



Transportation Technology Center, Inc., a subsidiary of the Association of American Railroads



Railroad Bridge Opportunities for Big Data

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**UNL BRIDGE-ing Big Data
Workshop**

A scenic landscape featuring a mountain range in the background under a cloudy sky. The foreground is dominated by a dense forest with trees in various shades of green and yellow, indicating autumn. A long, dark bridge spans across the middle ground, with a train consisting of several black and yellow locomotives and cars crossing it. The overall scene is a mix of natural beauty and industrial infrastructure.

Presentation Overview

- ◆ **Railroads & Large Volumes of Data**
- ◆ **Opportunities Using Existing Bridge Records**
- ◆ **Future Opportunities**
- ◆ **Potential Uses**
- ◆ **Leading Causes of RR Bridge Service Outages**
- ◆ **Challenges & Cautions**

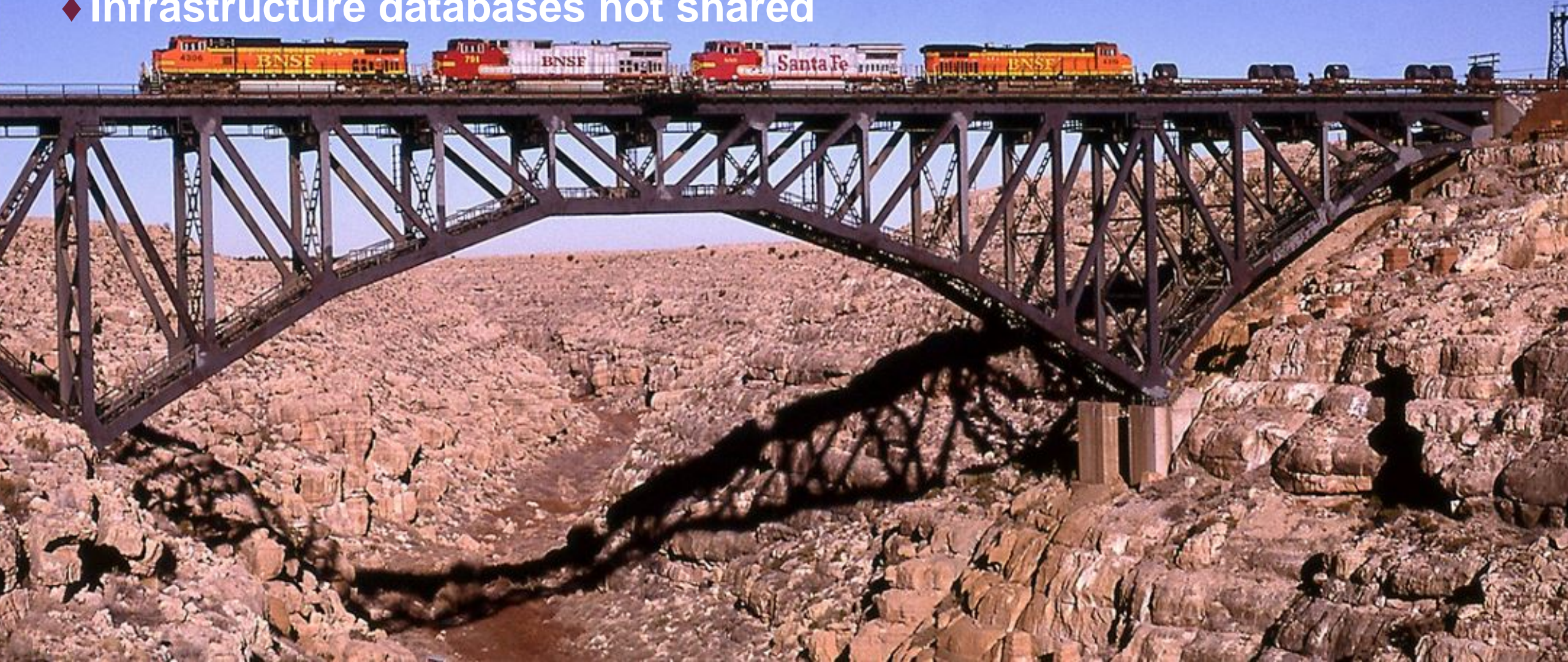
Railroads & Large Volumes of Data

- ◆ 1.5 million freight cars on network
- ◆ Each car tracked & trended using wayside detection systems
 - Car performance & maintenance forecast
 - Car characteristics & repair billing
- ◆ Industrywide shared databases



Railroads & Large Volumes of Data

- ◆ Major US freight RRs own 15,000 miles to 26,000 route miles each (95,000 miles total)
- ◆ Infrastructure databases not shared



Railroads & Large Volumes of Data

- ◆ Major US freight RRs own 60,000 bridges
- ◆ Over 1,400 miles or 7.6 million feet
- ◆ Each major RR owns more than 10,000 bridges



Opportunities Using Existing Records

- ◆ Tonnage amounts & types over each bridge
- ◆ Some historical traffic records
- ◆ Load capacity ratings
- ◆ Annual inspection records
- ◆ Maintenance records & expenditures



Railroad Bridges & Big Data

An aerial photograph of a long, multi-arched railroad bridge spanning a river valley. The bridge is constructed of concrete and features a series of repeating arches. A train is visible crossing the bridge. The surrounding landscape is lush with green trees and a small town is visible in the background.

Opportunities Using Existing Records

- ◆ Photos & video increasingly available
- ◆ Scans of plans & records now available
- ◆ Speed restrictions & maintenance calls

Future Opportunities

- ◆ Robotic-assisted inspection (UAV, spider, monkey, crawler)
- ◆ Machine vision detection of condition changes
- ◆ Programmed inspection route



Future Opportunities

◆ Vehicle-based detections

- Track geometry & track deflection cars
- Equipped locomotives

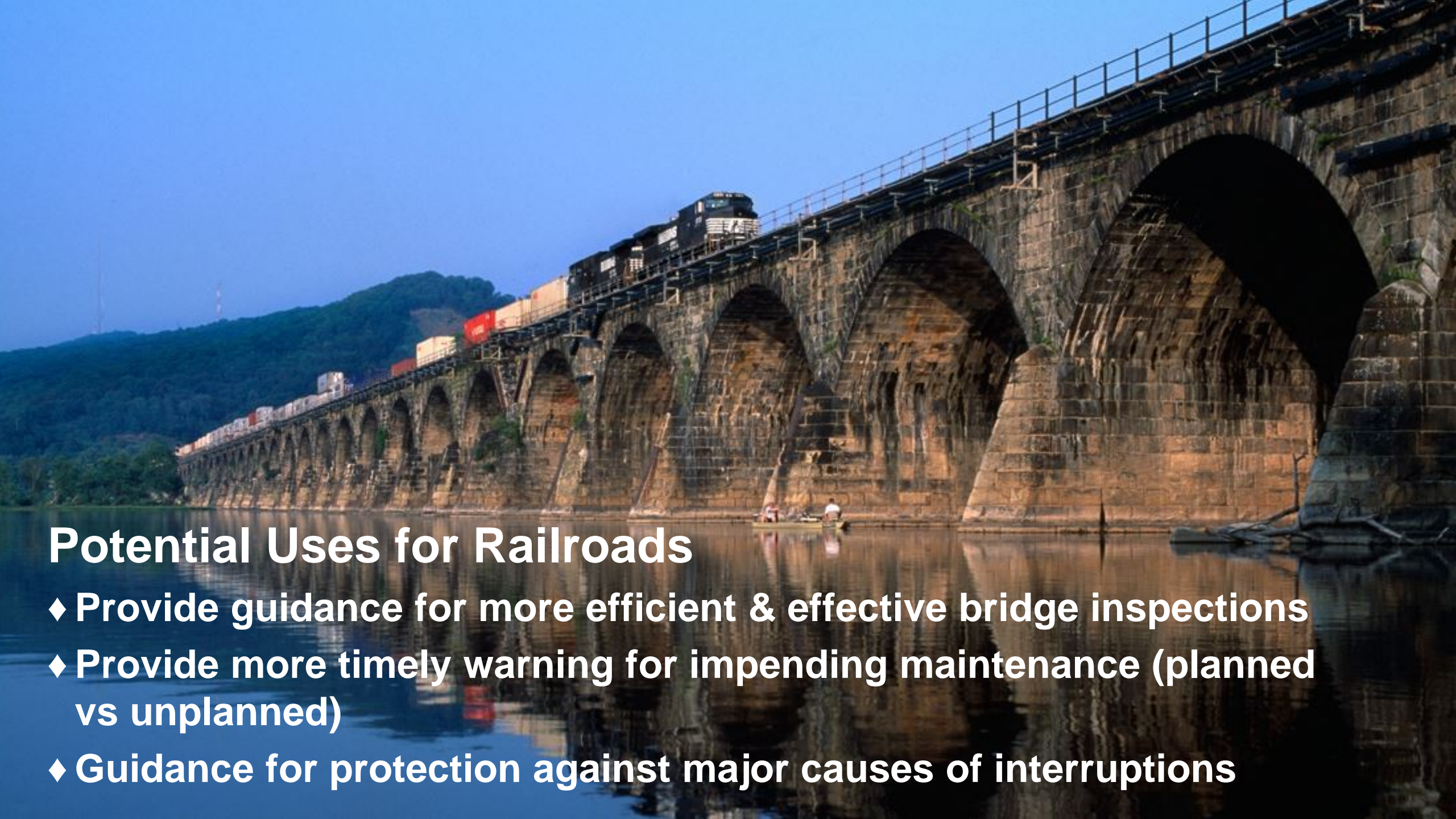
◆ Signature identification & trending needed



Potential Uses for Railroads

- ◆ Railroads are a very capital intensive business
- ◆ Better capital planning (shareholder funds)
- ◆ Reduction of speed restrictions & service interruptions (unplanned capacity reduction)





Potential Uses for Railroads

- ◆ Provide guidance for more efficient & effective bridge inspections
- ◆ Provide more timely warning for impending maintenance (planned vs unplanned)
- ◆ Guidance for protection against major causes of interruptions



Leading Causes for Railroad Bridge Service Interruptions

- ◆ **Vehicle strikes**
Highway, marine, & rail vehicles or loads
- ◆ **Hydraulic events (flood, scour, washout, etc.)**

Leading Causes for Railroad Bridge Service Interruptions

- ◆ Movable bridge issues, particularly related to signal system & interlocks
- ◆ Fire, especially timber bridges



Challenges & Cautions

- ◆ Big data can provide a wealth of information
- ◆ Railroads need data to be appropriate
- ◆ Can big data help better plan & prepare for bridge maintenance & capital spending?



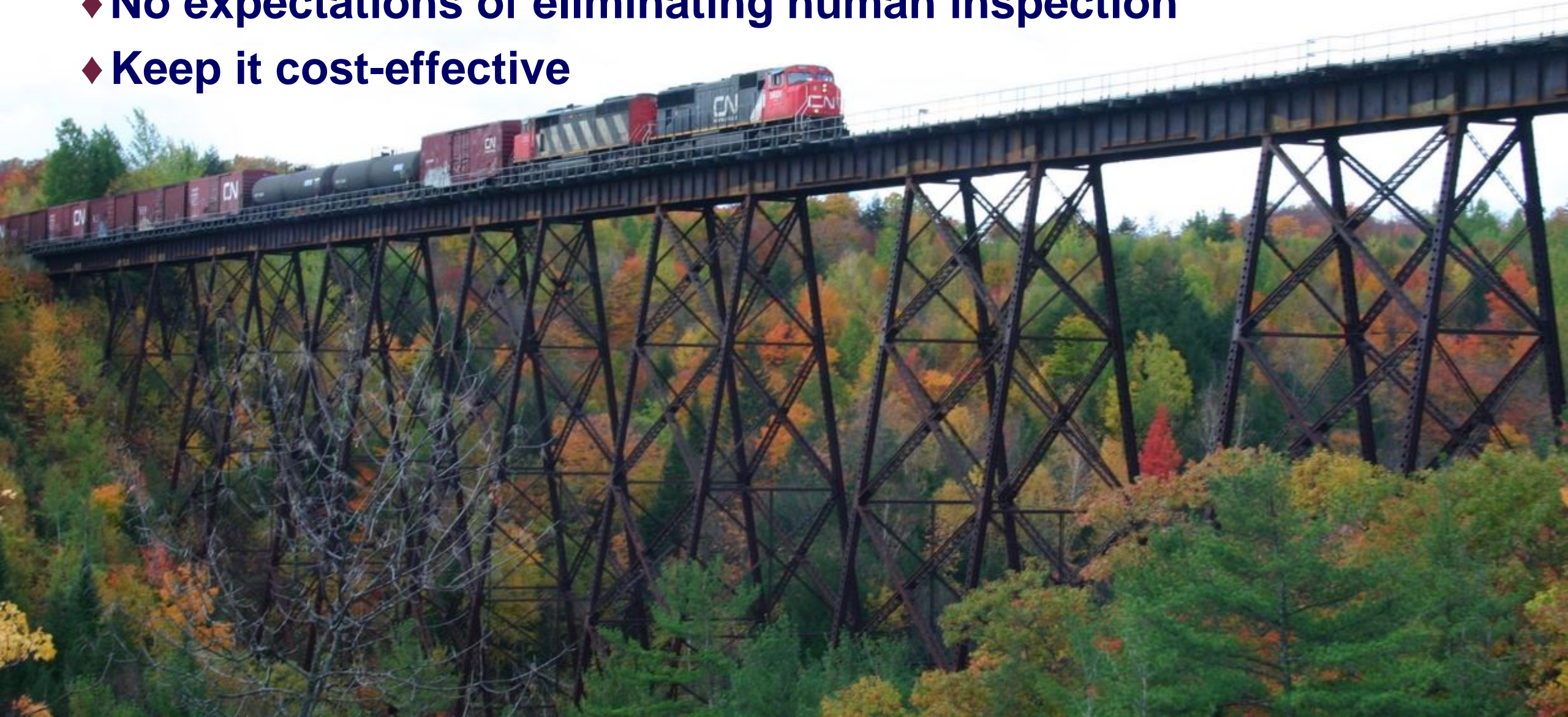
Challenges & Cautions

- ◆ Railroads need actionable information
- ◆ Can big data help prevent, protect against, or prepare for unplanned service outages?



Challenges & Cautions

- ◆ No expectations of eliminating human inspection
- ◆ Keep it cost-effective



Two Things a Railroader Wants to Learn

- ◆ What can big data tell railroads that we don't already know about our bridges?
- ◆ How can big data help railroads better manage our bridge inventories & capital replacement decisions?



Questions? Comments? Answers?



Photos courtesy of:
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