New Initiative Needed to Prevent Railroad Trespassing & Suicides

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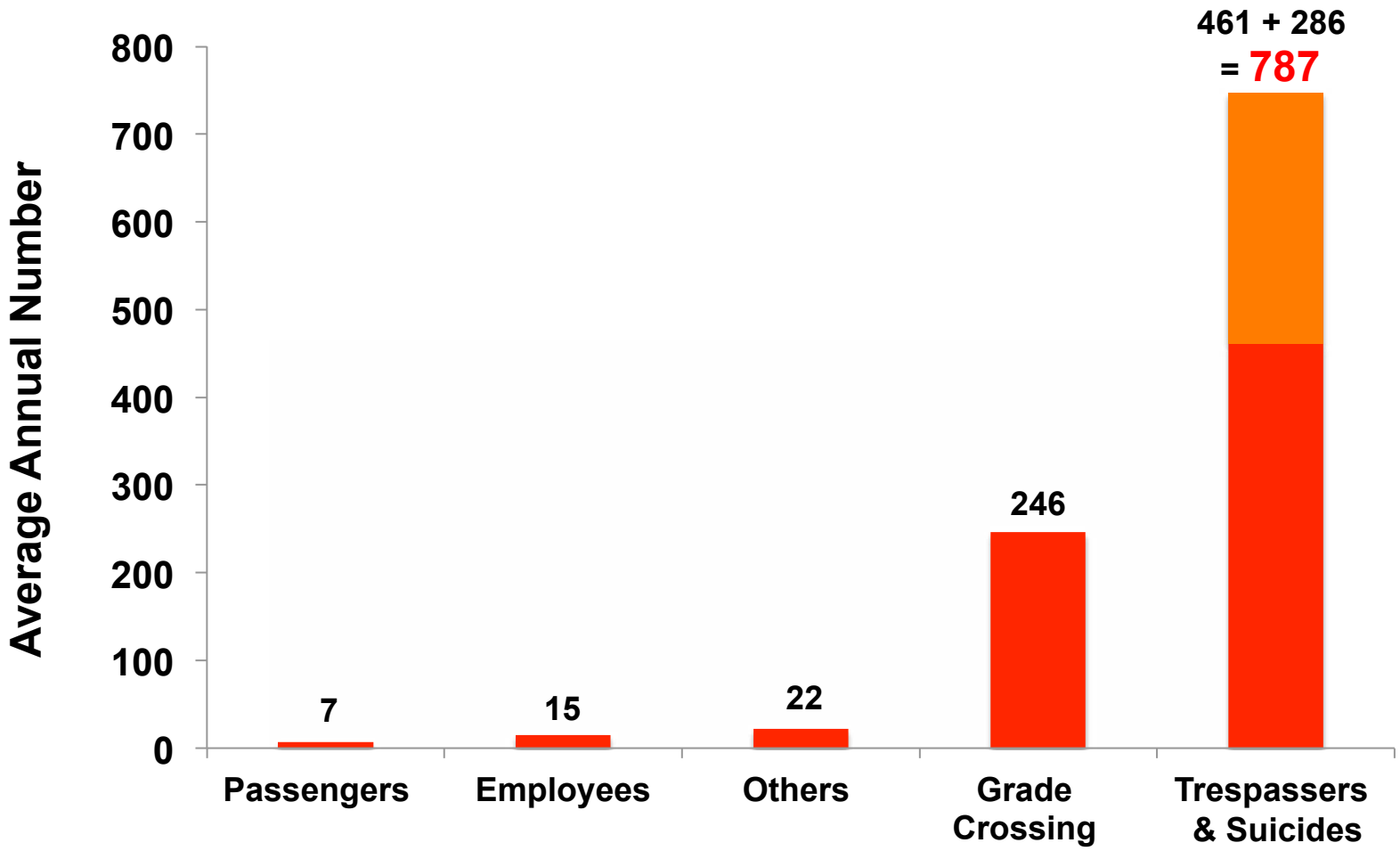
Presentation Outline

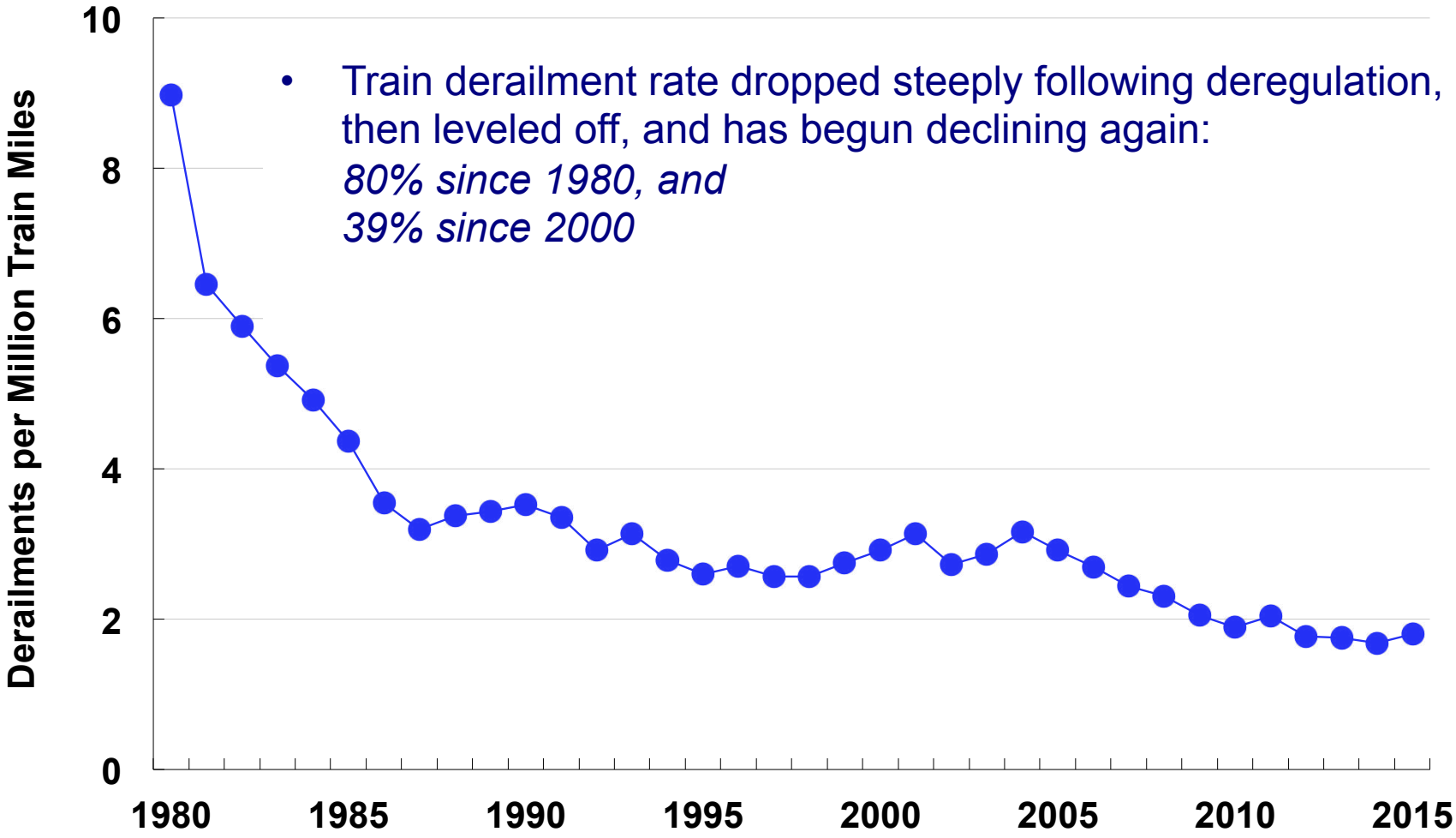
- Causes of railroad fatalities
- Trends in railroad safety
- Institutional successes & challenges
- Further understanding is essential to effective solutions
- Macro and micro-level risk based approach
- Technology options to quantify
- Pokémon Go: a new threat *(and a new opportunity?)*
- Possible path forward

Cause Distribution of U.S. Railroad Fatalities



- Five year averages

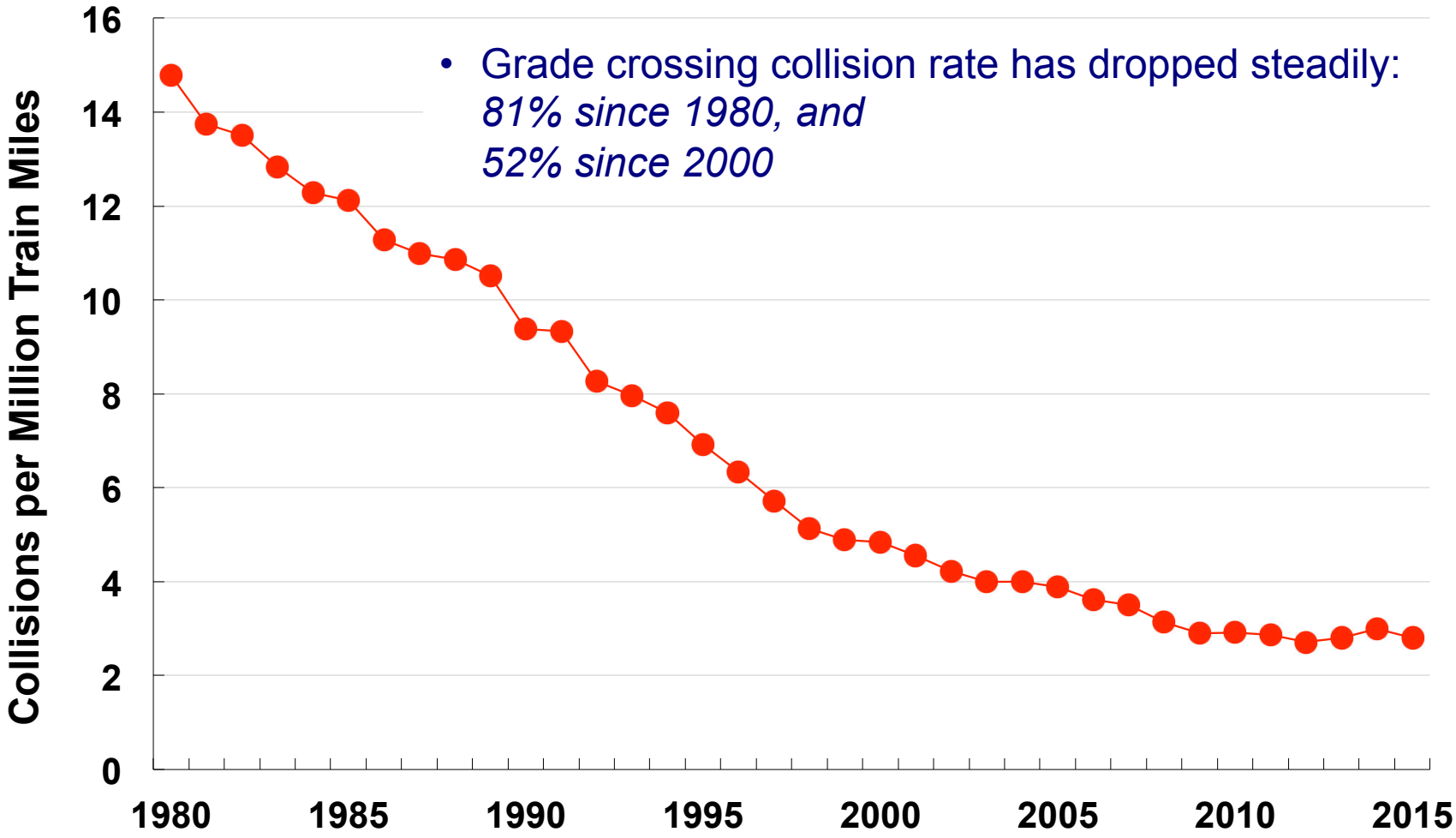
25-year decline in railroad derailment rate



- Train derailment rate dropped steeply following deregulation, then leveled off, and has begun declining again:
  80% since 1980, and
  39% since 2000

FRA Data

25-year decline in grade crossing collision rate



- Grade crossing collision rate has dropped steadily:
  81% since 1980, and
  52% since 2000

FRA Data

No significant progress in trespasser fatalities

- Trespasser fatality rate has fluctuated over the past 30 years, but essentially unchanged
- Concern about increase in last two years
- Beginning in 2011, FRA began recording suicides
- Shone new light on the magnitude of the problem

FRA Data

Why so much progress in train derailments and grade crossings, but not trespasser/suicides?

- **Institutional**
  - Railroads control most causes of derailments
  - Railroads and highway departments have long-established, relationships and protocols for grade crossing safety
  - Complex set of stake-holders for trespassing and suicide prevention and no thoroughly unified approach
- **Technical**
  - Railroads have deep, well-established understanding of operating safety protocols and safe designs for infrastructure and rolling stock
  - Railroads and highway departments have a well-established set of standards for warning systems and prioritization of installation
  - Incomplete understanding of problem and the effectiveness of feasible technical solutions

Why so much progress in train derailments and grade crossings, but not trespasser/suicides?

- **Organizational**
  - Coordinated commitment to R&D by AAR, FRA and railroads
  - Coordinated commitment through Operation Lifesaver, Inc. (OLI)
  - Trespassers are part of OLI mission, but should this be expanded?
- **Funding**
  - Railroads have inherent financial interest in derailment prevention
  - Dedicated Section 130 funding for grade crossing safety improvement
  - No dedicated funding source to address the problem
- **"Ownership"**
  - Railroads "own" derailments
  - Railroads and highway departments "own" grade crossings
  - Who "owns" trespasser and suicide problem?

Railroad safety & technology research and investment

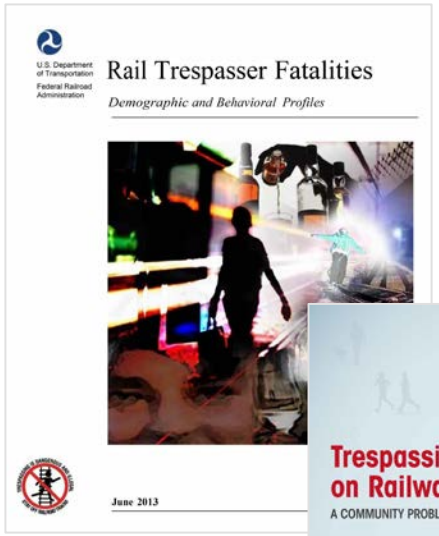
- Systematic, data-driven approach to railroad safety R&D and investment
  - Analysis of FRA, AAR, and railroad data
  - Coordinated, pro-active, R&D program addressing most-important topics
    - Improve component and system designs
    - Develop new technologies
  - Extensive investment in most promising approaches
- Parallel success with highway-rail grade crossing safety
  - Decades of research to understand problem
    - Development of engineering solutions and new technologies
    - Strong, coordinated focus on educational programs
  - Quantitative models to identify highest risk crossings
  - Prioritized investment in engineering, education and enforcement of grade crossing safety

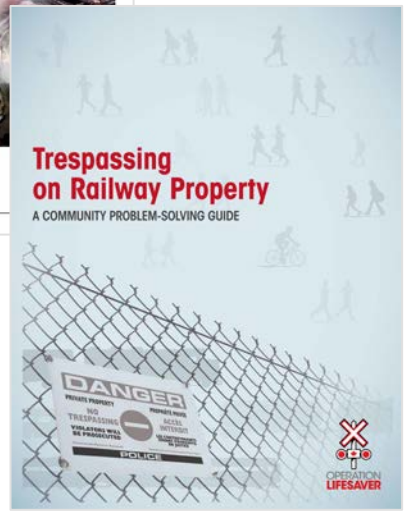
No comparable parallel focus to solve trespasser/suicide problem

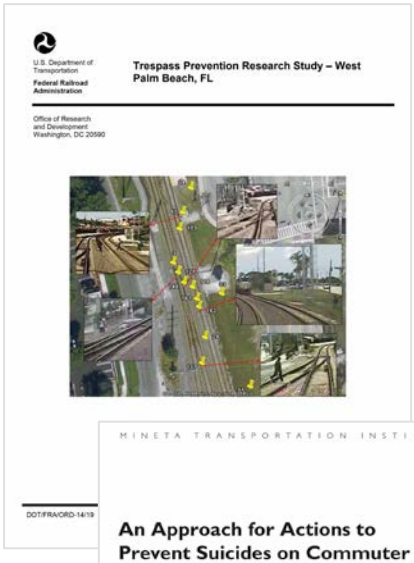
- OLI and others have made this a substantial focus of their efforts
- FRA and others have conducted useful and informative research
- But the data speak to the need for something *new*, *additional* or *different* than previous efforts
- We are doing the same thing but hoping for a different outcome
- We need to *change* our approach to this problem
  - More implementation
  - Smarter application
  - New solutions

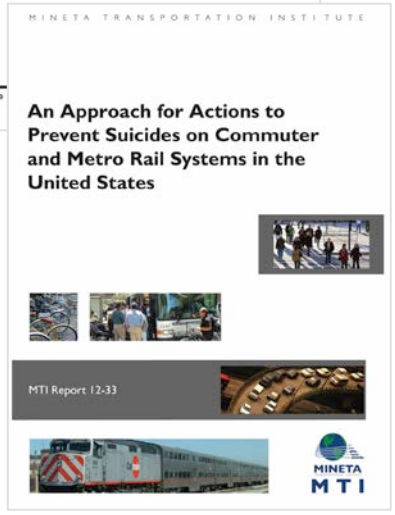
Effective Solutions Require Understanding the Problem

- Trespasser problem has multiple dimensions
- Where are they?
  - Stations
  - Grade crossings
  - Along ROW
- Who are they?
  - Passengers
  - Pedestrians
- Why are they there?
  - Pedestrians
    - Barrier to cross
    - Path to destination
  - Destination
    - Loitering and socializing
  - Impaired – Judgment affected by drugs or alcohol
  - Homeless & hoboes
  - Malicious – theft or vandalism
  - Suicidal – use railroad to inflict harm on one's self







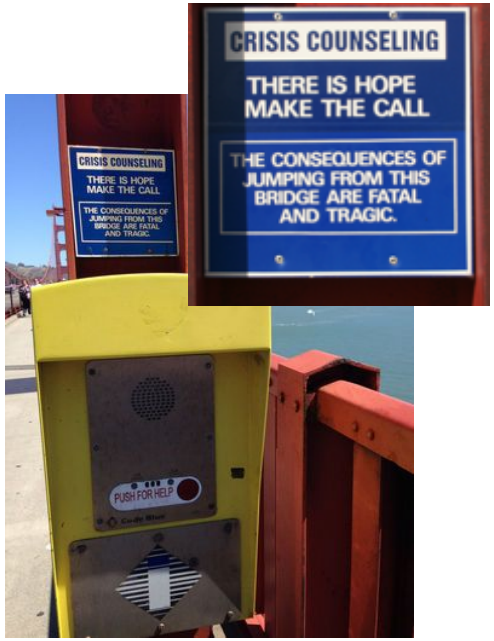


What is the role of technology?

- Detection
- Quantification
- Prevention
- Mitigation

Trespassing versus Suicide

- Problems are related in some ways but highly distinct in others
- Some types of preventive measures may address both problems, but others will only help one or the other
- These distinctions must be understood when evaluating which solutions to use and under what circumstances



Havârneanu et al review and analysis of literature on railroad trespasser & suicide prevention

- Havârneanu with the International Union of Railways
- Conducted an extensive review of the literature
- 139 publications ranging from 1978 to 2014

Accident Analysis and Prevention 81 (2015) 30–50

Contents lists available at ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

A systematic review of the literature on safety measures to prevent railway suicides and trespassing accidents

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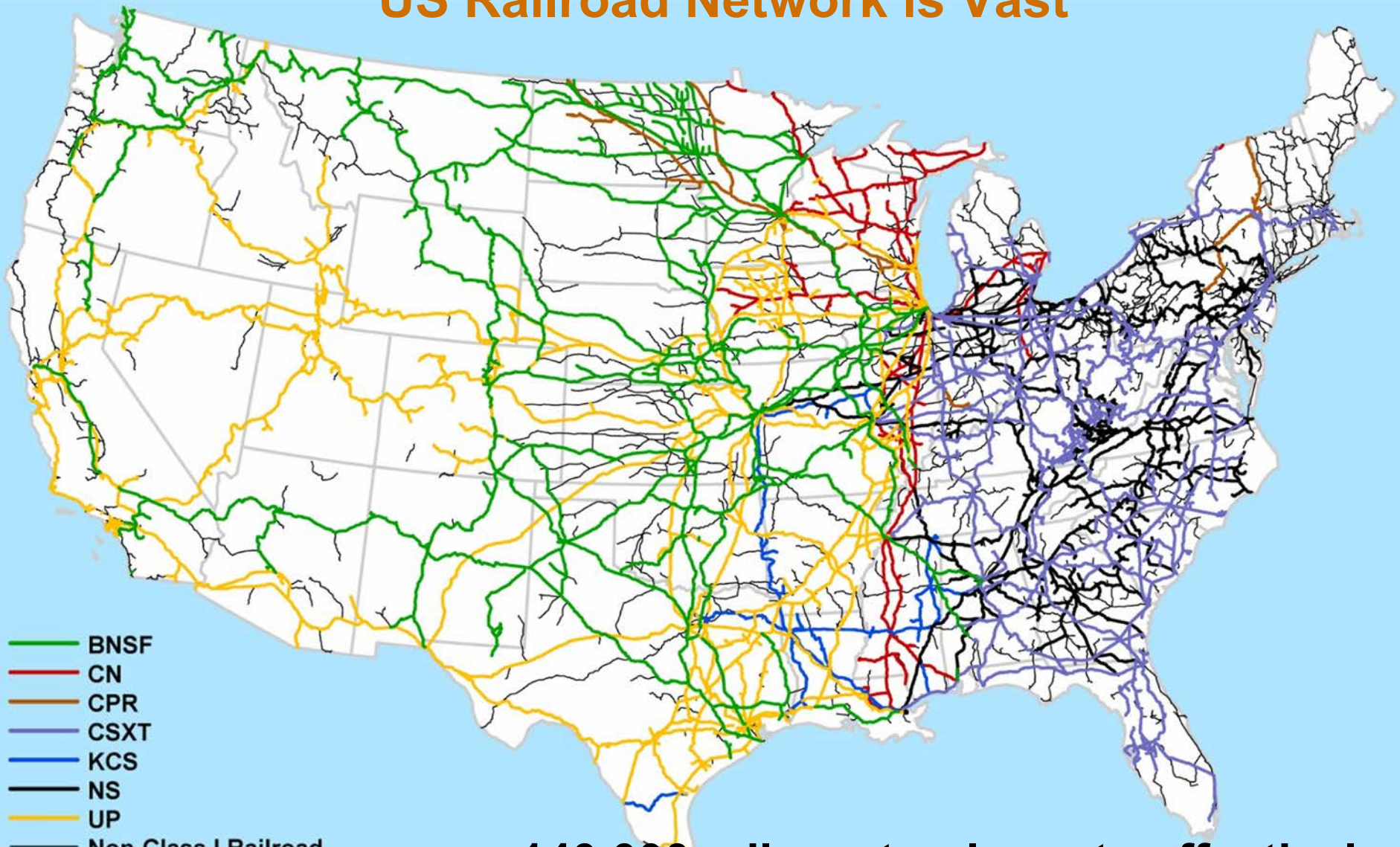
US Railroad Network is Vast

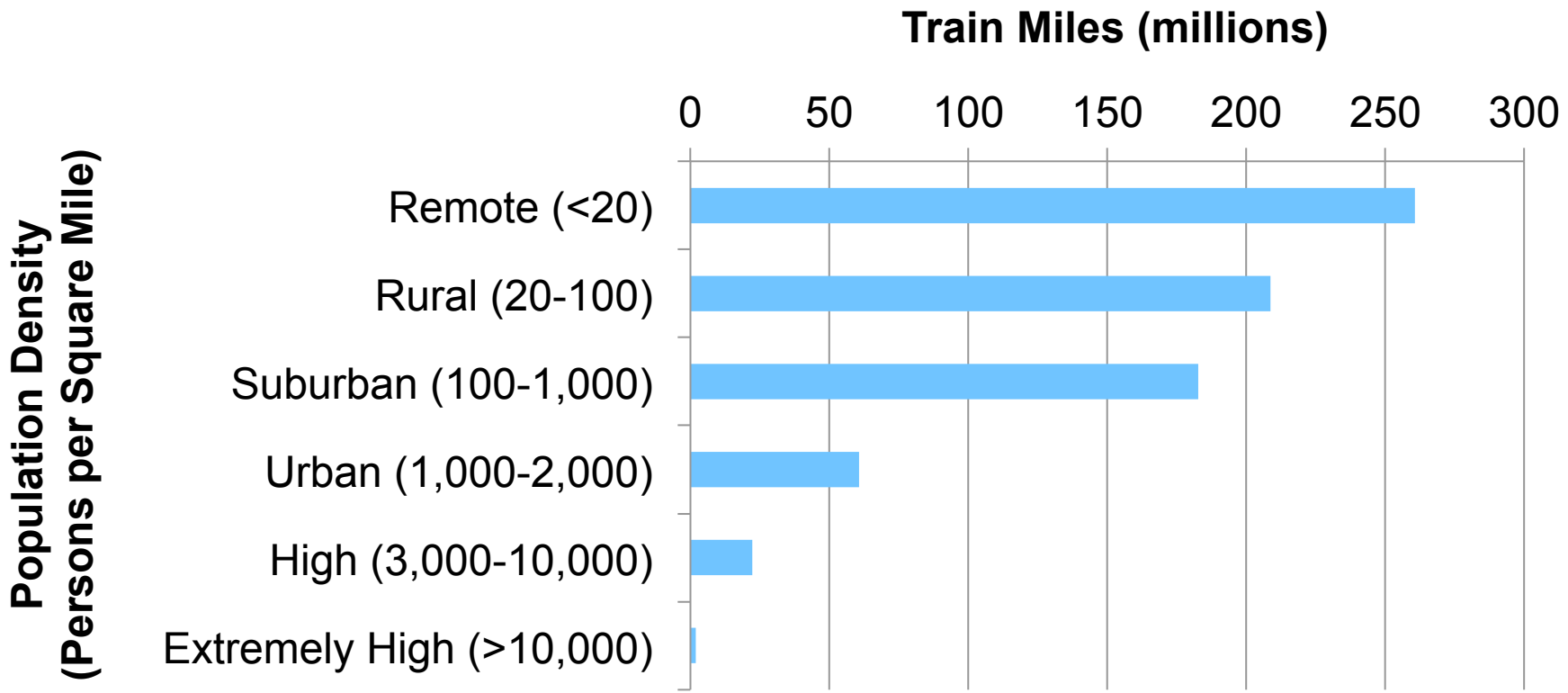


140,000 miles – too large to effectively patrol & prevent trespassing

Where do we allocate resources?

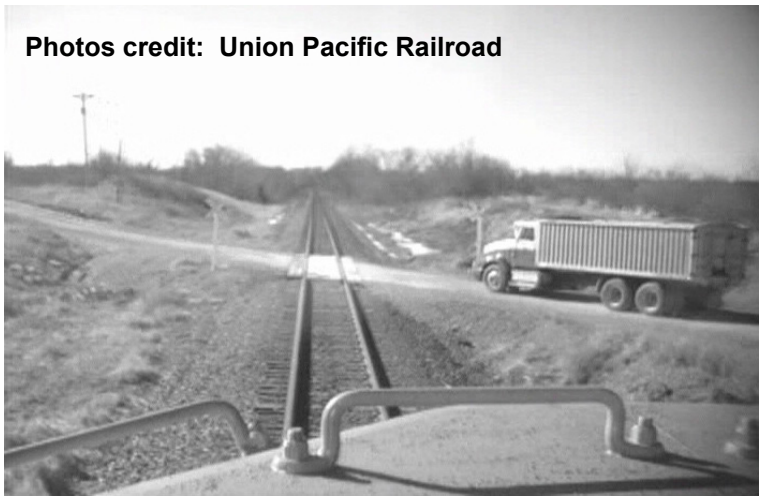
- Risk-based approach needed
- First step geographical - must understand where the problem occurs
  - **Macro** – Statistical analysis of network level factors affecting trespass occurrence and incidents
    - GIS analysis of trespasser & suicide incidents
    - Need precursor data, where & when do “near hits” occur?
    - Develop technology to automatically identify and geocode
    - Identify areas and predictive factors requiring more detailed analysis
  - **Micro** – Focused analysis of specific local conditions
    - Where, when & why occurring
    - What factors affecting
    - Targeted prevention and mitigation

Estimate* of population density exposure to U.S. railroad train traffic



* This distribution is derived from a different, prior study and is presented here for illustration purposes and It should not be considered representative. A new, up-to-date investigation is planned

Front-facing locomotive cameras



- Can this technology be adapted to quantify trespasser occurrences?

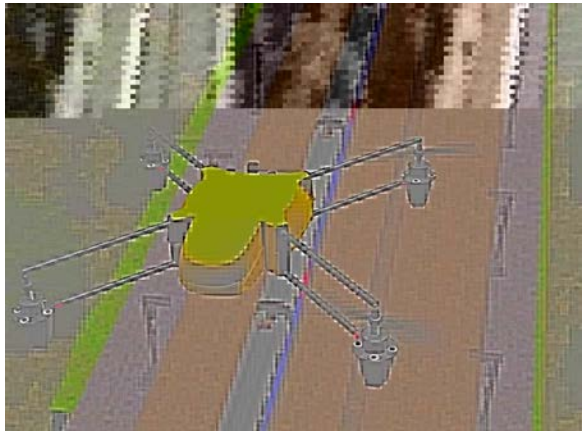
Front-facing locomotive cameras

- Develop machine-vision algorithms to detect trespassers
- Integrate with GPS location info
- Automated quantification of trespasser locations
- Identify “hot spots” for prioritized prevention and mitigation

Photo credit: FRA Trespass Prevention Research Study – West Palm Beach, FL

Localized detection & monitoring technologies

- Surveillance (personnel or CCTV)
- Automated intrusion detection technologies: fences, visual, infrared, etc.
- UAVs - offer a whole new set of opportunities for detection (and possibly deterrence as well)

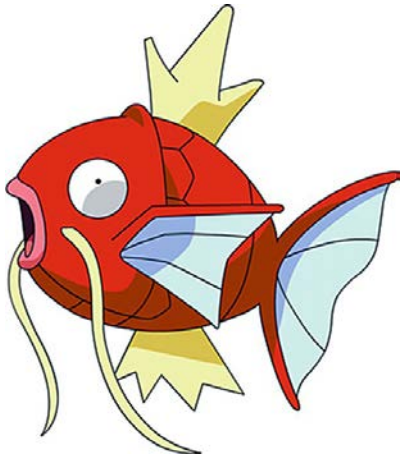


Pokémon Go: A new hazard

- Pokémon Go ("Augmented Reality" game) has created a new incentive to trespass
- Players chasing Pokémon have been found trespassing on railroad tracks and entering railyards
- FRA and AAR wrote a joint letter to Niantic Labs CEO (Pokémon Go creator) requesting that they seek ways to discourage unsafe behavior near railroad tracks

Pokémon NO!

- Can Pokémon Go be used to discourage railroad trespassing?
- Challenged some Pokémon players for some ideas
  - Developer should never place any game feather on railroad property
  - Railroad routes and affected areas could be marked in red on the Pokémon Go map, so players can easily see them
  - Disable Pokémon App when too close to railroads including when crossing tracks at grade crossings
  - If a player gets too close to a rail line an audio and visual alarm would alert the player
  - If the player does not depart they will lose a Pokémon buddy or downgrade their level



Pokémon YES!

- Positive incentives as well
- A reward policy could be set up
  - When a player finds a rail route or rail area not marked on the Pokémon Go map, they can report it
  - They will have a chance to choose a new Pokémon they do not own, or get Pokémon candy

- **More generally, are there ways we can use personal device technology to *help* with the trespasser/suicide problem?**

A Cliché, a Corollary and an Approach

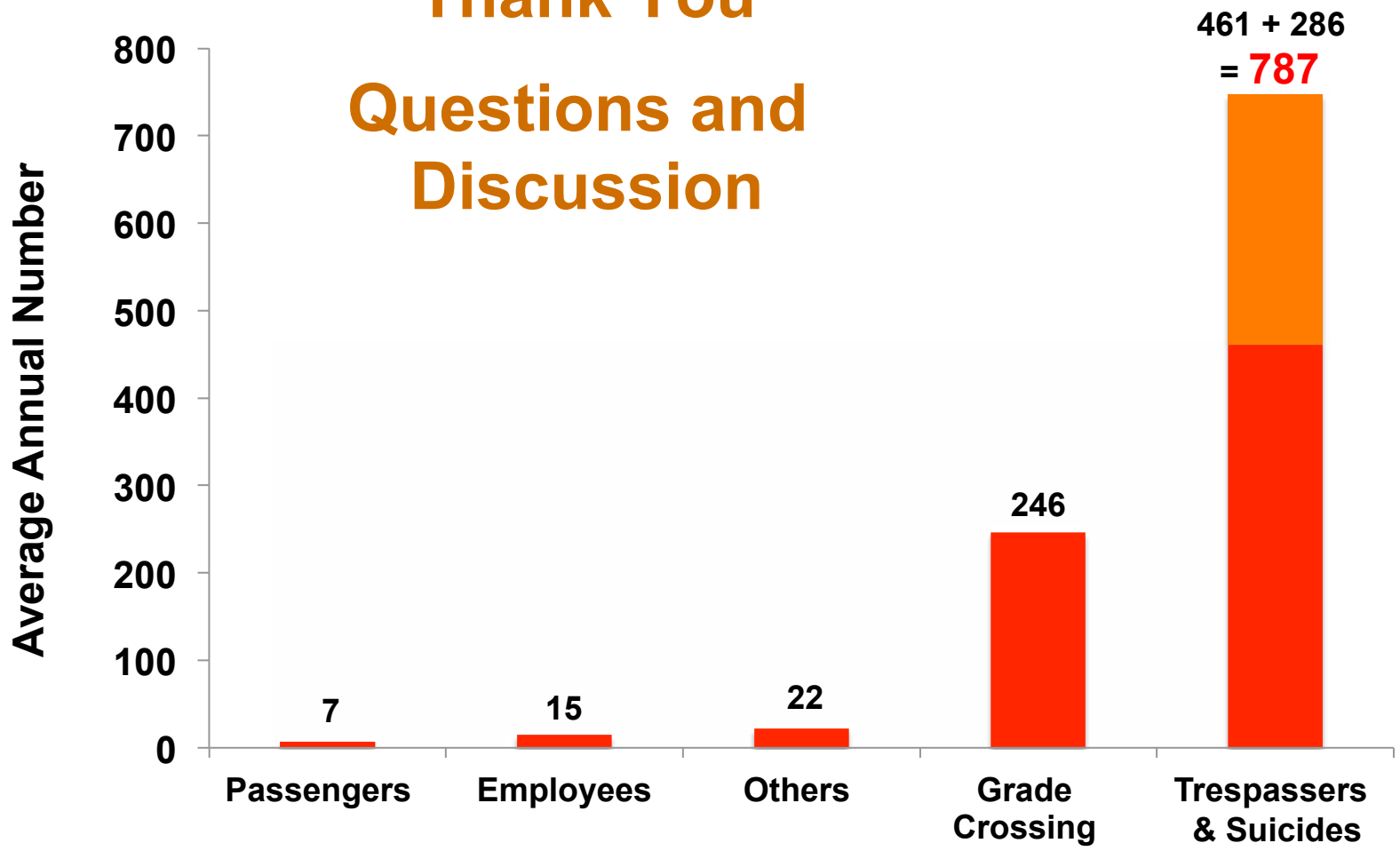
- No “Silver Bullets”
  - Complex, multi-faceted problem – no one or two solutions will solve it
- Perfect is the Enemy of the Good
  - We should not shy away from implementation of partial solutions
- But we must be *“data-driven”* in search of the most effective solutions
- Develop, risk-based approach that can be effectively adapted to local conditions
- FRA, AAR, OLI, APTA, FTA, State agencies and others should take leadership in understanding problem, developing solutions and *assisting communities to implement them*

New Initiative

- Interdisciplinary Task Force to thoroughly understand problem and develop suite of solutions – both general and contextual
- Leadership and expertise in:
  - Railroad engineering, transportation and casualty prevention
  - Human factors
  - Psychology
  - Law enforcement
  - Pedestrian safety
  - Drug and alcohol
  - Risk analysis
  - Communities
  - Education & educators
  - Urban and community planning
- *Sustained funding, implementation and ongoing follow-up essential*

Thank You

Questions and Discussion



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