation on both a local (state) and national (federal) basis. An effort in this direction will aid in eliminating confusion, strengthening the laws and removing any loopholes that may effectively weaken the efforts of law enforcement.

In addition to laws and regulations, railroad companies and law enforcement agencies may have corporate policies or programs that improve the effectiveness of rail safety initiatives. These programs often create a holistic approach to trespass prevention by arranging collaborations between law enforcement, the railroad, and the community. This type of cooperative approach can result in positive outcomes.

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<sup>12</sup> <http://www.fra.dot.gov/eLib/Details/L04234>

<sup>13</sup> <http://www.fra.dot.gov/Page/P0693>

<sup>14</sup> <http://www.fra.dot.gov/eLib/Details/L03623>

<sup>15</sup> <http://www.nysenate.gov/print/108416>

Union Pacific (UP) Railroad's safety grant program provides financial support to community-owned railroad safety initiatives. Programs eligible for "UP CARES" grant funds include youth education activities, school or community safety days, community safety blitzes and grade crossing educational enforcement activities. When local police partnered with the rail service provider, it allowed for more effective outreach activities.

Finally, successful enforcement policies or programs do not necessarily require a physical presence in the community. Incentives can successfully increase the reporting of violations by employees within an organization. As an example, BNSF (Burlington Northern Santa Fe) instituted a security awareness campaign that encouraged employees and service partners to report trespassers and other suspicious incidents. Those who reported suspicious activity became eligible for recognition.

#### **4.2 Identify Problem Areas**

In Indiana, the practice of trespassing is curbed by employing simple data mining tactics. The railroad service provider works with local law enforcement to maintain an extensive database of trespass offenders. If a repeat offender is caught during an enforcement period, that individual is either cited or incarcerated instead of being given a verbal warning or receiving a less severe reprimand. This approach attempts to match the probability of re-offense with the level of punishment.

This promising approach highlights the usefulness and innate potential of data collected by rail providers as well as the information that can be generated from such data. Demographics can indicate that rail trespassing is more likely to occur at certain times, places and during certain events. Coordinating law enforcement activities with these projected events may help reduce the rate of incidents.

Although demographic data are widely reported, their value becomes evident when they are used to effect change. For example, an FRA report titled *Rail Trespasser Fatalities Demographic and Behavioral Profiles, June 2013*<sup>16</sup>, focuses on the rail trespasser and provides information that can be used as a starting point for trespass research. This report shines a spotlight on high-risk areas, times of offense, and offender behaviors and profiles. The information contained within *Rail Trespasser Fatalities* can be used in planning targeted enforcement campaigns, new technologies, educational outreach programs and future scientific studies.

The research team discussed similar approaches with rail safety professionals. One rail safety consultant suggested that railroads and local law enforcement could form a partnership in which railroads provide police with the Global Positioning System (GPS) locations of trespass activity. This would allow law enforcement to focus resources in the areas of greatest need. One of the organizers of a successful initiative in Manville, NJ believed that understanding the "who, when, why and how" of the local trespass problem was crucial in effectively addressing the issue, which emphasizes the importance of demographics.

Identifying problem areas will also determine the most effective trespass mitigation measures at a location. Removing homeless shelters along tracks may decrease the frequency of incidents and eliminating opportunities for vandalism and graffiti by providing surveillance or increased

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<sup>16</sup> <http://www.fra.dot.gov/eLib/details/L04702>

lighting, can also reduce trespass occurrence. To achieve a complete understanding of the issue, authorities must identify where unwanted behaviors occur around the tracks.

### 4.3 Physical Presence

Maintaining a law enforcement presence around an area with frequent trespassing is one of the most effective means of deterring trespass activity along the right of way. Trespass laws may be enforced with warning citations and arrests or potential trespassers may be simply warned about the dangers along the right of way.

Safety information blitzes are organized by rail entities, local law enforcement agencies, rail safety organizations or a combination of stakeholders. Timeframes and specifics may vary, but the overarching theme of these efforts is education, awareness and safety. Locations vary as well, in that the delivery of information may be at local public institutions (schools, hospitals, etc.), grade crossings, stations or other places along the right of way. In all circumstances, the goal is to flood an at-risk area with messages about how to practice safe behavior around railroad tracks.

An enforcement blitz, for the purposes of this report, must include the on-site presence of a law enforcement official, including representatives of local and/or rail law enforcement agencies. Sites could include grade crossings, community patrol meetings, and “officer on a train” initiatives; while blitz-related activities may involve information dissemination, issuing verbal and/or written warnings, and regulatory enforcement. Most importantly, the presence of a law enforcement representative is imperative, because he or she will remind the public that trespassing on railroad property has legal consequences.

Innovative programs which employ a physical presence have evolved in response to need. In Los Angeles County, an ambassador program has been implemented at crossings. Retired rail personnel serve as “ambassadors,” who are strategically positioned to observe behavior, note responses to warning devices and signs, and intervene when observing unsafe acts. Results have been encouraging. Other examples feature members of the law enforcement community that perform community outreach and deliver educational materials as well as public service announcements throughout the community. The city of Elmhurst, IL has held positive reinforcement blitz where pedestrians who behaved appropriately at rail crossings and stations were rewarded with free food or beverages.

Although informational blitzes are presumed to be effective in educating the general public, it is not certain whether or not this method alone is effective in actually changing behaviors, both in the short term and over time. In 2002, the Department of Psychology, Division of Science and Technology at the University of Auckland published a report entitled *An evaluation of four types of railway pedestrian crossing safety intervention*<sup>17</sup>. The study evaluated a series of interventions designed to reduce illegal and unsafe crossings near a city station by boys on their way to and from the adjacent high school in Auckland, New Zealand. The boys were observed crossing before, during, and after implementation of each intervention. It was concluded that punishment may be more effective in reducing unsafe behavior in this type of situation than targeted education, and it heightens awareness in ways that communication does not.

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<sup>17</sup> <http://www.sciencedirect.com/science/article/pii/S000145750200026X>

Another project with an on-site “physical presence” is located in the town of Manville, New Jersey. The town is small, has a high density of track, and averaged approximately 1 trespasser fatality per year. Following an Operation Lifesaver presentation, a member of the Manville Fire Department enlisted support from the school superintendent, railroad police and local police to conduct a safety blitz in the community. During the blitz, 42 written warnings and 1 citation were issued.

In September 2008, when school started, the Manville Police Department parked a cruiser at the crossing near the school. Manville police officers attended a rail safety class and kept an eye on the tracks during their regular patrols. Any persons found on or near the tracks were stopped and addressed. Following the blitz, the school system agreed to implement Operation Lifesaver presentations on a 3 year rotation in the high school and sent out a rail safety flyer in student’s report cards. A Manville police officer attended the Operation Lifesaver presentation, lending gravity to the message. Since making these efforts in 2008, there has been no fatality or injury related to rail trespassing in Manville.

In 2001, the Federal Railroad Administration (FRA) and the Illinois Commerce Commission (ICC) established the Public Education and Enforcement Research Study (PEERS) to test the whether education and enforcement techniques could improve compliance with traffic safety laws at highway-rail grade crossings. As part of PEERS, communities in Illinois conducted additional rail safety education and enforcement programs. FRA tasked the Volpe Center with conducting a field operational test to measure the effectiveness of education and enforcement on behavior. The Volpe Center conducted a before-during-after study in the community of Arlington Heights, IL.

As part of PEERS, the community of Arlington Heights conducted three types of blitzes: information blitzes, motor vehicle enforcement blitzes, and pedestrian enforcement blitzes. Citations were only issued during the enforcement blitzes. Over the 12-month test period, the Arlington Heights police force conducted 8 information blitzes, 12 pedestrian enforcement blitzes, and 16 motor vehicle enforcement blitzes. Violation rates were analyzed for the overall study period versus the days when a blitz was conducted. Pedestrian violation rates were 18.1 percent lower on all blitz days than during the overall test period and 30.8 percent lower on days when there was a pedestrian enforcement blitz. These numbers suggest that pedestrians responded positively to information and enforcement blitzes.<sup>18</sup>

Although pedestrians responded positively, it is worth noting that police presence is waning as funding shrinks, according to DSRC. PEERS grants were available to many of the communities that are served by the safety council. These funds were used to increase police presence and perform educational services. Since the program has completed its course through fiscal year 2010, there is less involvement in rail safety by police agencies.

#### **4.4 Technology and Engineering Solutions**

In areas where law enforcement resources are limited and/or tracks are in remote locations or spread over a wide area, an on-site police presence may not be feasible. For these locations and communities, an engineering or technological solution may be the more appropriate approach.

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<sup>18</sup> <http://www.fra.dot.gov/eLib/details/L01636>

Under the direction of FRA, the Volpe Center conducted a 3-year study of an automated prototype railroad security system on a railroad bridge. In Pittsford, New York, where trespassing is commonplace, a video-based trespass monitoring and deterrent system was used to send audio and visual signals to a monitoring workstation at a local security company. An attendant validated each alarm, issued real-time warnings to trespassers via a pole-mounter speaker, and called local police as well as rail police.

When the study concluded in August 2006, the investigators issued a report entitled *Railroad Infrastructure Trespassing Detection Systems Research in Pittsford, New York*.<sup>19</sup> The findings suggest that the technology used to detect and warn trespassers in real-time may have saved five lives in three separate trespassing incidents. However, the authors noted that anecdotal evidence was not always accurate. When local organizations and representatives talked about the target railroad bridge, they had the impression that local teenagers used the bridge as a gathering place. However, after analysis of the data, it was found that the bridge was being used as a shortcut over the Erie Canal instead. The report emphasizes the potential benefits of enforcement via technology and discusses the importance of using sound demographic data as a foundation upon which to further efforts at trespass abatement.

In the village of Hinsdale, IL, the town installed remote monitoring cameras along the right of way. The camera feed runs continuously in the Hinsdale Police Department headquarters. Although the cameras were not originally installed for the purposes of preventing trespassing, they successfully mitigated unintended trespassing events when motorists turned onto the tracks. The community was able to address the challenges observed at the intersection and thereby reduce motorists' confusion. By utilizing remote camera technology, problem areas can be located and addressed.

A technological solution that is used at grade crossings but has not been employed for trespass abatement is photo enforcement. A photo enforcement system acts as a police force multiplier by supplying automated enforcement without requiring additional personnel. Additionally, photo enforcement cameras positioned at strategic locations will make people aware to rail trespass issues. However, one obvious challenge is identifying pedestrians or bicyclists. Photo enforcement provides vehicle license plate and registration information, which allows law enforcement to identify trespassers in motor vehicles. If trespassers are not in motor vehicles, identification is much more difficult. Finally, photo enforcement technology can help identify problem areas. Cameras that can collect many images of trespassers at one location allow law enforcement officers to prioritize their resources and handle the high risk location.

Although not practical for long stretches of track or entire corridors, fencing and/or barricades can be effective when strategically situated. Suitable locations include known shortcuts, pathways across the tracks and/or popular recreation areas. For locations where trespassing occurs despite fencing (e.g., panels have been removed, links are cut, etc.), high security fencing options can be considered.

Improving the visibility, frequency and placement of signage around crossings can help deter trespass. When communicating with trespassers, people must be aware that the tracks are private property and know that trespassing is a punishable offense in order for deterrence to work.. Signage can be a first attempt at sharing that message.

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<sup>19</sup> <http://ntl.bts.gov/lib/34000/34800/34871/DOT-VNTSC-FRA-05-07.pdf>

Finally, Ohio has taken a fresh approach to rail safety through law enforcement. the State Highway Patrol uses a method named Observe, Report & Respond,<sup>20</sup> where trooper-piloted aircraft are dispatched to a variety of Ohio locations. The pilot then observes trespassers and then communicates via radio with appropriate law enforcement jurisdictions. Monitoring, whether remote or in person, by video or on patrol, is critical to identifying the problem and deterring individuals from trespassing.

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<sup>20</sup> <http://www.fra.dot.gov/conference/trespass2012/pdf/Reference/TEA-Trespass%20Enforcement%20Through%20Aviation.pdf>

## 5. Conclusions

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Enforcement plays a key role in preventing rail trespassing incidents and casualties. As seen in several locations, when law enforcement personnel participates in rail safety, the number of risky behaviors along the right of way (including trespassing) is reduced. There are many different strategies that can be successful and the most appropriate strategy for a community will depend on resources, location, and trespasser demographics.

Empirical data on the effectiveness of law enforcement initiatives for preventing rail trespassing is not readily available. As a result, the majority of findings in this report are based on anecdotal evidence of successful initiatives, discussions with rail safety professionals and reviews of articles and reports on the subject point to some generally accepted guidelines for success.

One major factor in determining if law enforcement efforts successfully counter rail trespassing is the availability of funding. Rail safety advocates and law enforcement professionals from Illinois emphasized the benefits that were realized when PEERS grants were made available to communities. Law enforcement agencies have competing priorities and limited resources. A dedicated funding source greatly supports the proper enforcement of the law, specifically when concerned with trespassing programs. Additionally, the availability of funds allows expands the types of strategies that can be used. Funding mechanisms that should be explored include federal grants, such as PEERS, or partnerships with private companies, such as the UP CARES program.

Another factor that leads to success is a thorough understanding of the local trespassing problem. In order to understand the problem, project participants must identify trespasser “hotspots,” develop demographics on trespasser behavior, and select strategies that appropriately target the trespassing issue. Amassing quality data from controlled sources is a first step in building a trespass prevention program. The data then needs to be analyzed to reveal basic demographics. Information from local individuals, law enforcement personnel, rail personnel, and other concerned parties need to be considered for relevance, alongside relevant (data) analyses.

One piece of research received during the outreach phase of this effort tends to support this conclusion. The authors of *Rail Trespassing Occurrences and Countermeasure Strategies*<sup>21</sup>, written for The Transportation Development Centre Transport Canada, stated the following: “A positive trend in the rail enforcement community is a site-specific problem-solving approach, based on a firm understanding of trespasser demographics and the underlying causes of their actions. Collecting such information should be an integral component of any countermeasure strategy.”

A third factor to consider is the approach used to develop a solution. If law enforcement strategies are used in combination with other categories of preventive measures, the results may be more effective in curbing trespass behaviors than law enforcement strategies alone. The authors of the Canadian report cited above contend that “video or other forms of detection-intervention systems are only effective when supplemented by active in-person enforcement, a measure that is not sustainable over the longer-term (due to the vastness or railway networks and the resources that it would require).” Continuing in the same vein, the authors find that “rail

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<sup>21</sup> April 2012, Stewart, Ron and Colwill, Matt, *Rail Trespassing Occurrences and Countermeasure Strategies*, Prepared for Transportation Development Centre Transport Canada by IBI Group.

trespassing countermeasure strategies that focus solely on educational [sic] or enforcement have seldom been effective in achieving long-term reductions in trespassing activity.” Finally, the authors assert that “Public awareness, education, and enforcement are integral components of addressing rail trespassing, but ... these measures alone cannot tackle a prime trespass location. Even with an extensive education program and frequent enforcement, there will be some locations where a significant engineering countermeasure, such as a non-traversable barrier or alternative routing, is the only long-term solution to a trespassing problem.” Thus, it is reasonable to employ a multi-layered approach which is based on a strong understanding of the underlying demographics and consideration for the three E’s: Education, Engineering and Enforcement.

Another factor to consider is collaboration. Trespass enforcement requires the coordination of many parties in order to be successful, including the community, law enforcement, the judicial system and the rail industry. Inclusion creates an environment where all parties take ownership of the problem and are vested in the potential outcome. Grass roots organizations, such as DRSC, have been effective in identifying stakeholders, bringing these stakeholders together, and keeping the topic of rail safety and trespassing on point. Outreach agencies such as Operation Lifesaver, Inc. continually demonstrate how to coordinate rail organizations, local law enforcement agencies and national advocacy groups. These multi-organizational coalitions can work together to spread the word and increase awareness, work more effectively than a one-agency approach, combine manpower, share experience, spread their reach and reduce the overall cost.

Finally, continued research is warranted to maintain focus on the existing problem, assist in isolating solutions, and provide a basis for continued funding that supports research, education and enforcement. In order to establish the effectiveness of law enforcement efforts, formal research is encouraged. This type of research can provide a scientific basis for future research efforts and a more optimal allocation of resources, resulting in greater safety benefits for the community.

## Appendix A. Abbreviations and Acronyms

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BNSF	Burlington Northern Santa Fe Railroad
CCTV	Closed-circuit television
DOT	Department of Transportation
DRSC	DuPage Rail Safety Council
ERADIS	European Railway Agency Database of Interoperability and Safety
FTA	Federal Transit Administration
FRA	Federal Railroad Administration
ICC	Illinois Commerce Commission
PEERS	Public Education and Enforcement Research Study
RAIRS	Railroad Accident and Incident Reporting System
RESTRAIL	REduction of Suicides and Trespasses on RAILway property
RSIA	Railroad Safety Improvement Act
UIC	International Union of Railways
UP	Union Pacific
Volpe Center	John A. Volpe National Transportation Systems Center

## Appendix B. Resources

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American Public Transportation Association	<a href="http://www.apta.com/Pages/default.aspx">http://www.apta.com/Pages/default.aspx</a>
Association of American Railroads	<a href="https://www.aar.org/Pages/Home.aspx">https://www.aar.org/Pages/Home.aspx</a>
ERADIS database	<a href="https://eradis.era.europa.eu/">https://eradis.era.europa.eu/</a>
Federal Highway Administration	<a href="http://www.fhwa.dot.gov/">http://www.fhwa.dot.gov/</a>
Federal Motor Carrier Safety Administration	<a href="http://www.fmcsa.dot.gov/">http://www.fmcsa.dot.gov/</a>
Federal Railroad Administration	<a href="http://www.fra.dot.gov/Page/P0001">http://www.fra.dot.gov/Page/P0001</a>
Federal Transit Administration	<a href="http://www.fta.dot.gov/">http://www.fta.dot.gov/</a>
FRA Model State Legislation - Railroad Trespass Prevention	<a href="http://www.fra.dot.gov/eLib/Details/L03623">http://www.fra.dot.gov/eLib/Details/L03623</a>
FRA Office of Safety Analysis Safety Data	<a href="http://safetydata.fra.dot.gov/OfficeofSafety/Default.aspx">http://safetydata.fra.dot.gov/OfficeofSafety/Default.aspx</a>
FRA Trespasser Casualty Map	<a href="http://fragis.fra.dot.gov/Apps/Trespassers/">http://fragis.fra.dot.gov/Apps/Trespassers/</a>
National Transportation Safety Board	<a href="http://www.nts.gov/">http://www.nts.gov/</a>
Operation Lifesaver, Inc.	<a href="http://oli.org/">http://oli.org/</a>
U.S. Department of Transportation	<a href="http://www.dot.gov/">http://www.dot.gov/</a>
UIC Safety Database	<a href="http://uic.org/spip.php?article2290">http://uic.org/spip.php?article2290</a>