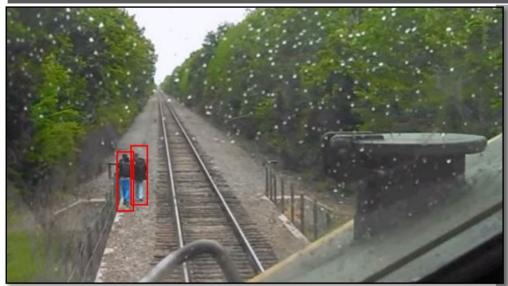
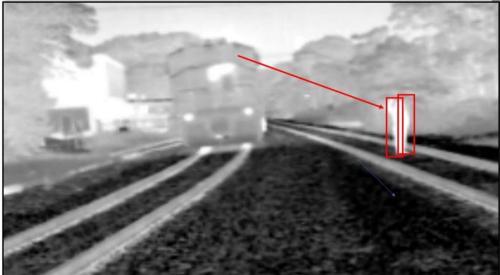


Technical Transfer_Transfer of Knowledge Obtained During Related to Rail Trespassing Using Lunch and Learns





Prepared By
Institute for Transportation
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Prepared For North Carolina Department of Transportation (NCDOT)

Submission Date August 17th, 2023



Transfer of Knowledge Obtained During Related to Rail Trespassing Using Lunch and Learns

Chris Cunningham - PI Kyra Stash

Institute for Transportation Research and Education (ITRE)
North Carolina State University

Technical Transfer for NCDOT 2019-08_Phase 2 August 2023

TECHNICAL DOCUMENTATIONS PAGE

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Abstract

BeRailSafe is a safety initiative sponsored by the North Carolina Department of Transportation (NCDOT), dedicated to raising awareness about the risks associated with railroad trespassing. In 2019, NCDOT collaborated with the Institute for Transportation Research and Education (ITRE) to conduct an extensive study on rail trespassing incidents in high-traffic areas of North Carolina. The primary objective was to identify ways to predict and reduce such incidents. This comprehensive research shed light on several critical aspects, including the prevalence of trespassing in these areas, the underlying motivations for trespassing, dispelling common myths related to trespassing, and the perceptions of those affected by such incidents. To disseminate these valuable findings to the public, it was determined that a series of ten educational events would be organized across North Carolina, specifically targeting regions with higher rates of rail trespassing. These workshops, led by former State Highway Patrol Officer Roger Smock and the Principal Investigator of the research, Chris Cunningham, served as platforms to present the research results. Attendees gained insight into actual rail trespassing incidents that had occurred across the state, and through visualizations, they witnessed how quickly a person can unwittingly place themselves in grave danger. Furthermore, in collaboration with Nicholas Allen of NCA&T, the workshops included a pre- and post-presentation survey component. This survey aimed to gauge how attendees' attitudes and perceptions regarding rail trespassing evolved throughout the workshop, contributing valuable data to the ongoing efforts to mitigate these risks in North Carolina

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Key Words		Distribution State	ement	
Railroad Trespassing, Pedestrians, Safety				
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DISCLAIMER

The contents of this report reflect the views of the authors and not necessarily the views of the Institute for Transportation Research and Education or North Carolina State University. The authors are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the North Carolina Department of Transportation or the Federal Highway Administration at the time of publication. This report does not constitute a standard, specification, or regulation.

NCDOT RP 2019-08 (Ph2) Final Report_Technical Transfer

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INTRODUCTION

BeRailSafe is a safety initiative sponsored by NCDOT with the goal of educating North Carolinians about the dangers of railroad trespassing. In 2019, NCDOT sponsored the Institute for Transportation Research and Education (ITRE) to research rail trespassing incidents in high-volume areas of North Carolina, seeking ways to predict and reduce such incidents. This research provided insights into trespassing rates, motivations behind trespassing, common myths, and the perspectives of those affected. To disseminate these findings, ten educational events were planned across North Carolina, led by former State Highway Patrol Officer Roger Smock and the technical transfer Principal Investigator, Chris Cunningham. These workshops aimed to present the study's findings, share North Carolina incidents, and illustrate how quickly someone can unknowingly put themselves in danger. In addition, participants were asked to complete surveys before and after the presentations to measure attitude changes toward rail trespassing, part of a separate study by Nicholas Allen at North Carolina Agricultural and Technical State University.

INITIAL OUTREACH

The original proposal involved going to 10 different cities: Elon, Morrisville, Kannapolis, Lexington, Kings Mountain, Wilson, Asheville, Sanford, Fayetteville, and Wadesboro. These areas had dense populations near major railroads and were thus deemed as "high risk" areas where outreach would be needed the most. A list of "persons of interest" was made in order to help decide who to reach out to based on people who would be interested in making their local area safer and people who would have the necessary resources that could be reinvested into their communities. This list included police officers, firemen, local town council members, school principals, transportation employees, town planners, ER personnel, district court judges, prominent business owners, civic organization leaders, and churches. To incentivize people to attend, ITRE's NC Local Technical Assistance Program (LTAP) division and a Zoom option was arranged for those who were interested but could not attend in person. As such, these workshops were considered informational "Lunch and Learn" events where participants would come during lunchtime and listen to the presentation. It was decided early on that a BeRailSafe email account would be made under Roger Smock's name in order to manage logistical matters. This account was managed by Kyra Stash and was used for large scale email invitation campaigns, making registration lists that tracked participant needs, and responding to participant questions and feedback.

The original plan was to visit ten different cities: Elon, Morrisville, Kannapolis, Lexington, Kings Mountain, Wilson, Asheville, Sanford, Fayetteville, and Wadesboro – areas with dense populations near major railroads. A list of potential attendees included police officers, firemen, local town council members, school principals, transportation employees, town planners, emergency room personnel, district court judges, prominent business owners, civic organization leaders, and churches. To incentivize people to attend, ITRE's NC Local Technical Assistance Program (LTAP) offered free meals while also inviting its constituents to attend. In addition, a Zoom option were arranged for remote attendance. These events were dubbed "Lunch and Learn" sessions where participants would come during lunchtime and listen to the presentation. A BeRailSafe email account was established under Roger Smock's name to handle logistical matters, which was managed by Kyra Stash of ITRE for email campaigns, registration, and participant inquiries.

ISSUES ENCOUNTERED

The first challenge was finding suitable, cost-effective venues, especially in less populated areas. Many facilities lacked the necessary resources, and some required nonrefundable deposits. Most facilities were either unable to accommodate our presentation needs including access to Wi-Fi, projector for the slides, space for the anticipated group, and the ability to have catered food. After contacting numerous venues, spaces were secured at community colleges and NC State's County Extension Centers.

The second issue was obtaining contact information for potential attendees. While some contacts were available, more outreach was needed. Ain Flowers and Kyra Stash compiled a list of over 1,300 people through online research. Mr. Smock and Cunningham included contacts for law enforcement agencies as well as traffic engineers and planners across the state. However, it became evident that registration numbers would not justify ten events, leading to a compromise of three workshops in Greensboro, Charlotte, and Raleigh. To further assist with registrations, a video filmed and assembled by the NCDOT Communications Department featuring testimonials of Greensboro workshop participants and their experience with the event. The hope was that if the video was linked in the email invitation to potential participants in Charlotte and Raleigh, it would incentivize people to register by showing how informative the workshop was.

EVENT OUTCOMES

Greensboro

The workshop in Greensboro took place on April 11th, 2023, with 17 in-person attendees. The Zoom session had low turnout, likely due to inadequate reminders. Participants engaged well, with a councilwoman expressing interest in further collaboration and a police officer pledging support for rail safety education. The presentation itself was well received and there was plenty of audience participation, in particular a local councilwoman Marikay Abuzuaiter gave a personal account about her years spent working with Vision Zero and spreading awareness about rail safety. In one of our feedback surveys when asked if they would recommend the Lunch and Learn workshop to her constituents, a transportation analyst for the High Point Metropolitan Planning Organization (MPO) expressed interest in working with the organization's PR team to "get this info to our council members and the public." Additionally, when asked if they were more inclined to support rail safety education, a Greensboro Police Officer stated "Absolutely. I will continue to support rail safety education outreach efforts as long as I can. The outreach is very impactful and encourages railroad safety." Overall the workshop was informative for participants and set a decent standard for how the rest of the workshops should go. The Zoom session was recorded, stitched with the presentation and is now available on ITRE's website for future use.



Figure 1: Roger Smock (left) and Chris Cunningham (right) presenting research findings in Greensboro (colorized)

Charlotte

The Charlotte workshop was held on June 14th, 2023 at Huntersville Town Hall and proved to be the smallest of the three sessions. It had the lowest registration numbers at 14 and only 10 of those people attended. Moreover, due to a major technical issue, the Zoom session had to be cut short. To compensate for this shortcoming, virtual attendees were later given a link to the full presentation done in Greensboro. Although discussion during the presentation was good, there was minimal feedback that followed once the presentation was completed.

Raleigh

The Raleigh event was held on June 16th, 2023 and was easily the most engaging of the three. Of the 32 that registered, 20 came in person and 3 attended via Zoom. These participants were much more eager to ask questions about the surveys they were given, talk about their own experiences with rail safety, and talk about portions of the presentation they found interesting. The portion of the presentation mentioned the most featured a graph comparing the decibels of a train at varying distances to that of other common noises, such as a baby crying. Participants stated that having a visual comparison helped them put into perspective how quiet modern trains are even from short distances away. This was the most successful event by far, with the highest attendance and most active group of participants of the three workshops.

SURVEY RESULTS

The focus of the survey was on collecting data regarding common misconceptions about railroad safety and how dangerous participants thought rail trespassing was in practice. A before-and-after survey was administered to in-person participants to track changes in their responses after viewing the presentation. Following the presentation, a quarter fewer people believed that pedestrians on the track would have enough time to move to safety if they saw a train, and no participants believed pedestrians would have enough time if they heard a train. Additionally, over half of the participants who had previously claimed they would cross the tracks illegally if it saved them walking time wrote that they would no longer engage in such behavior after watching the presentation. The results clearly demonstrated that people could change their minds

about this topic when presented with the facts of railroad safety, underscoring the critical importance of the work of BeRailSafe and ITRE's research in improving safety around railroad tracks.

FUTHER OUTREACH

Moving forward, there are several ways to continue spreading the BeRailSafe message in addition to Ms. Ain Flowers ongoing work with Mr. Smock. These workshops could be hosted by ITRE annually, utilizing the NC State County Extension Centers as venues and partnering with them to promote the event locally. Additionally, there could be follow-up email campaigns in which the BeRailSafe account sends a message containing our mission statement, the testimonial video, the recording of the presentation, and resources to help recipients get involved. One participant also suggested having booths at events such as National Night Out, family-friendly fairground events, and the farmers' markets to expand outreach. The purpose of any of these options would be to continue engaging people with the message, encouraging them to share it with others, and making their communities safer.

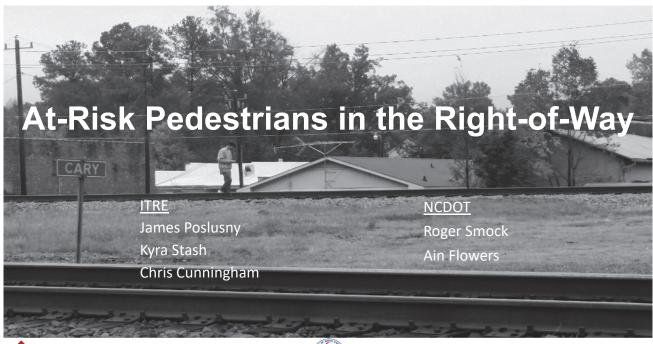
CONCLUSION

BeRailSafe is an educational safety initiative that highlighted the dangers of railroad trespassing and the importance of public outreach in improving the lives of railroad pedestrians. After sponsoring ITRE to study the effects of railroad trespassing, BeRailSafe sponsored "Lunch and Learn" events to disseminate the findings and dispel commonly held misconceptions. The survey data and the feedback provided suggest that people are willing to change their rail pedestrian habits and educate others about the dangers of illegal crossings. Reaching out to these pillars of the community and sharing this vital information is the first of many steps in increasing public awareness and putting an end to rail fatalities.

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APPENDIX

Updated slides for Lunch and Learns





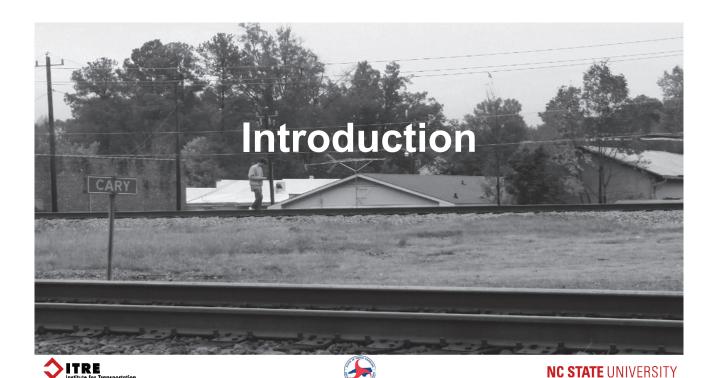


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Outline



- Introduction
- Perceptions and Risks
- NC Statistics
- Case Study Examples
- Resources and Potential Solutions



Objective



• Conduct outreach with community leaders to better relay rail safety issues related to pedestrians in the right-of-way while providing resources that can help "close the gap".

Who is At-Risk?



- Anyone in the Right of Way (ROW)
- ROW?
 - Most established under General Railroad ROW Act of 1875
 - Land owned by the railroad where the tracks are constructed and trains actively run.
 - Typical ROW Width: 30' to 200'





Introduction

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Who is Walking in the ROW?



• continued...













• Many diverse groups with single and multiple users







Introduction

& Risks

NC Statistics

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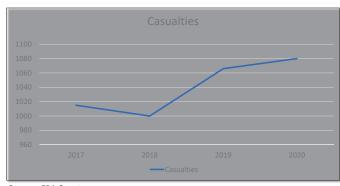
Resources

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How many people are hurt/killed?



- More than 1,000 reported people a year are killed or injured just by walking in the ROW.
- Likely underrepresented sample



Source: FRA Counts



Introduction Percent & Ri

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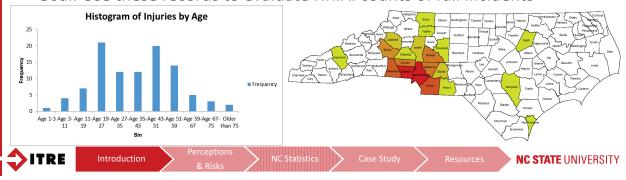
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NCDETECT/NEMSIS

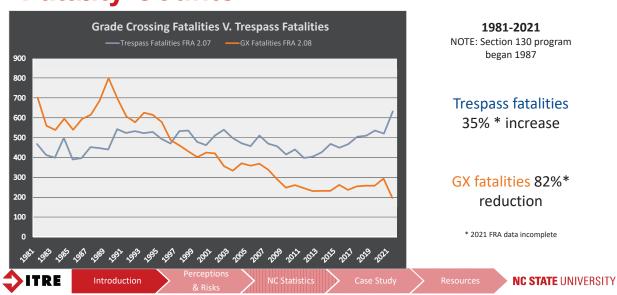


- North Carolina Disease Event Tracking and Epidemiologic Collection Tool
- National Emergency Medical Services Information System
- Goal: Use these records to evaluate F.R.A. counts of rail incidents



U.S. Grade Crossing & Trespass Fatality Counts





Summary NC Rail Incident Costs from 2010-2021 (in \$2022) Casualty, Delay, Rerouting, Supply Chain, Emergency Responder, Emissions, +

Year	Casualty Costs ¹	Equipment Damage ²	Delay, Rerouting & Supply Chain ³	Emissions Costs ⁴	Operating Costs ⁵	Emergency Responder Costs ⁶	Total Costs
2010	\$238,390,000	\$9,137,000	\$892,000	\$117,000	\$68,000	\$72,000	\$248,677,000
2011	\$201,890,000	\$4,176,000	\$1,235,000	\$129,000	\$74,000	\$164,000	\$207,667,000
2012	\$203,629,000	\$3,018,000	\$757,000	\$109,000	\$63,000	\$85,000	\$207,661,000
2013	\$310,758,000	\$3,674,000	\$1,761,000	\$168,000	\$95,000	\$85,000	\$316,542,000
2014	\$296,430,000	\$4,033,000	\$1,666,000	\$162,000	\$93,000	\$184,000	\$302,569,000
2015	\$285,010,000	\$5,576,000	\$1,707,000	\$161,000	\$92,000	\$103,000	\$292,650,000
2016	\$328,820,000	\$3,357,000	\$1,405,000	\$135,000	\$77,000	\$78,000	\$333,871,000
2017	\$203,629,000	\$3,062,000	\$1,244,000	\$139,000	\$79,000	\$71,000	\$208,226,000
2018	\$373,481,000	\$12,137,000	\$2,973,000	\$194,000	\$110,000	\$189,000	\$389,084,000
2019	\$290,738,000	\$4,199,000	\$1,808,000	\$151,000	\$84,000	\$69,000	\$297,048,000
2020	\$170,587,000	\$3,273,000	\$944,000	\$93,000	\$53,000	\$70,000	\$175,020,000
2021	\$341,175,000	\$6,546,000	\$1,888,000	\$185,000	\$106,000	\$141,000	\$350,041,000
Total	\$3,244,537,000	\$62,188,000	\$18,280,000	\$1,743,000	\$994,000	\$1,311,000	\$3,329,056,000

¹ Monetized cost of injuries using the KABCO injury scale at unknown injury severity and the USDOT value of statistical life for fatalities (see "Monetized Casualty Costs" for methodology)







²Equipment damage reported on FRA form 6180,54 and 6180,57 (Train Accidents and Highway-Rail Accidents) from 2010-2019, converted to \$2020 (see "Property Damage Costs" for methodology)

³Includes value of time for passengers and workers, opportunity, spoilage, useful life, and replacement costs for cargo, and up/downstream delay effects (see "Delay, Rerouting, and Supply Chain Costs" for methodology)

⁴Includes emissions costs resulting from additional locomotive runtime (see "Additional Emissions Costs" for methodology)

⁵Includes fuel and ownership costs resulting from additional locomotive runtime (see "Additional Operating Costs" for methodology)

⁶ Includes first responder and emergency personnel and equipment costs resulting from an incident (see "First Responder and Emergency Management Costs" for methodology)

This is not a Victimless Act















Brown Line	Significant Delays
Green Line	Significant Delays
Orange Line	Significant Delays
Purple Line	Significant Delays
Pink Line	Significant Delays



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This is not a Victimless Act









- Perception
 - "Walking across or down the railroad tracks or in the right-of-way is legal."



- Truth
 - · Railroads are privately owned and cannot be used by pedestrians or any other modality.



Myth 2: Event Types



- Perception
 - "Most casualties on the tracks are from homeless camps or suicide attempts!"
- Truth
 - All kinds of people use rail lines for various reasons. Most just want to get somewhere using the quickest route.





Myth 2: Event Types, cont.

- Approximately 25% of pedestrians on the tracks are living on or around the rail ROW.
- 15-25% of pedestrian fatalities are related to suicide attempts
- Currently unknown how many non-fatal strikes take place.



Myth 3: Train Noise

- Perception
 - "Trains are loud! You should have PLENTY of time to get out of the way!"

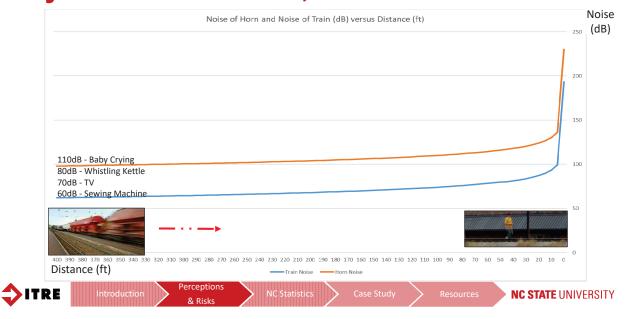


- Truth
 - By the time a pedestrian hears an oncoming train, it may already be too late.



Myth 3: Train Noise, cont.





Video: Train Noise w/ Earbuds







Perceptions & Risks

Statistics

Case Study

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Video: Welded vs. Jointed Rail





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& Risks

NC Statistics

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Myth 4: Reaction Time



- Perception
 - "If I hear or see a train, there is PLENTY of time to get out of the way!"
- Truth
 - You may not actually see the train until it is to late!
 - Perception times ≈ 1.0 sec.
 - Reaction times ≈ 1.0 sec.
 - Walking speeds ≈ 4 fps ≈ 1.1 sec.
 - 3+ seconds needed to perceive, react, and get out of path



Myth 5: Train Speeds



- Perception
 - "Trains are not that fast, there is PLENTY of time to get out of the way by the time I see it!"
- Truth
 - Trains can legally go as fast as 79mph in some areas!
 - Trains can take more than a mile to stop.

Train Speed (mph)	Distance (ft. in 3 secs)
20	88
30	132
40	176
50	220
60	264
70	308
80	352



troduction & Risk

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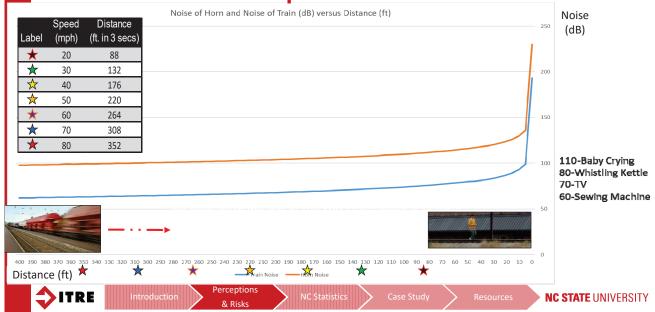


What do all these perceptions mean?



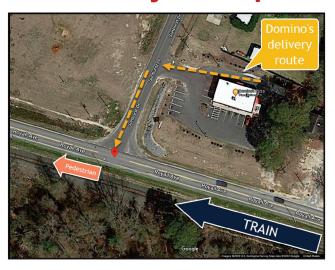
Train Noise vs. Perception/Reaction





Case Study Example





30 December 2021, 8:57 PM Weather 64.9°F, Dew point 63°F, Visibility 800'

Train crew: "[the victim]... appeared out of the fog."

Witness: "[Conductor]... was sounding the horn."

Locomotive (GE-AC 4400 CW) width-9'11" Rail gauge (width) – 4' 8%" Train horn- 96 -110 dB(A) at 100'

>ITRE

Perceptions & Risks

Statistics

Case Stud

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Case Study Example....cont.





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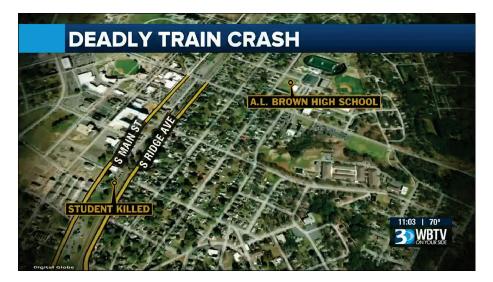


* Used w/ permission



Example_April 21, 2023







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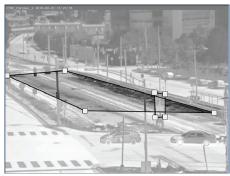






What's the true scope of the Issue?

- From 2018 to 2020, the Institute of Transportation Research and Education (ITRE) placed cameras in areas where pedestrians were suspected to cross the rails in North Carolina Communities
- 680 Days of Data were collected



Detection Zone b/w Parking Deck and DPAC (Durham, NC)



Introduction

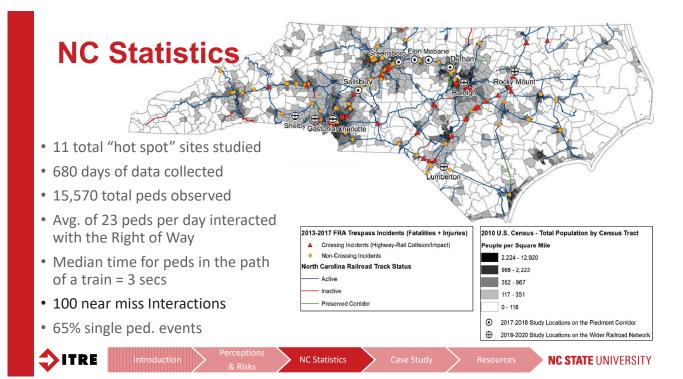
& Risks

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Observed Peds in Rail ROW by Location





Time-of-Day

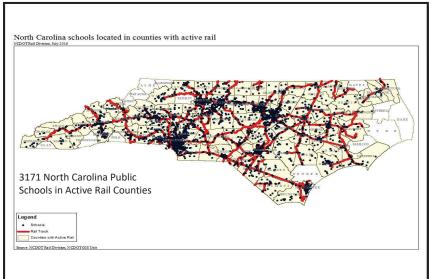


Site	*		*	
	6:00-11:00	11:00-4:00	4:00-9:00	9:00-6:00
Charlotte	26%	31%	35%	8%
Durham	22%	38%	27%	13%
Elon	8%	18%	25%	48%
Gastonia	29%	35%	20%	15%
Greensboro	31%	29%	24%	16%
Lumberton	37%	33%	19%	11%
Mebane	24%	37%	32%	7%
Raleigh	21%	47%	26%	6%
Rocky Mount	23%	32%	29%	15%
Salisbury	11%	39%	25%	25%
Shelby	22%	28%	37%	13%



NC Schools Locations







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Railroads are ACTIVE near schools!



- 96% of all schools are in active rail counties.
- 60% of these schools are within 1 mile of a railroad crossing
- 55% of these schools are within ½ mile of a railroad crossing







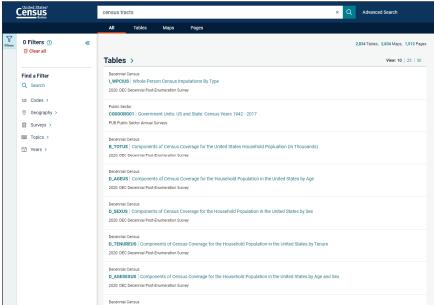
- EAD = 55.84(PNV) + 63.03(BDLIH) 26.69(BDR) + 7.05(BDSS) + 20.98
 - EAD Estimated Average Daily Events (pedestrians/day)
 - PNV Percent w/ No Vehicle that Walk to Work
 - BDLIH Business Density in Low Income Housing (per 1,000 people)
 - BDR Business Density (Retail Food, Grocers, Convenience) (per 1,000 people)
 - BDSS Business Density (Social Services) (per 1,000 people)
- This model has been shown to be within 6.3 events of the average observed during the study



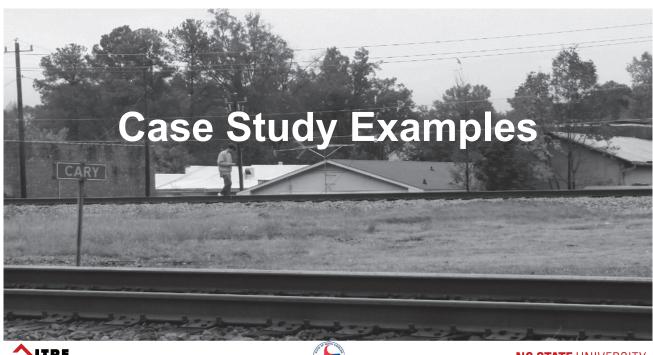
Estimating the Problem



- Census data is used in the model
 data.census.gov
- Census tracts within 1-mile











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Why do People Take the Risk?



- It's the shortest route between origin and destination
- It is the *easiest route* for alternative modes such as walking.
- Perceived low risk
- Examples are not hard to find!



Example_Crossing (Poor Planning)





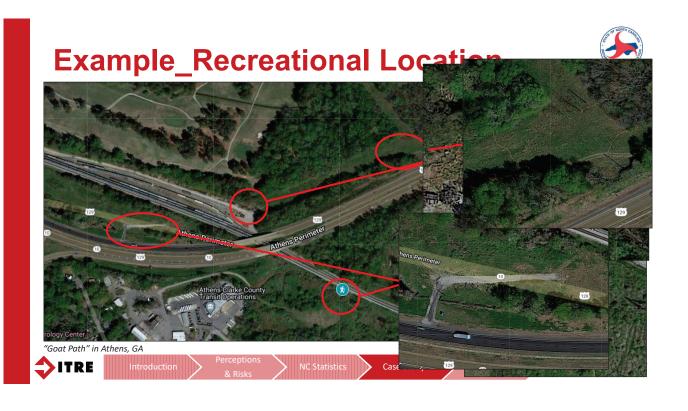
Downtown Raleigh, No



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Trespass evidence- Greensboro & High Point









Example_Crossing Location (NCSU)





How many expected events/day at NCSU?



- Using Model on Slide 37
- From census data:
 - PNV: 27% (near a university, student workers captured)
 - BDLIH(per 1000 people): 0.0246
 - BDR (per 1000 people): 0.003462
 - BDSS(per 1000 people): 0.003191
- EAD: 38 events per day.









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What Can Be Done?



- Be involved in future planning efforts (zoning and construction, highways, rail, etc.)
- Contact NCDOT, rail owners, adjacent property owners, law enforcement
- Consider treatments
 - Fencing not a blanket solution
 - May be other possible treatments
- Education
- "Eduforcement" campaigns



Pedestrians Climbing Newly Installed Fence (Elon, NC)



Further Resources



- Operation Lifesaver https://oli.org/
 - Operation Lifesaver in NC https://community.oli.org/state/nc#about
- Rail Trespass Prevention F.R.A. https://railroads.dot.gov/highway-rail-crossing-and-trespasser-programs/trespassing-prevention/trespass-prevention
- BeRailSafe http://berailsafe.org/
- Comprehensive Cost of Rail Incidents in North Carolina research & Cost Tool Calculator
 - https://connect.ncdot.gov/projects/research/pages/ProjDetails.aspx?Projectl D=2020-44



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NC Statistic

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Further Resources



- USDOT Volpe Center- Preventing Rail Trespass Fatalities (Tool Kit)
 - https://www.volpe.dot.gov/news/preventing-rail-trespass-fatalities

Or Google USDOT Volpe Rail for numerous resources



Acknowledgements



- NCDOT
- FRA
- Operation Lifesaver
- BeRailSafe



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