

Potential Landslides In The Bay Area

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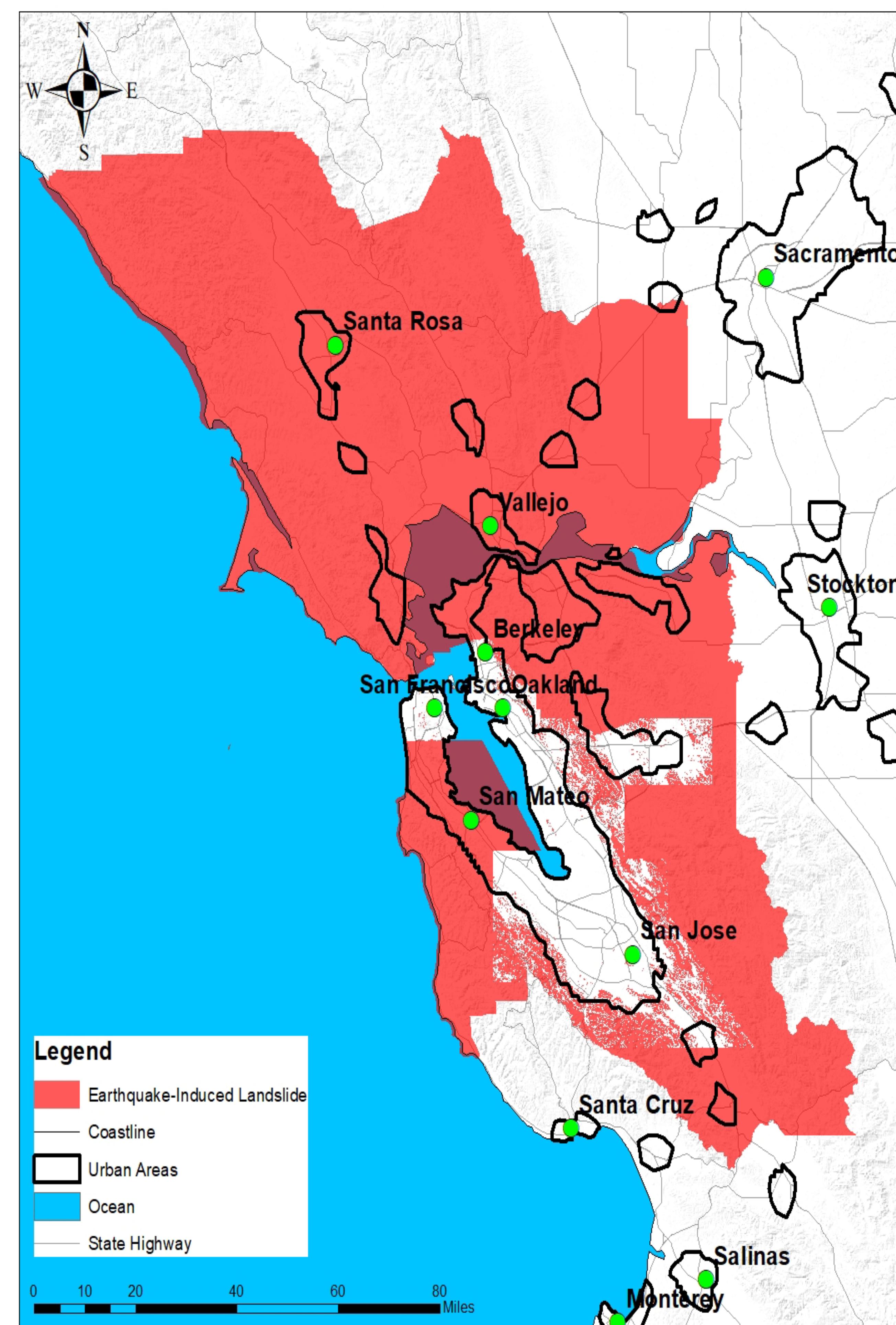
Abstract

The landslides in Bay Area can be categorized as earthquake-induced or rainfall-induced. The development of the Landslide Hazard Zone in the area is based on the landslide generation caused by major earthquake and rainstorm events from 1950 to 2009. Both earthquake-induced and rainfall-induced landslide are common. However, the region is primarily more susceptible to landslide caused by rainfall. The purpose of this project is to identify the areas in the Bay Area that are prone to earthquake-induced and rainfall-induced landslide.

Introduction

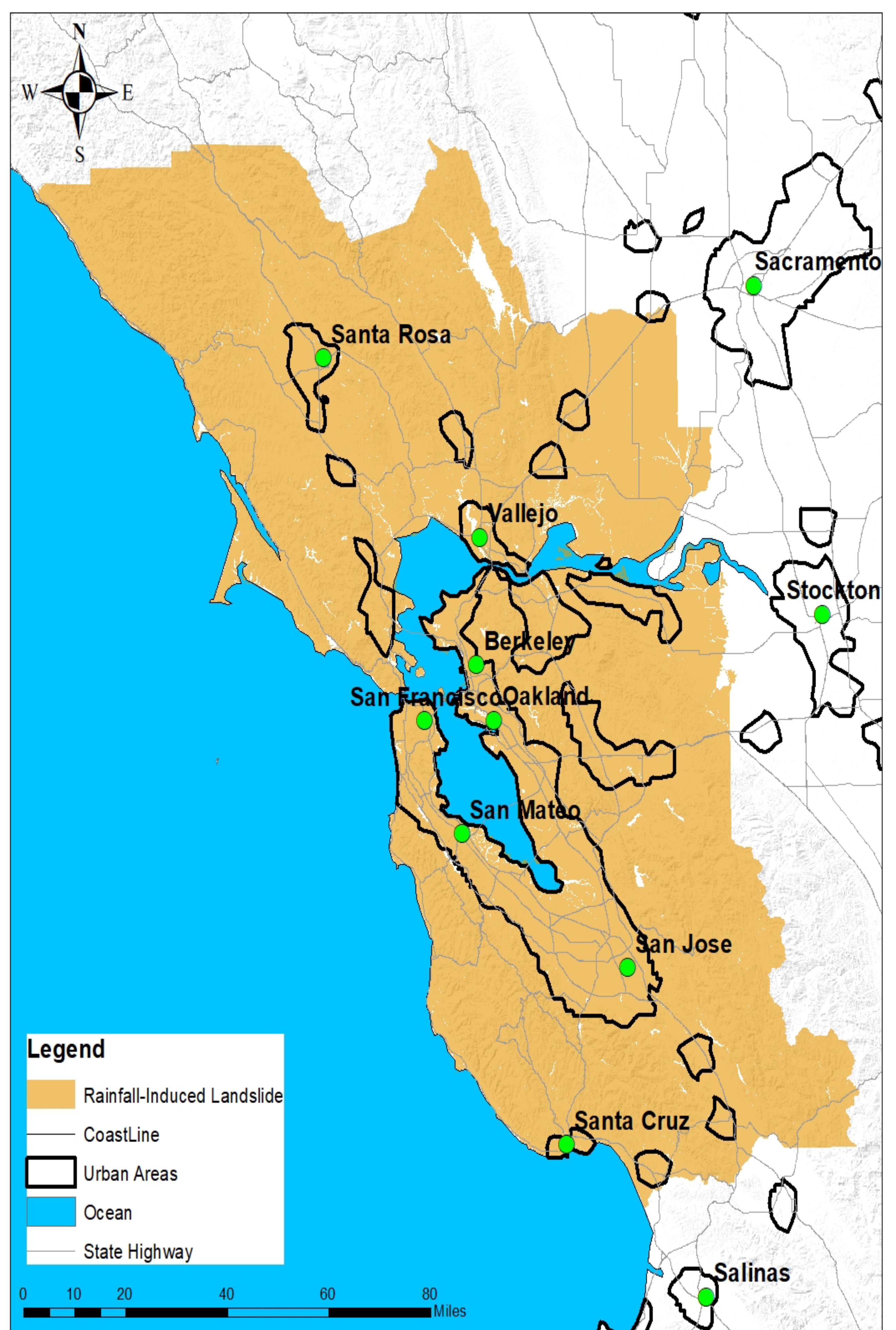
The San Francisco Bay Area in California is an area known for its high susceptibility to different types of landslide. Due to its large number of population that is continuously growing, landslide is considered one of the most dangerous hazards in the region. The occurrence of landslide in the Bay Area is mainly caused by environmental and geologic factors. Therefore, the two most common types of landslide that occur in the Bay Area can be categorized as earthquake-induced landslide and rainfall-induced landslide. After World War II, multiple developments that started in the flatland areas continued into the foothills and steep slopes of the mountains surrounding the Bay Area. As a result, the cost for landslide damage increased and landslide monitoring became more crucial.

Map 1. Earthquake-Induced Landslide



16,889 km² of potential earthquake-induced landslide

Map 2. Rainfall-Induced Landslide



18,325 km² of potential rainfall-induced landslide

Results

- 23% of the 4.39 million acres of land in the Bay Area are areas mapped where existing intense landsliding occur.
- 8.3% of the urban areas and 28.2% of non-urban lands are included in areas where current intense landslides occur (caused by both factors).
- 58.1% of the 94,704 acres of urban land included in the areas where current intense landsliding occur is in residential use.
- Urban land located in these mostly landslide areas range from 17.7% in Marin County, 13.7% in Sonoma County, and 10.9% in Contra Costa County to a low of 1% in San Francisco.

Conclusion

Based on the map shown, rainfall-induced landslide is more common than earthquake-induced landslide in the Bay Area. There is 16,889 km² of potential landslide caused by earthquake (Map 1) and 18,325 km² of possible rainfall-induced landslide (Map 2). The areas where both of these types of landslide can potentially occur are underlain by a weak type of soil that can easily fail during an earthquake or rainstorm event. Overall, the whole San Francisco Bay Area region is highly susceptible to any type of landslides. Both urban and non-urban areas in the Bay Area may experience landslides based on the current occurrence of landslides caused by both earthquake and intense amount of rainfall.

Methods

The following list includes all the steps performed in order to complete the project using ArcGIS:

1. Gather GIS data from sources specified in the References section.
2. Add the States and Provinces layer.
3. Select and create a new layer for California.
4. Add layers such as Coastline, Ocean, Urban Areas, Populated Places, and State Highways.
5. Clip all the layers mentioned in the previous step to California.
6. Add the California DEM layer.
7. Add hillshade background using the California DEM layer.

Location



References

- <http://resilience.abag.ca.gov/open-data/>
- <https://www.naturalearthdata.com/downloads/>
- Multi-Jurisdictional Local Hazard Mitigation Plan For the San Francisco Bay Area. Association of Bay Area Governments Resilience Program. <http://resilience.abag.ca.gov/wp-content/documents/ThePlan-C-2010.pdf>
- San Francisco Bay Area Landslide Folio. US Geological Survey. <https://earthquake.usgs.gov/learn/topics/geologicmaps/landslides.php>