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## Introduction

In Vermont, lane departure crashes account for over 70% of fatal and serious injury crashes. While they represent a large number, the locations where these crashes occur change from year to year. The challenge of finding where lane departure crashes are likely to take place can be resolved by using the systemic method since the site characteristics associated with these crashes are stable and identifiable. The purpose of this project was to identify those site characteristics and assess the crash risk of every curves and straight road segments on all public roads in Vermont in order to proactively implement treatments.

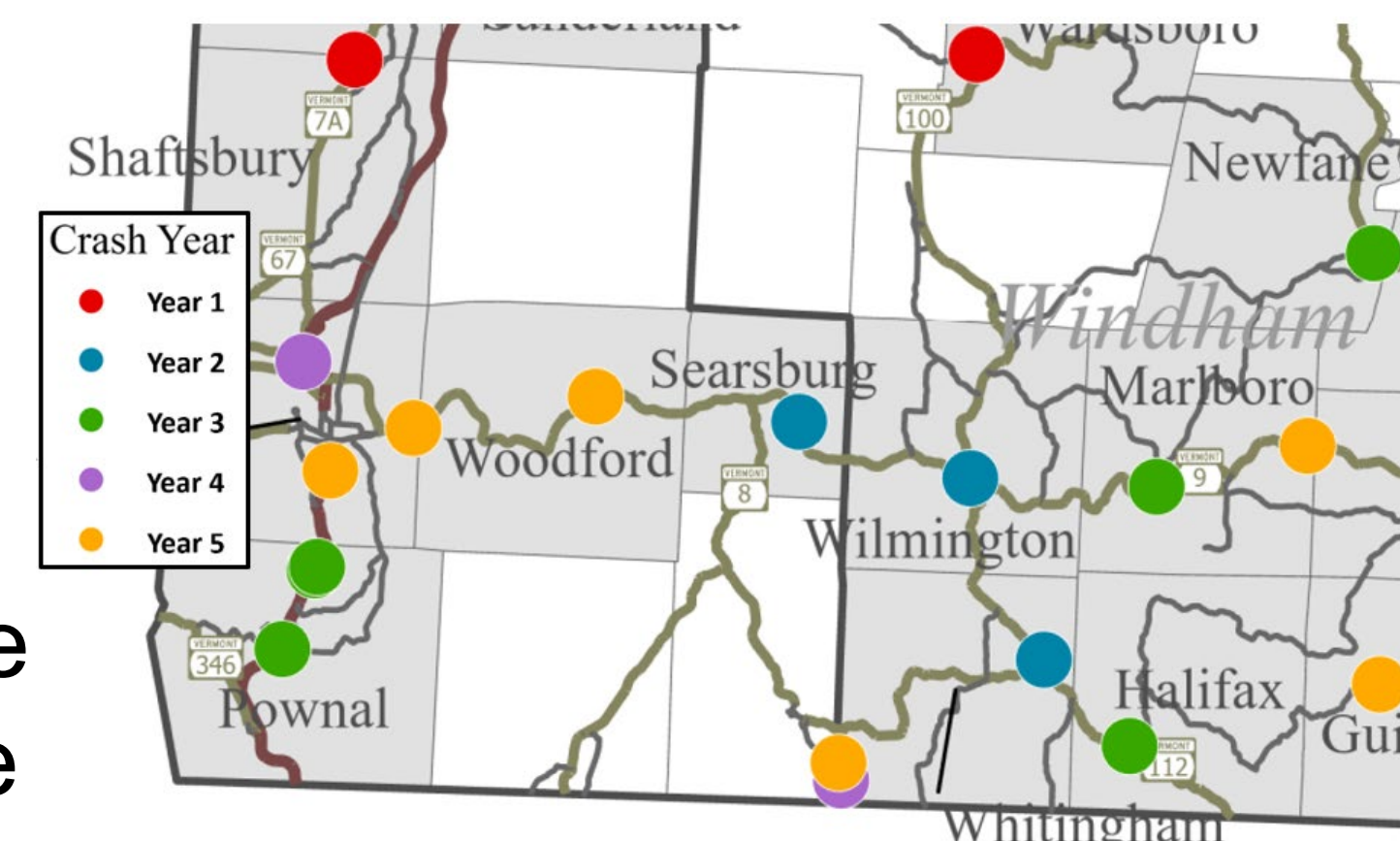
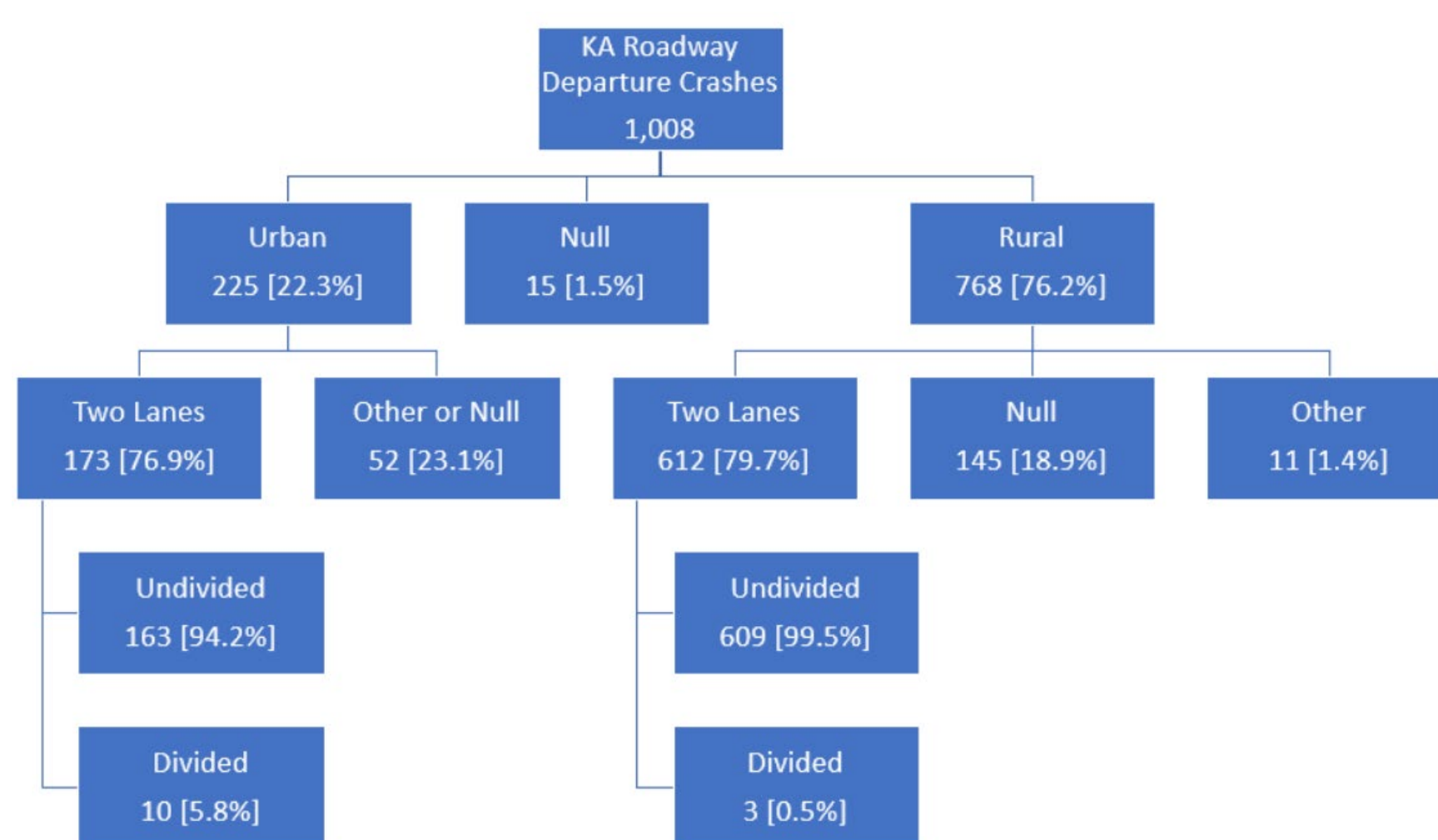


Figure 1. Lane Departure Crash Locations Are Random

## Methodology

The systemic method looks at crash history to identify factors that correlate with a crash type. The more factors that are present at a site, the greater the likelihood of a crash happening at that site. To identify the focus facility types, crash tree diagrams were used. Binary logic regression was used to identify the risk factors. Segments were scored for each focus crash type based on the presence of the risk factors within the segment and their assigned weights.



Risk Factor	Risk Factor Value	Segment Value	Risk Weight	Risk Score
AADT	Over 15000 vehicles per day	28200	1	1
Guardrail	None	Right Guardrail Present	1 (if not present)	0
Type A Warning Sign	Present	Present	2	2
<b>Total Risk Score (Sum)</b>				<b>3</b>

Figure 2. Crash Tree Example (left). Risk Score Calculation Example (right).

## Results

Each segment was given a percentile rank based on its total score and assigned to a risk category. Five categories of risk were determined: Minimal Risk, Low Risk, Medium Risk, High Risk, Primary Risk. Risk maps were developed for fourteen combinations of focus crash and focus facility types. Lane Departure Route Logs were also developed for state roads. A companion three-tier countermeasure matrix was generated. A web application was created to view the risk-based assessment.

Figure 3. Screening is available for these following focus crash types and facility types.

Number	Severity	Manner	Time of Day	Setting	Ownership	Geometry	Functional Class
1	KAB	Head-On	All	Rural	Local	Curve	
2	KAB	Overturn	All	Rural	Local	Curve	
3	KA	Run Off Road	All	Rural	Local	Curve	
4	KA	Striking Fixed Object	All	Rural	Local	Curve	
5	KAB	Run Off Road	Night	Rural	Local	Curve	
6	KAB	Head-On	All	Rural	State	Curve	Minor Arterials & Major Collectors
7	KAB	Overturn	All	Rural	State	Curve	Minor Arterials, Major Collectors, and Principal Arterials - Other
8	KA	Run Off Road	All	Rural	State	Curve	Minor Arterials & Major Collectors
9	KA	Striking Fixed Object	All	Rural	State	Curve	Minor Arterials & Major Collectors
10	KAB	Run Off Road	Night	Rural	State	Curve	Minor Arterials & Major Collectors
11	KA	Overturn	All	State	State	Curve	Interstate
12	KAB	Head-On	All	Rural	State	Tangent	Minor Arterials, Major Collectors, and Principal Arterials - Other
13	KAB	Overturn	All	Rural	State	Tangent	Minor Arterials, Major Collectors, and Principal Arterials - Other
14	KA	Run Off Road	All	Rural	State	Tangent	Minor Arterials & Major Collectors

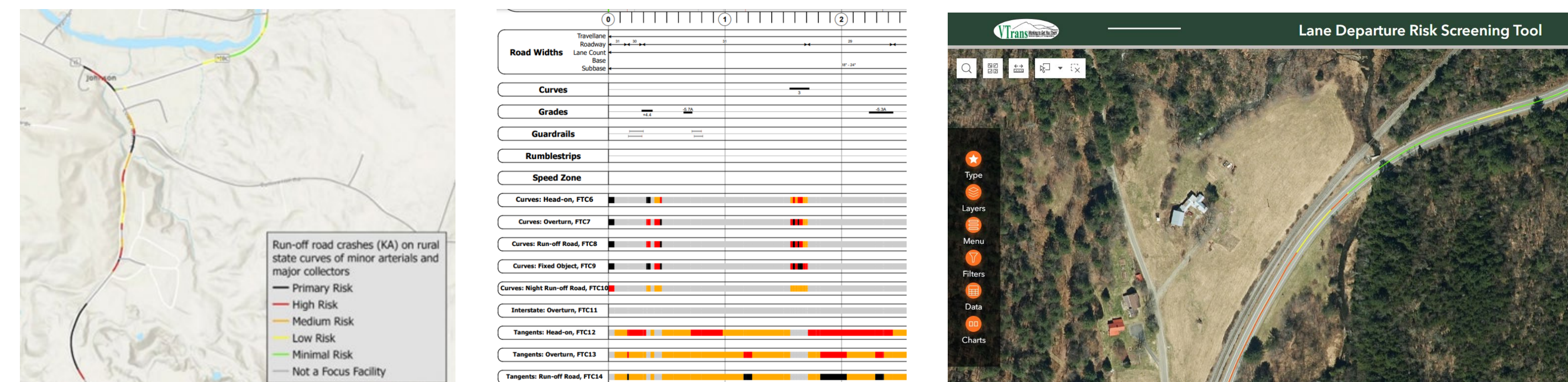


Figure 4. A Risk Map (left) and a Route Log (center). VTrans Lane Departure Tool Web App (right)

## Impacts and Benefits

All roads in Vermont have been assigned risk levels for the likelihood of lane departure crash events. This risk assessment provides roadway entities with a means of proactively addressing lane departure crashes in Vermont by implementing targeted treatments at several locations before crashes happen.

## Acknowledgments

The Vermont Agency of Transportation led the project with federal funds through the Transportation Records Coordinating Committee. The consulting firm VHB performed the analysis work. The Operations and Safety Bureau built the viewing tool to provide access to the results. This poster was prepared by VTrans.