

# Roadway Safety on Indian Reservations

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Work crew inspects newly constructed portion of Seventeen Mile Road.

**R**educing fatal and injury crashes on tribal lands has been a recognized need for years. In 2006, the Wind River Indian Reservation, located in central western Wyoming, obtained funding for safety improvements on Seventeen Mile Road, the most hazardous road on the reservation. In 2011, the tribe decided to develop a comprehensive safety improvement program.

## Problem

According to a report by the National Center for Statistics and Analysis, fatal crashes in the United States declined by 2.2 percent between 1975 and 2002—from 39,161 to 38,309. On Indian reservations during the same period, however, the annual number of fatal crashes increased by more than 50 percent—from 181 in 1975 to 276 in 2002.

Limited resources, a lack of crash data, and inadequate coordination across jurisdictions have made it difficult for Native American communities to address roadway safety concerns. Tribal communities face challenges similar to those of other rural communities with low volumes of traffic, vehicles traveling at high speeds, alcohol consumption, and inadequate roadway geometrics.

## Solution

The Wyoming Technology Transfer–Local Technical Assistance Program (WYT<sup>2</sup>-LTAP), in cooperation with the Wyoming Department of Transportation (DOT) had developed the Wyoming Rural Road Safety Program (WRRSP) to help local governments improve safety at high-risk locations (1). Indian reservation roads have similarities to rural local roads; therefore the research adopted the following objectives:

- ◆ Modify the WRRSP to fit the needs of Indian reservations, identify low-cost safety improvements, and allocate funds for the improvements.
- ◆ Determine the gaps in crash data on Indian reservations, recommend ways to bridge the gaps, and identify the high-risk locations.
- ◆ Assist tribes in developing a strategic highway safety plan to address safety concerns.

## Road Safety Program

The WRRSP developed and implemented a five-step methodology for the Wind River Indian Reservation to address the unique challenges on tribal lands (2):

- ◆ Crash data analysis,
- ◆ Level I field evaluation of roadway conditions,
- ◆ Combined ranking of crash and field ranks to identify potential high-risk locations,
- ◆ Level II field evaluation to identify countermeasures, and
- ◆ Benefit–cost analysis.

Crashes on the Wind River Indian Reservation during the 10-year period from 2002 through 2011 were analyzed. Gaps were immediately discovered in the crash data. The Wind River Indian Reservation law enforcement agency had no way to upload crash reports to the state crash database. Once this was remedied, several years of backlogged data were uploaded manually into the state system.

Crashes on Indian Reservation Roads (IRRs), however, could not be tied to a specific location because they were not linked to Wyoming DOT's inventories. Wind River Indian Reservation contracted to have the IRRs inventoried on a geographic



PHOTO: WYOMING DOT



Seventeen Mile Road before construction of safety improvements.

information system (GIS) platform that would link to the Wyoming DOT database.

**Benefit–Cost Ratios**

The five-step methodology was applied to the county roads within the Wind River Indian Reservation; 12 county roads were identified for safety improvements. To calculate the expected benefit–cost ratio, researchers used Wyoming DOT’s standard crash costs for fatal, injury, and property-damage-only crashes, the cost reduction factors for each improvement, and the estimated cost of each type of project. Preliminary cost estimates normalized over the 10-year crash period were used to calculate the project cost.

The benefit–cost ratios ranged from 2.0 to 399.5. The proposed improvements were submitted to Fremont County for action.

With no locations specified, the crashes on IRRs were analyzed separately, and the following trends were identified:

- ◆ Crash severity was higher on the reservation than throughout the state.
- ◆ Fixed objects most frequently were the first harmful events.
- ◆ Most crashes were run-off-the-road crashes.

**Systemic Approach**

Because of these trends, the similarities to county roads, and the tribes’ knowledge of crashes on these roads, a systemic approach was recommended for improvements to the IRRs. Systemwide improvement projects addressing signage and pavement markings were submitted to Wyoming DOT and gained approval for funding.

With no specific locations identified for crashes

on IRR roads, a systemwide benefit–cost analysis was performed. Improvements were proposed for only 37 of the 209 miles of IRRs; therefore the expected benefit of reduced crashes was based on 17.7 percent of the total crashes for the 10-year period of 2002 to 2011. The benefit–cost ratios were 20.3 for signs and 8.1 for pavement markings (Table 1, below).

**Highway Safety Plan**

The Wind River Indian Reservation recognized the need to develop a strategic highway safety plan and requested assistance from WYT<sup>2</sup>-LTAP to apply for a grant from the Federal Highway Administration; the project was selected as one of three pilots. Stakeholders included tribal leadership, WYT<sup>2</sup>-LTAP, the Northern Plains Tribal Technical Assistance Program, the Bureau of Indian Affairs, law enforcement, Indian Health Services, and other local partners.

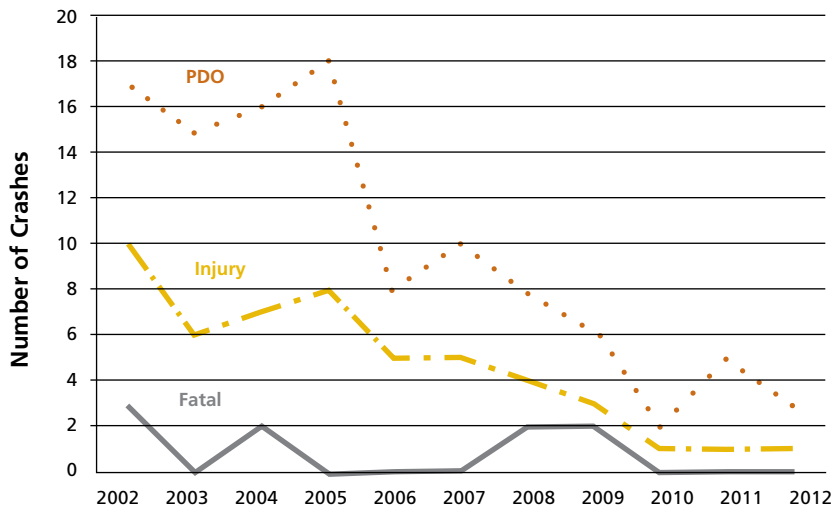
The first step in developing a tribal safety management program was to analyze the crash data to identify problem areas. The crash trends confirmed that alcohol, young drivers, and the nonuse of safety equipment were main concerns. These findings were consistent with themes discussed at the transportation safety summits conducted annually by tribes from across the nation.

The tribal community has envisioned raising safety awareness and improving safety for all users of

**TABLE 1 Estimated 10-Year Benefit, Cost, and Benefit–Cost Ratio for Indian Reservation Roads**

Project	Benefit	Cost	B-C Ratio
Signs	\$4,861,629	\$240,000	20.3
Pavement marking	\$2,026,650	\$249,480	8.1

Note: B-C = benefit–cost.



**FIGURE 1** Crash history on Seventeen Mile Road, Wind River Indian Reservation, 2002–2012. (Note: PDO = property damage only.)

the roadways. Behavioral, roadway, vehicle, weather, and nonmotorized transportation were among the safety issues to be addressed. Behavioral issues, however, were recognized as the greatest concern, and the goals included strategies to change the safety culture of the tribal people.

The Wind River Indian Reservation developed a strategic plan using the available crash data, identifying ways to improve crash reporting, and incorporating the five-step safety improvement program into the strategic plan.

Crew member signals traffic during construction on Seventeen Mile Road near Riverton.



PHOTO: WYOMING DOT

## Benefits

The Wind River Indian Reservation now has a comprehensive safety program. With the improvements to the Seventeen Mile Road, starting in 2006, the number of crashes has dropped by approximately 50 percent (Figure 1, left). The roadway previously had the highest number of crashes on the reservation.

The projected reduction in the annual crash rate—and in injuries and fatalities—by 50 percent across the Wind River Indian Reservation would yield a potential savings of more than \$4 million per year (Table 2, below). By itself, the signage project for IRRs, with a benefit–cost ratio of 20.3, could produce more than \$4.6 million in benefits.

The methodology developed in the research can be adapted to the specific needs of tribes across the United States. WYT<sup>2</sup>-LTAP has been working with Tribal Technology Assistance Program centers across the country to facilitate implementation.

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Suggestions for Research Pays Off topics are welcome. Contact G. P. Jayaprakash, Transportation Research Board, Keck 488, 500 Fifth Street, NW, Washington, DC 20001 (202-334-2956; [gjayaprakash@nas.edu](mailto:gjayaprakash@nas.edu)).

**TABLE 2** Expected Annual Cost Savings from Reducing Crashes

Crash Type	Crashes, 2002–2011	Annual Crash Rate	Annual Crash Costs	Annual Benefit of Reduced Crashes		
				10% Reduction	25% Reduction	50% Reduction
Fatal	28	2.8	\$7,000,000	\$700,000	\$1,750,000	\$3,500,000
Injury	206	20.6	\$1,236,000	\$123,600	\$309,000	\$618,000
PDO	394	39.4	\$236,400	\$23,640	\$59,100	\$118,200
Total	628	62.8	\$8,472,400	\$847,240	\$2,118,100	\$4,236,200