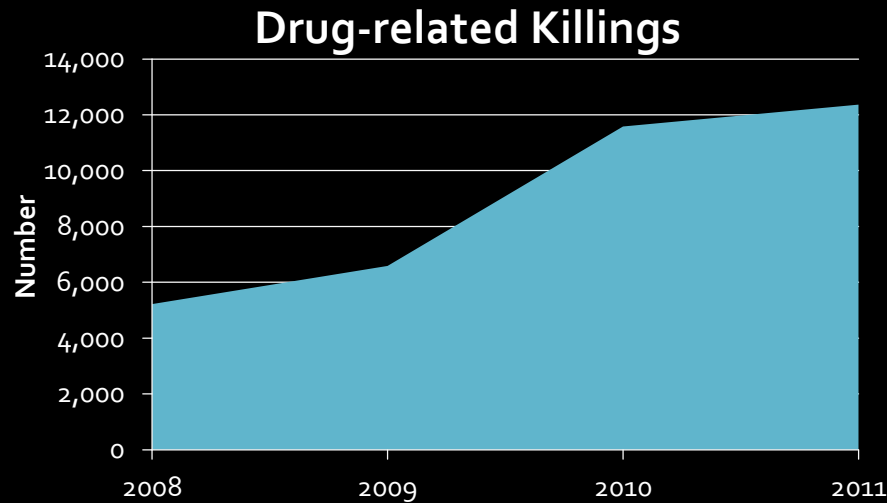


# Scalable Vector Graphics (SVG) for Mapping



## Drug-related Killings in Mexico



Theresa Firestine  
Pennsylvania State University  
Masters in Geographic Information Systems  
Capstone Project  
Advisor: Frank Hardisty  
03/26/12

# Motivation: A escalating issue



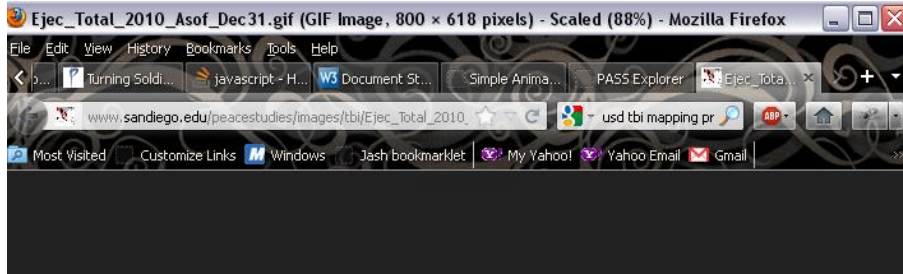
- Roughly 11 in 100,000 died in a drug-related homicide in 2011

*Source: Data tallied by the University of San Diego Trans-Border Institute from La Reforma newspaper*

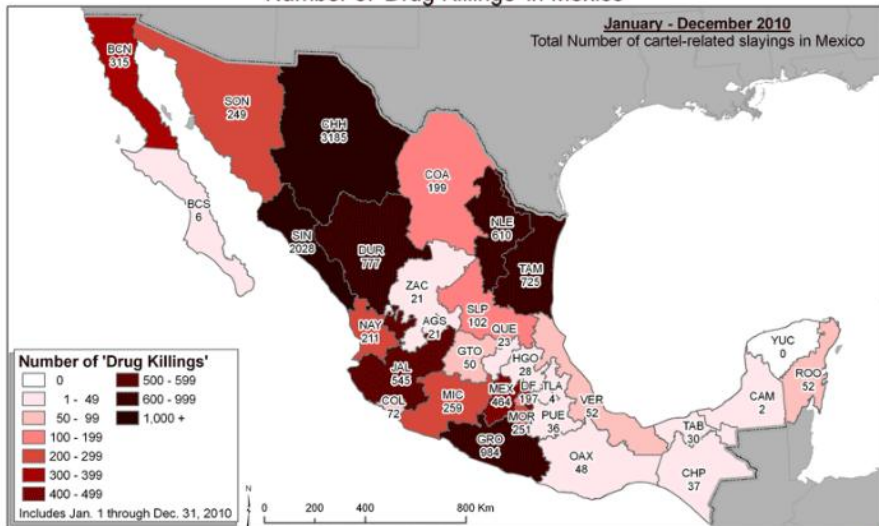
\$205 million in drug money seized in Mexico city — the largest single drug cash seizure in history (2007)

Source: DEA, 2007 [1]

# Motivation: Improving data access



Number of 'Drug Killings' in Mexico



Source: State and national totals of cartel-related slayings in Mexico ("ejecuciones" and "narcoejecuciones") obtained from data provided by Reforma newspaper.

Maximum and Minimum values:

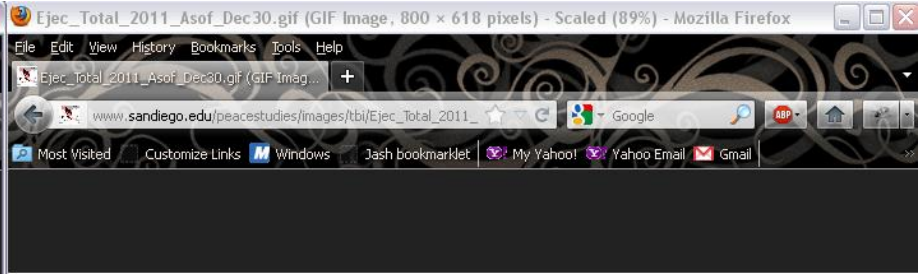
Maximum value: 3,185 in Chihuahua

Minimum value: No "ejecuciones" were recorded in the state of Yucatán

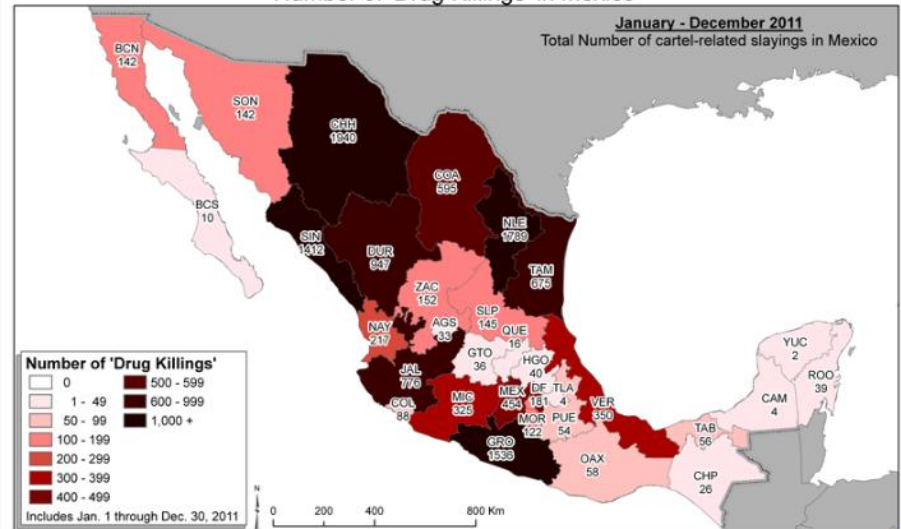
according to the source for these maps, Reforma newspaper.

National average: The national total number of "ejecuciones" (cartel-related slayings) Jan. 1 - Dec. 31, 2010 was 11,583

Maps produced by Theresa Firestone  
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Number of 'Drug Killings' in Mexico



Source: State and national totals of cartel-related slayings in Mexico ("ejecuciones" and "narcoejecuciones") obtained from data provided by Reforma newspaper.

Maximum and Minimum values:

Maximum value: 1,940 in Chihuahua

Minimum value: 2 in Yucatán.

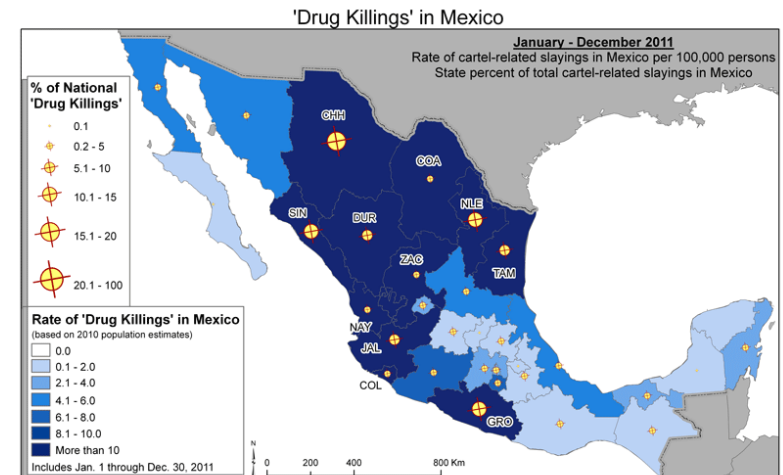
National average: The national total number of "ejecuciones" (cartel-related slayings) Jan. 1 - Dec. 30, 2011 was 12,366

Maps produced by Theresa Firestone  
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# Purpose

- Demonstrate the advantage of SVG for client side vector mapping
- Develop an interactive web map for showing drug-related killings
  - SVG used as the enabling technology



Source: State and national totals of cartel-related slayings in Mexico ("ejecuciones" and "narcoejecuciones") obtained from data provided by Reforma newspaper.

Maximum and Minimum values:  
Maximum value: 57.99/100,000 (7.7% of national 'ejecuciones') in Durango  
Minimum value: 0.10/100,000 (0.02% of national 'ejecuciones') in Yucatán.  
National average: The national average rate of 'ejecuciones' (cartel-related slayings) Jan. 1 - Dec. 30, 2011 was 11.01

# Outline

- SVG
  - What is it?
  - Why use SVG?
  - How can it be used for web mapping?
    - What about other technologies?
  - Is it time for SVG?
    - How is it currently used?
    - What are the disadvantages of using SVG?
- Mapping drug related slayings in Mexico
  - Why create a web map?
  - Why use SVG?
  - Prototype demonstration
- Future steps
- Concluding remarks





# What is SVG?

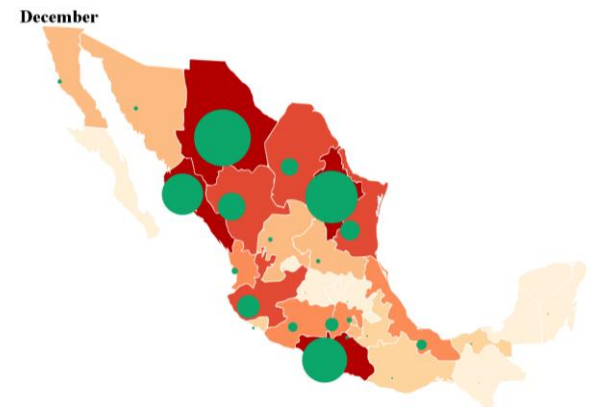
- A vector graphics recommendation
- Markup contained in XML files

```
1 <?xml version="1.0" encoding="UTF-8" standalone="no"?>
2 <!-- Created with Inkscape (http://www.inkscape.org/) -->
3
4 <svg
5   xmlns:dc="http://purl.org/dc/elements/1.1/"
6   xmlns:cc="http://creativecommons.org/ns#"
7   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
8   xmlns:svg="http://www.w3.org/2000/svg"
9   xmlns="http://www.w3.org/2000/svg"
10  xmlns:sodipodi="http://sodipodi.sourceforge.net/DTD/sodipodi-0.dtd"
11  xmlns:inkscape="http://www.inkscape.org/namespaces/inkscape"
12  id="svg3919"
13  sodipodi:version="0.32"
14  inkscape:version="0.48.2 r9819"
15  width="999.73236"
16  height="679.94141"
17  version="1.0"
18  sodipodi:docname="Mexico_Map_Wiki.svg"
19  inkscape:output_extension="org.inkscape.output.svg.inkscape">
20 <metadata
```



# The Case for SVG

- SVG is the future web mapping technique for client side vector mapping
  - Open, interoperable, and extensible (Neumann and Winter 2001; Peng and Zhang 2004; Ramos et al 2007)
  - Suitable for animation and for static images (Clarke 2005)
  - Resolution independent



```
<animateTransform
  attributeType="XML"
  attributeName="transform"
  type="scale"
  keyTimes=str_times
  values=str_values
  dur="12s"
  fill="freeze"
  repeatCount="1"/>
```

# How Can SVG be Used for Web Mapping?

- Two methods
  - Loading directly into the browser
  - Programmatic rendering



# SVG Loaded into the Browser



No.  
323

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FEBRUARY 8, 2011

## Cross Platform Scalable Vector Graphics with svgweb

by **JIM RAY**

Published in: [Browsers](#), [HTML](#) and [XHTML](#)  
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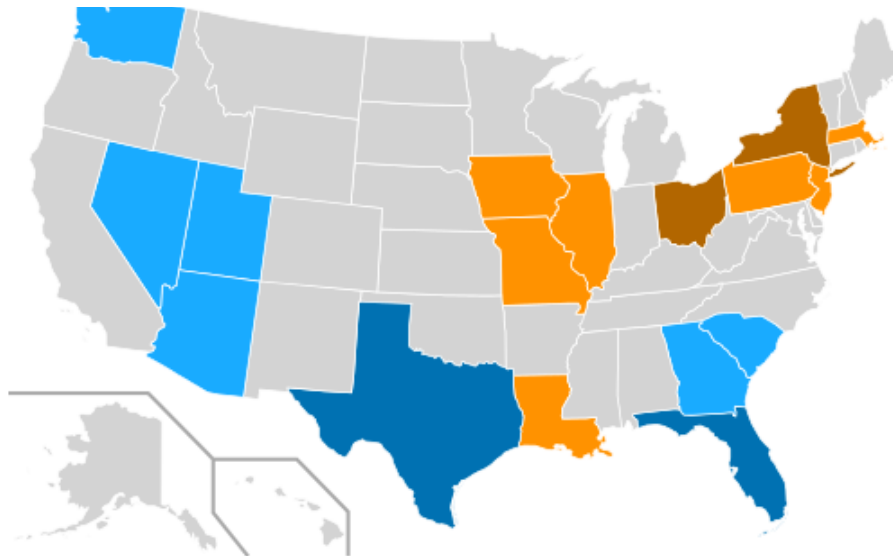
Topics

[Code](#) >

[Content](#) >

[Culture](#) >

[Design](#) >



Uses SVG Web  
Javascript  
library to load  
and manipulate  
an SVG file

# Programmatic Rendering

» Web Development » Charts, Graphs and Images » Charts



## SVG World Map

By [Marcelo Ricardo de Oliveira](#) | 4 Oct 2011

[Javascript](#) [HTML](#) [Dev](#) [Intermediate](#) [jQuery](#) [HTML5](#) [SVG](#)

Licence [CPOL](#)  
First Posted **29 Sep 2011**  
Views **19,034**  
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An interactive World Map using SVG and jQuery.



Prize winner in Competition "Best Web Dev article of September 2011"

[Article](#)

[Browse Code](#)

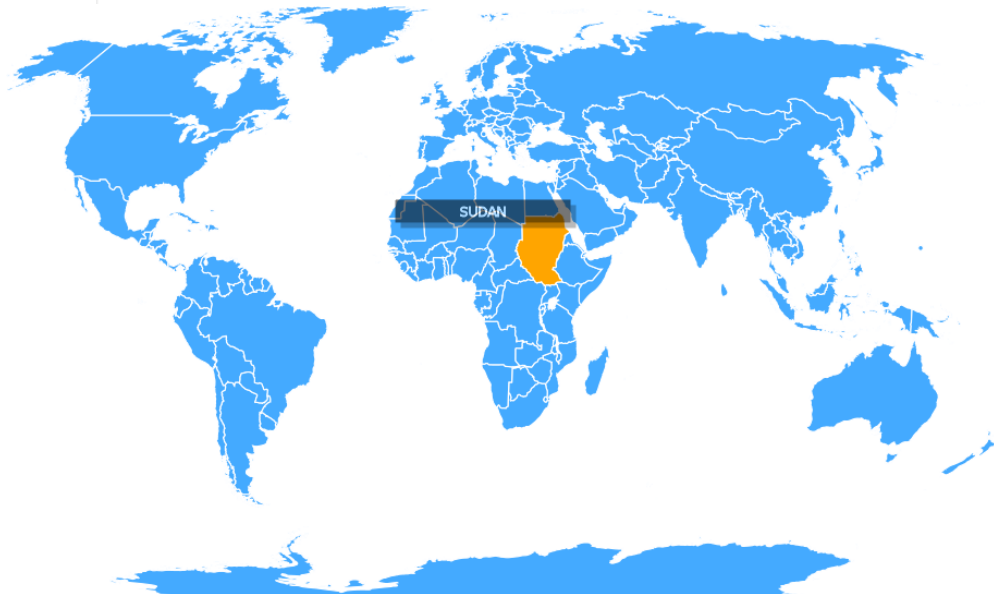
[Stats](#)

[Revisions \(7\)](#)

[Alternatives](#)



4.90 (52 votes)



Countries drawn through Javascript by their SVG coordinate paths

# What About Other Technologies?

- Custom drawings: Flash and Canvas
- Web-based GIS: tile-based services like Google Maps, Open Layers

The New York Times Technology | Personal Tech | Business Day

## Bits

### Adobe to Kill Mobile Flash, Focus on HTML5

By NICK BILTON | November 9, 2011, 1:15 PM | 29



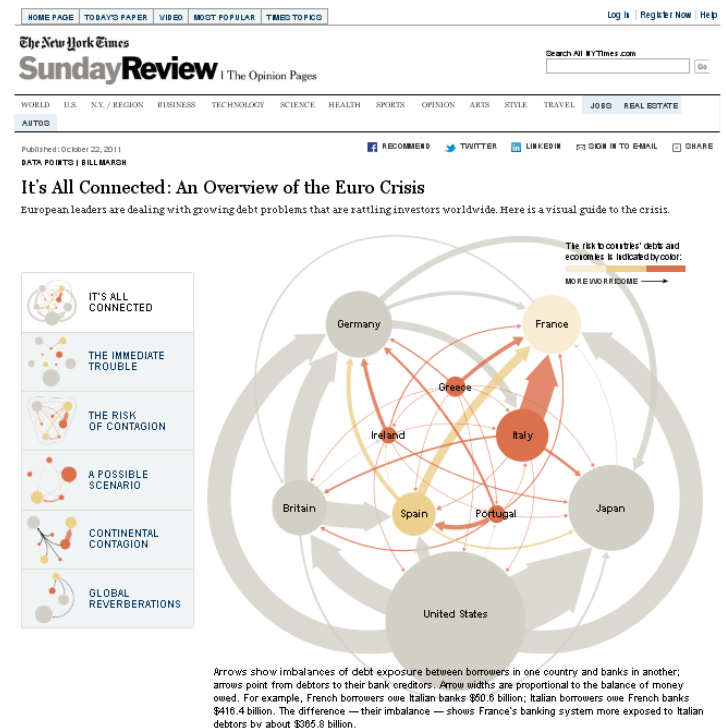
screenshot via [Apple.com](#)

Adobe Flash does not work on any [Apple](#) mobile devices. In a video demonstration of the [iPad](#), Apple left a large hole in place of the Flash Player.

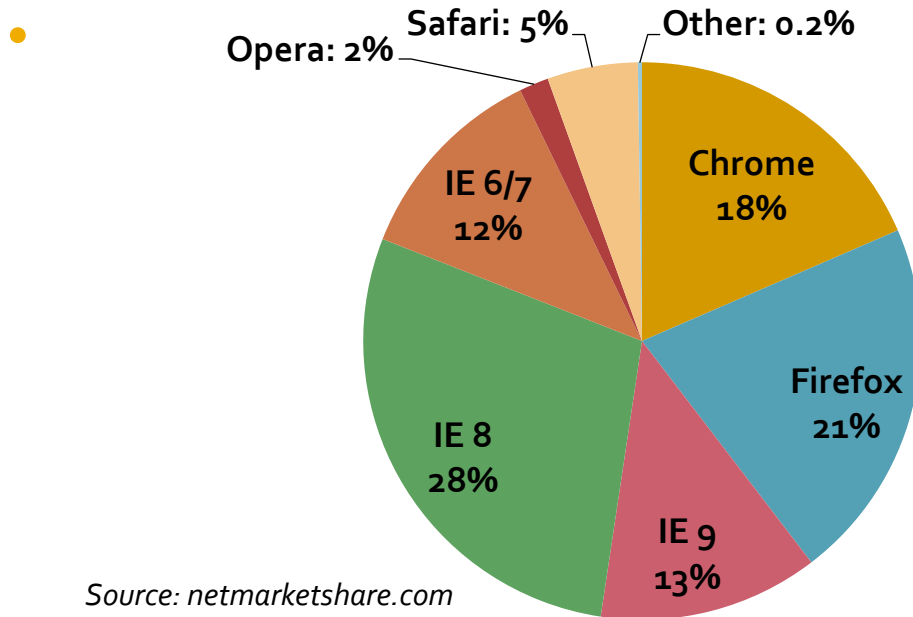
[Adobe Systems](#), the software company, said Wednesday that it is killing its Flash for mobile browsers, and will instead focus its efforts on HTML5 for mobile developers.

# Time for SVG?

- Recognized for role in producing high quality interactive maps in 2001 (Neumann and Winter)
- Supported gradually
  - Common format in Wikimedia
  - Native format in Inkscape (released 2003)
  - Open source GIS



# Disadvantages



Source: [netmarketshare.com](http://netmarketshare.com)  
February 2012

Browser	Native SVG support
Internet Explorer 9	Yes
Other Internet Explorer versions	No
Firefox	Yes
Chrome	Yes
Safari	Yes
Opera	Yes

Source: <http://www.codedread.com/svg-support.php>

- Rendering can be slow when complexity increases

# SVG Case Study: Background

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## PROJECTS

US-Mexico Border  
Immersion Program

U.S.-Mexico Security  
Cooperation Project

USD-UABC Legal  
Education Program

Summer Seminar in  
Border Studies

Mapping Project

## Mapping Project

This project is made possible through the generous support of the TBI Justice in Mexico Project. These maps are being developed and map justice related trends (such as homicide rates) in relation to unemployment, inequality, party governance, etc.).

### [Crime and Law Enforcement](#)

[Drug Killings in Mexico \(Annual/Midyear Totals\)](#)

[Drug Killings in Mexico \(Bi-monthly\)](#)

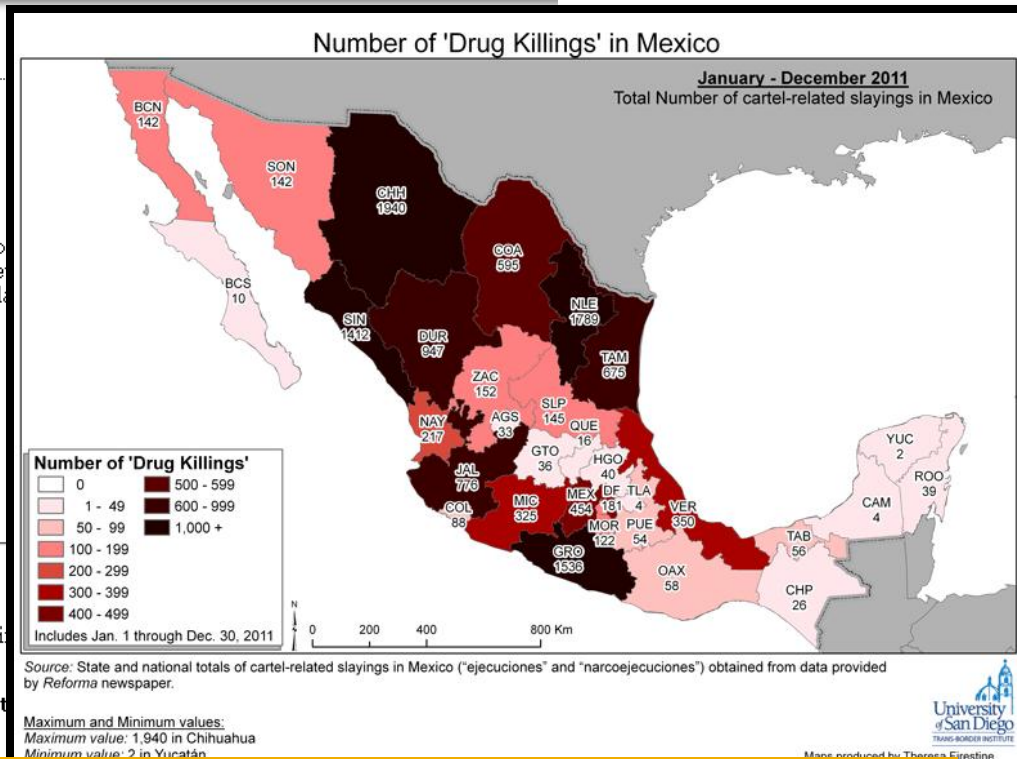
[Demographics](#)

[Immigration](#)

[Socio-economics](#)

[Political](#)

- **Crime and Law Enforcement**
  - Criminal Charges Filed for Homicide by State in Mexico [ [image](#) | [methodology](#) ]
- **Drug Killings in Mexico (Annual/Midyear Totals)**
  - 2006 Drug Killings by State
    - Total Number of Drug Killings

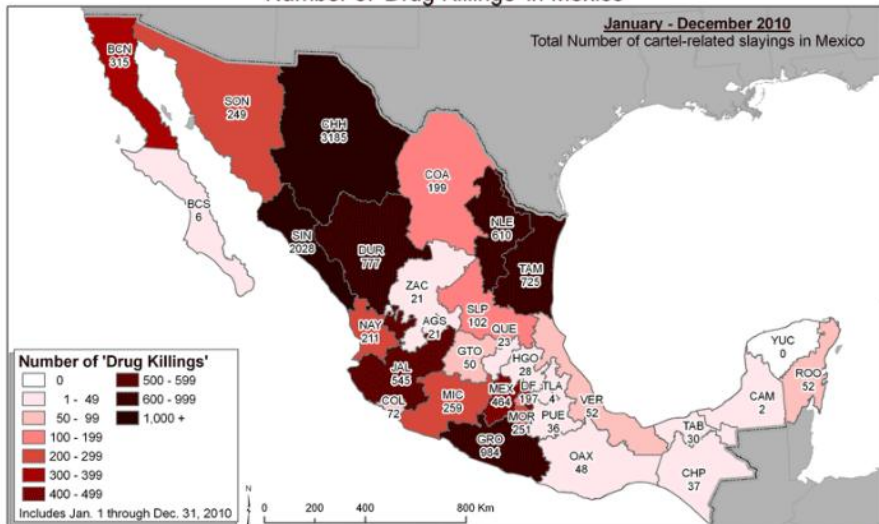




# Motivation: Improve data dissemination



Number of 'Drug Killings' in Mexico



Source: State and national totals of cartel-related slayings in Mexico ("ejecuciones" and "narcoejecuciones") obtained from data provided by Reforma newspaper.

Maximum and Minimum values:

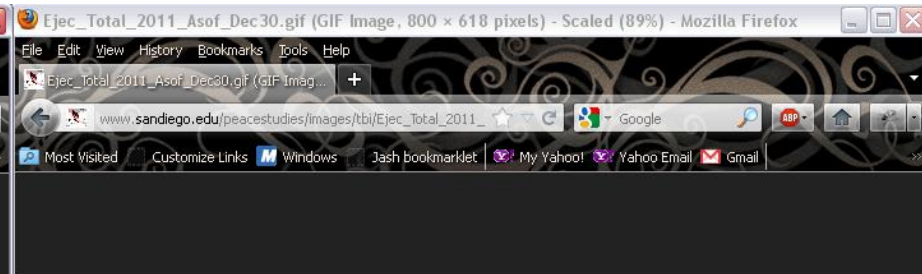
Maximum value: 3,185 in Chihuahua

Minimum value: No "ejecuciones" were recorded in the state of Yucatán

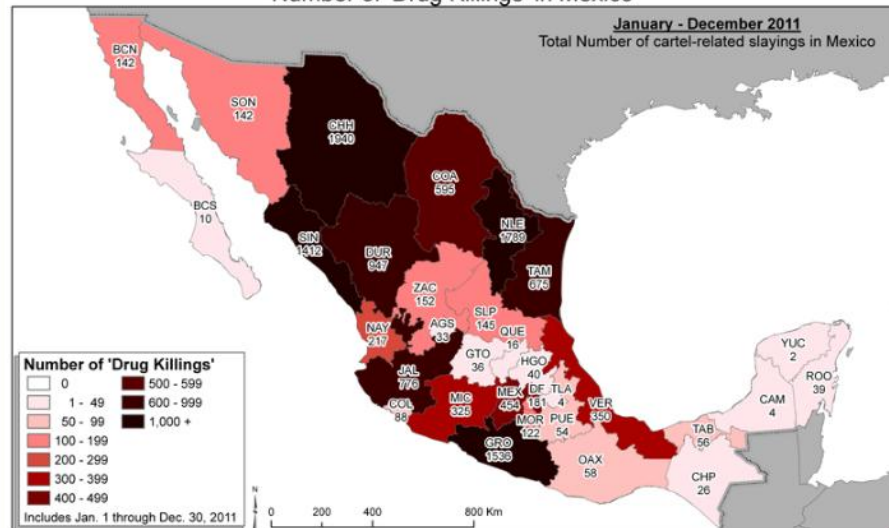
according to the source for these maps, Reforma newspaper.

National average: The national total number of "ejecuciones" (cartel-related slayings) Jan. 1 - Dec. 31, 2010 was 11,583

Maps produced by Theresa Firestone  
Copyright 2010 by Trans-Border Institute



Number of 'Drug Killings' in Mexico



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Maps produced by Theresa Firestone  
Copyright 2012 by Trans-Border Institute



# Identified Needs

- User control
- Ability to view data values
- Publically available

# Existing Systems

## ■ Los Angeles Times











### MEXICO UNDER SIEGE The drug war at our doorstep

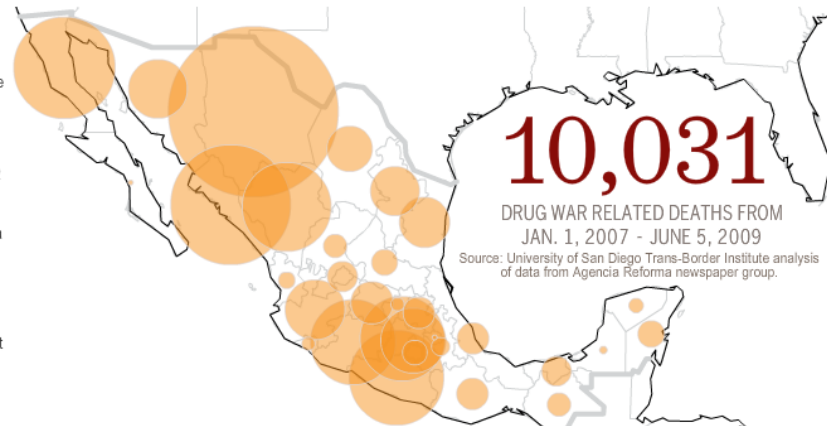
Last updated March 13, 2012

>> IT'S A WAR >> INTERACTIVE MAP >> MULTIMEDIA GALLERY >> VIDEO Q&A >> COMPLETE SERIES

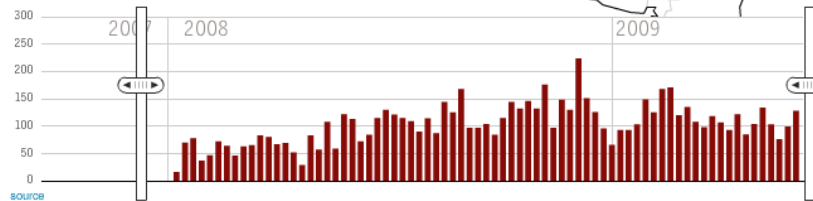
#### MAJOR PLAYERS

Roll over list below to view complete profile & locate main area of operation

-  **Wenceslao Alvarez** was the suspected finance officer of the Gulf cartel. Arrested in
-  **Benjamin Arellano Felix** was sentenced in 2007 to 22 years in a Mexican prison.
-  **Eduardo Arellano Felix** is a member of the Arellano Felix cartel. Arrested by
-  **Francisco Javier Arellano Felix** is a member of the Arellano Felix cartel. Caught
-  **Francisco Rafael Arellano Felix** of the Arellano Felix cartel was arrested in 1993
-  **Ramon Arellano Felix** was the legendary enforcer of the Arellano Felix cartel. Killed
-  **Alfredo "El Mochomo" Beltran Leyva** leads a faction of drug traffickers
-  **Arturo "El Barbas" Beltran Leyva** leads a faction of the Sinaloa group with brother



#### DEATHS BY WEEK



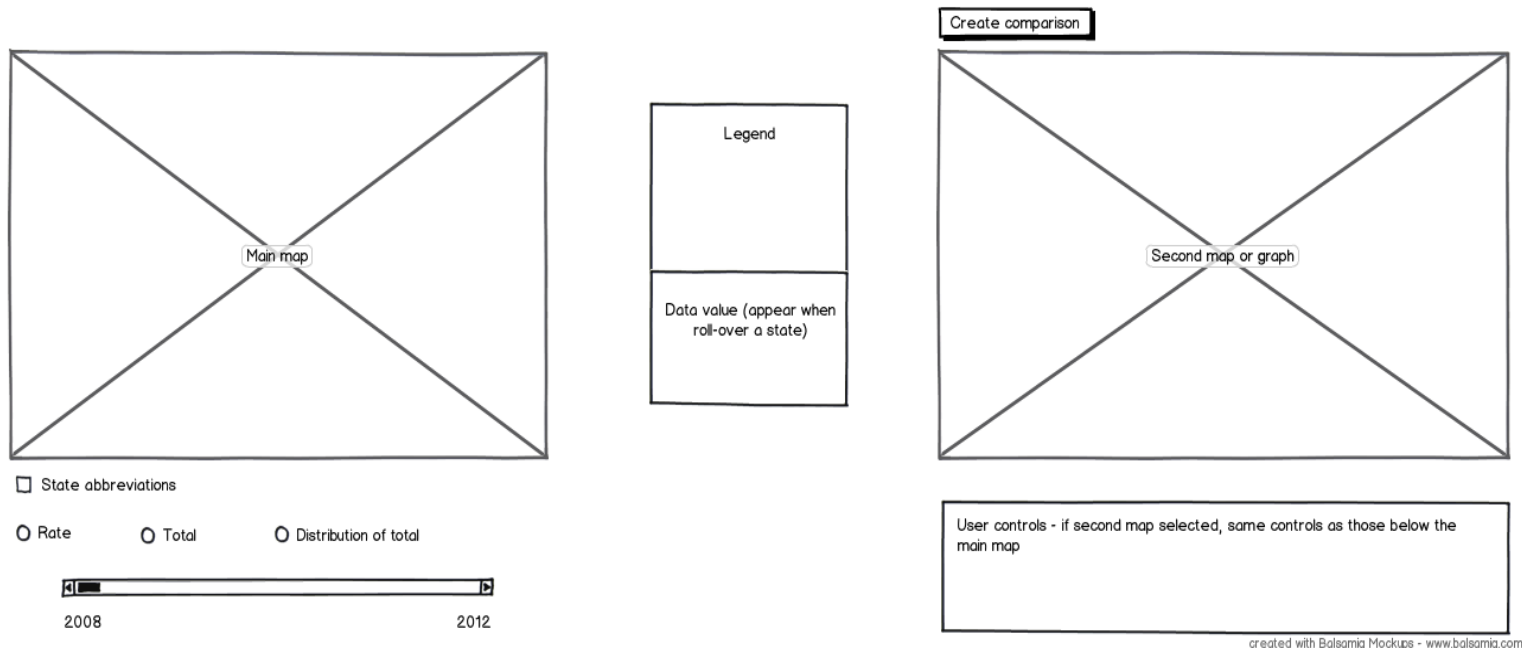
CREDITS

Uses Flash

<http://projects.latimes.com/mexico-drug-war/#/interactive-map>

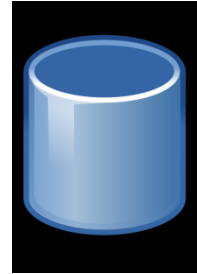
# Proposed system

- Interactive web map made available through standard browser

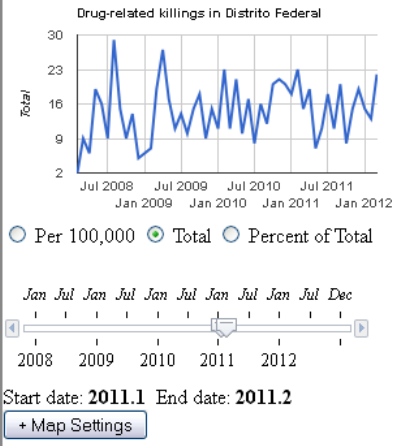


# Requirements

- Drawing library
- Database
- Database maintenance



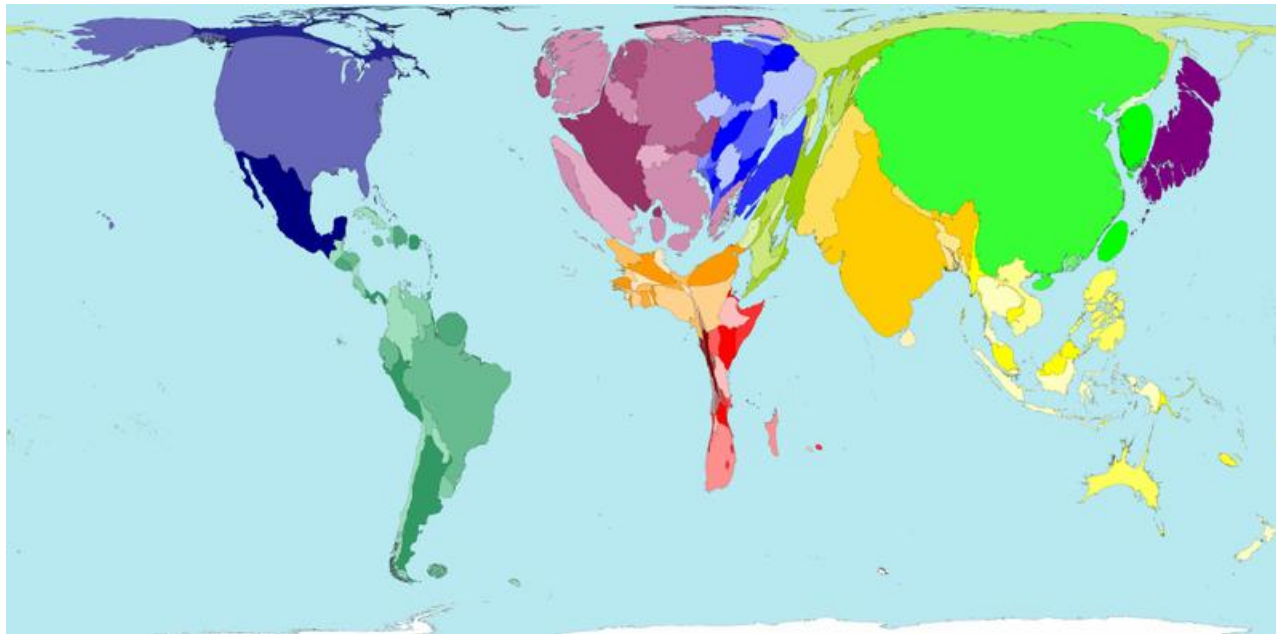
# Prototype





# Future Steps

- Review of application
- Re-evaluation of classification system used
- Exploration of alternative visualization



# Concluding Remarks

- SVG is an advantageous web-mapping technology for web-based interactive mapping
- Interactive web maps enhance spatial data access and exploration

# Contact Information

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Theresa Firestine

[taf5118@psu.edu](mailto:taf5118@psu.edu)

# References

- Neumann, A. and A. M. Winter (2001). "Time for SVG – Towards High Quality Interactive Web-Maps," paper presented at the 20<sup>th</sup> International Cartography Conference in Beijing China. Retrieved March 29, 2012 from: [http://icaci.org/files/documents/ICC\\_proceedings/ICC2001/icc2001/default.htm](http://icaci.org/files/documents/ICC_proceedings/ICC2001/icc2001/default.htm)
- Clarke, Paul (2005). "Dynamic Web-mapping Using Scalable Vector Graphics (SVG)," paper presented at the 2005 Esri International User Conference. Retrieved March 29, 2012 from: [http://pelagis.net/gis\\_con/paper/svg.pdf](http://pelagis.net/gis_con/paper/svg.pdf)
- Peng, Z. and C. Zhang (2004). "The Roles of Geography Markup Language (GML), Scalable Vector Graphics (SVG), and Web Feature Service (WFS) Specifications in the Development of Internet Geographic Information Systems (GIS), " *Journal of Geographic Systems*, 6: 95-116. Retrieved March 29, 2012 from: <http://gis.geog.uconn.edu/personal/paper1/journal%20paper/3%202004%20GeographicalSystem1.pdf>
- Ramos, C., W. Cartwright, and R. de Almeida (2007). "Scalable Vector Graphics and Web Map Publishing," Chapter in *Multimedia Cartography*. Eds. W. Cartwright, M. Peterson, and G. Gartner. Springer: New York, New York.

# Image References

- Slide 2: Drug Enforcement Administration [Public domain or Public domain], via Wikimedia Commons. [http://upload.wikimedia.org/wikipedia/commons/3/3f/Drug\\_Money\\_and\\_weapons\\_seized\\_by\\_the\\_Mexican\\_Police\\_and\\_the\\_DEA\\_2007.jpg](http://upload.wikimedia.org/wikipedia/commons/3/3f/Drug_Money_and_weapons_seized_by_the_Mexican_Police_and_the_DEA_2007.jpg)
- Slide 3: Presenter's own work for the University of San Diego Trans-Border Institute: [http://www.sandiego.edu/peacestudies/images/tbi/Ejec\\_Overlay\\_2011\\_Asof\\_Dec30.gif](http://www.sandiego.edu/peacestudies/images/tbi/Ejec_Overlay_2011_Asof_Dec30.gif)
- Slide 4: tkgd2007. [Public domain], via Wikimedia Commons. [http://commons.wikimedia.org/wiki/File:Letters\\_SVG.svg](http://commons.wikimedia.org/wiki/File:Letters_SVG.svg)
- Slide 5: Allstrak (File:States of Mexico.svg) [CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0) or GFDL (www.gnu.org/copyleft/fdl.html)], via Wikimedia Commons. [http://commons.wikimedia.org/wiki/File:Mexico\\_Map.svg](http://commons.wikimedia.org/wiki/File:Mexico_Map.svg)
- Slide 7: Screenshot taken by presenter of *New York Times* article. Marsh, Bill. "It's All Connected: An Overview of the Euro Crisis," *The New York Times*, October 22, 2011. Retrieved March 29, 2012 from: <http://www.nytimes.com/interactive/2011/10/23/sunday-review/an-overview-of-the-euro-crisis.html>
- Slide 8: Screenshot taken by presenter of *New York Times* article. Bilton, Nick. "Adobe to Kill Mobile Flash, Focus on HTML5," *New York Times*, November 9, 2011. Retrieved March 18, 2012 from: <http://bits.blogs.nytimes.com/2011/11/09/adobe-to-kill-mobile-flash-focus-on-html5/>
- Slide 10: Screenshot taken by presenter of SVG mapping application <http://www.alistapart.com/d/cross-platform-scalable-vector-graphics-with-svgweb/map-example/> on March 17, 2012
- Slide 11: Screenshot taken by presenter of SVG mapping application <http://www.codeproject.com/Articles/262179/SVG-World-Map> on March 17, 2012
- Slide 13: Screenshot taken by presenter of the University of San Diego's Trans-Border Institute's website. Map is presenter's own work for the University of San Diego Trans-Border Institute: [http://www.sandiego.edu/peacestudies/images/tbi/Ejec\\_Total\\_2011\\_Asof\\_Dec30.gif](http://www.sandiego.edu/peacestudies/images/tbi/Ejec_Total_2011_Asof_Dec30.gif)
- Slide 15: Map prototype designed and developed by presenter using Balsamiq (<http://www.balsamiq.com/products/mockups>)
- Slide 16: RRZEicons (Own work) [CC-BY-SA-3.0 (www.creativecommons.org/licenses/by-sa/3.0)], via Wikimedia Commons. <http://commons.wikimedia.org/wiki/File:Database.svg>
- Slide 17: Screenshot of application designed and developed by the presenter. Taken March 29, 2012.
- Slide 18: SASI Group (University of Sheffield) [CC-BY-3.0 (www.creativecommons.org/licenses/by/3.0)], via Wikimedia Commons. [http://commons.wikimedia.org/wiki/File:Fleischkonsum\\_126.png](http://commons.wikimedia.org/wiki/File:Fleischkonsum_126.png)