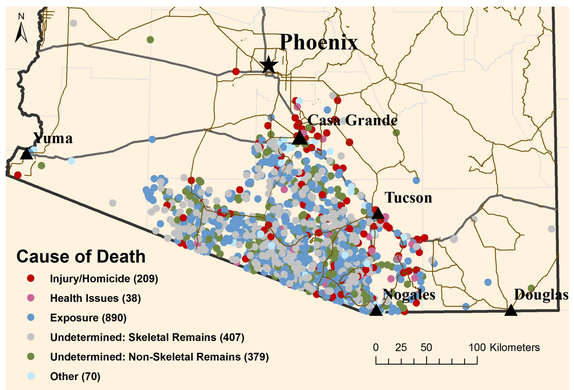
# Identifying Deadliest Migration Corridors Along the Arizona-Mexico Border

## Project Overview

Each year an unknown number of undocumented immigrants cross the US-Mexico border, often in an attempt to seek employment or reunite with family members. Some migrants successfully complete the journey, many are caught by enforcement authorities and eventually deported, but still others are never heard from again. This project seeks to identify the deadliest migration corridors along the Arizona-Mexico border.

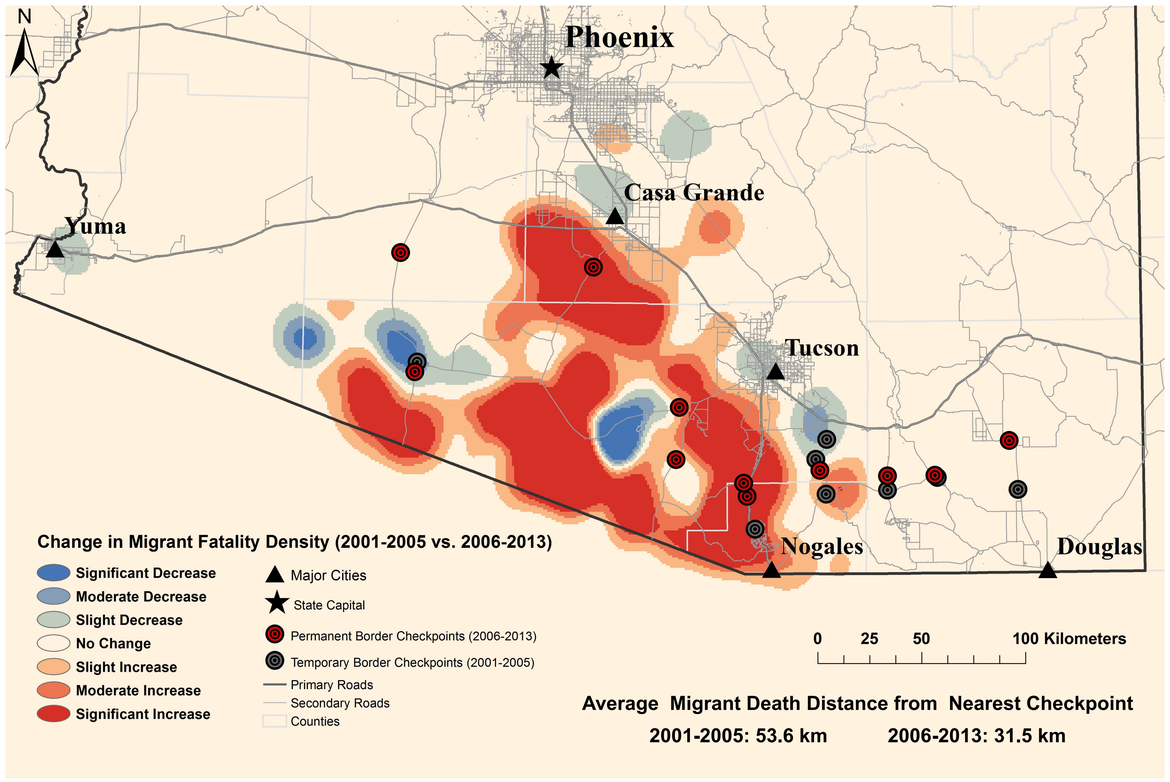
In particular, it examines how spatial patterns of migrant death have changed following the implementation of permanent Customs and Border Patrol (CBP) checkpoints in Southern Arizona in 2006. The results could assist NGOs in identifying areas for the targeted distribution of life-saving resources and also allow CBP to conduct more effective search-and-rescue operations.

## Migrant Death Dataset (2001-2013)




## Changes in Migrant Death Density Along the Arizona-Mexico Border

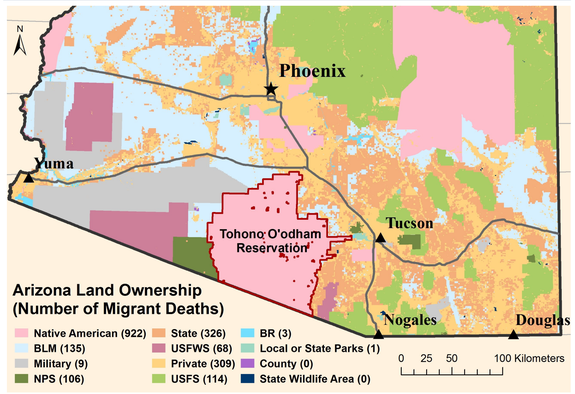
### Following Implementation of Permanent Border Control Checkpoints in 2006




**Average Migrant Death Distance from Nearest Checkpoint**

**2001-2005: 53.6 km** **2006-2013: 31.5 km**

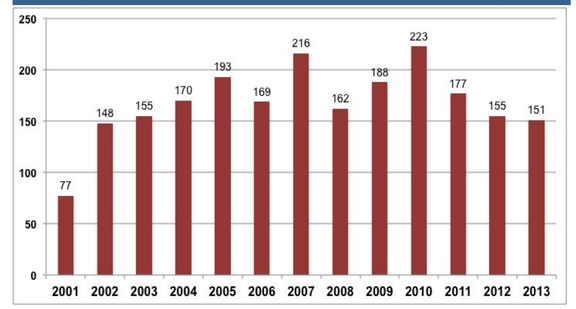
## Arizona Land Ownership




BLM: Bureau of Land Management NPS: National Park Service USFWS: US Fish and Wildlife Service USFS: US Forest Service BR: Bureau of Reclamation

## Total Number of Migrant Deaths by Year

### (Southern Arizona, Humane Borders Dataset)




## Methodology

Using a migrant fatality dataset assembled by the NGO Humane Borders in conjunction with the Office of the Pima County Medical Examiner, I first plotted the locations of all migrant death records based on latitude and longitude coordinates representing the sites where remains were recovered. While the full 2001-2013 dataset included 2142 individual records, I removed 149 from the dataset for analysis purposes because of coordinate input errors.

By grouping the data into two sets, representing 2001-2005 deaths and 2006-2013 deaths, I was able to determine how fatality hotspots changed between these two periods. After performing kernel density analysis on each dataset separately to measure the magnitude of migrant deaths per square kilometer for each time period, I differenced the two to detect relative levels of change. I also calculated the average distance of migrant death locations to the nearest contemporaneous checkpoint.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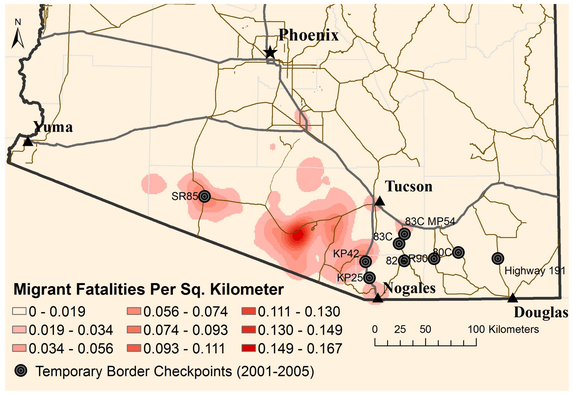
**GIS for International Applications**
**Projected Coordinate System:**
**NAD_1983_UTM_Zone_12N**
**Cartography by Krista Zegura**
**May 2014**

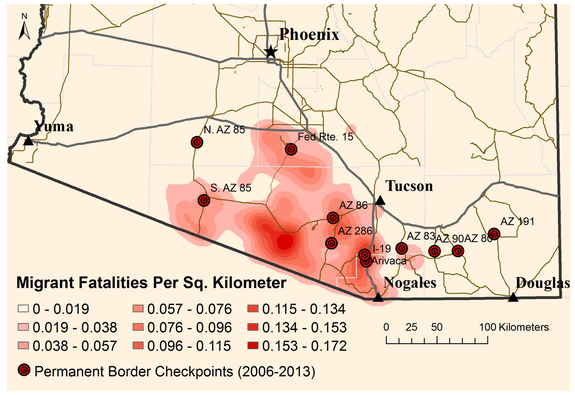
## Results

The density change detection analysis indicates areas where there have been significant increases or decreases in migrant fatalities since the creation of permanent CBP checkpoints in 2006 (See Map Above). Overlaying the change hotspots on a map of Arizona Land Ownership shows that not only did the most total deaths occur on Native American Land (2001-2013), but that much of the area of "Significant Increase" after 2006 falls within the Tohono O'odham Reservation. A possible explanation for this is that both CBP and NGOs have strained relationships with the Tribe, meaning that migrants have less access to aid in this border region. .

### Migrant Fatality Density 2001-2005




### Migrant Fatality Density 2006-2013




## Limitations

While the Humane Borders dataset is remarkably complete in terms of compiling information on records of *known* migrant deaths, the foregoing analysis is ultimately hampered by two main factors: 1) lack of data on *all* migrant deaths, and 2) lack of data on total number of undocumented entries per year. In addition, Humane Borders' data comes largely from the Pima County Office of the Medical Examiner, so deaths in Pima County are overrepresented in the dataset. Therefore the analysis cannot give a complete picture of migrant death patterns in Southern Arizona.

Further, the locations of the Temporary Border Checkpoints (2001-2005) are approximated from a US Government Accountability Office report, making the distance calculations ball-park estimates. Finally, while average annual migrant deaths increased after the introduction of permanent checkpoints in 2006 and hotspots generally shifted even farther east, it is impossible to determine the relationship between the two.

**Data Sources**
**Migrant Deaths:** Humane Borders, Inc., with Pima County Office of the Medical Examiner (2014)
**Border Checkpoints:** US Government Accountability Office, based on US Customs and Border Patrol Records, Interviews and Site Visits (2005); *Arizona Daily Star* (2011)
**Land Management:** Arizona Bureau of Land Management, derived from Arizona State Land Department 1984 LAND dataset (2012)
**Roads**: Arizona Department of Transportation (2014); US Census Bureau Tiger/Line (2010)
**Administrative:** US Census Bureau Tiger/Line (2010)