

Background

- Low-volume roads (LVRs) are an integral part of the US highway system providing critical access to remote rural areas.
- On low-volume roads, crash occurrence, particularly fatal and serious injury crashes, is less frequent. This makes it difficult to identify candidate sites on the network for possible safety improvements using historical crash data.
- There is a need for identifying candidate sites for safety improvements on low-volume roads without solely relying on crash history.



Research Objective

The project objective was to develop a method for identifying candidate sites for safety improvements on low-volume roads without solely relying on crash history. The prospective method would help to reduce crash numbers and severities occurring on the low-volume roads.

Key Project Tasks and Findings

- State-of-the-art review
 - Review included network screening methods and risk factors.
- Develop criteria for assessing screening methods
 - Eight criteria were developed for assessing screening methods.
- State-of-the-practice review
 - Lack of empirical or science-based methods for network screening on low-volume roads
- Assessment of screening methodologies
 - Conventional crash frequency, rate, and severity method as well as the empirical bayes (EB) method scored the highest.

- Develop new methodology for screening LVRs network in Montana
 - A methodology was developed for network screening using roadway characteristics, traffic characteristics and crash history
- Economic assessment of the proposed methodology
 - The benefit-to-cost ratio for using the proposed methodology varied between 16 and 23.

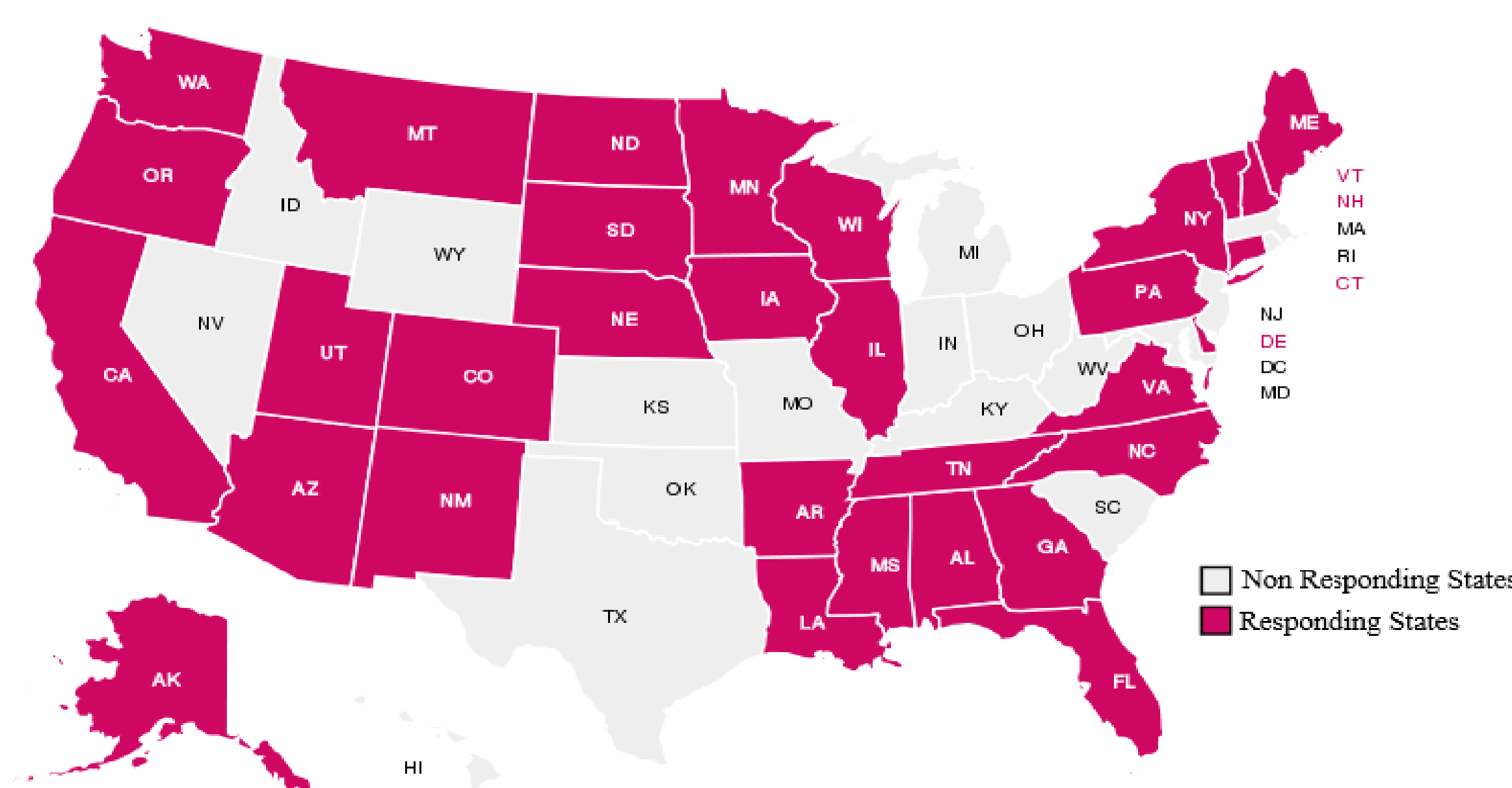


Figure 1: States Responding to Project Practice Survey

New Methodology

LVR Segments Ranking Scheme	
Safety-Related Questions	If yes, add:
Risk Factors	
Total width (TD)	
<i>TD ≤ 20 ft.?</i>	7
<i>20 ft. < TD ≤ 24 ft.?</i>	4
Horizontal curve?	
<i>Flatter curve (R ≥ 300 ft.)</i>	30
<i>Sharper curve (R < 300 ft.)</i>	60
Grade steeper than ± 4%?	3
Six or more driveways per mile?	5
Side slope steeper than 1V:3H?	4
Fixed objects within 15 ft of travel lane?	4
Unpaved Road?	14
Poor pavement condition? (rutting, potholes, etc.)	7
Crash History?	
Fatal or serious injury crashes (N ₁)	N ₁ X 80
Other crashes (N ₂)	N ₂ X 5
Relative Risk Compound Score (RRCS)	
Speed ≥ 50 mph?	RRCS X 1.25
Got ADT?	
<i>ADT ≤ 300</i>	RRCS X 1.0
<i>300 < ADT ≤ 600</i>	RRCS X 3.0
<i>600 < ADT ≤ 1000</i>	RRCS X 5.0
<i>ADT > 1000</i>	RRCS X 7.0
Global Risk Score (GRS)	

Figure 2: Relative Risk Ranking Scheme for Roadway Segments

LVR Intersections Ranking Scheme	
Safety-Related Questions	If yes, add:
Baseline Score	
	50
Roadway Factors	
Skew angle > 20 deg ?	10
Non-controlled intersection?	60
Lighting?	-7
Left-turn lanes on non-controlled approach?	-30
Crash History?	
Fatal or serious injury crashes (N ₁)	N ₁ X 80
Other crashes (N ₂)	N ₂ X 5
Relative Risk Compound Score (RRCS)	
Got ADT?	
<i>ADT_{int} ≤ 600</i>	RRCS X 1.0
<i>600 < ADT_{int} ≤ 1200</i>	RRCS X 2.0
<i>1200 < ADT_{int} ≤ 2000</i>	RRCS X 4.0
<i>ADT_{int} > 2000</i>	RRCS X 6.0
Global Risk Score (GRS)	

Figure 3: Relative Risk Ranking Scheme for Intersections

- Method is based on safety principles and empirical evidence.
- Method does not rely on crash history alone.
- Method requires information that can easily be acquired.
- Method can be used by staff with limited technical background.

Recommendations

- Conduct a periodic review to ensure that the HSIP funding being spent on low-volume roads roughly balances with the higher severity crashes occurring on these roads.
- Assign safety management staff and resources to focus on low-volume road safety. Low-volume roads have unique safety challenges and involve multi-agency ownership.
- Implement the proposed network screening methodology for identifying and ranking candidate sites for safety improvement projects. Applying the proposed methodology has potential in improving safety on these roads.
- A large proportion of low-volume roads are owned by local agencies. Appropriate outreach and education on the use of the proposed methodology should be provided to local agency staff. This allows their successful engagement in the new network screening process.
- Until the full implementation of the proposed methodology is realized, it is recommended to use the proposed method in the interim for ranking sites as part of identifying systemic safety improvement project sites, or as part of selecting safety improvement project sites on local roads.