

Turning Data into Action: Truck Tractor Crashes on Tribal Lands in Arizona, 2007-2015



Source: azcentral.com

National Tribal Transportation Conference
October 6, 2016

Topics

- Background
- 3 Crash Analyses
- 2 Road Safety Assessments
- Recommendations
- Outcomes for the Kaibab Band of Paiute Indians



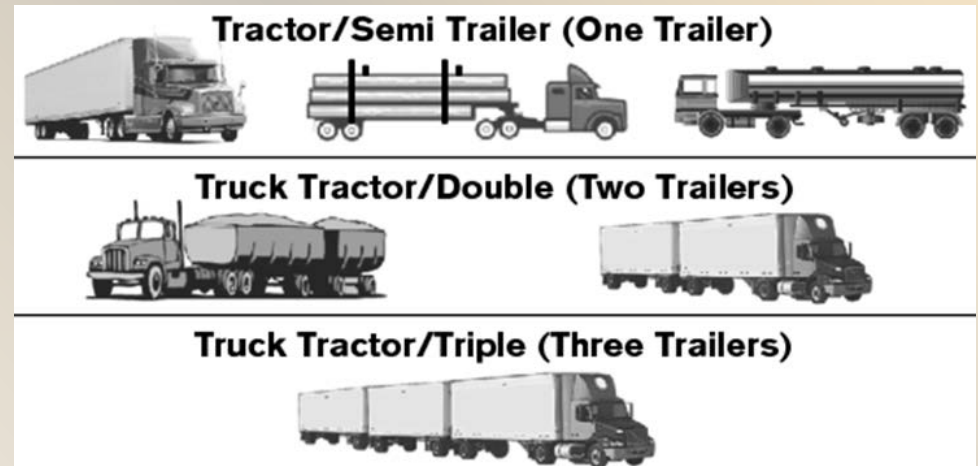
Source: azcentral.com



Background

Definition: Truck Tractor

- Non-cargo carrying power unit in combination with a semi-trailer.
- Truck tractors and semi-trailer combinations, referred to as tractor/trailers.



Source: U.S. Department of Transportation, Federal Motor Carrier Safety Administration

Why Care about Truck Traffic Safety in Arizona?

- Arizona is in the middle of a large, expanding trade triangle connecting Southern California, Texas and northern Mexico.
- Annually, commercial trucks make about 8 million trips into and out of Arizona with most on east-west interstate routes.
- North-south trade with Mexico and Canada is a major initiative for Arizona.
- By 2050, freight shipments are expected to triple in Arizona.



Source: Santa Cruz Commerce Center



1997-2006 Crash Analysis MVCs on American Indian Reservations in Arizona



2010 Statewide Crash Analysis Report

- Utilized reported 1997-2006 crash data in the Arizona Location Identification Surveillance System
- Completed an analysis of statewide crashes on Tribal lands in Arizona
- Injury and fatal crash rates were about 5 times higher on Tribal lands than statewide for:
 - Lane departure crashes involving truck tractors
 - Speed-related crashes involving truck tractors
- Under reporting of vehicle type in 9% of lane departure fatal crashes on Tribal lands



1997-2006 Crash Analysis

2012 Crash Summary



2012 Statewide Crash Summary Method & Result

- Utilized 1997-2006 reported crash data in the Arizona Location Identification Surveillance System (ALISS)
- Examined 27,382 total crashes on Tribal lands
- Identified n=1,543 total truck tractor crashes on Tribal lands

Objectives

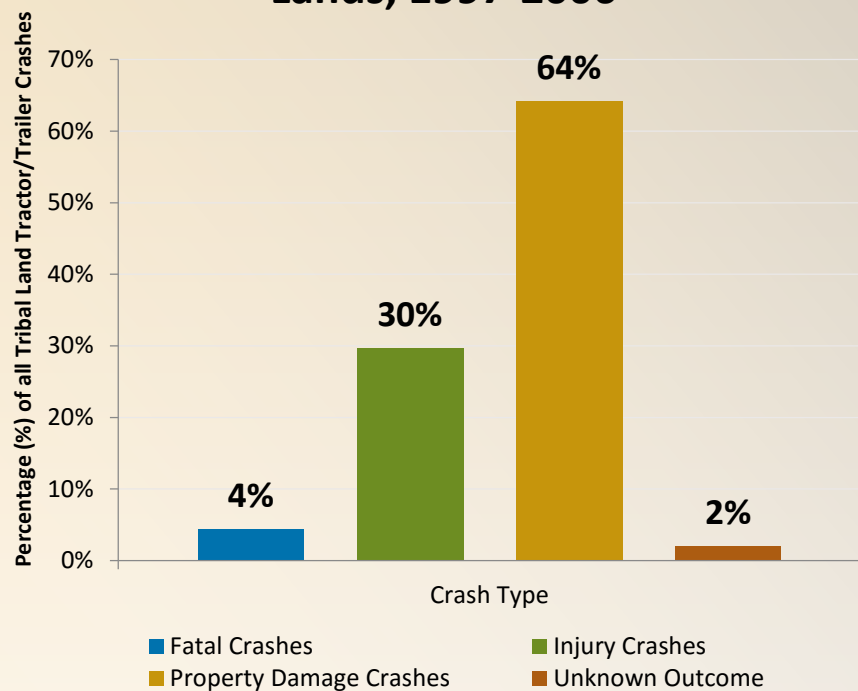
- Compile truck tractor crash rates for Tribal lands and statewide
 - Total
 - Fatal
 - Injury
- Identify high crash locations
- Identify frequencies
 - Crash severity
 - Collision manner
 - First harmful event
 - Low light conditions



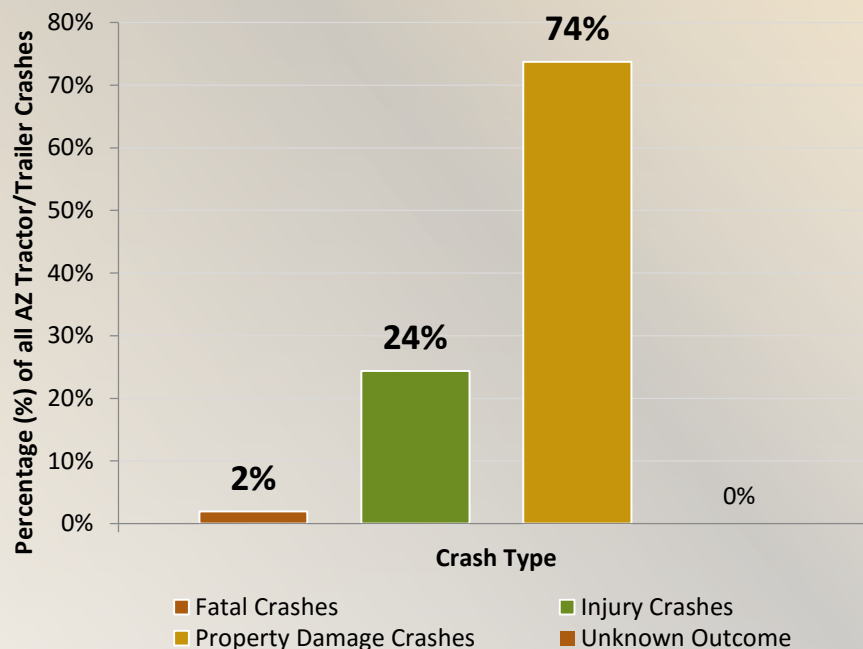
Source: overdrive.com

Comparison of Truck Tractor Crash Rates on Tribal Lands and Statewide, 1997-2006

Tractor Trailer Crash Rates, Tribal Lands, 1997-2006

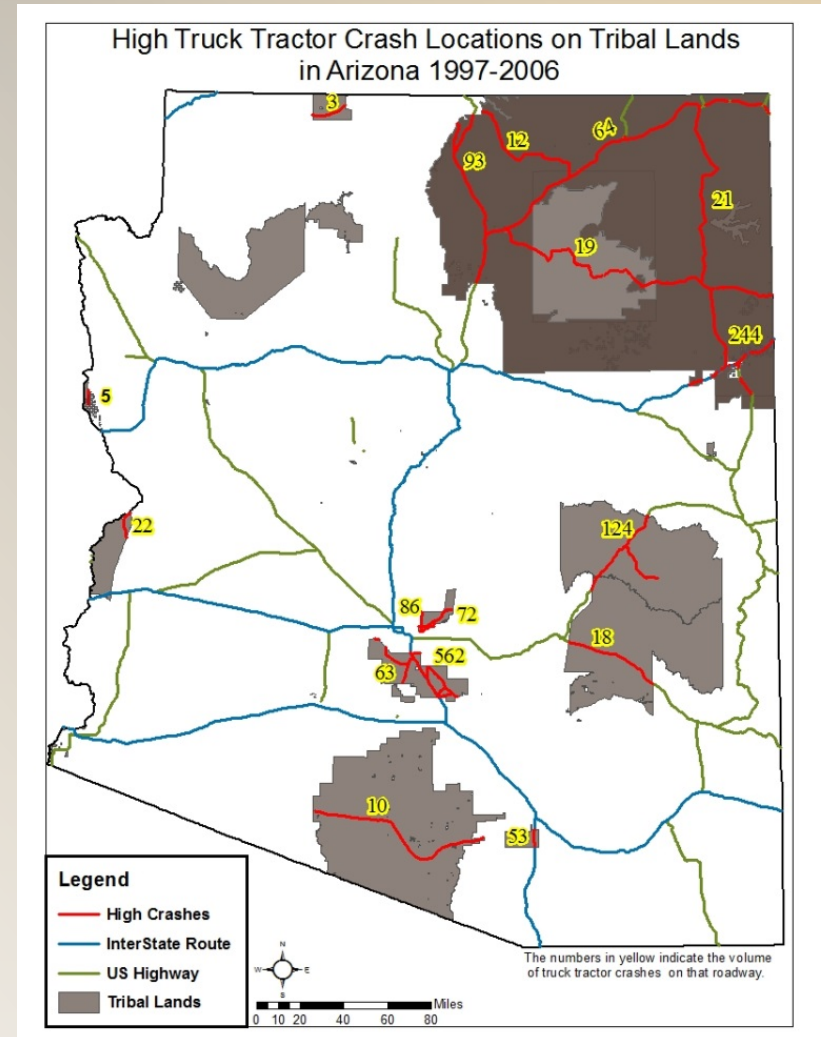


Tractor Trailer Crash Rates, Statewide, 1997-2006



High Crash Locations on Tribal Lands

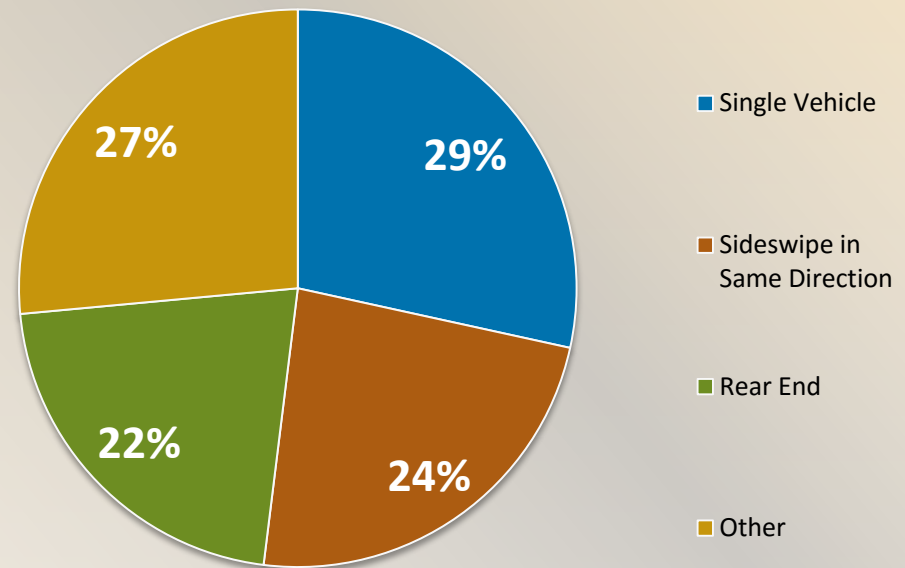
- 93% of truck tractor crashes occurred on interstates and state routes
- 33% of truck tractor crashes occurred on I-10
- 14% of truck tractor crashes occurred on I-40



Collision Manner

- Single vehicle crashes: 29%
- Multiple vehicle crashes:
 - Sideswipe in same direction: 24%
 - Rear-end crashes: 22%
- Other: 27%

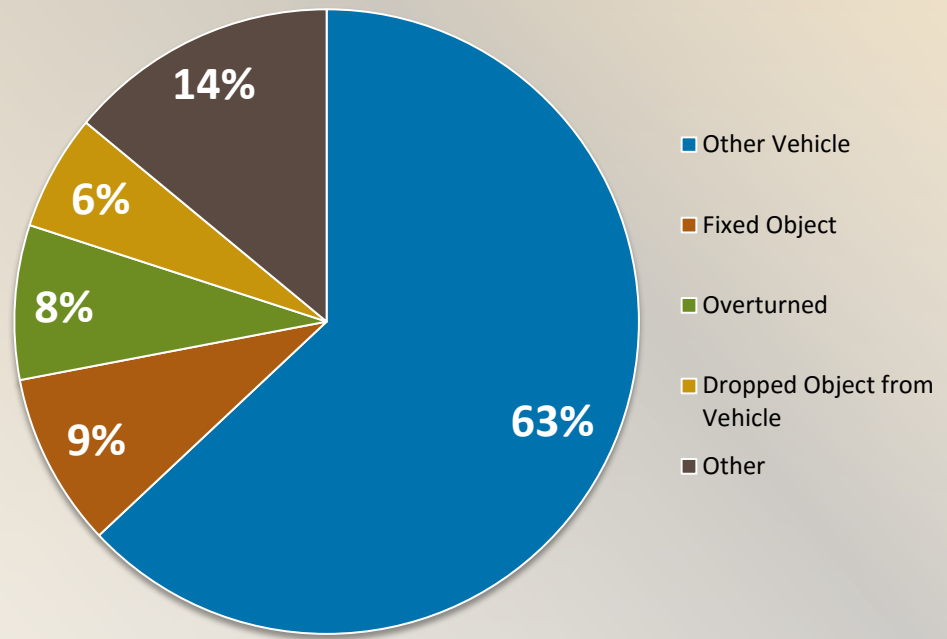
Truck Tractor Crashes by Collision Manner, 1997-2006



First Harmful Event

- Crashed with other vehicle crashes: 63%
- Crashed into fixed object: 9%
- Overturned: 8%
- Dropped object from vehicle: 6%
- Other: 14%

Truck Tractor Crashes by First Harmful Event, 1997-2006



Low Light Conditions

- Defined as dark/dusk/dawn
- 35% of total truck tractor crashes occurred within low light conditions
- 48% of single vehicle truck tractor crashes happened in low light conditions



Source: www.mybinc.com/blog/category/motor-vehicle-record-check




Source: www.corporatedriving.com/semi-truck-driving-safety/



2007-2015 Crash Analysis

Truck Tractor Crashes On and Off Tribal Lands in Arizona



Truck Tractor Crash Analysis: 2007-2015

Methods & Results

- Utilized 2007-2015 reported crash data in ALISS
- Used Global Position System coordinates to identify truck tractor crashes on and off Tribal lands
- Identified n=17,292 total truck tractor crashes
 - 760 on Tribal lands
 - 16,532 off Tribal lands

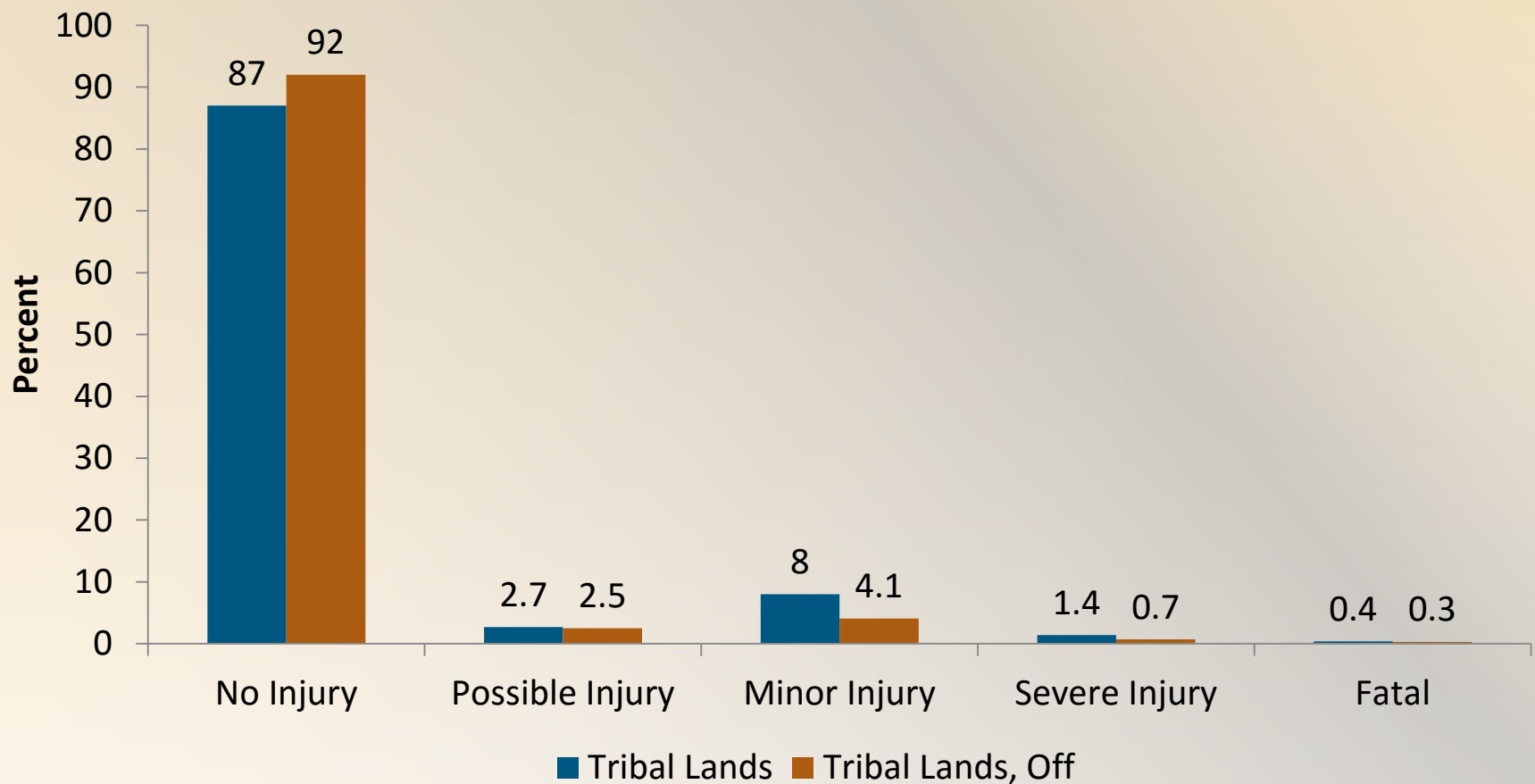
Objectives

- Compare truck tractor crash rates on Tribal lands versus off Tribal lands
 - Total
 - Fatal
 - Injury
- Identify high crash locations
- Identify frequencies
 - Crash severity
 - Collision manner
 - First harmful event
 - Light conditions
 - Time of day
 - Single and Multiple Vehicles Crashes

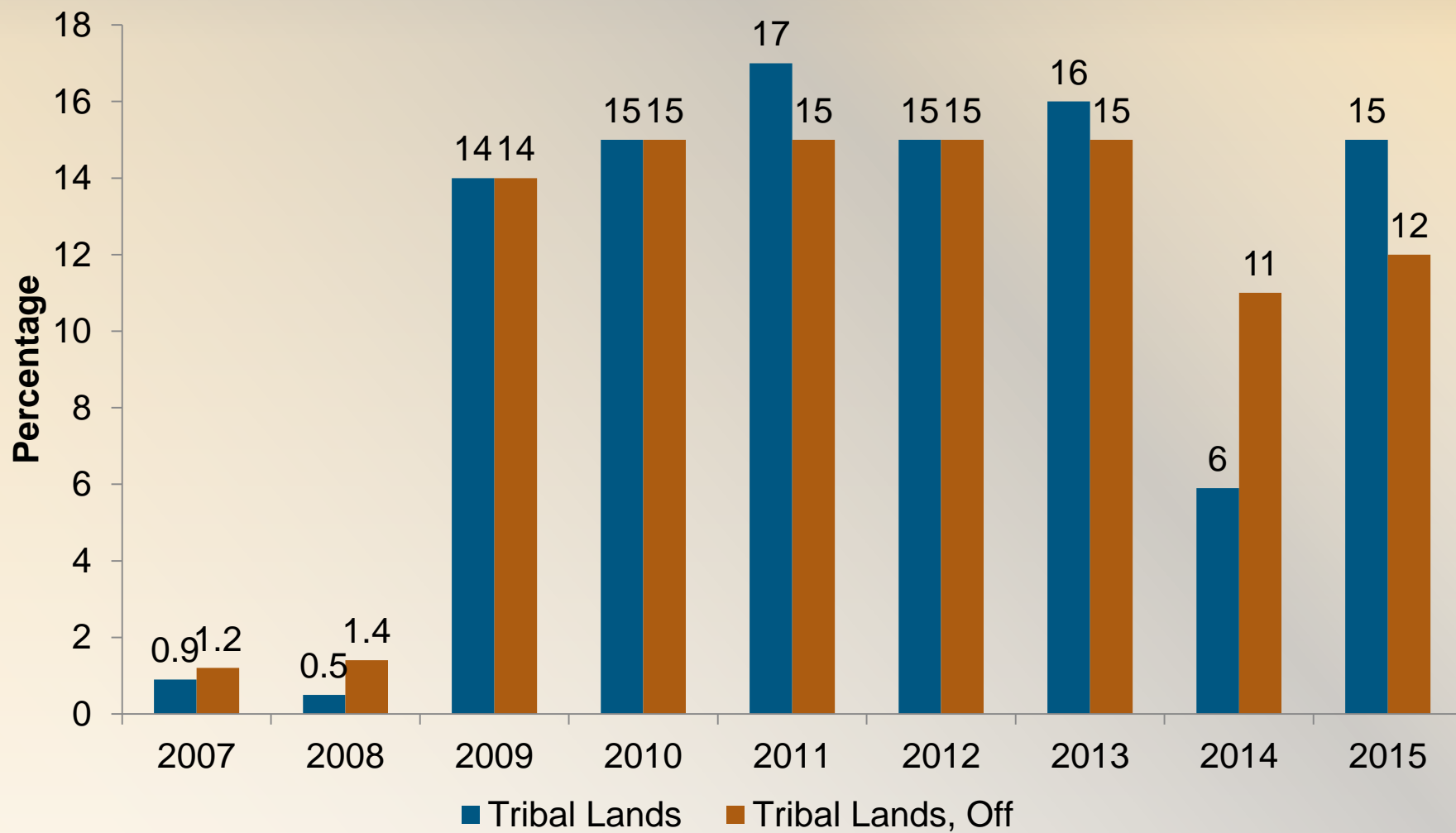


Source: overdrive.com

Comparison of Truck Tractor Crash Rates on and off Tribal Lands, 2007-2015

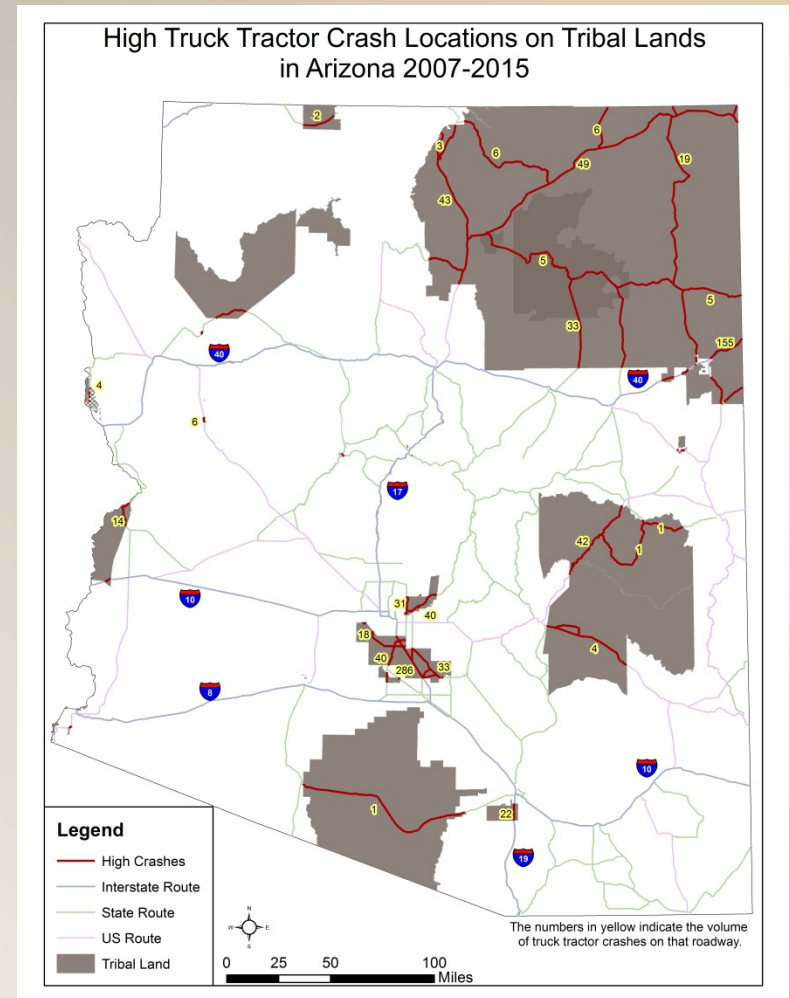


Year

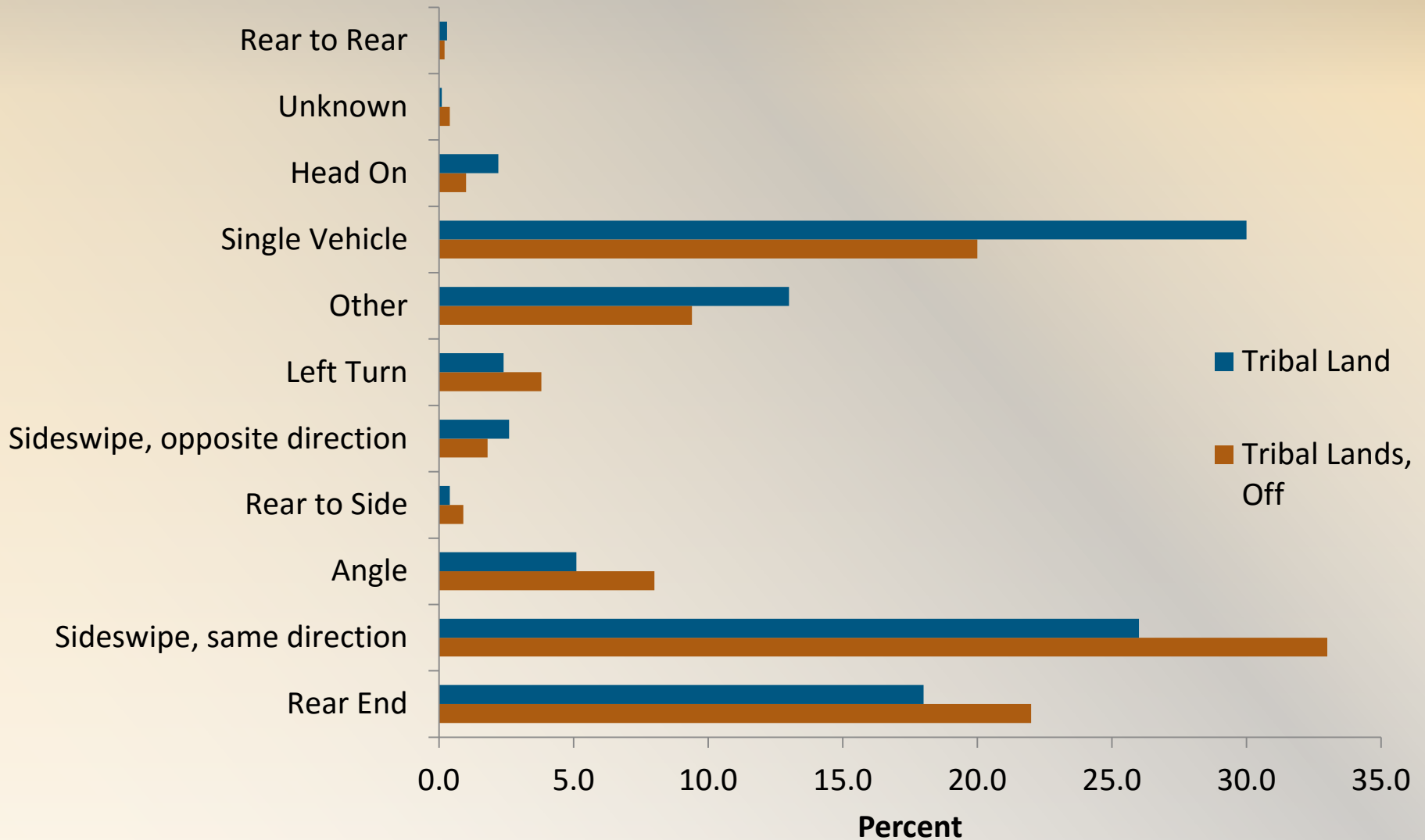


High Crash Locations on Tribal Lands

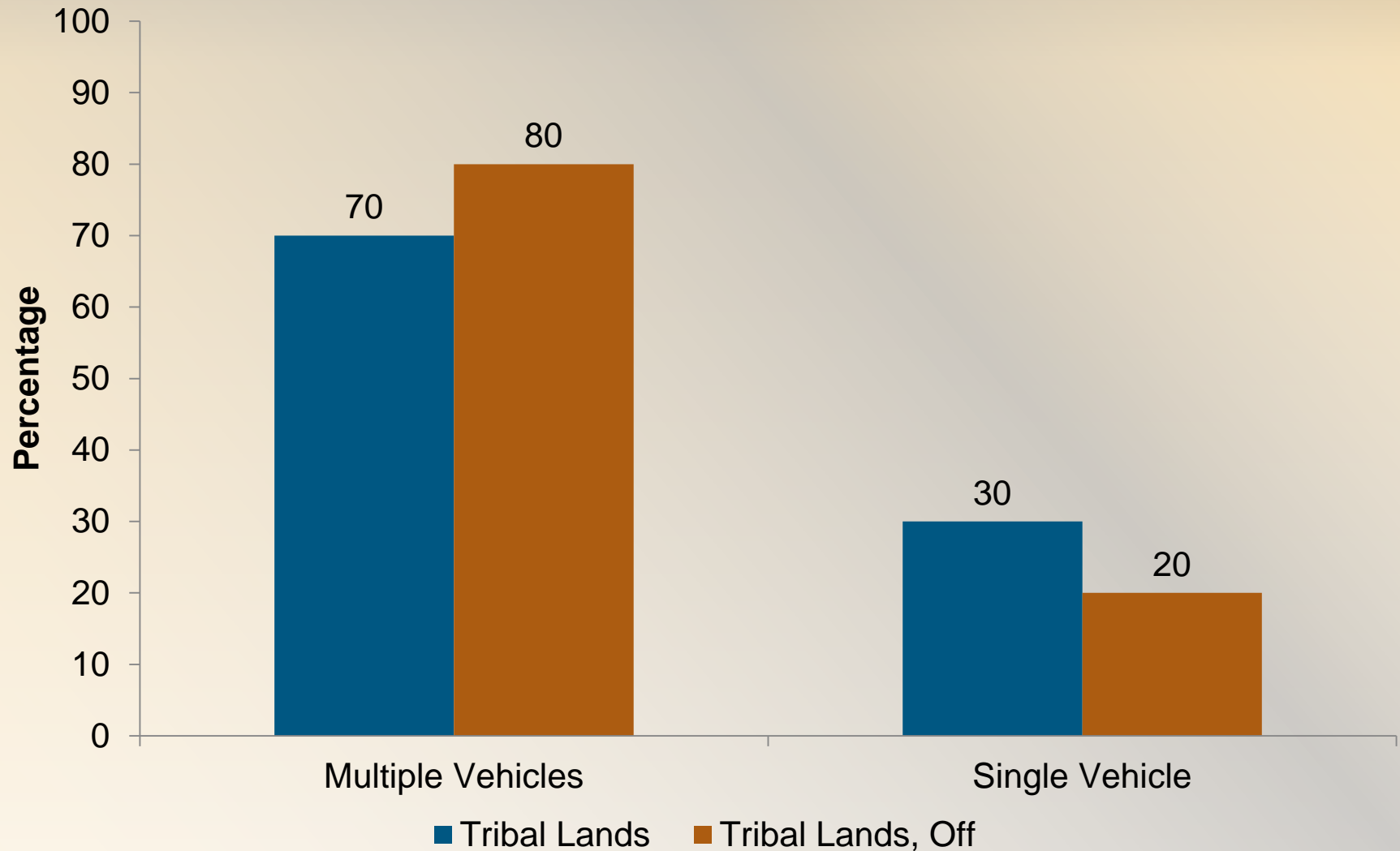
- 93% of truck tractor crashes occurred on interstates and state routes
- 33.5% of truck tractor crashes occurred on I-10
- 18% of truck tractor crashes occurred on I-40



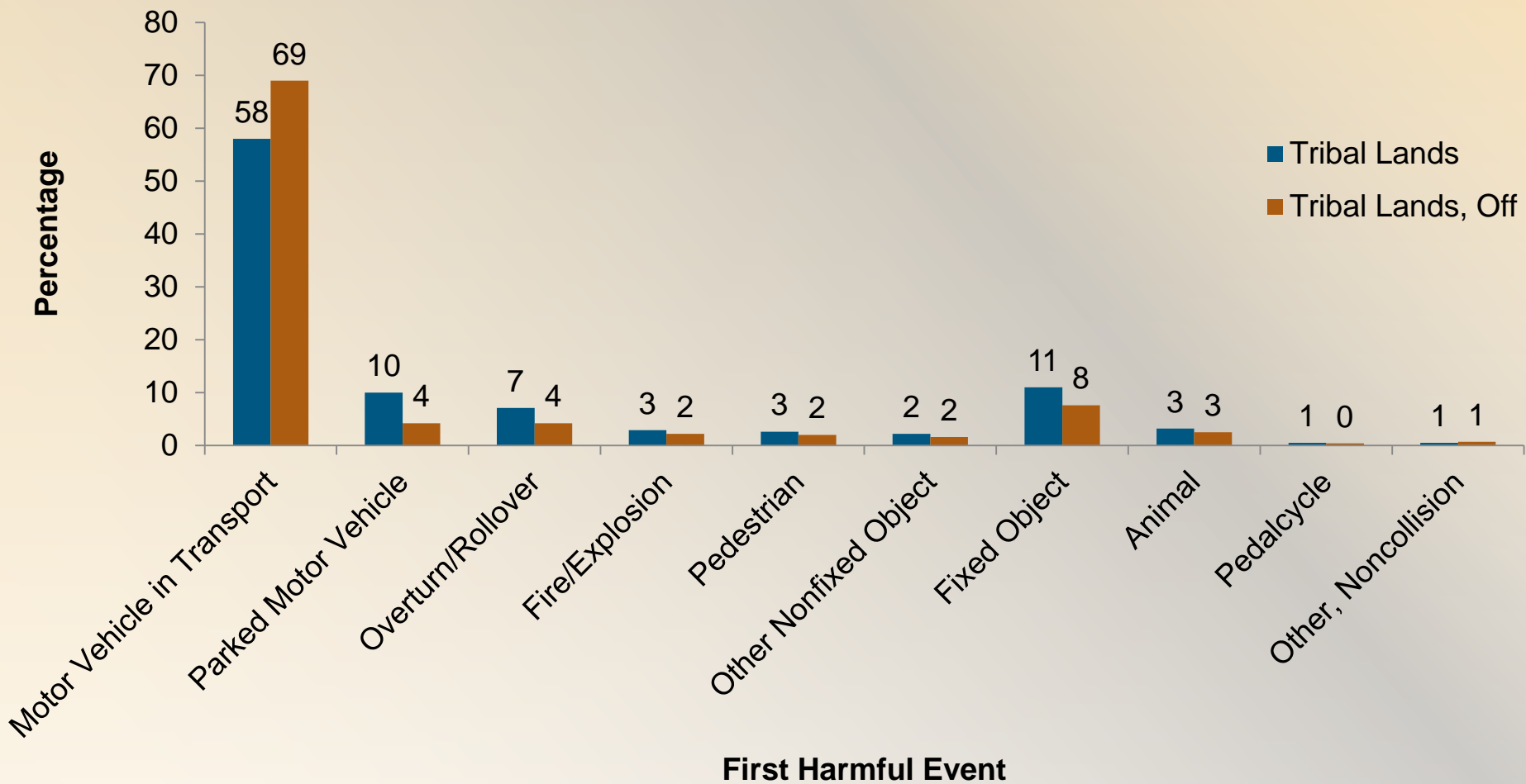
Collision Manner



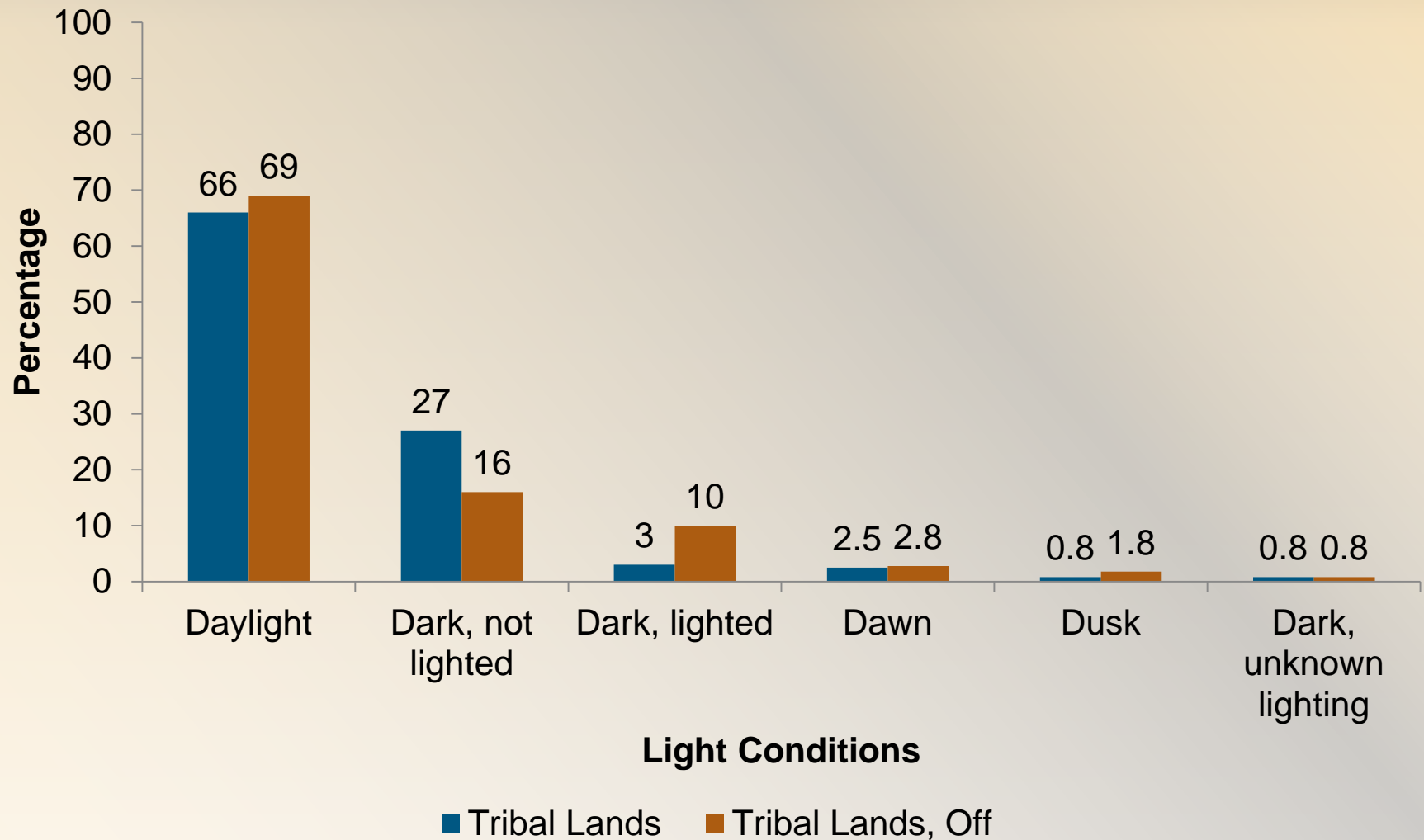
Single and Multiple Vehicle Crashes



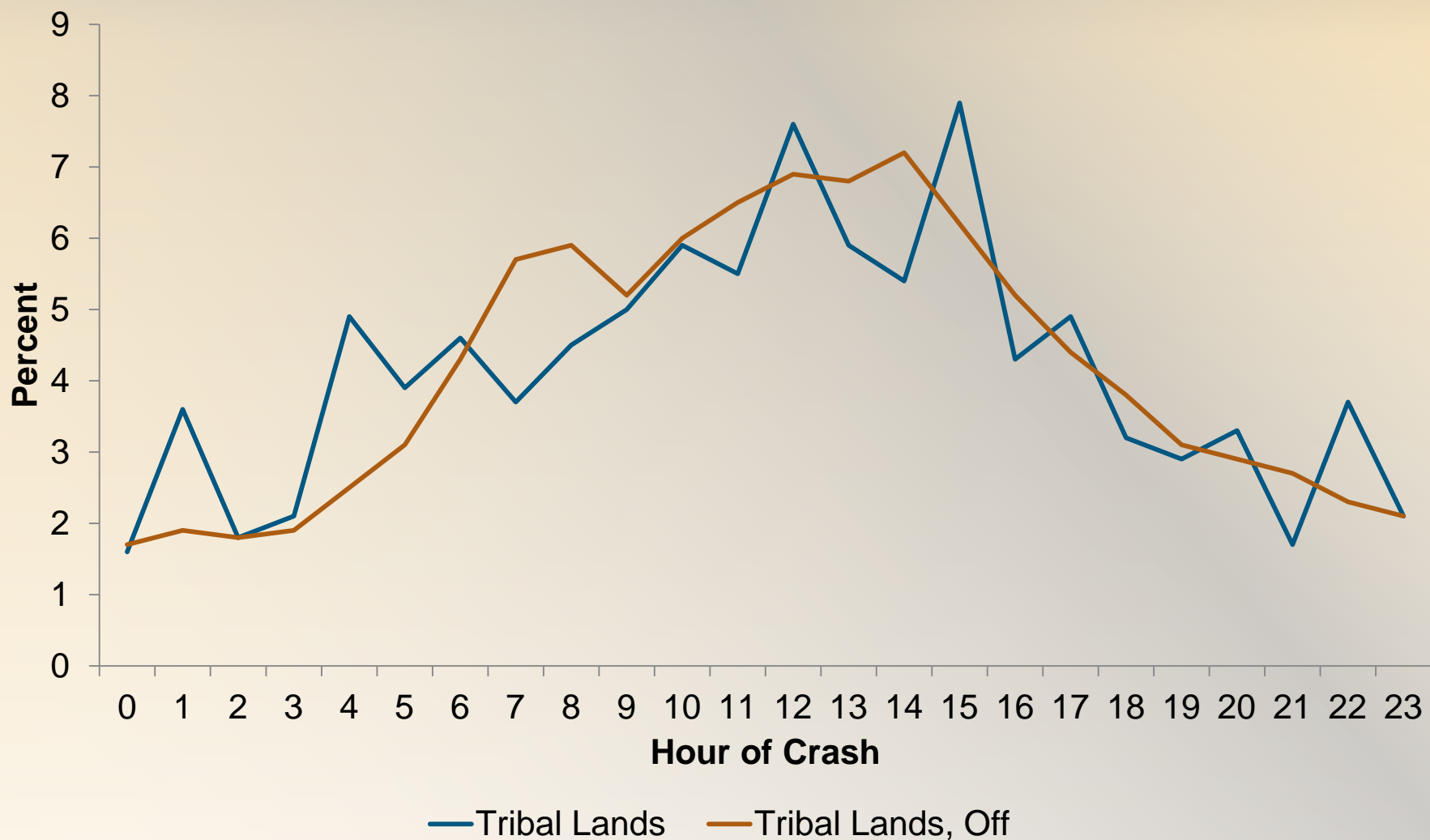
First Harmful Events



Light Conditions



Time of Day



Strengths and Limitations of ALISS Data Analyses

Strengths

- 8 & 10 years of crash data in analyses
- Crash locations are accurate

Limitations

- Include tribal and non-tribal drivers
- Misclassification of truck tractor trailers



Source: Federal Highway Administration, FHWA-RD-01-159

ITCA Recommendations for Tribes

Policy:

- ✓ Strengthen Tribal traffic codes pertaining to commercial traffic on Tribal lands
- ✓ Participate in Arizona Strategic Highway Safety Plan implementation for heavy vehicles

Enforcement:

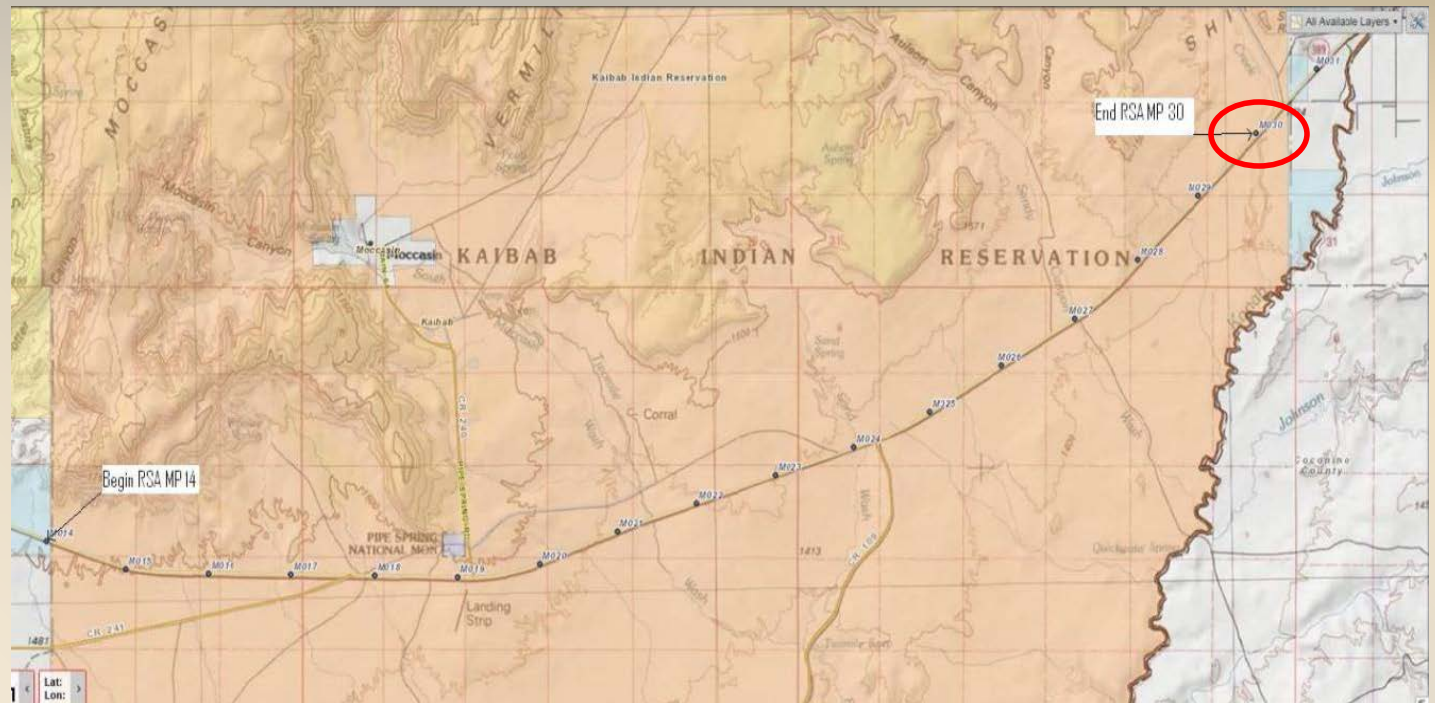
- ✓ Conduct traffic stops of commercial vehicles
- ✓ Invest in Tribal police training to become certified commercial vehicle inspectors
- ✓ Conduct commercial vehicle inspections regularly

Education:

- ✓ Conduct “Share the Road” training for Tribal members to heighten awareness of driving strategies near commercial vehicles

Engineering:

- ✓ Complete analyses of MVC involving commercial traffic
- ✓ Utilize Road Safety Assessments
- ✓ Utilize traffic calming strategies on state routes through Tribal communities
- ✓ Place rumble strips to minimize lane departures



July 2010 Road Safety Assessment



Process

- Assessment of State Route (SR) 389, mileposts 30-31

2-lane, unlit, rural asphalt road w/paved shoulders	East-west direction
Generally flat w/low hills and flat horizontal curves	Speed is 65 mph
Center line recessed pavement markers	Center and edge line rumble strips

- Team: ADOT, ADPS, BIADOT WRO, and IHS



Data Analyses

2008 Traffic Count

- ADOT data
- Average Daily Traffic 2,500 vehicles per day at intersection of State Route (SR)389 and BIA50
- 15% truck traffic
- ADOT/ADPS indicated truck volumes **significantly higher, possibly 30%**
- SR389 one of few non-interstate routes to permit triple trailers

Crash History, 1999-2008

- 50 total crashes
 - 2 fatalities
 - 5 serious injuries
- Overturn crashes

Start-up Meeting: Tribal Concerns

- Tribe has a current turning lanes project at BIA50
- Many “near misses” at BIA50 and SR389
- SR389 unique mix of road users: large trucks, unfamiliar drivers, international visitors, recreational vehicles, boat trailers, bicyclists and local traffic



BIA50 and SR389 Intersection



Suggestions

Potential Safety Issue	Potential Countermeasures
Difficult to see the intersection, especially at night	<ul style="list-style-type: none">• Install advance intersection warning sign approx. 500 prior to BIA50• Install 2-directional arrow sign on the south side of SR389• Install 360 degree delineators along the turn radii on BIA50
Passing zone in intersection relays conflicting information to drivers	<ul style="list-style-type: none">• Mark SR389 for no passing zone at BIA50 intersection
Stop bar is faded and located 21 feet from the intersection	<ul style="list-style-type: none">• Relocate BIA 50 stop bar closer to SR389
Stop sign is too high at 10 feet	<ul style="list-style-type: none">• Lower stop sign to 7 feet
Need right turning lane on SR389	<ul style="list-style-type: none">• Construct right turn lane on SR389<ul style="list-style-type: none">○ Consider off set rather than conventional right-turn lane
Need left turning lane on SR389	<ul style="list-style-type: none">• Provide left turning lanes on SR389



March 2014

Road Safety Assessment (RSA)



Process

- Assessment of SR389, mileposts 14-30

2-lane, unlit, rural asphalt road w/paved shoulders	East-west direction
Generally flat w/low hills and flat horizontal curves	Speed is 65 mph
Center line recessed pavement markers	Center and edge line rumble strips

- Team: ADOT, Mohave County and ITCA



Data Analyses

Traffic Counts

- County data
- Average Annual Daily Traffic at the SR389/Pipe Springs Intersection projected as 2,400 vehicles per day by 2030
- Average Daily Traffic 585 vehicles per day, Jul. 27-Aug. 10, 2011

Crash History, 2004-2013

- 31 total crashes
 - 0 fatalities
 - 1 serious injury
- Rear-end and overturn crashes

Start-up Meeting: Tribal Concerns

- Lack of advance signage for intersection
- Disruption of traffic on SR389 caused by mining truck turning at intersection
- Miners directly accessing SR389 from parking area rather than intersection



**SR389/South Antelope Valley Road (CR109)
Intersection**



Suggestions

Potential Safety Issue	Countermeasure for Consideration
At parking area, miners have created direct access to SR389 instead of using the intersection	<ul style="list-style-type: none">• Limit parking area access to the intersection• Remove direct access to SR389 from parking area
No advance street name signs for the intersection	<ul style="list-style-type: none">• Install advance street name signs on SR389 for Antelope Valley

Start-up Meeting: Tribal Concerns



**SR389/Pipe Springs National Monument
Road (CR15) Intersection**

- Lack of storage space in turn lanes causes traffic backups on SR389
- Truck parking on shoulders of SR389 shoulder or Pipe Springs causes congestion
- No lighting at intersection
- Directional signage too close to the intersection
- Shoulder drop offs too steep near the intersection
- Increased traffic volumes to monument, restaurant, gas station and campground

Suggestions

Potential Safety Issue	Countermeasure for Consideration
Limited sight distance for vehicle turning from Pipe Springs	<ul style="list-style-type: none">• Move stop line on Pipe Springs closer to SR389
Shoulder parking on Pipe Springs	<ul style="list-style-type: none">• Restripe Pipe Springs approach
EB and WB traffic queuing on SR389 right and left turns to Pipe Springs	EB and WB turn lanes are insufficient length for 65 mph <ul style="list-style-type: none">• Lengthen turn lanes
EB and WB guide and recreational sign are inconsistent: legend, placement and lateral offset	<ul style="list-style-type: none">• Place consistent signage: legend, placement and lateral offset
WB regulatory sign position	<ul style="list-style-type: none">• Position WB regulatory sign



2012-2016

Outcomes for the Kaibab Band of Paiute Indians



Intersection of BIA50 and SR389

RSA Purpose for Tribe

- Increase safety
- No turning lanes on SR389
- Heavy commercial truck traffic on SR389
 - 3 trailers
- No shoulders on SR389 to pull over
- Limited visibility on SR389
 - Sunrise: morning hours
 - Sunset: evening hours
- Speeding on SR389: 70+mph
 - Posted limit is 65mph





Funding

- SR389 improvements were funded with Highway Safety Improvement Program monies: Federal Aid safety funds administered by ADOT.
- BIA50 design and construction for the turning lane project was funding by the Tribal Transportation Program.

Road Feature Improvements

- Constructed offset right turn lane on SR389
- Installed left turn lane on SR389
- Added no passing zone in the intersection and signage on SR389
- Installed an intersection warning sign with BIA50 route plaques 500 feet in advance of the intersection on east and west sides
- Installed a two-direction arrow sign on SR389
- Refreshed the stop bar on BIA50 and relocated it closer to SR389
- Lowered the stop sign on BIA50 to 7 feet
- Installed 360 delineators along the turn radii on BIA50.





Intersection of Mohave County 15
and SR389



RSA Purpose for Tribe

SR389 is the western access road to the Grand Canyon northern rim and a freight route.

SR389 and Mohave County 15 are access roads to:

- Tribal Administration building
- Tribal gas station, convenience store and restaurant
- Tribal recreational vehicle campground
- Pipe Springs National Monument (National Parks)
- Communities of Moccasin and villages of Red Hills, Juniper and Kaibab

Large Vehicle Types Using the Intersection of SR389 and Mohave County 15

- Truck tractor trailers, including petroleum
- Recreational vehicles
- Pickup trucks hauling trailers
- Trucks with boat trailers
- School busses



Challenges

- 2 access roads on the Kaibab Indian Reservation are owned by ADOT (SR389) and Mohave County (15)
- In the data driven process for the Highway Safety Improvement Program, the traffic counts and crash data were examined and don't show fatalities or serious injuries.
- In Arizona, road owners have to apply for the Highway Safety Improvement Program funds
- The tribe is interested to apply for funding with road owners approval.
- Due to tribal staff shortage and new administration, RSA meeting and agreements have been delayed.



Next Steps

- Tribe to meet with Mohave County and ADOT to get approval to apply for funding for road improvement and expansion.
- Tribe and 2 road owners enter into an agreement to improve the intersection.
- Tribal Council resolution to support road owners' funding application.



June 2016

Share the Road Training



Partnerships

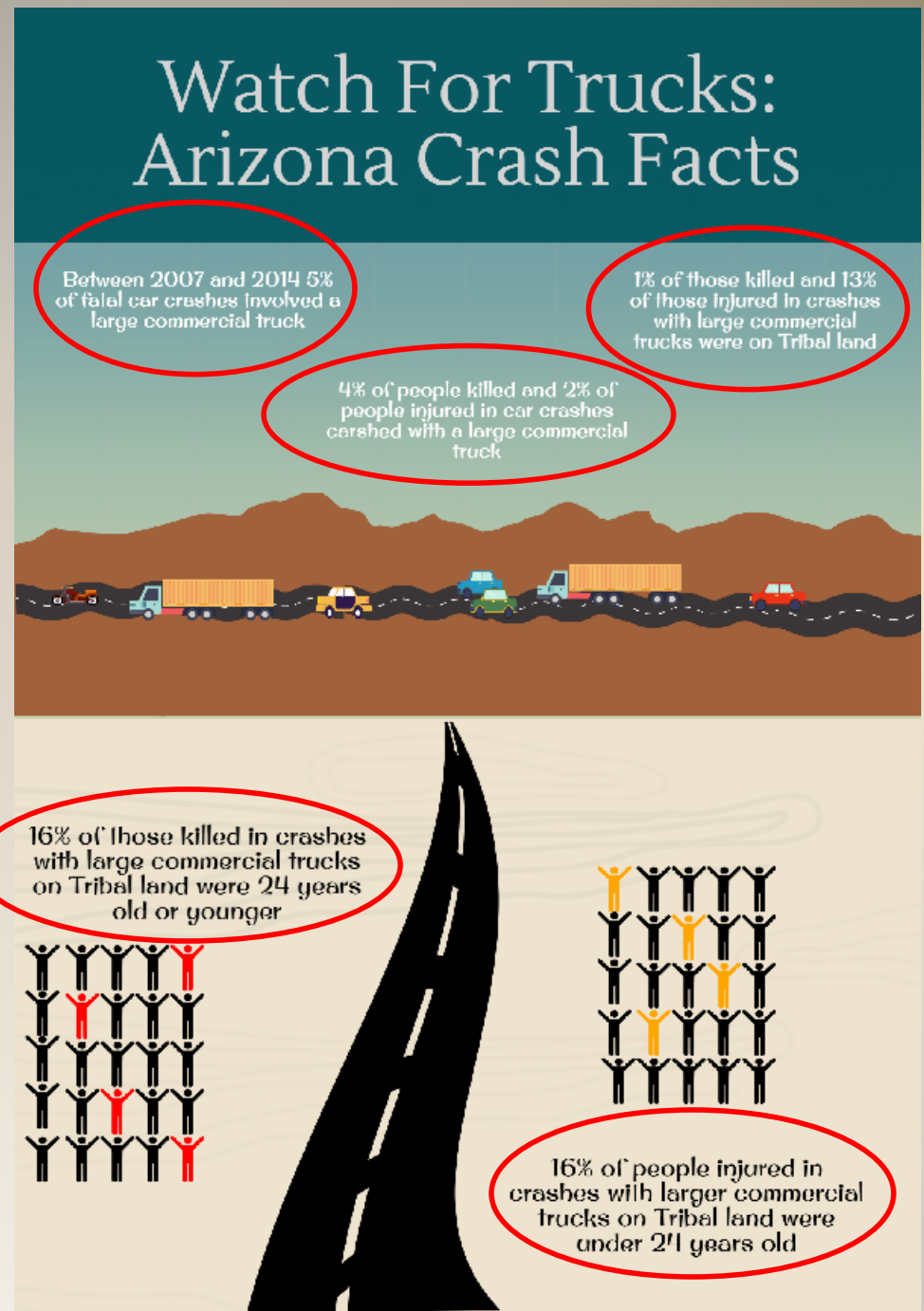
- Kaibab Band of Paiute Indians
 - Government
 - Tribal members, including teens
- Arizona Department of Public Safety
- Inter Tribal Council of Arizona, Inc.
- Walmart

Crashes, 2007-2014

- 5% of **fatal** crashes involved a commercial vehicle
- 1% of **people fatally injured** involved a commercial vehicle crash on Tribal lands in Arizona
- 13% of **people injured** involved a commercial vehicle crash on Tribal lands in Arizona

Injuries

- **People <21 years of age:** 16% of **people fatally injured** in commercial vehicle crashes on Tribal lands in Arizona were under 21 years
- **People <24 years of age:** 16% of **people injured** in commercial vehicle crashes on Tribal lands in Arizona were under 24 years





Curriculum Messages

Car drivers are principally at fault in 70-75% of fatal car-truck crashes.

- Stay out of the No Zones (Blind spots)
- Pass trucks with caution (pass trucks on the left side for maximum visibility and maintain a consistent speed)
- Don't cut off a truck (leave plenty of room when you pull in front of a truck)
- Give sufficient space to trucks (give plenty of room to trucks to avoid dangerous situations)
- Allow space between trailer and curb (trucks make wide turns)
- Practice patience (try to avoid any erratic moves or rapid lane changes, speeding, aggressive driving)
- Lower your headlights (bright lights reflecting off large trucks can be blinding to truck drivers)
- Signal sooner (gives trucks a chance to slow down or stop sooner)
- Merge with caution (avoiding merging in front of a truck, if traffic is present)

Blind Spot Demonstration

- Positioned commercial vehicle in front of 2 vehicles parked in the right and rear blind spots
- Participants sit in the parked commercial vehicle to view the blind spots while the driver explains the dangers



Look for the entire truck in your rear view mirror before moving in front of a big truck

Pass at a safe speed only on the left side of a big truck



Never tailgate or draft a big truck

Evaluation

Topics	Government Employees	Teens
Reported the training increased their knowledge and awareness	97%	100%
Reported that it resulted in a change in their attitudes and perceptions	91%	100%
Reported that the training enhanced their skills	94%	100%
Were overall satisfied with the training	97%	100%

Contacts

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Partially funded by the Department of Health and Human Services Office of Minority Health