

# Analysis of Safety at Quiet Zones

2014 Global Level Crossing Safety & Trespass Prevention Symposium

Urbana, IL



# F E D E R A L R A I L R O A D A D M I N I S T R A T I O N



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**The Federal Railroad Administration (FRA)** enables the safe, reliable, and efficient movement of people and goods for a strong America, now and in the future.

- Safety is our number one priority
- We are laying a foundation for higher performing rail
- Promulgating and enforcing rail safety regulations
- Investing in America's rail corridors
- Research and development to advance rail safety



Moving America Forward



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**Rail has never been safer.**

FRA is committed to continuous safety improvement:

- Maintaining onsite inspections identifying safety violations;
- Development rules, regulations and guidance; and
- Workforce training

**FRA is the Chief Safety Regulator for all Passenger and Freight Railroads Nationwide**

- FRA employs nearly 900 people
- With eight regional offices strategically located across the Nation
- Dedicated to our vision:  
**RAIL**-*Moving America Forward*



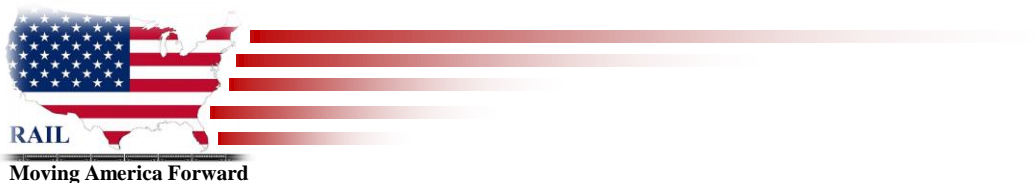
## *Laying a foundation for higher performing rail*

### Our Multi-Billion Dollars Portfolio Includes:

- Amtrak Operating and Capital Programs - \$7 billion
- High Speed and Intercity Passenger Rail (HSIPR) Grants - \$10.1 billion
- Research and Development - \$30 million
- Railroad Rehabilitation and Improvement Financing (RRIF) Program – \$1.7 billion
- Transportation Investment Generating Economic Recovery (TIGER) Programs - \$423 million
- Rail Line Relocation Grants - \$86 million
- Disaster Assistance Grants -\$18 million



# Analysis of Safety at Quiet Zones

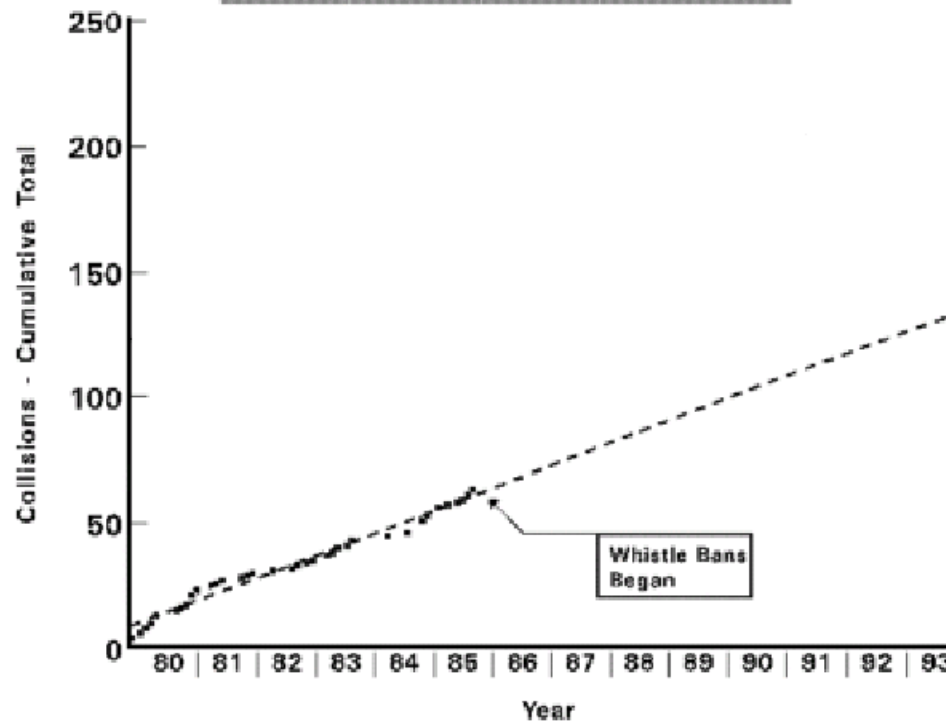


# Background

- Most states had laws that require trains to provide an audible warning while approaching public crossings
- Some states permitted whistle bans under state law or home rule
- This rule was required by statute in order to provide a National policy for train horn use

# Florida Experience

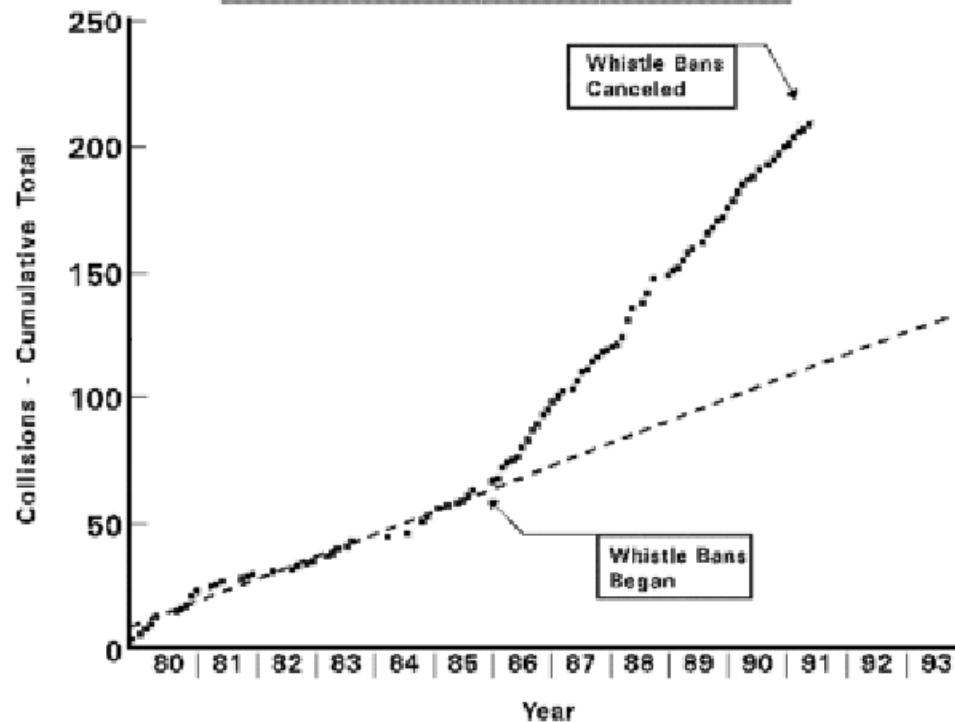
**Collisions at Crossings During 10 PM to 6AM Whistle Bans  
Florida East Coast Railroad**





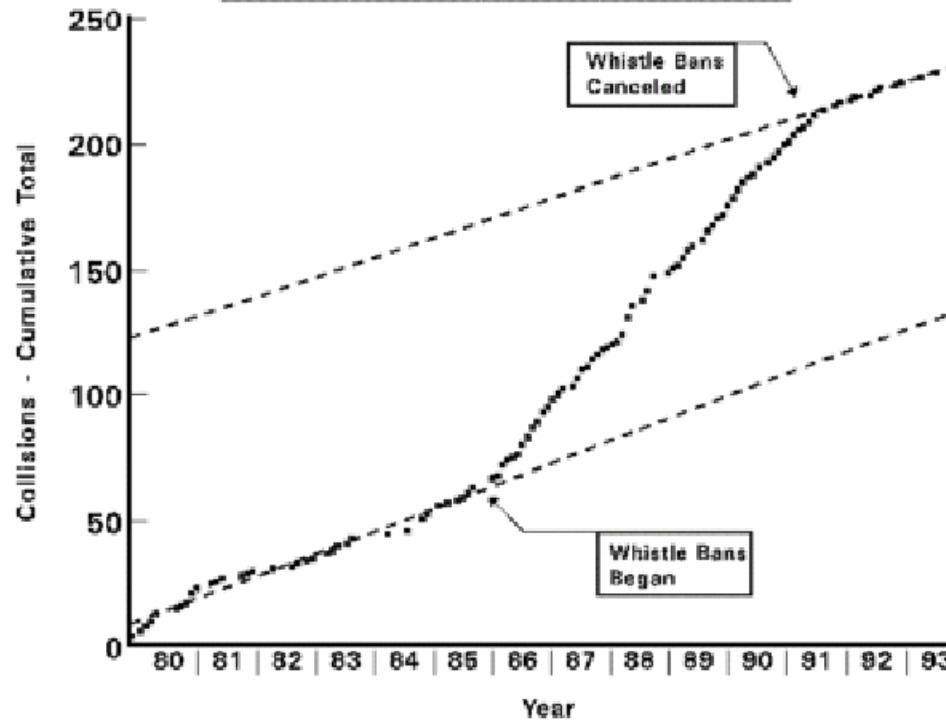
# Florida Experience

**Collisions at Crossings During 10 PM to 6AM Whistle Bans  
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# Florida Experience

**Collisions at Crossings During 10 PM to 6AM Whistle Bans  
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# National Safety Impact

- Florida - nighttime ban
  - 195% increase in collisions
- 1st Nationwide Study
  - +84% average increase in collisions
- Nationwide Study - revised
  - +62% at crossings with gates
- Rule
  - +66.8% at crossings with gates

# Study

- Considered quiet zones established between May 2005 and April 2011
- 203 quiet zones
  - 81 pre-rule
  - 121 new
  - 1 wayside horn
- 903 crossings

# Hypothesis

There will be no statistical difference between the number of incidents that occurred before the quiet zone was established and the number of incidents that occurred after the quiet zone was established.

# Statistical Analysis

- Statistical analysis was conducted on all quiet zones based on
  - Year of quiet zone establishment
  - Quiet Zone Type (New, Pre Rule)
  - Basis for establishment or BAS Section.

# Data Collection

- CCM QZ database
  - Date of establishment
  - Pre-rule or new
  - Basis of establishment
- Railroad Accident Incident Reporting System
  - Grade crossing collision reports

# Data

- Study included only the quiet zones that had been established for at least one year.
- 202 quiet zones were observed with establishment dates from May 2005 through April 2011.
  - 81 Pre-Rule
  - 121 New



# Eliminated Data

- A minimum of 12 months of observable data both prior to and following the implementation of the quiet zone was required to avoid biased estimates that could occur because of seasonal factors.
- 2 quiet zones did not contain proper NOE's and therefore were not included in the study.
- The remaining 203 quiet zones being observed were established between May 2005 and April 2011.
- Chicago exempt crossings not included

# Incident Data

- 2 groups of incident data:
  - Incidents which occurred during the year period  $N$  before the quiet zone
    - $N$  is the number of full observable years before (and after) the establishment of the quiet zone.
  - Incidents that occurred during the year period  $N$  after the quiet zone
  - Data outside of this criterion were eliminated; consequently, incidents which occurred either before or after the full 12 month period (in a 1 year study) were eliminated.

# Analysis Methodology

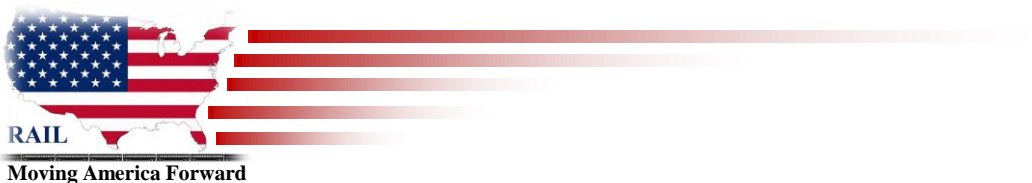
- A paired t-test is a statistical method used to compare two population means where observations in one population can be paired with observations in the other population.
- Specifically, incident data for a time interval of 1, 2, 3, 4, 5, 6 or 7 year(s) before the quiet zone was established was compared to incident data during a time interval of 1, 2, 3, 4, 5, 6 or 7 year(s) after the quiet zone was established.
- A comparison of the means of each of sample was used to analyze incidents that occurred during these specific time frames.

# Hypothesis

The null hypothesis is that there will be no statistical difference between the number of incidents that occurred before the quiet zone was established and the number of incidents that occurred after the quiet zone was established (due to the installation of SSMs or ASMs which compensate for the increased risk attributable to the lack of the horn).

# Null Hypothesis

- If the t-test value is 0.05 or less, the difference is statistically significant
- Null hypothesis is false



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# QZs Grouped By Years

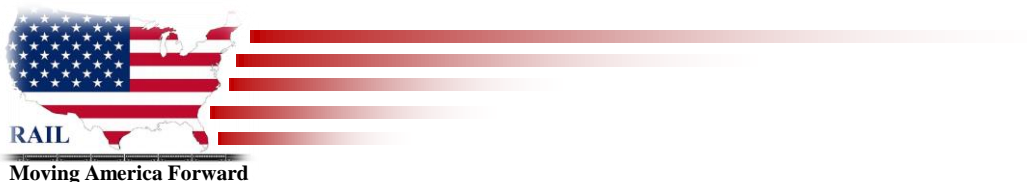
Group	Established Between		Consecutive months of data	# of QZs in group
1	May-05	April-06	84	82
1A	May-05	April-06	84	73
2	May-06	April-07	72	21
3	May-07	April-08	60	28
4	May-08	April-09	48	26
5	May-09	April-10	36	25
6	May-10	April-11	24	31
7	May-11	April-12	Not Included	

# Collision Data

Group	Observation	Incidents Before NOE	Incidents After NOE
1	82	202	178
1A	73	188	167
2	21	39	35
3	28	40	40
4	26	27	24
5	25	18	14
6	31	11	22
<b>TOTAL</b>	<b>213</b>	<b>337</b>	<b>313</b>

# Analysis

Group	Established Between		P(T<=t) two-tail
1	May-05	April-06	0.302766172
1A	May-05	April-06	0.343798355
2	May-06	April-07	0.618187035
3	May-07	April-08	1.00
4	May-08	April-09	0.822847496
5	May-09	April-10	0.294672782
6	May-10	April-11	0.025108245
7	May-11	Present	





# Quiet Zone Type

Quiet Zone Type	QZ Count	Pre Ax	Post Ax
New	122	138	133
Pre Rule	81	199	178
Wayside Horns	1	4	0
Total	204	341	311

# Analysis by Type

Quiet Zone Type	P(T<=t) two-tail	Is P-value > $\alpha = .05$ ?
New (§ 222.39)	0.790213291	Yes, FAIL TO REJECT
Pre Rule (§ 222.41)	0.350349621	Yes, FAIL TO REJECT

# Basis of Establishment

- No statistically significant difference in the number of accidents before and after the establishment of Quiet Zones observed in the BAS Sections as highlighted in **green** on the next slide.
- Not enough data in other BAS Sections for analysis

BAS Section	Description	QZs	Pre Acc	Post Acc
<b>222.39(a)(1)</b>	SSM at each Crossing	43	38	29
222.39(a)(2)(i)	QZRI <= NSRT, no SSMs	5	1	0
222.39(a)(2)(ii)	QZRI <= NSRT, with SSMs	4	1	2
<b>222.39(a)(3)</b>	QZRI <= RIWH with SSMs	48	75	85
222.39(b)	Public Authority Application	1	0	1
<b>222.39(b)(4)(i)(A)</b>	App QZRI<= RIWH	20	20	16
222.39(b)(4)(i)(B)	App QZRI<= NSRT	0	0	0
222.41(a)(1)(i)	SSM at each Crossing	2	1	0
<b>222.41(a)(1)(ii)</b>	QZRI <= NSRT	40	107	96
<b>222.41(a)(1)(iii)</b>	NSRT<= QZRI<= 2 x NSRT, no relevant collisions	16	24	25
<b>222.41(a)(1)(iv)</b>	QZRI <= RIWH	4	15	24
<b>222.41(b)(1)(i)</b>	Partial QZ, SSM at each Crossing	0	0	0

# Conclusions

- No significant difference in collisions before and after the establishment of quiet zones
  - Overall
  - Pre-rule or New
  - By year except for the latest year – unexplained and will need further analysis.

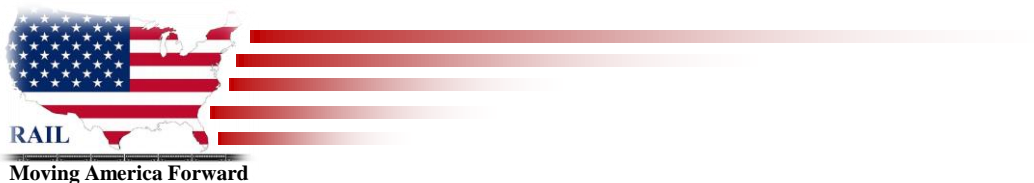
# Questions?

Thank you to Marquese Lewis.

Ron Ries

[Ron.ries@dot.gov](mailto:Ron.ries@dot.gov)

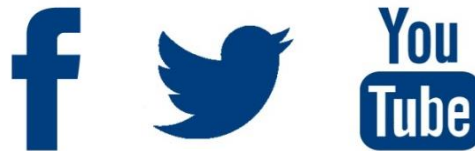
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