

Session 1: Roadside Safety Problem, Clear Zone and Warrants for Barrier




FAST Act Guardrail Safety Training
Highway Barrier Installation, Inspection and Maintenance Training

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Disclaimer


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Ground Rules


- Be on time
- Participate
- Restrict sidebar conversations
- Turn off cellphones







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Three Elements of a Crash

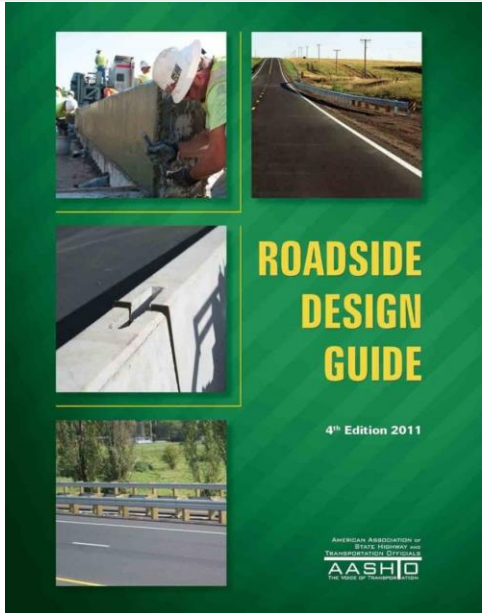
 DRIVER

 VEHICLE

 ROADWAY




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Basis for Guidance Presented




NDDOT follow:


- NDDOT Design Manual (Chpt. III, Section 13, with App. A, and B),
- NDDOT Standard Drawings (D-764), and
- AASHTO Roadside Design Guide, 2011

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Session 1: Roadside Safety Problem, Clear Zone and Warrants for Barrier




Safety problem




Safety problem




Potential warrant



Clear zone





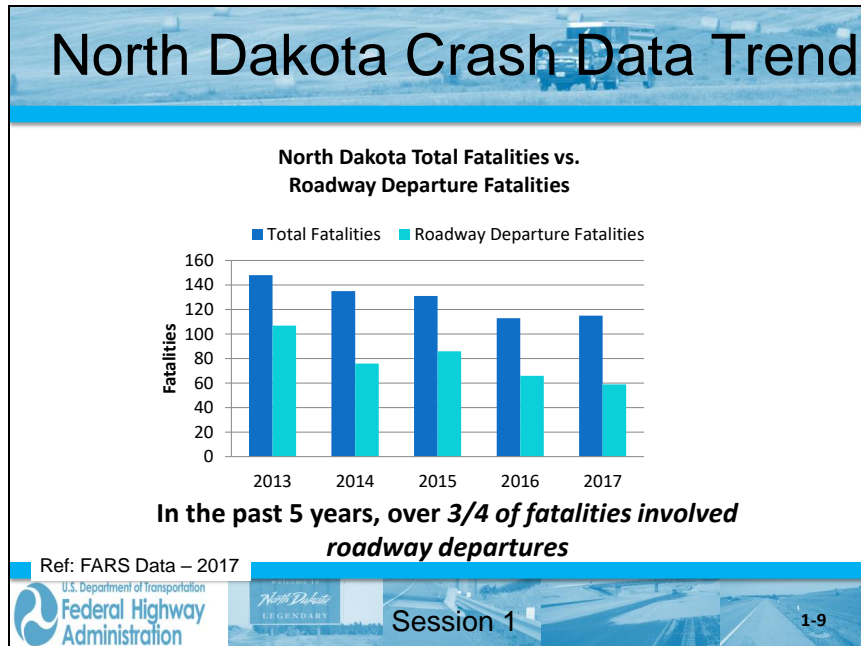
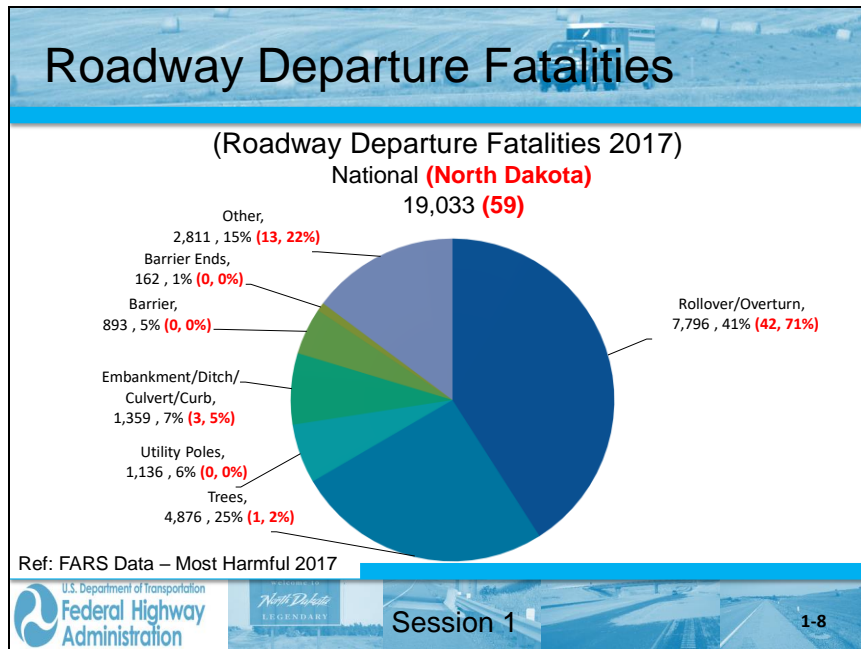
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Session 1 Learning Outcomes

At the end of this session, you will be able to:

- Describe the primary Roadside Safety Concerns in North Dakota.
- Identify the need for training.
- Define clear zone and barrier guidelines.




North Dakota Strategic Highway Safety Plan





Lane Departure

On North Dakota roadways, there were 1,581 serious injury lane-departure crashes resulting in 1,906 serious injuries between 2012 and 2016. This is an average of 381 serious injuries per year and accounted for nearly 58% of serious injury crashes during the 5-year study period (NDDOT, 2017).



VISION ZERO
Zero fatalities. Zero excuses.

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Real World Crashes



Video Clip




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Need for Training

Examples of improper installation of systems:



Need for Training

Examples of improper installation of systems:



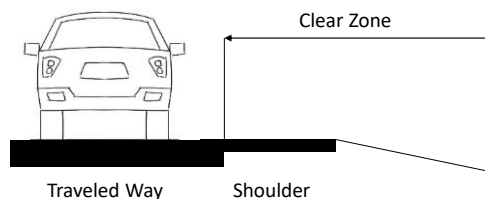
Fatal Flaw

Need for Training

Examples of improper installation of systems:



Clear Zone: A Definition



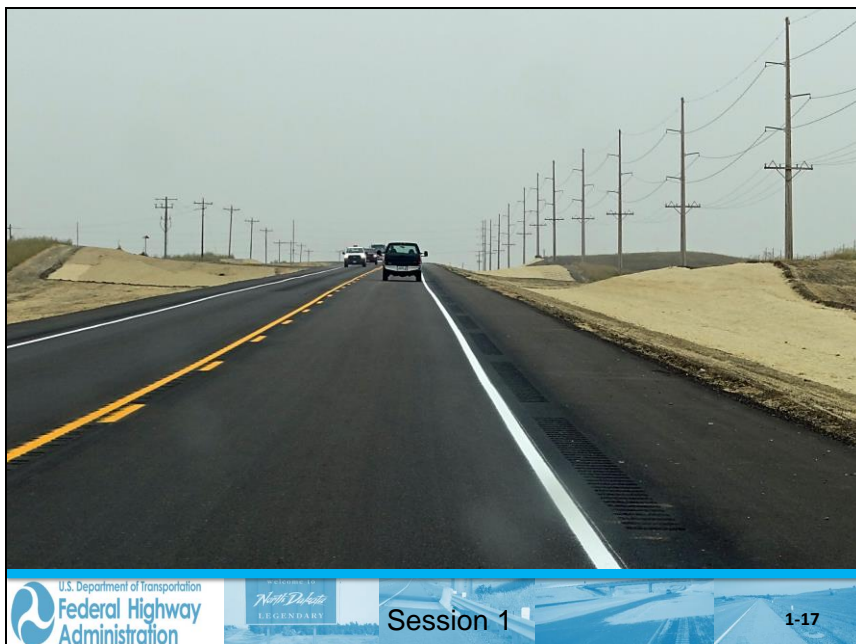
The unobstructed, traversable area provided beyond the edge of the through traveled way for the recovery of errant vehicles. The clear zone includes shoulders, bike lanes, and auxiliary lanes, except those auxiliary lanes that function like through lanes.

Ref: AASHTO ROADSIDE DESIGN GUIDE, 4th EDITION, Glossary

Important Distinction

Available Clear Zone = Area Existing for recovery

Design Clear Zone = A selected value used for design to provide recovery area for the majority of errant drivers



Clear Zone Principles

Do not compromise available clear zone

Strive to maintain what you already have

Do not use the Design clear zone to reduce the area available to an errant vehicle

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Do Not Compromise Clear Zone

Added trees in available clear zone

Vehicle encroachment

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Clear Zone Factors

- Slope Type and Steepness
- Design Speed
- Traffic Volume
- Horizontal Curvature

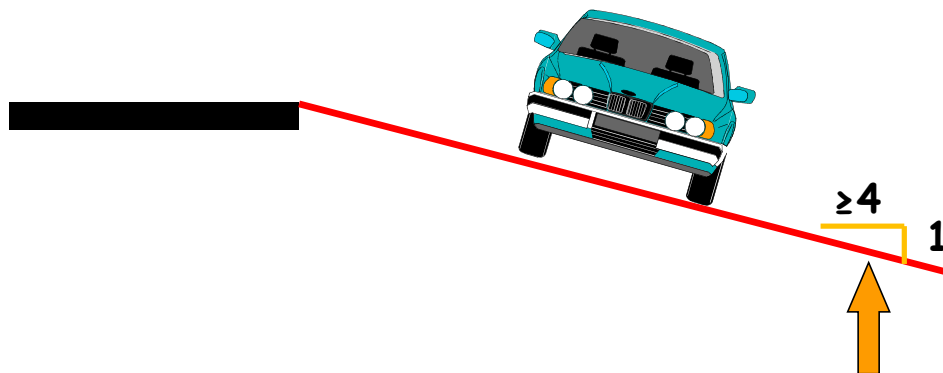


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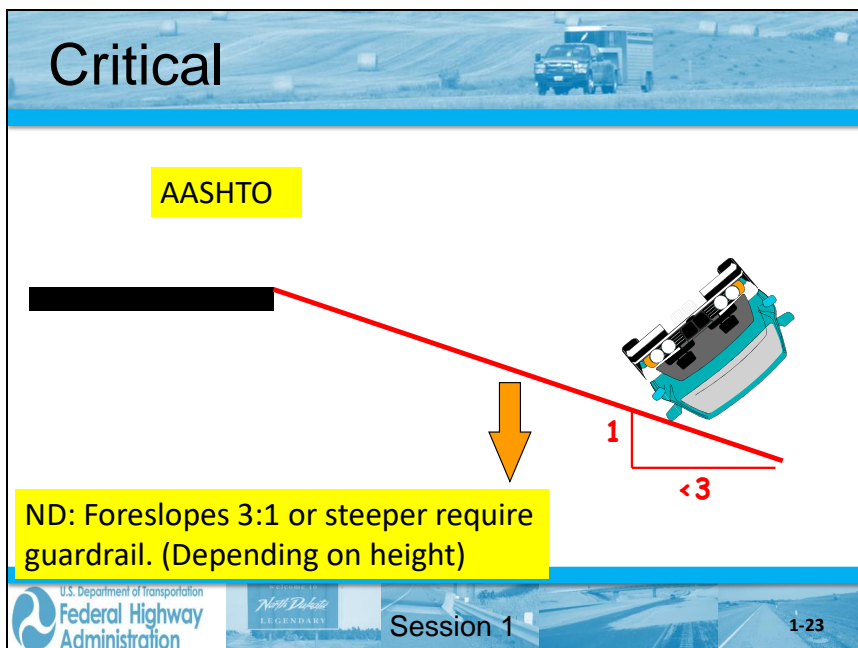
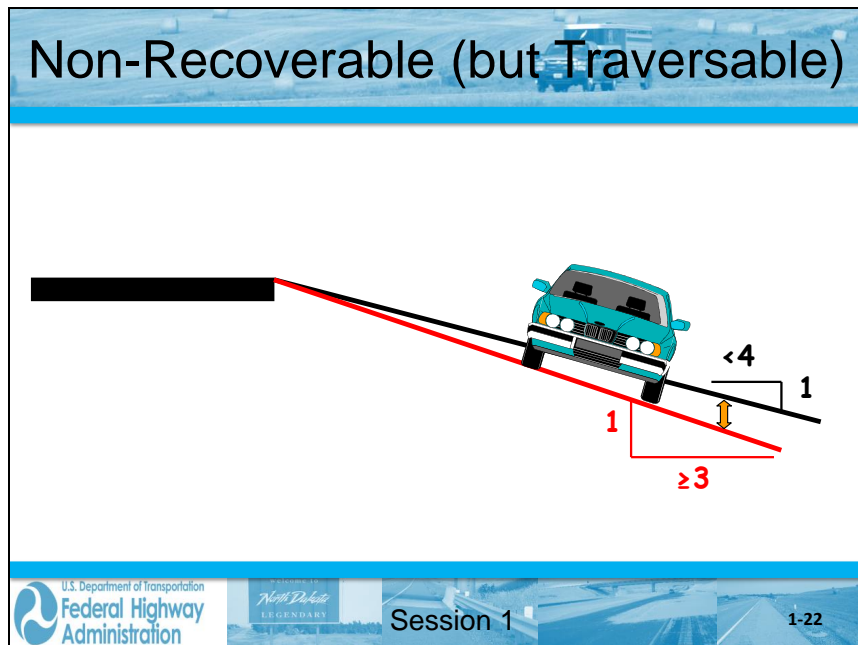
SLOPES – Recoverable

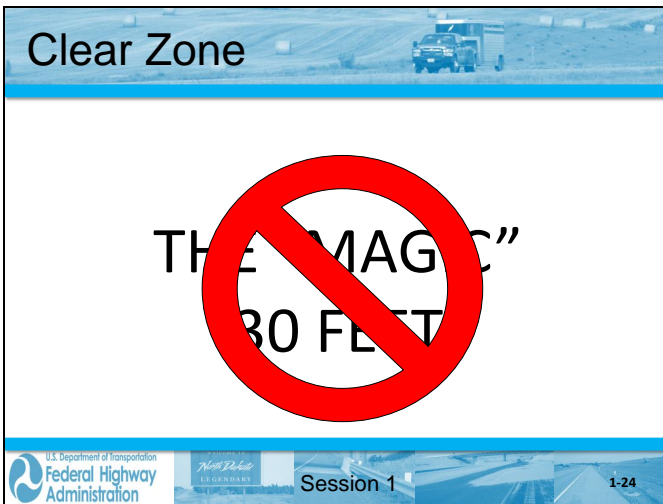


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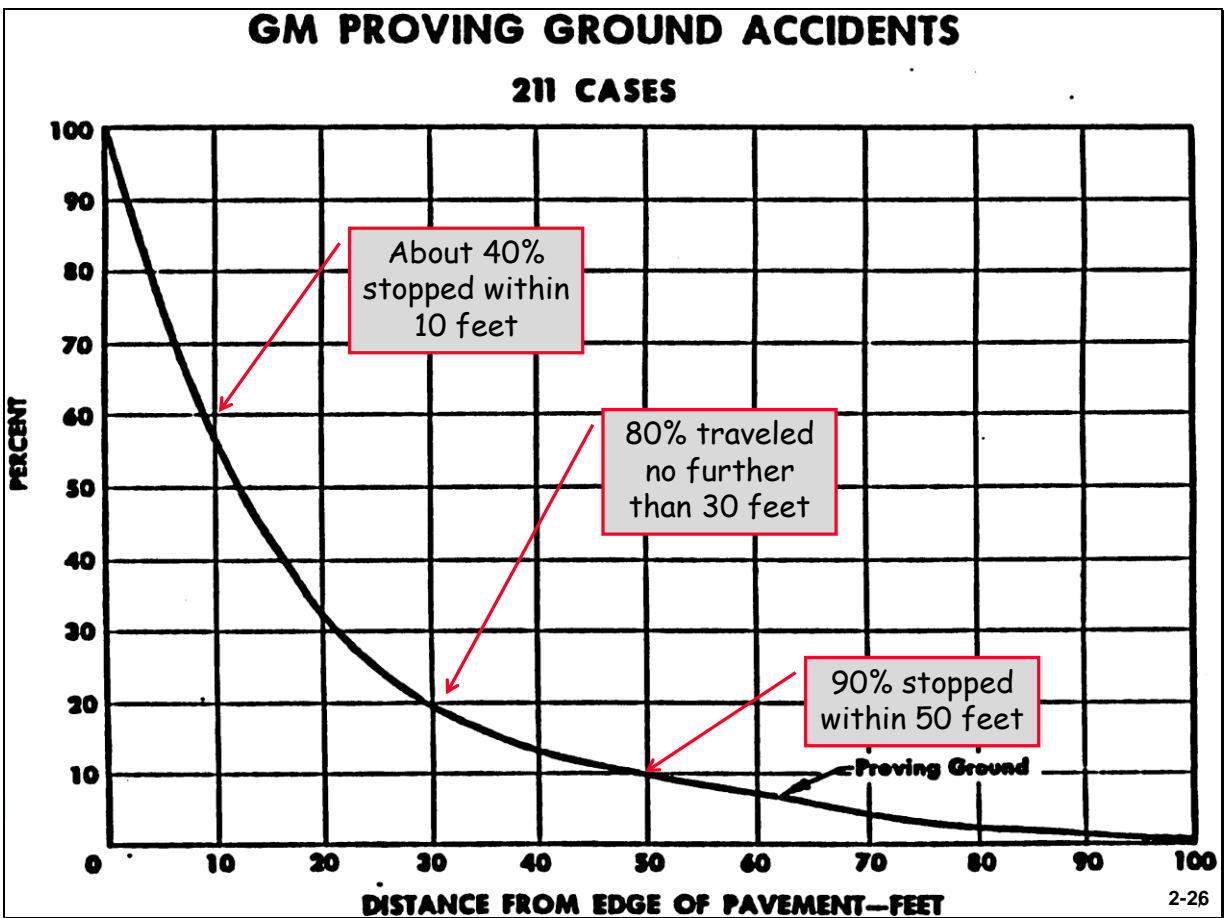




NDDOT Design Clear Zone Determination											
Design Speed (mph)	Design ADT***	Foreslopes					Backslopes				
		FLAT	1V:6H	1V:5H	1V:4H	1V:3H	1V:3H	1V:4H	1V:5H	1V:6H	FLAT
≤40	UNDER 750	7-10	7-10	7-10	7-10	**	7-10	7-10	7-10	7-10	7-10
	750-1500	10	12	12	14	**	12-14	12-14	12-14	12-14	12-14
	1500-6000	12	14	14	16	**	14-16	14-16	14-16	14-16	14-16
	OVER 6000	14	16	16	18	**	16-18	16-18	16-18	16-18	16-18
45-50	UNDER 750	10	12	12	14	**	8-10	8	10	10	12
	750-1500	14	16	16	20	**	10-12	12	14	14	15
	1500-6000	16	18	20	26	**	12-14	14	16	16	18
	OVER 6000	20	22	24	28	**	14-16	18	20	20	22
55	UNDER 750	12	14	14	18	**	8-10	10-12	10-12	10-12	10-12
	750-1500	16	18	20	24	**	10-12	14	16	16	18
	1500-6000	20	22	24	30	**	14-16	16	18	20	22
	OVER 6000	22	24	26	32*	**	16-18	20	22	22	24
60	UNDER 750	16	18	20	24	**	10-12	12	14	14	16
	750-1500	20	24	26	32*	**	12-14	16	18	20	22
	1500-6000	26	30	32*	40*	**	14-18	18	22	24	26
	OVER 6000	30	32*	36*	44*	**	20-22	24	26	26	28
65-75	UNDER 750	18	20	20	26	**	10-12	14-16	14-16	14-16	14-16
	750-1500	24	26	28	36*	**	12-16	18	20	20	22
	1500-6000	28	32*	34*	42*	**	16-20	22	24	26	28
	OVER 6000	30	34*	38*	46*	**	22-24	26	30	28	30

Ref: NDDOT DESIGN MANUAL, Appendix III-14-B, Revised Jan 26, 2016





Design Options in Order of Preference

1. Remove the obstruction
2. Make the obstruction traversable
3. Relocate obstruction beyond the clear zone
4. Reduce impact severity by using an appropriate breakaway system
5. SHIELD the obstruction with a longitudinal barrier or crash cushion (only if obstruction cannot be removed, relocated, or redesigned)
6. Delineate obstruction (only if all above options are not appropriate.)

Ref: NDDOT DESIGN MANUAL Section III 14.05



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Barriers should reduce the severity of potential crashes and should not introduce a new severe risk regardless where they are located



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NDDOT Barrier Guidelines

Obstacle	Guidelines
Fill Slopes	Slopes 3:1 or steeper. Judgment decision based on fill height and slope (shielding / slope flattening based on cost effective.)*
Trees	Maximum allowable diameter 4 inches. Remove if in design clear zone.*
Mailboxes	If located in design clear zone, relocate or utilize approved supports.
Culvert Ends	Provide traversable end treatments. or extend beyond clear zone*
Sign Posts	Locate behind existing or planned barrier or use terrain features to reduce potential of impact; breakaway features *
Sign bridges and cantilever sign supports	Shielding generally required for non-breakaway supports in clear zone.*
Traffic signals	Relocate/ consider crash cushion.*
Utility poles	Relocate/ consider crash cushion.*
Light standards	Normally breakaway.*
Fixed Objects extending 4 inches above ground.	Shielding generally required if removal or relocation not feasible.* (E.g. boulders, bridge rails, cabinets, piers, retaining walls etc.)
Water	Depth of 2 feet or more for year or longer in clear zone.*


*Use traffic barriers when other measures cannot be accomplished and conditions are appropriate based on an engineering analysis. Ref. NDDOT Design Manual Section III



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Is barrier required at the location shown in the following photograph?

If required, is it likely to be effective?

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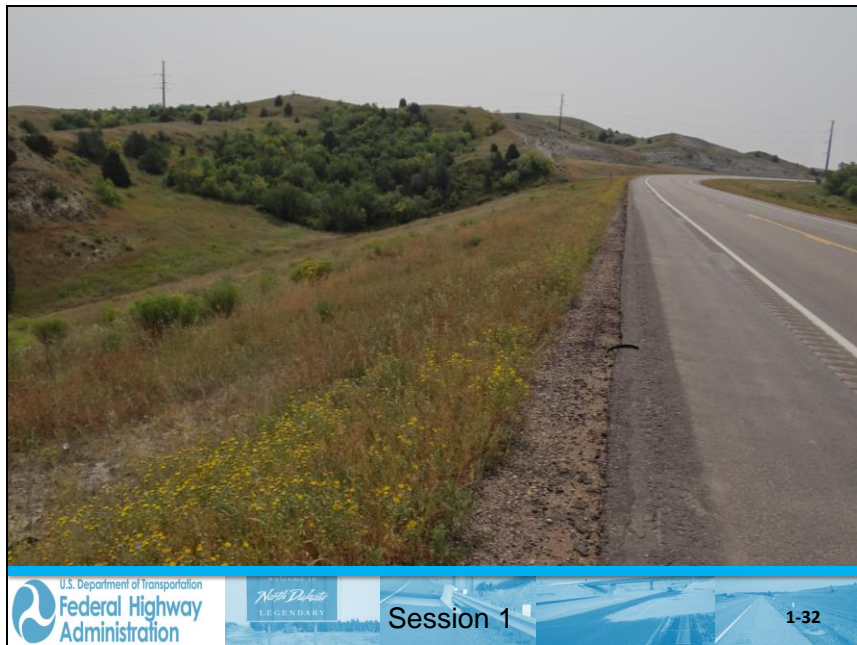


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Review Learning Outcomes

- Describe the primary Roadside Safety Concerns in North Dakota.
- Identify the need for training.
- Define clear zone and barrier guidelines.



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HIGHWAYS

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